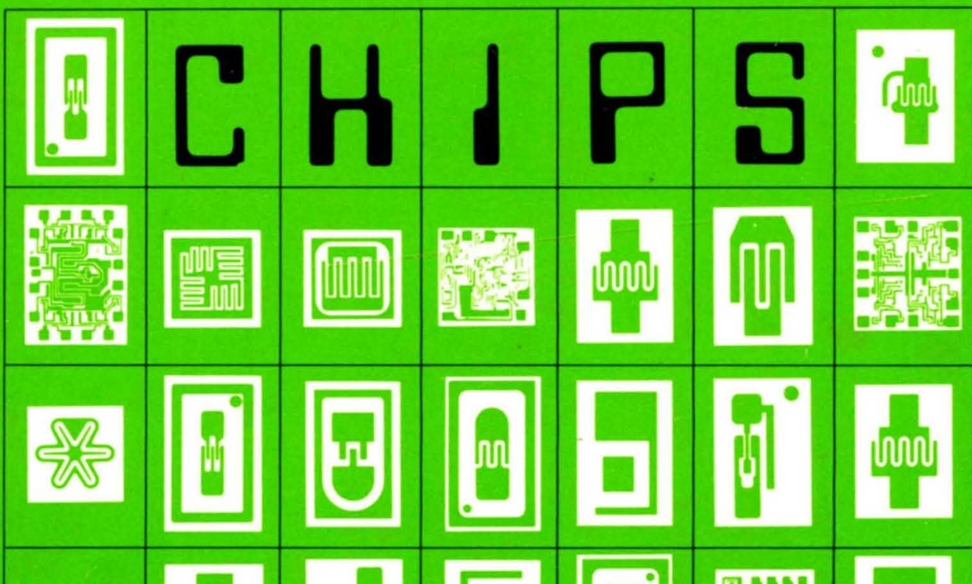
Volume 8/Series A

Semiconductor Data Library



MOTOROLA *Semiconductor Products Inc.*

Volume 8/Series A

prepared by
Technical Information Center

Semiconductor Data Library

CHIPS

The increasing complexity of today's electronic systems is accompanied by paralleling demands for increased component density, improved subsystem reliability and reduced functional costs. This triple requirement is leading to widespread adaptation of hybrid technologies and consequently, to a rapidly expanding demand for unencapsulated semiconductor components.

Motorola is responsding to this demand by making available, in chip form, virtually all of the thousands of discrete and integrated circuit devices in its standard-product catalogs.

The information in this book has been carefully checked and is believed to be reliable, however, no responsibility is assumed for inaccuracies. Furthermore, this information does not convey to the purchaser of semiconductor devices any license under the patent right of any manufacturer.

Printed in U.S.A.

CHAPTER 1
General Information

GENERAL INFORMATION

This Chips Data Book provides the information on physical characteristics, size, geometry, pad layout, metallization and bonding techniques, needed by hybrid microcircuit manufacturers to use these chips in their circuits. It presupposes that the electrical selection has been made and a specific device or electrical selection thereof has been determined.

HOW TO USE THE CHIPS DATA BOOK

STEP 1 Determine the standard device by JEDEC or Motorola part number that meets your electrical requirements. Motorola's Semiconductor Data Library, Selector Guides, Cross References, Data Sheets, Handbooks, and Application Notes are complete and convenient sources of electrical selection information.

STEP 2 Find the desired device by JEDEC or Motorola number in the Index. For discrete devices note the Product Family and geometry number.

STEP 3 Turn to the Product Family section for specific information on chip layout, metallization, bonding, testing guidelines, and ordering information. Discrete geometries within a Product Family are in alphanumeric sequence by geometry number; IC geometries are by device number. The table of contents on the first page of each chapter will assist in locating the information.

STEP 4 See the following pages and specific Product Family sections for additional information on packaging, probe capabilities, quality assurance provisions, special features, Hi-Rel testing, visual inspection, ordering, and non-standard process capabilities.

STEP 5 Place order with your nearest Motorola Sales Office or franchised distributor.

CHIP AVAILABILITY

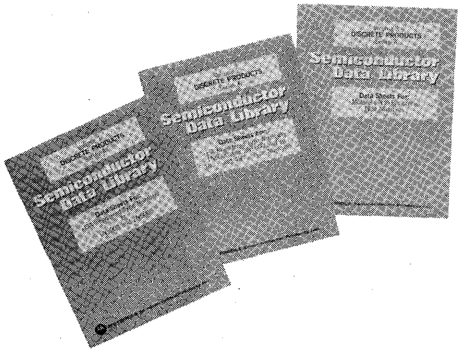
A great strength of Motorola's chip program is the ability to draw from the vast classified wafer inventory for all standard products. The presence of this wafer inventory permits quick response to orders for most standard devices and for electrical selections from the standards.

A wide variety of IC and discrete Flip Chips, designed specifically for use in hybrid circuits, are supplied by Motorola. See the Flip Chip section for complete information on these devices.

Motorola is completely equipped with electrical, visual and environmental test equipment to provide chips and wafers qualified to the most stringent reliability requirements of Space and Military applications.

Most of these chips are available to the user at any stage of processing from unscribed, class or sample-probed wafers, to fully tested, individual chips in Multi-Pak carriers. The processing stages for discrete chips are presented in the following Discrete Chip Processing Flow Chart. Integrated circuit Processing Flow is presented in the specific Product Family sections.

THE MOTOROLA SEMICONDUCTOR DATA LIBRARY



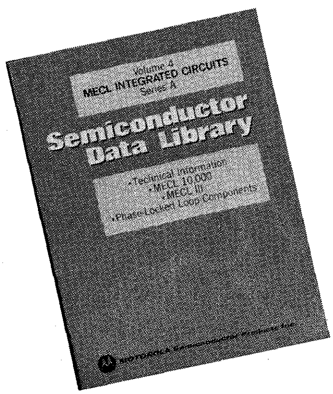
This reference library provides technical data on a wide variety of discrete devices. It is an ideal working tool for all designers and users of semiconductors.

VOLUME 1 Includes complete data sheets for EIA-registered type numbers available from Motorola up to 1N5000 and 2N5000.

VOLUME 2 Includes complete data sheets for EIA-registered type numbers available from Motorola from 1N5000 and 2N5000 and up, plus 3N- and 4N-types.

VOLUME 3 Includes complete specifications for all Motorola discrete component non-registered device type numbers.

$9.00/set



VOL. 4 – MECL DATA BOOK

This Data Book provides comprehensive specifications, and family systems characteristics of the MECL family of digital integrated circuits. Data sheets are included on MECL III and the popular MECL 10,000 family, plus information on compatible circuits, phase-locked loops and Motorola's MIL-M-38510 program.

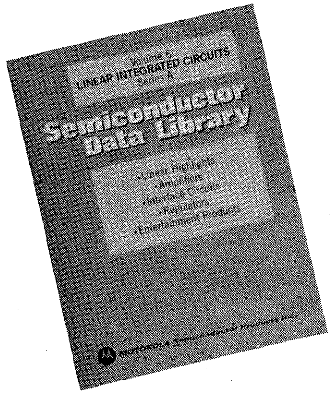
$3.00

VOL. 5 – CMOS DATA BOOK

Written with the very latest mid-'76 industry-wide B-Series CMOS specifications formulated under JEDEC cognizance, this all-CMOS (*only* CMOS) data book is *the* authoritative work in its field.

The book covers over 100 parts in the new Motorola B-Series, representing the broadest line of presently available B-Series CMOS in SSI, MSI and LSI complexities. It also features CMOS LSI circuits. In addition to data sheets, reliability and handling procedures and all the other reference material you've come to expect in Motorola data books, you'll find one section on "previews" of new devices.

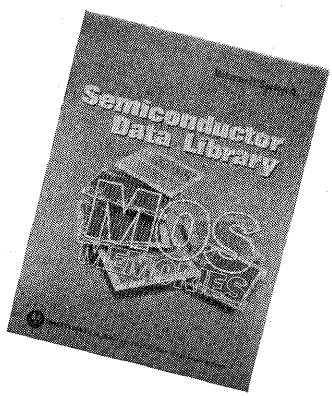
$2.50



VOL. 6 – LINEAR IC DATA BOOK

This 847 page book includes master index, product highlights, selector guides, previews of new products, cross-reference, MIL-M-38510, data sheet specs, package information and application notes. All at your fingertips, in one handy volume!

$3.00



VOL. 7 – MOS MEMORIES DATA BOOK

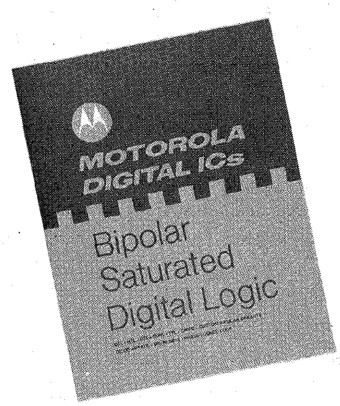
This 320-page book presents technical information on all of Motorola's broad, expanding MOS memory lines in data sheet format. NMOS and CMOS RAMs and ROMs are detailed, with selection guides for quick reference. In addition, it includes applications and reliability information together with the memories that are a part of Motorola's M6800 Family for microcomputer systems. One chapter is devoted to the necessary information on memory interface. The book deals with those memories planned as well as those already available.

$2.50

BIPOLAR SATURATED DIGITAL LOGIC BOOK

This 200-page book provides selector guides, logic diagrams, and general family information on a wide variety of bipolar digital product lines. Included are TTL (including SUHL types), DTL, HTL, RTL, and Diode Arrays. A cross reference and a listing of devices included in Motorola's MIL-M-38510 program add to the usefulness of this book.

$1.50



CHIP DESIGNATION SYSTEM

The chips of all Motorola JEDEC devices and Motorola non-registered devices are designated by the letter *C* after the prefix. These chips are tested and or guaranteed to the published Motorola data sheet performance subject to probe limitations and qualifications detailed in each Product Family section.

The chip designation system also includes each chip processing stage and works as follows:

TABLE 1 — CHIP DESIGNATION EXAMPLES:

Encapsulated Device Designation	Chip Device Designation	* Example of Chip Device with Typical Packaging Suffix (See Table 2)
Discrete Devices		
2N2222	2NC2222	2N2222 (Multi-Pak; no quantity)
MPSA92	MPSAC92	MPSAC92-2 (Multi-Pak; 100 chips)
MJ3055	MJC3055	MJC3055-25 (Multi-Pak; 25 chips)
1N749	1NC749	1NC749PV (Vial)
MBD201	MBDC201	MBDC201PK (Vacu-Pak)
Integrated Circuits		
MC10101L	MCC10101	MCC10101-1 (Multi-Pak, 10 chips)
MCC5400	MC5400	MCC5400-2 (Multi-Pak, 100 chips)
	Wafer Designation	
MC4344	MCW4344	MCW4344 (IC Wafer)

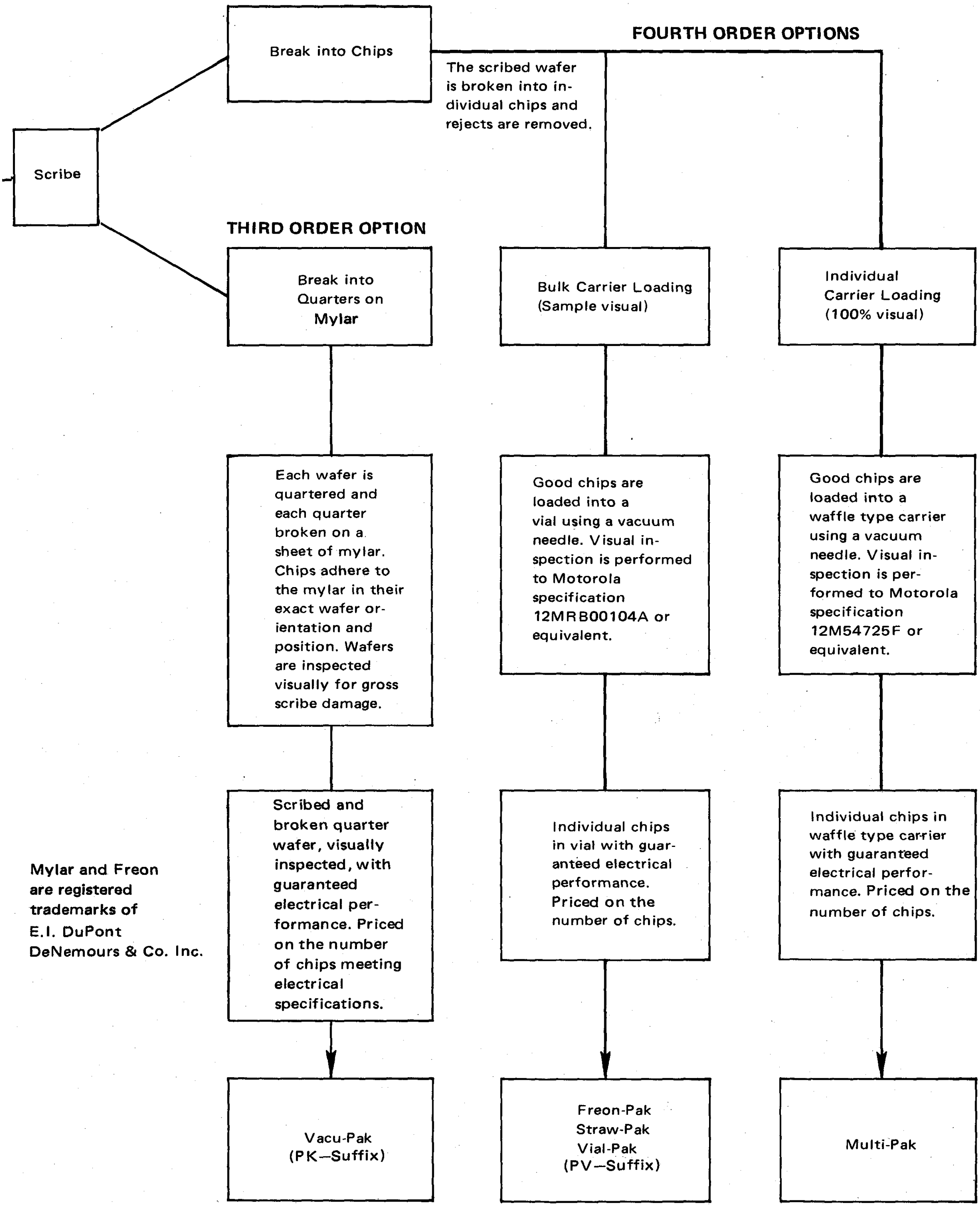
TABLE 2 — PACKAGING SUFFIX

	Suffix	Description
Discrete Products & Integrated Circuits	(none)	Multi-pak, no quantity limitation, 100% visual inspection to standard criteria of each Product Family.
	-1	10 chips per Multi-pak; 100% visual
	-2	100 chips per Multi-pak; 100% visual
	-25	25 chips per Multi-pak; 100% visual
	-4	400 chips per Multi-pak; 100% visual
Discrete Products only	L	Multi-pak; any quantity per carrier, 100% visual per standard Product Family criteria to relaxed LTPD and/or lower power inspection
	PV	Vial; sample visual
	PK	Vacu-Pak; sample visual
	W	Wafer-Pak; class probed, unscribed wafer, sample visual
	WP	Wafer-Pak; unit probed, unscribed wafer, sample visual

DISCRETE CHIP PROCESSING FLOW CHART

		FIRST ORDER OPTION	SECOND ORDER OPTION
	Wafer Classification (Visual)	Wafer Class Probe (Electrical)	Wafer Unit Probe (Electrical)
PROCESS DESCRIPTION	Each wafer visually inspected by a qualified Q. C. inspector to Motorola specification 12M55254L or equivalent. Only wafers passing this inspection are accepted for further processing. See Appendix A for details.	At least 10 chips on each wafer are probed for DC parameters. The wafer is then assigned for processing to a specific device specification.	All chips on each wafer are probed for specific DC parameters. All electrical rejects are inked.
RESULTING PRODUCT		Unscribed wafer visually inspected, with statistically guaranteed electrical performance. Priced on a wafer basis.	Unscribed wafer, visually inspected; with guaranteed electrical performance. Priced according to the number of chips meeting electrical specifications.
SHIPPING CARRIER	All carriers are shipped with "tamper-proof" seals affixed by Q.A. personnel. See Appendix A for suggested incoming visual inspection.	Glass-Pak Wafer-Pak (W–Suffix)	Glass-Pak Wafer-Pak (WP–Suffix)

1



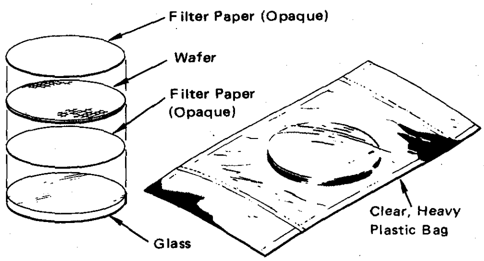
Mylar and Freon are registered trademarks of E.I. DuPont DeNemours & Co. Inc.

CHIP PACKAGING

Motorola supplies chips in a variety of standard packages to handle the different processing stages and to accommodate customers with both large and small quantity requirements.

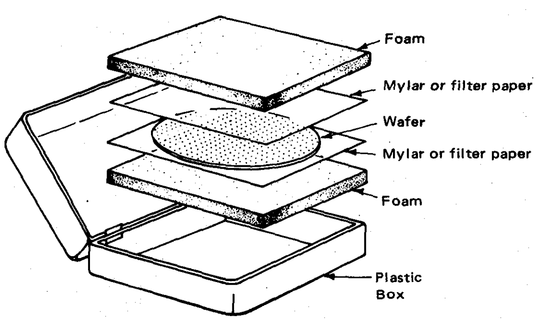
WAFER PACKAGING

FIGURE 1 — GLASS-PAK (Discrete Products only)
(Wafer — Unscribed)



The unscribed wafer is held between two pieces of filter paper and is protected from breakage by the thick glass plate. The wafer and the glass plate are held together firmly in the evacuated and thermally sealed plastic bag.

FIGURE 2 — WAFER-PAK
(Discrete Products and Integrated Circuits)
(Wafer — Unscribed)

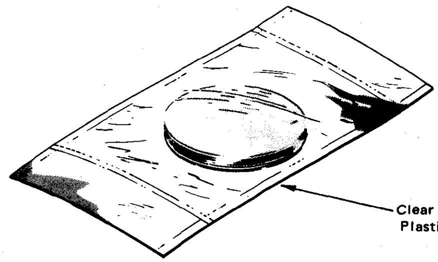


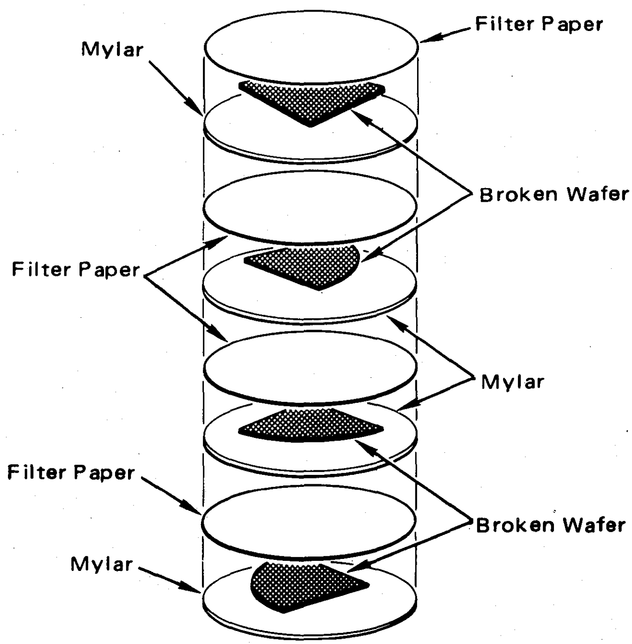
Wafers are shipped between two layers of mylar of inert filter paper sandwiched between two layers of polyfoam pressed together in a plastic box. This technique prevents movement or damage to the wafer in shipment.

FIGURE 3 – VACU-PAK (Discrete Products only)
(Wafer-Scribed and Broken on Mylar)

1

Each quarter wafer is scribed and broken on a sheet of mylar with the gold-backed side against the mylar. The chips stick to the mylar and maintain their exact wafer orientation and spacing. A maximum of four-quarter wafer sections are packaged as illustrated. The evacuated plastic bag is thermally sealed, holds the contents securely, and allows no chip movement. See handling precautions for Vacu-Pak Carrier.





VACU-PAK – HANDLING PRECAUTIONS

Care must be exercised when opening the package to avoid disturbing the chips. The following procedure is recommended:

STEP 1: Place the Vacu-Pak on a flat surface with the opaque filter paper side of the sandwich up and the mylar side down.

STEP 2: With a sharp knife, cut through three sides of the top of the plastic bag so it can be carefully rolled back. Gently hold the top piece of filter paper in position as the bag is rolled back.

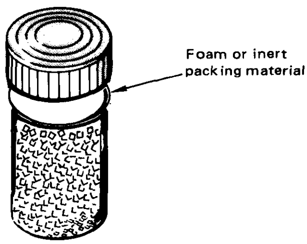
STEP 3: Roll back the filter paper on the top layer of scribed and broken wafer quarters making sure no chips adhere to the filter paper.

STEP 4: With tweezers grasp the uppermost mylar sheet and slide the exposed quarter wafer on to a grease plate, bonding platform or container for storage. Do not make waves in the mylar.

STEP 5: Keep the mylar on a flat, smooth surface. Individual chips can be easily lifted off the mylar with a vacuum pick-up needle without disturbing the remaining chips.

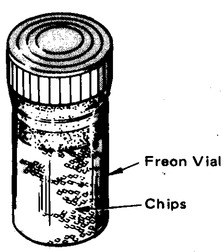
BULK PACKAGING

FIGURE 4 — VIAL-PAK (Discrete Products only)



The Vial-Pak is designed for the large quantity user. Chips are held in position with foam or inert packing material.

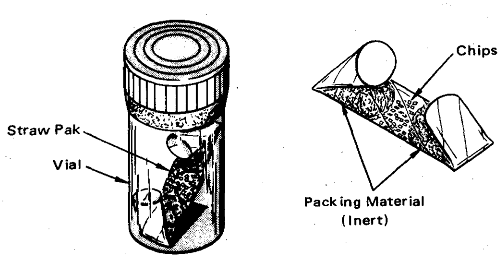
FIGURE 5 — FREON VIAL (Zener Products only)
(5000 Chips, Maximum)



Chips are protected from damage by being immersed in Freon TF.

Freon TF (Trichlorotrifluoroethane) is non-flammable, non-explosive, exceptionally pure, chemically stable and low in toxicity. Freon TF leaves a residue-free surface when parts are dried at room temperature. To remove the chips pour the Freon TF through a piece of filter paper into a beaker or waste can. Chips will dry rapidly when left at room temperature.

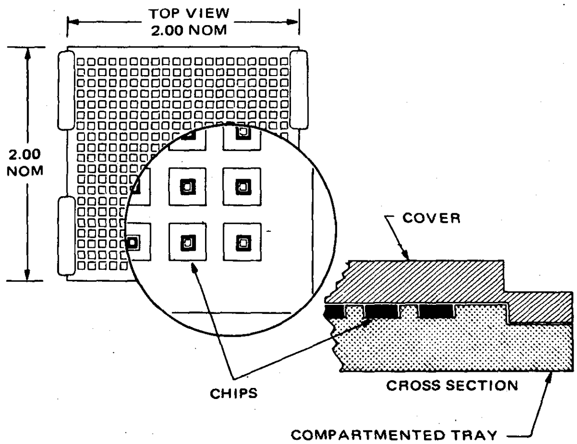
FIGURE 6 — STRAW-PAK (Discrete Products only)



The chips are contained in a section of straw which is placed in a plastic vial. Packing material as indicated prevents movement of the chips and keeps the chips from being crushed by the top bend of the straw during packaging and subsequent opening and closing for inspection and use.

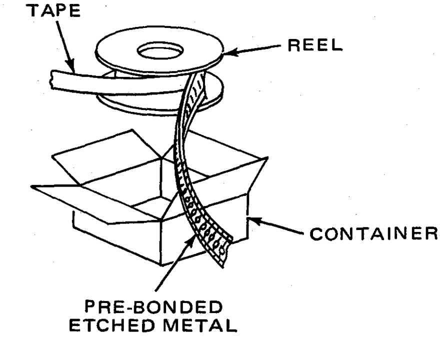
INDIVIDUAL PACKAGING

FIGURE 7 – MULTI-PAK
(Discrete Products and Integrated Circuits)



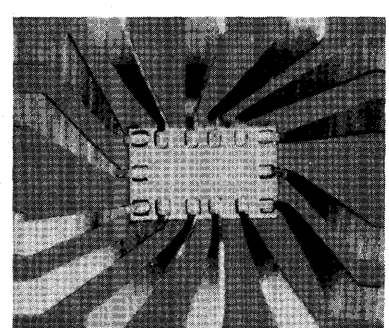
This is a 2"x2" waffle type carrier with a separate hole for each chip, holding up to 400 chips depending upon chip size.

FIGURE 8 – M.E.S.A. PAK
(Motorola Etched Strip Assembly)



Dice pre-bonded to an etched metal tape pattern. The M.E.S.A. method of chip mounting offers excellent heat conductivity away from the die.

Consult factory for availability.



PROBE CAPABILITY

Individual chips are tested to data sheet or negotiated specifications for dc parameters within the limitations of chip probe capabilities. The following table presents unit probe capabilities of equipment in use at this time.

During unit probe, the desired tests and limits are programmed and all chips on the entire wafer are probed. Chips failing any test are automatically inked as rejects. Parameters that are outside the accuracies or limits of the test equipment can often be guaranteed by correlating to measureable values. Wafers can be qualified to certain limits by encapsulating and measuring a sample of chips from the wafer on standard test set-ups.

Ac parameters, switching and threshold (noise figure, power gain) tests cannot be performed directly on a chip in wafer form, but can be guaranteed on the basis of testing encapsulated samples from a wafer or lot.

TABLE 3 – ELECTRICAL TEST CAPABILITY FOR PROBING OF BIPOLAR TRANSISTORS AND DIODE DISCRETE CHIPS

Parameter	Test Condition Limits	Limits
All Breakdown Voltages	10μA-150mA	0-500V
All Leakage Currents	0-500V	100nA-1.5mA
Current Gain (h_{FE})	100μA-500mA	0-15,000
All Saturation & "on" Voltages	100μA-1.5A	0-10V
Forward Voltages (V_F)	0-150mA	0-25V

RELIABILITY AND QUALITY ASSURANCE

Chip processing steps include several independent visual and electrical checks on the product by Quality Assurance (QA) personnel. Prior to shipment, a final QA examination of the product is performed to insure that all requirements of the purchase order are met. The total function of the Motorola Reliability and Quality Assurance (R and QA) organization is quite broad is presented in the Semiconductor Products Division R and QA Manual, which is available upon request.

Integrated circuit chips are subjected to the same in-process controls as Motorola's standard encapsulated devices. The chips processing and quality control requirements are designed to ensure reliability and performance of the finished product. A.C. and D.C. parameters which cannot be tested directly to limits and conditions as specified on standard data sheets, are guaranteed to an LTPD of 20/2. These quaranteed limits are valid only when the chips are properly assembled.

TABLE 4 – STANDARD QA SAMPLING PLANS FOR DEVICE AND WAFERS

Characteristic	LTPD	Maximum Sample Size	Maximum Acceptance No.
Visual and Mechanical			
Multi-Pak, Vial-Pak (100% Production Inspected)	10	52	2
Glass-Pak and Vacu-Pak	20	69	9
DC Electrical Parameters	10	38	1
AC Electrical and Temperature Parameters	20	25	2

RECOMMENDED INCOMING INSPECTION PROCEDURES

Motorola assures that the devices will meet the customers' incoming visual inspection when inspected to the visual criteria and LTPD limits specified. Inspection must be performed at the power and magnification indicated. Motorola guarantees dc parameters to LTPD limits specified.

Return Components

It is suggested that the customer perform incoming inspection in the following sequence:

1. Visual
2. Test dc electrical parameters

A. If the lot fails visual inspection, containers must be closed and secured and the entire lot returned to Motorola with a detailed inspection report. In no case will Motorola accept rejected material that the customer has inspected 100%.

B. After the lot has passed incoming visual inspection, samples are selected and subjected to electrical tests of the dc parameters. If samples do not pass the electrical tests, they shall be packaged separately and identified with all the information from the original package of chips. The shipping container must be closed and secured. The entire lot together with the test samples and a detailed inspection report shall be returned to Motorola. In no case will Motorola accept rejected material that the customer has inspected 100%.

HI REL TESTING

Chips and wafers can be qualified for extremely critical applications by rigorous testing of encapsulated samples, tight 100% visual inspection, SEM, strict process control and traceability to wafer and lot.

Chips used in military or other highly reliable applications are tested by the Motorola QA personnel and conform to the following military specifications:

MIL-C-45662	Calibration System Requirements
MIL-I-45208	Inspection System Requirements
MIL-M-38510	General Specifications for Microcircuits
MIL-Q-9858	Quality Program Requirements
MIL-S-19500	General Specifications for Semiconductor Devices
MIL-S-883	Test Methods and Procedures for Microelectronics

1

NOTES

CHAPTER 2
Index

2

KEY TO COLUMN IDENTIFICATION FOR DISCRETE DEVICE CHIPS

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1	2	3	4	5	6

Column 1 — Device Type

Alphanumeric listing of nearly all discrete, encapsulated devices made by Motorola and with data sheets published by Motorola.

Column 2 — Chip Number

Designation for the chip probed as closely as possible to the data sheet of the Column 1 device. Refer to the Product Family sections and General Information section for specific information on physical characteristics and probe limitations.

Column 3 — Alternate Chip

Designation of an alternate chip which could offer advantages over the Column 2 chip in areas of performance, availability, physical characteristics or price. Refer to the Product Family section for guidance.

Column 4 — Family

The following abbreviations are used for discrete devices; the page number for each family is listed on page 3-1.

Diac	Bilateral Trigger
FETJ	Junction FET
FETM	MOSFET
FETM(D)	Dual MOSFET
FETMDG	Dual Gate MOSFET
FETMQ	Monolithic Quad MOSFET
IRED	Infrared-Emitting Diode
PDD	PIN Photodiode Detector
PDT	Phototransistor Detector
PDTR	Photodarlington Detector
PIN	PIN Switching Diode
PUT	Programmable UJT (Trigger)
PWR	Silicon Power Transistor
RF	RF Transistor
SBD	Schottky Barrier Low-Level Diode
SBR	Schottky Barrier Rectifier
SBS	Silicon Bidirectional Switch (Trigger)
SCR	Silicon-Controlled Rectifier
SST	Small-Signal Transistor
SST(D)	Dual Small-Signal Transistor
SSTR	Darlington Small-Signal Transistor
SUS	Silicon Unidirectional Switch (Trigger)
SWD	Silicon Switching Diode
TD	Abrupt Junction Tuning Diode
TD-D	Monolithic Dual Diodes
TDHA	Hyper-Abrupt Junction Tuning Diodes
Triac	Bilaterial SCR
UJT	Unijunction Transistor (Trigger)
Z	Zener Voltage Regulator Diode
ZCL	Field-Effect Current Regulator Diode
ZREF	Precision Voltage Reference Diode (Zero TC)

Column 5 — Polarity

Shows polarity of transistors: N for NPN, or P for PNP.

Column 6 — Geometry

This number indicates a specific geometry which is *shown in alphanumeric order in the Product Family section.*

ALPHANUMERIC INDEX

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1M110ZS10,5	1MC110ZS10,5		Z		B
thru	thru				
1M200ZS10,5	1MC100ZS10,5		Z		B
1N746,A	1NC746,A	MZC3.3A10,5	Z		B-A
1N747,A	1NC747,A	MZC3.6A10,5	Z		B-A
1N748,A	1NC748,A	MZC3.9A10,5	Z		B-A
1N749,A	1NC749,A	MZC4.3A10,5	Z		B-A
1N750,A	1NC750,A	MZC4.7A10,5	Z		B-A
1N751,A	1NC751,A	MZC5.1A10,5	Z		B-A
1N752,A	1NC752,A	MZC5.6A10,5	Z		B-A
1N753,A	1NC753,A	MZC6.2A10,5	Z		B-A
1N754,A	1NC754,A	MZC6.8A10,5	Z		B-A
1N755,A	1NC755,A	MZC7.5A10,5	Z		B-A
1N756,A	1NC756,A	MZC8.2A10,5	Z		B-A
1N757,A	1NC757,A	MZC9.1A10,5	Z		B-A
1N758,A	1NC758,A	MZC10A10,5	Z		B-A
1N759,A	1NC759,A	MZC12A10,5	Z		B-A
1N821,A	1NC821,A		ZREF		F
1N823,A	1NC823,A		ZREF		F
1N825,A	1NC825,A		ZREF		F
1N827,A	1NC827,A		ZREF		F
1N829,A	1NC829,A		ZREF		F
1N914	1NC914		SWD		EL241
1N914A	1NC914A		SWD		
1N935,A,B	CF		ZREF		F
thru					
1N939,A,B	CF		ZREF		F
1N941,A,B	CF		ZREF		F
thru					
1N945,A,B	CF		ZREF		F
1N957,A,B	1NC957,A,B	MZC6.8A10,5	Z		B-A
1N958,A,B	1NC958,A,B	MZC7.5A10,5	Z		B-A
1N959,A,B	1NC959,A,B	MZC8.2A10,5	Z		B-A
1N960,A,B	1NC960,A,B	MZC9.1A10,5	Z		B-A
1N961,A,B	1NC961,A,B	MZC10A10,5	Z		B-A
1N962,A,B	1NC962,A,B	MZC11A10,5	Z		B-A
1N963,A,B	1NC963,A,B	MZC12A10,5	Z		B-A
1N964,A,B	1NC964,A,B	MZC13A10,5	Z		B-A
1N965,A,B	1NC965,A,B	MZC15A10,5	Z		B-A
1N966,A,B	1NC966,A,B	MZC16A10,5	Z		B-A
1N967,A,B	1NC967,A,B	MZC18A10,5	Z		B-A
1N968,A,B	1NC968,A,B	MZC20A10,5	Z		B-A
1N969,A,B	1NC969,A,B	MZC22A10,5	Z		B-A
1N970,A,B	1NC970,A,B	MZC24A10,5	Z		B-A
1N971,A,B	1NC971,A,B	MZC27A10,5	Z		B-A
1N972,A,B	1NC972,A,B	MZC30A10,5	Z		B-A
1N973,A,B	1NC973,A,B	MZC33A10,5	Z		B-A
1N974,A,B	1NC974,A,B	MZC36A10,5	Z		B-A
1N975,A,B	1NC975,A,B	MZC39A10,5	Z		B-A
1N976,A,B	1NC976,A,B	MZC43A10,5	Z		B-A
1N977,A,B	1NC977,A,B	MZC47A10,5	Z		B-A
1N978,A,B	1NC978,A,B	MZC51A10,5	Z		B-A
1N979,A,B	1NC979,A,B	MZC56A10,5	Z		B-A
1N980,A,B	1NC980,A,B	MZC62A10,5	Z		B-A
1N981,A,B	1NC981,A,B	MZC68A10,5	Z		B-A
1N982,A,B	1NC982,A,B	MZC75A10,5	Z		B-A
1N983,A,B	1NC983,A,B	MZC82A10,5	Z		B-A
1N984,A,B	1NC984,A,B	MZC91A10,5	Z		B-A
1N985,A,B	1NC985,A,B	MZC100A10,5	Z		B-A
1N986,A,B	1NC986,A,B	MZC110A10,5	Z		B-A
1N987,A,B	1NC987,A,B	MZC120A10,5	Z		B-A
1N988,A,B	1NC988,A,B	MZC130A10,5	Z		B-A
1N989,A,B	1NC989,A,B	MZC150A10,5	Z		B-A

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1N990,A,B	1NC999,A,B	MZC160A10,5	Z		B-A
1N991,A,B	1NC991,A,B	MZC180A10,5	Z		B-A
1N992,A,B	1NC992,A,B	MZC200A10,5	Z		B-A
1N2804,A,B	CF		Z		E
thru					
1N2846,A,B	CF		Z		E
1N2970,A,B	CF		Z		D
thru					
1N3015,A,B	CF		Z		D
1N3016,A	CF		Z		C
thru					
1N3051,A	CF		Z		C
1N3305,A,B	CF		Z		E
thru					
1N3350,A,B	CF		Z		E
1N3600	1NC3600		SWD		
1N3785,A,B	CF		Z		E
thru					
1N3820,A,B	CF		Z		E
1N3821,A	CF		Z		C
thru					
1N3830,A	CF		Z		C
1N3993,A	CF		Z		D
thru					
1N4000,A	CF		Z		D
1N4099	1NC4099	MZC6.8B5	Z		B-A
1N4100	1NC4100	MZC7.5B5	Z		B-A
1N4101	1NC4101	MZC8.2B5	Z		B-A
1N4102	1NC4102	MZC8.7B5	Z		B-A
1N4103	1NC4103	MZC9.1B5	Z		B-A
1N4104	1NC4104	MZC10B5	Z		B-A
1N4105	1NC4105	MZC11B5	Z		B-A
1N4106	1NC4106	MZC12B5	Z		B-A
1N4107	1NC4107	MZC13B5	Z		B-A
1N4108	1NC4108	MZC14B5	Z		B-A
1N4109	1NC4109	MZC15B5	Z		B-A
1N4110	1NC4110	MZC16B5	Z		B-A
1N4111	1NC4111	MZC17B5	Z		B-A
1N4112	1NC4112	MZC18B5	Z		B-A
1N4113	1NC4113	MZC19B5	Z		B-A
1N4114	1NC4114	MZC20B5	Z		B-A
1N4115	1NC4115	MZC22B5	Z		B-A
1N4116	1NC4116	MZC24B5	Z		B-A
1N4117	1NC4117	MZC25B5	Z		B-A
1N4118	1NC4118	MZC27B5	Z		B-A
1N4119	1NC4119	MZC28B5	Z		B-A
1N4120	1NC4120	MZC30B5	Z		B-A
1N4121	1NC4121	MZC33B5	Z		B-A
1N4122	1NC4122	MZC36B5	Z		B-A
1N4123	1NC4123	MZC39B5	Z		B-A
1N4124	1NC4124	MZC43B5	Z		B-A
1N4125	1NC4125	MZC47B5	Z		B-A
1N4126	1NC4126	MZC51B5	Z		B-A
1N4127	1NC4127	MZC56B5	Z		B-A
1N4128	1NC4128	MZC60B5	Z		B-A
1N4129	1NC4129	MZC62B5	Z		B-A
1N4130	1NC4130	MZC68B5	Z		B-A
1N4131	1NC4131	MZC75B5	Z		B-A
1N4132	1NC4132	MZC82B5	Z		B-A
1N4133	1NC4133	MZC87B5	Z		B-A
1N4134	1NC4134	MZC91B5	Z		B-A
1N4135	1NC4135	MZC100B5	Z		B-A
1N4370,A	1NC4370,A		Z		B-A
1N4371,A	1NC4371,A		Z		B-A
1N4372,A	1NC4372,A		Z		B-A
1N4549,A,B	CF		Z		E
thru					
1N4564	CF		Z		E
1N4565,A	CF		ZREF		F
1N4566,A	CF		ZREF		F
1N4567,A	CF		ZREF		F
1N4568,A	CF		ZREF		F
1N4569,A	CF		ZREF		F

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1N4570,A	CF		ZREF		F
1N4571,A	CF		ZREF		F
1N4572,A	CF		ZREF		F
1N4573,A	CF		ZREF		F
1N4574,A	CF		ZREF		F
1N4575,A	CF		ZREF		F
1N4576,A	CF		ZREF		F
1N4577,A	CF		ZREF		F
1N4578,A	CF		ZREF		F
1N4579,A	CF		ZREF		F
1N4580,A	CF		ZREF		F
1N4581,A	CF		ZREF		F
1N4582,A	CF		ZREF		F
1N4583,A	CF		ZREF		F
1N4584,A	CF		ZREF		F
1N4728,A	1N4728,A		Z		B
thru	thru				
1N4764,A	1NC4764,A		Z		B
1N4765,A	1NC4765,A		ZREF		F
thru	thru				
1N4784,A	1NC4784,A		ZREF		F
1N4896,A	1NC4896,A		ZREF		F
thru	thru				
1N4932,A	1NC4932,A		ZREF		F
1N5139,A	MVC5139,A		TD		VL19-30
thru	thru				
1N5148,A	MVC5148,A		TD		VL19-30
1N5159	CF				
1N5160	CF				
1N5221,A,B	1NC5221,A,B	MZC2.4A10,5	Z		B-A
1N5222,A,B	1NC5222,A,B	MZC2.5A10,5	Z		B-A
1N5223,A,B	1NC5223,A,B	MZC2.7A10,5	Z		B-A
1N5224,A,B	1NC5224,A,B	MZC2.8A10,5	Z		B-A
1N5225,A,B	1NC5225,A,B	MZC3.0A10,5	Z		B-A
1N5226,A,B	1NC5226,A,B	MZC3.3A10,5	Z		B-A
1N5227,A,B	1NC5227,A,B	MZC3.6A10,5	Z		B-A
1N5228,A,B	1NC5228,A,B	MZC3.9A10,5	Z		B-A
1N5229,A,B	1NC5229,A,B	MZC4.3A10,5	Z		B-A
1N5230,A,B	1NC5230,A,B	MZC4.7A10,5	Z		B-A
1N5231,A,B	1NC5231,A,B	MZC5.1A10,5	Z		B-A
1N5232,A,B	1NC5232,A,B	MZC5.6A10,5	Z		B-A
1N5233,A,B	1NC5233,A,B	MZC6.0A10,5	Z		B-A
1N5234,A,B	1NC5234,A,B	MZC6.2A10,5	Z		B-A
1N5235,A,B	1NC5235,A,B	MZC6.8A10,5	Z		B-A
1N5236,A,B	1NC5236,A,B	MZC7.5A10,5	Z		B-A
1N5237,A,B	1NC5237,A,B	MZC8.2A10,5	Z		B-A
1N5238,A,B	1NC5238,A,B	MZC8.7A10,5	Z		B-A
1N5239,A,B	1NC5239,A,B	MZC9.1A10,5	Z		B-A
1N5240,A,B	1NC5240,A,B	MZC10A10,5	Z		B-A
1N5241,A,B	1NC5241,A,B	MZC11A10,5	Z		B-A
1N5242,A,B	1NC5242,A,B	MZC12A10,5	Z		B-A
1N5243,A,B	1NC5243,A,B	MZC13A10,5	Z		B-A
1N5244,A,B	1NC5244,A,B	MZC14A10,5	Z		B-A
1N5245,A,B	1NC5245,A,B	MZC15A10,5	Z		B-A
1N5246,A,B	1NC5246,A,B	MZC16A10,5	Z		B-A
1N5247,A,B	1NC5247,A,B	MZC17A10,5	Z		B-A
1N5248,A,B	1NC5248,A,B	MZC18A10,5	Z		B-A
1N5249,A,B	1NC5249,A,B	MZC19A10,5	Z		B-A
1N5250,A,B	1NC5250,A,B	MZC20A10,5	Z		B-A
1N5251,A,B	1NC5251,A,B	MZC22A10,5	Z		B-A
1N5252,A,B	1NC5252,A,B	MZC24A10,5	Z		B-A
1N5253,A,B	1NC5253,A,B	MZC25A10,5	Z		B-A
1N5254,A,B	1NC5254,A,B	MZC27A10,5	Z		B-A
1N5255,A,B	1NC5255,A,B	MZC28A10,5	Z		B-A
1N5256,A,B	1NC5256,A,B	MZC30A10,5	Z		B-A
1N5257,A,B	1NC5257,A,B	MZC33A10,5	Z		B-A
1N5258,A,B	1NC5258,A,B	MZC36A10,5	Z		B-A
1N5259,A,B	1NC5259,A,B	MZC39A10,5	Z		B-A
1N5260,A,B	1NC5260,A,B	MZC43A10,5	Z		B-A
1N5261,A,B	1NC5261,A,B	MZC47A10,5	Z		B-A
1N5262,A,B	1NC5262,A,B	MZC51A10,5	Z		B-A
1N5263,A,B	1NC5263,A,B	MZC56A10,5	Z		B-A
1N5264,A,B	1NC5264,A,B	MZC60A10,5	Z		B-A

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1N5265,A,B	1NC5265,A,B	MZC62A10,5	Z		B-A
1N5266,A,B	1NC5266,A,B	MZC68A10,5	Z		B-A
1N5267,A,B	1NC5267,A,B	MZC75A10,5	Z		B-A
1N5268,A,B	1NC5268,A,B	MZC82A10,5	Z		B-A
1N5269,A,B	1NC5269,A,B	MZC87A10,5	Z		B-A
1N5270,A,B	1NC5270,A,B	MZC91A10,5	Z		B-A
1N5271,A,B	1NC5271,A,B	MZC100A10,5	Z		B-A
1N5272,A,B	1NC5272,A,B	MZC110A10,5	Z		B-A
1N5273,A,B	1NC5273,A,B	MZC120A10,5	Z		B-A
1N5274,A,B	1NC5274,A,B	MZC130A10,5	Z		B-A
1N5275,A,B	1NC5275,A,B	MZC140A10,5	Z		B-A
1N5276,A,B	1NC5276,A,B	MZC150A10,5	Z		B-A
1N5277,A,B	1NC5277,A,B	MZC160A10,5	Z		B-A
1N5278,A,B	1NC5278,A,B	MZC170A10,5	Z		B-A
1N5279,A,B	1NC5279,A,B	MZC180A10,5	Z		B-A
1N5280,A,B	1NC5280,A,B	MZC190A10,5	Z		B-A
1N5281,A,B	1NC5281,A,B	MZC200A10,5	Z		B-A
1N5283	1NC5283	CF	ZCL		G
thru	thru				
1N5314	1NC5314	CF	ZCL		G
1N5333,A,B	CF		Z		C
thru					
1N5388,A,B	CF		Z		C
1N5441A, B, C	MVC5441A, B, C		TD		VL44-59
thru	thru				
1N5456A, B, C	MVC5456A, B, C		TD		VL44-59
1N5461A, B, C	MVC5461A, B, C		TD		VL44-59
thru	thru				
1N5476A, B, C	MVC5476A, B, C		TD		VL44-59
1N5518,A,B	1NC5518,A,B	MZC3.3A10,5	Z		B-A
1N5519,A,B	1NC5519,A,B	MZC3.6A10,5	Z		B-A
1N5520,A,B	1NC5520,A,B	MZC3.9A10,5	Z		B-A
1N5521,A,B	1NC5521,A,B	MZC4.3A10,5	Z		B-A
1N5522,A,B	1NC5522,A,B	MZC4.7A10,5	Z		B-A
1N5523,A,B	1NC5523,A,B	MZC5.1A10,5	Z		B-A
1N5524,A,B	1NC5524,A,B	MZC5.6A10,5	Z		B-A
1N5525,A,B	1NC5525,A,B	MZC6.2A10,5	Z		B-A
1N5526,A,B	1NC5526,A,B	MZC6.8A10,5	Z		B-A
1N5527,A,B	1NC5527,A,B	MZC7.5A10,5	Z		B-A
1N5528,A,B	1NC5528,A,B	MZC8.2A10,5	Z		B-A
1N5529,A,B	1NC5529,A,B	MZC9.1A10,5	Z		B-A
1N5530,A,B	1NC5530,A,B	MZC10A10,5	Z		B-A
1N5531,A,B	1NC5531,A,B	MZC11A10,5	Z		B-A
1N5532,A,B	1NC5532,A,B	MZC12A10,5	Z		B-A
1N5533,A,B	1NC5533,A,B	MZC13A10,5	Z		B-A
1N5534,A,B	1NC5534,A,B	MZC14A10,5	Z		B-A
1N5535,A,B	1NC5535,A,B	MZC15A10,5	Z		B-A
1N5536,A,B	1NC5536,A,B	MZC16A10,5	Z		B-A
1N5537,A,B	1NC5537,A,B	MZC17A10,5	Z		B-A
1N5538,A,B	1NC5538,A,B	MZC18A10,5	Z		B-A
1N5539,A,B	1NC5539,A,B	MZC19A10,5	Z		B-A
1N5540,A,B	1NC5540,A,B	MZC20A10,5	Z		B-A
1N5541,A,B	1NC5541,A,B	MZC22A10,5	Z		B-A
1N5542,A,B	1NC5542,A,B	MZC24A10,5	Z		B-A
1N5543,A,B	1NC5543,A,B	MZC25A10,5	Z		B-A
1N5544,A,B	1NC5544,A,B	MZC28A10,5	Z		B-A
1N5545,A,B	1NC5545,A,B	MZC30A10,5	Z		B-A
1N5546,A,B	1NC5546,A,B	MZC33A10,5	Z		B-A
1N5758	1NC5758		DIAC		TL51/53
1N5758A		1NC5758	DIAC		TL51/53
1N5759	1NC5759		DIAC		TL51/53
1N5759A		1NC5759	DIAC		TL51/53
1N5760	1NC5760		DIAC		TL51/53
1N5760A		1NC4760	DIAC		TL51/53
1N5761	1NC5761		DIAC		TL51/53
1N5761A		1NC5761	DIAC		TL51/53
1N5762	1NC5762		DIAC		TL51/53
1N5762A		1NC5762	DIAC		TL51/53
1N5779	CF				
thru	thru				
1N5793	CF				
1N5817	1NC5817		SBR		RL754
1N5818	1NC5818		SBR		RL754

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1N5820	1NC5820		SBR		RL755
1N5821	1NC5821		SBR		RL755
1N5823	1NC5826		SBR		RL756
1N5824	1NC5827		SBR		RL756
1N5825	CF		SBR		RL756
1N5826	1NC5826		SBR		RL756
1N5827	1NC5827		SBR		RL756
1N5828	CF		SBR		RL756
1N5829	1NC5832		SBR		RL760
1N5830	1NC5833		SBR		RL760
1N5831	CF		SBR		RL760
1N5832	1NC5832		SBR		RL760
1N5833	1NC5833		SBR		RL760
1N5834	CF		SBR		RL760
1N5837,A,B	1NC5837,A,B	MZC2.4A10,5	Z		A
1N5838,A,B	1NC5838,A,B	MZC2.5A10,5	Z		A
1N5839,A,B	1NC5839,A,B	MZC2.7A10,5	Z		A
1N5840,A,B	1NC5840,A,B	MZC2.8A10,5	Z		A
1N5841,A,B	1NC5841,A,B	MZC3.0A10,5	Z		A
1N5842,A,B	1NC5842,A,B	MZC3.3A10,5	Z		A
1N5843,A,B	1NC5843,A,B	MZC3.6A10,5	Z		A
1N5844,A,B	1NC5844,A,B	MZC3.9A10,5	Z		A
1N5845,A,B	1NC5845,A,B	MZC4.3A10,5	Z		A
1N5846,A,B	1NC5846,A,B	MZC4.7A10,5	Z		A
1N5847,A,B	1NC5847,A,B	MZC5.1A10,5	Z		A
1N5848,A,B	1NC5848,A,B	MZC5.6A10,5	Z		A
1N5849,A,B	1NC5849,A,B	MZC6.0A10,5	Z		A
1N5850,A,B	1NC5850,A,B	MZC6.2A10,5	Z		A
1N5851,A,B	1NC5851,A,B	MZC6.8A10,5	Z		A
1N5852,A,B	1NC5852,A,B	MZC7.5A10,5	Z		A
1N5853,A,B	1NC5853,A,B	MZC8.2A10,5	Z		A
1N5854,A,B	1NC5854,A,B	MZC8.7A10,5	Z		A
1N5855,A,B	1NC5855,A,B	MZC9.1A10,5	Z		A
1N5856,A,B	1NC5856,A,B	MZC10A10,5	Z		A
1N5857,A,B	1NC5857,A,B	MZC11A10,5	Z		A
1N5858,A,B	1NC5858,A,B	MZC12A10,5	Z		A
1N5859,A,B	1NC5859,A,B	MZC13A10,5	Z		A
1N5860,A,B	1NC5860,A,B	MZC14A10,5	Z		A
1N5861,A,B	1NC5861,A,B	MZC15A10,5	Z		A
1N5862,A,B	1NC5862,A,B	MZC16A10,5	Z		A
1N5863,A,B	1NC5863,A,B	MZC17A10,5	Z		A
1N5864,A,B	1NC5864,A,B	MZC18A10,5	Z		A
1N5865,A,B	1NC5865,A,B	MZC19A10,5	Z		A
1N5866,A,B	1NC5866,A,B	MZC20A10,5	Z		A
1N5867,A,B	1NC5867,A,B	MZC22A10,5	Z		A
1N5868,A,B	1NC5868,A,B	MZC24A10,5	Z		A
1N5869,A,B	1NC5869,A,B	MZC25A10,5	Z		A
1N5870,A,B	1NC5870,A,B	MZC27A10,5	Z		A
1N5871,A,B	1NC5871,A,B	MZC28A10,5	Z		A
1N5872,A,B	1NC5872,A,B	MZC30A10,5	Z		A
1N5873,A,B	1NC5873,A,B	MZC33A10,5	Z		A
1N5874,A,B	1NC5874,A,B	MZC36A10,5	Z		A
1N5875,A,B	1NC5875,A,B	MZC39A10,5	Z		A
1N5876,A,B	1NC5876,A,B	MZC43A10,5	Z		A
1N5877,A,B	1NC5877,A,B	MZC47A10,5	Z		A
1N5878,A,B	1NC5878,A,B	MZC51A10,5	Z		A
1N5879,A,B	1NC5879,A,B	MZC56A10,5	Z		A
1N5880,A,B	1NC5880,A,B	MZC60A10,5	Z		A
1N5881,A,B	1NC5881,A,B	MZC62A10,5	Z		A
1N5882,A,B	1NC5882,A,B	MZC68A10,5	Z		A
1N5883,A,B	1NC5883,A,B	MZC75A10,5	Z		A
1N5884,A,B	1NC5884,A,B	MZC82A10,5	Z		A
1N5885,A,B	1NC5885,A,B	MZC87A10,5	Z		A
1N5886,A,B	1NC5886,A,B	MZC91A10,5	Z		A
1N5887,A,B	1NC5887,A,B	MZC100A10,5	Z		A
1N5888,A,B	1NC5888,A,B	MZC110A10,5	Z		A
1N5889,A,B	1NC5889,A,B	MZC120A10,5	Z		A
1N5890,A,B	1NC5890,A,B	MZC130A10,5	Z		A
1N5891,A,B	1NC5891,A,B	MZC140A10,5	Z		A
1N5892,A,B	1NC5892,A,B	MZC150A10,5	Z		A
1N5893,A,B	1NC5893,A,B	MZC160A10,5	Z		A
1N5894,A,B	1NC5894,A,B	MZC170A10,5	Z		A
1N5895,A,B	1NC5895,A,B	MZC180A10,5	Z		A

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
1N5896,A,B	1NC5896,A,B	MZC190A10,5	Z		A
1N5897,A,B	1NC5897,A,B	MZC200A10,5	Z		A
1N5913,A,B			Z		C
thru					
1N5956,A,B			Z		C
1N5985,A,B		MZC2.4A10,5	Z		B-A
1N5986,A,B		MZC2.7A10,5	Z		B-A
1N5987,A,B		MZC3.0A10,5	Z		B-A
1N5988,A,B		MZC3.3A10,5	Z		B-A
1N5989,A,B		MZC3.6A10,5	Z		B-A
1N5990,A,B		MZC3.9A10,5	Z		B-A
1N5991,A,B		MZC4.3A10,5	Z		B-A
1N5992,A,B		MZC4.7A10,5	Z		B-A
1N5993,A,B		MZC5.1A10,5	Z		B-A
1N5994,A,B		MZC5.6A10,5	Z		B-A
1N5995,A,B		MZC6.2A10,5	Z		B-A
1N5996,A,B		MZC6.8A10,5	Z		B-A
1N5997,A,B		MZC7.5A10,5	Z		B-A
1N5998,A,B		MZC8.2A10,5	Z		B-A
1N5999,A,B		MZC9.1A10,5	Z		B-A
1N6000,A,B		MZC10A10,5	Z		B-A
1N6001,A,B		MZC11A10,5	Z		B-A
1N6002,A,B		MZC12A10,5	Z		B-A
1N6003,A,B		MZC13A10,5	Z		B-A
1N6004,A,B		MZC15A10,5	Z		B-A
1N6005,A,B		MZC16A10,5	Z		B-A
1N6006,A,B		MZC18A10,5	Z		B-A
1N6007,A,B		MZC20A10,5	Z		B-A
1N6008,A,B		MZC22A10,5	Z		B-A
1N6009,A,B		MZC24A10,5	Z		B-A
1N6010,A,B		MZC27A10,5	Z		B-A
1N6011,A,B		MZC30A10,5	Z		B-A
1N6012,A,B		MZC33A10,5	Z		B-A
1N6013,A,B		MZC36A10,5	Z		B-A
1N6014,A,B		MZC39A10,5	Z		B-A
1N6015,A,B		MZC43A10,5	Z		B-A
1N6016,A,B		MZC47A10,5	Z		B-A
1N6017,A,B		MZC51A10,5	Z		B-A
1N6018,A,B		MZC56A10,5	Z		B-A
1N6019,A,B		MZC62A10,5	Z		B-A
1N6020,A,B		MZC68A10,5	Z		B-A
1N6021,A,B		MZC75A10,5	Z		B-A
1N6022,A,B		MZC82A10,5	Z		B-A
1N6023,A,B		MZC91A10,5	Z		B-A
1N6024,A,B		MZC100A10,5	Z		B-A
1N6025,A,B		MZC110A10,5	Z		B-A
1N6026,A,B		MZC120A10,5	Z		B-A
1N6027,A,B		MZC130A10,5	Z		B-A
1N6028,A,B		MZC150A10,5	Z		B-A
1N6029,A,B		MZC160A10,5	Z		B-A
1N6030,A,B		MZC180A10,5	Z		B-A
1N6031,A,B		MZC200A10,5	Z		B-A
2N656	2NC657		SST	N	SL26
2N657	2NC657		SST	N	SL26
2N681	2NC681	MCRC3201	SCR		320
2N682	2NC682	MCRC3201	SCR		320
2N683	2NC683	MCRC3201	SCR		320
2N684	2NC684	MCRC3202	SCR		320
2N685	2NC685	MCRC3202	SCR		320
2N686	2NC686	MCRC3203	SCR		320
2N687	2NC687	MCRC3203	SCR		320
2N688	2NC688	MCRC3204	SCR		320
2N689	2NC689	MCRC3205	SCR		320
2N690	2NC690	MCRC3206	SCR		320
2N691	2NC691	MCRC3207	SCR		320
2N692	2NC692	MCRC3207	SCR		320
2N696		2NC697	SST	N	SL2
2N697	2NC697		SST	N	SL2
2N699		2NC2102	SST	N	SL98
2N702		2NC706B	SST	N	SL73
2N706	2NC706		SST	N	SL73
2N706A		2NC706B	SST	N	SL73
2N706B	2NC706B		SST	N	SL73

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N708	2NC708		SST	N	SL73
2N718	2NC1613		SST	N	SL98
2N718A	2NC1613		SST	N	SL98
2N720		2NC720A	SST	N	SL98
2N720A	2NC720A		SST	N	SL98
2N721		2NC2906	SST	P	SL333
2N722		2NC2906	SST	P	SL333
2N726		2NC869A	SST	P	SL44
2N731		2NC2221A	SST	N	SL2
2N735		2NC720A	SST	N	SL98
2N736	2NC740		SST	N	SL98
2N739		2NC3020	SST	N	SL98
2N740	2NC740		SST	N	SL98
2N743		2NC706B	SST	N	SL73
2N744		2NC3011	SST	N	SL73
2N753	2NC2369		SST	N	SL73
2N834	MPSC834		SST	N	SL73
2N835	2NC835		SST	N	SL73
2N840		2NC720A	SST	N	SL98
2N841		2NC740	SST	N	SL98
2N869		2NC3250A	SST	P	SL271
2N869A	2NC869A		SST	P	SL44
2N871		2NC2102	SST	N	SL98
2N910	2NC910		SST	N	SL98
2N911		2NC910	SST	N	SL98
2N914	2NC914		SST	N	SL73
2N915	2NC915		SST	N	EL221
2N916		2NC915	SST	N	EL221
2N917	2NC917		SST	N	SL75
2N918	2NC918		SST	N	SL75
2N929	2NC929		SST	N	SL18
2N930	2NC930		SST	N	SL18
2N930A	2NC930A		SST	N	SL18
2N956	2NC1711		SST	N	SL2
2N978		2NC2906A	SST	P	SL333
2N995		2NC3251	SST	P	EL271
2N996		2NC869A	SST	P	SL44
2N1131	2NC1131A		SST	P	SL333
2N1131A	2NC1131A		SST	P	SL333
2N1132	2NC1132A		SST	P	SL333
2N1132A	2NC1132A		SST	P	SL333
2N1420		2NC2222	SST	N	SL2
2N1595	2NC1595	MCRC6391	SCR		639
2N1596	2NC1596	MCRC6391	SCR		639
2N1597	2NC1597	MCRC6392	SCR		639
2N1598	2NC1598	MCRC6393	SCR		639
2N1599	2NC1599	MCRC6394	SCR		639
2N1613	2NC1613		SST	N	SL98
2N1708		2NC2319	SST	N	SL73
2N1711	2NC1711		SST	N	SL2
2N1842,A	2NC1842,A	MCRC3201	SCR		320
2N1843,A	2NC1843,A	MCRC3201	SCR		320
2N1844,A	2NC1844,A	MCRC3201	SCR		320
2N1845,A	2NC1845,A	MCRC3202	SCR		320
2N1846,A	2NC1846,A	MCRC3202	SCR		320
2N1847,A	2NC1847,A	MCRC3203	SCR		320
2N1848,A	2NC1848,A	MCRC3203	SCR		320
2N1849,A	2NC1849,A	MCRC3204	SCR		320
2N1850,A	2NC1850,A	MCRC3205	SCR		320
2N1890	2NC1890		SST	N	SL98
2N1893	2NC720A		SST	N	SL98
2N1959		2NC5859	SST	N	SL27
2N1983		2NC2221A	SST	N	SL2
2N1984		2NC2222	SST	N	SL2
2N1990		2NC3114	SST	N	SL26
2N1991	2NC1991		SST	P	SL333
2N2102	2NC2102		SST	N	SL98
2N2192		2NC2193A	SST	N	SL98
2N2192A		2NC2193A	SST	N	SL98
2N2192B		2NC2193A	SST	N	SL98
2N2193		2NC2193A	SST	N	SL98
2N2193A	2NC2193A		SST	N	SL98
2N2194		2NC2193A	SST	N	SL98

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N2194A		2NC2193A	SST	N	SL98
2N2194B		2NC2193A	SST	N	SL98
2N2195		2NC2193A	SST	N	SL98
2N2195A		2NC2193A	SST	N	SL98
2N2195B		2NC2193A	SST	N	SL98
2N2206		2NC753	SST	N	SL73
2N2218	2NC2221A		SST	N	SL2
2N2218A	2NC2221A		SST	N	SL2
2N2219	2NC2222		SST	N	SL2
2N2219A	2NC2222A		SST	N	SL2
2N2221	2NC2221A		SST	N	SL2
2N2221A	2NC2221A		SST	N	SL2
2N2222	2NC2222		SST	N	SL2
2N2222A	2NC2222A		SST	N	SL2
2N2224		2NC2221A	SST	N	SL2
2N2242		2NC708	SST	N	SL73
2N2270	2NC2270		SST	N	SL98
2N2297		2NC3020	SST	N	SL98
2N2319	2NC2319		SST	N	SL73
2N2322	2NC2322	MCRC6381	SCR		638
2N2323	2NC2323	MCRC6381	SCR		638
2N2324	2NC2324	MCRC6381	SCR		638
2N2325	2NC2325	MCRC6382	SCR		638
2N2326	2NC2326	MCRC6382	SCR		638
2N2327	2NC2327	MCRC6383	SCR		638
2N2328	2NC2328	MCRC6383	SCR		638
2N2329	2NC2329	MCRC6384	SCR		638
2N2330	2NC2330		SST	N	SL19
2N2331	2NC2331		SST	N	SL19
2N2368	2NC2368		SST	N	SL73
2N2369	2NC2369		SST	N	SL73
2N2369A	2NC2369A		SST	N	SL73
2N2405	2NC2405		SST	N	SL26
2N2410		2NC5859	SST	N	SL27
2N2476		2NC5859	SST	N	SL27
2N2477		2NC5859	SST	N	SL27
2N2481	2NC2481		SST	N	SL73
2N2483	2NC2483		SST	N	SL18
2N2484	2NC2484		SST	N	SL18
2N2501	2NC2501		SST	N	SL76
2N2537		2NC5859	SST	N	SL27
2N2538		2NC5859	SST	N	SL27
2N2539	2NC2539		SST	N	SL4
2N2540	2NC2540		SST	N	SL4
2N2573	2NC2573	MCRC3201	SCR		320
2N2574	2NC2574	MCRC3201	SCR		320
2N2575	2NC2575	MCRC3201	SCR		320
2N2576	2NC2576	MCRC3202	SCR		320
2N2577	2NC2577	MCRC3203	SCR		320
2N2578	2NC2578	MCRC3204	SCR		320
2N2579	2NC2579	MCRC3205	SCR		320
2N2608	2NC2608		FETJ	P	FM125
2N2609	2NC2609		FETJ	P	FM125
2N2646	2NC2646		UJT		TL58/59
2N2647	2NC2647		UJT		TL58/59
2N2695		2NC3673	SST	P	SL333
2N2696		2NC2907	SST	P	SL333
2N2710		2NC3014	SST	N	SL76
2N2716		MPSC2716	SST	N	EL220
2N2788		2NC2222	SST	N	SL2
2N2789		2NC2222A	SST	N	SL2
2N2790		2NC697	SST	N	SL2
2N2791		2NC2221A	SST	N	SL2
2N2792		2NC2222	SST	N	SL2
2N2800		2NC1132	SST	P	SL333
2N2801		2NC2907	SST	P	SL333
2N2837		2NC2907	SST	P	SL333
2N2838		2NC2907	SST	P	SL333
2N2845		2NC2221A	SST	N	SL2
2N2846		2NC5859	SST	N	SL27
2N2847		2NC2221A	SST	N	SL2
2N2848		2NC5859	SST	N	SL27
2N2857	2NC2857		RF	N	RF153

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N2894	2NC2894		SST	P	SL44
2N2895		2NC2102	SST	N	SL98
2N2896	2NC2896		SST	N	SL98
2N2897	2NC2896		SST	N	SL98
2N2904	2NC2906A		SST	P	SL333
2N2904A	2NC2906A		SST	P	SL333
2N2905	2NC2907		SST	P	SL333
2N2905A	2NC2907A		SST	P	SL333
2N2906	2NC2906A		SST	P	SL333
2N2906A	2NC2906A		SST	P	SL333
2N2907	2NC2907		SST	P	SL333
2N2907A	2NC2907A		SST	P	SL333
2N2923		MPSC2923	SST	N	EL220
2N2924		MPSC2924	SST	N	EL220
2N2925		MPSC2925	SST	N	EL220
2N2926		MPSC2923/4/5	SST	N	EL220
2N2944	2NC2944		SST	P	SL41
2N2945	2NC2945		SST	P	SL41
2N2945A	2NC2945A		SST	P	SL41
2N2946	2NC2946		SST	P	SL41
2N2946A	2NC2946A		SST	P	SL41
2N2951	2NC2951		SST	N	SL2
2N2952	2NC2951		SST	N	SL2
2N2958		2NC2221A	SST	N	SL2
2N2959		2NC2222	SST	N	SL2
2N3009		2NC3013	SST	N	SL76
2N3010		2NC3011	SST	N	SL73
2N3011	2NC3011		SST	N	SL73
2N3012		2NC869A	SST	P	SL44
2N3013	2NC3013		SST	N	SL76
2N3014	2NC3014		SST	N	SL76
2N3015		2NC5859	SST	N	SL27
2N3019	2NC3019		SST	N	SL98
2N3020	2NC3020		SST	N	SL98
2N3036		2NC3053	SST	N	SL98
2N3053	2NC3053		SST	N	SL98
2N3053A	2NC3053A		SST	N	SL98
2N3054A	2NC3054A		PWR	N	5HE-C
2N3055	2NC3055		PWR	N	4WH-C
2N3072	2NC3073		SST	P	SL333
2N3073	2NC3073		SST	P	SL333
2N3081		2NC2906A	SST	P	SL333
2N3110	2NC3110		SST	N	SL98
2N3114	2NC3114		SST	N	SL26
2N3115		2NC2221A	SST	N	SL2
2N3116		2NC2222	SST	N	SL2
2N3120		2NC2906A	SST	P	SL333
2N3121		2NC2907	SST	P	SL333
2N3133		2NC2906A	SST	P	SL333
2N3134		2NC2907	SST	P	SL333
2N3135		2NC2906A	SST	P	SL333
2N3136		2NC2907	SST	P	SL333
2N3137	2NC3137		RF	N	RF82
2N3209		2NC869A	SST	P	SL44
2N3210		2NC708	SST	N	SL73
2N3211		2NC3013	SST	N	SL76
2N3227	2NC3227		SST	N	SL73
2N3244	2NC3244		SST	P	SL337
2N3245	2NC3245		SST	P	SL337
2N3248		2NC869A	SST	P	SL44
2N3249		2NC3251	SST	P	EL271
2N3250	2NC3250A		SST	P	EL271
2N3250A	2NC3250A		SST	P	EL271
2N3251	2NC3251		SST	P	EL271
2N3251A	2NC3251A		SST	P	EL271
2N3252	2NC3252		SST	N	SL17
2N3253	2NC3253		SST	N	SL17
2N3295	2NC3295		SST	N	SL2
2N3298		2NC2369	SST	N	SL73
2N3299		2NC2221A	SST	N	SL2
2N3300		2NC2222A	SST	N	SL2
2N3301		2NC2221A	SST	N	SL2
2N3302		2NC2222A	SST	N	SL2

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N3303	2NC3303		SST	N	SL28
2N3307	2NC3307		SST	P	SL63
2N3308		2NC3307	SST	P	SL63
2N3330	2NC3330		FETJ	P	FM125
2N3380		2NC3307	SST	P	SL63
2N3390		MPSC3390	SST	N	EL220
2N3391		MPSC3391	SST	N	EL220
2N3391A		MPSC3391A	SST	N	EL220
2N3392		MPSC3392	SST	N	EL220
2N3393		MPSC3393	SST	N	EL220
2N3394		MPSC3394	SST	N	EL220
2N3395		MPSC3395	SST	N	EL220
2N3396		MPSC3396	SST	N	EL220
2N3397		MPSC3396	SST	N	EL220
2N3398		MPSC3396	SST	N	EL220
2N3439	2NC3439		PWR	N	4SB-G
2N3440	2NC3440		PWR	N	4SB-G
2N3441	2NC3441		PWR	N	7MS-G
2N3442	2NC3442		PWR	N	6KB-C
2N3444	2NC3444		SST	N	SL17
2N3445	2NC3445		PWR	N	8MW-C
2N3446	2NC3446		PWR	N	8MW-C
2N3447	2NC3447		PWR	N	8MW-C
2N3448	2NC3448		PWR	N	8MW-C
2N3467	2NC3467		SST	P	SL337
2N3468	2NC3468		SST	P	SL337
2N3485	2NC2906A		SST	P	SL333
2N3485A	2NC2906A		SST	P	SL333
2N3486	2NC2907		SST	P	SL333
2N3486A	2NC2907A		SST	P	SL333
2N3494	2NC3496		SST	P	SL47
2N3495	2NC3497		SST	P	SL47
2N3496	2NC3496		SST	P	SL47
2N3497	2NC3497		SST	P	SL47
2N3498	2NC3498		SST	N	SL26
2N3499	2NC3499		SST	N	SL26
2N3500	2NC3500		SST	N	SL26
2N3501	2NC3501		SST	N	SL26
2N3506	2NC3506		SST	N	SL22
2N3507	2NC3507		SST	N	SL22
2N3508	2NC3508		SST	N	SL73
2N3509	2NC3227		SST	N	SL73
2N3510	2NC3510		SST	N	SL76
2N3511	2NC3511		SST	N	SL76
2N3512		2NC5859	SST	N	SL27
2N3544	2NC3544		SST	N	SL75
2N3546	2NC3546		SST	P	SL45
2N3553	2NC3553		RF	N	RF140
2N3563		MPSC3562	SST	P	EL662
2N3583	2NC3583		PWR	N	4RW-C
2N3584	2NC3584		PWR	N	4RW-C
2N3585	2NC3585		PWR	N	4RW-C
2N3634	2NC3634		SST	P	SL54
2N3635	2NC3635		SST	P	SL54
2N3636	2NC3636		SST	P	SL54
2N3637	2NC3637		SST	P	SL54
2N3638		MPSC3638	SST	P	SL333
2N3638A		MPSC3638A	SST	P	SL333
2N3639		MPSC3639	SST	P	EL251
2N3640		MPSC3640	SST	P	EL251
2N3646		MPSC3646	SST	N	EL77
2N3647	2NC3510		SST	N	SL76
2N3648	2NC3511		SST	N	SL76
2N3671		2NC2907	SST	P	SL333
2N3673	2NC3673		SST	P	SL333
2N3693		MPSC3693	SST	N	EL235
2N3694		MPSC3694	SST	N	EL235
2N3700		2NC2896	SST	N	SL98
2N3702		MPSC3702	SST	P	SL333
2N3703		MPSC3703	SST	P	SL333
2N3704		MPSC3704	SST	N	EL210
2N3705		MPSC3705	SST	N	EL210
2N3706		MPSC3705	SST	N	EL210

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N3707		MPSC3707	SST	N	EL220
2N3709		MPSC3709	SST	N	EL220
2N3710		MPSC3710	SST	N	EL220
2N3711		MPSC3711	SST	N	EL220
2N3712		2NC3114	SST	N	SL26
2N3713	2NC3713		PWR	N	4WH-C
2N3714	2NC3714		PWR	N	4WH-C
2N3715	2NC3715		PWR	N	4WH-C
2N3716	2NC3716		PWR	N	4WH-C
2N3719	2NC3719		PWR	P	J34-G
2N3720	2NC3720		PWR	P	J34-G
2N3724	2NC3724		SST	N	SL27
2N3725	2NC3725		SST	N	SL27
2N3734	2NC3734		SST	N	SL27
2N3735	2NC3735		SST	N	SL27
2N3736	2NC3734		SST	N	SL27
2N3737	2NC3735		SST	N	SL27
2N3738	2NC3738		PWR	N	2AN-C
2N3739	2NC3739		PWR	N	2AN-C
2N3740	2NC3740		PWR	P	6KL-C
2N3741	2NC3741		PWR	P	6KL-C
2N3742	2NC6516		SST	N	EL644
2N3743	2NC6519		SST	P	EL694
2N3762	2NC3762		SST	P	SL60
2N3764	2NC3762		SST	P	SL60
2N3766	2NC3766		PWR	N	7MH-C
2N3767	2NC3767		PWR	N	7MH-C
2N3773	2NC3773		PWR	N	4KW-C
2N3789	2NC3789		PWR	P	3FR-C
2N3790	2NC3790		PWR	P	3FR-C
2N3791	2NC3791		PWR	P	3FR-C
2N3792	2NC3792		PWR	P	3FR-C
2N3796	2NC3796		FETM	N	FM110
2N3797	2NC3797		FETM	N	FM110
2N3798	2NC3798		SST	P	SL55
2N3799	2NC3799		SST	P	SL55
2N3799A		2NC3799	SST	P	SL55
2N3821	2NC3821		FETJ	N	FM131
2N3822	2NC3822		FETJ	N	FM131
2N3823	2NC3823		FETJ	N	FM130
2N3824	2NC3824		FETJ	N	FM130
2N3839		2NC2857/ 2NC5031	RF	N	
2N3866	2NC3866		RF	N	RF151
2N3866A	2NC3866		RF	N	RF151
2N3867	2NC3867		PWR	P	J34-G
2N3868	2NC3868		PWR	P	J34-G
2N3870	2NC3870	MCRC3201	SCR		320
2N3871	2NC3871	MCRC3202	SCR		320
2N3872	2NC3872	MCRC3204	SCR		320
2N3873	2NC3873	MCRC3206	SCR		320
2N3896	2NC3896	MCRC3201	SCR		320
2N3897	2NC3897	MCRC3202	SCR		320
2N3898	2NC3898	MCRC3204	SCR		320
2N3899	2NC3899	MCRC3206	SCR		320
2N3902	2NC3902		PWR	N	6KB-CN
2N3903	2NC3903		SST	N	EL221
2N3904	2NC3904		SST	N	EL221
2N3905	2NC3905		SST	P	EL271
2N3906	2NC3906		SST	P	EL271
2N3909	2NC3909		FETJ	P	FM125
2N3909A	2NC3909A		FETJ	P	FM125
2N3946		2NC3903	SST	N	EL221
2N3947		2NC3904	SST	N	EL221
2N3948	2NC3948		RF	N	RF161
2N3959		2NC3960	RF	N	
2N3960	2NC3960		RF	N	RF93
2N3970	2NC3970		FETJ	N	FM140
2N3971	2NC3971		FETJ	N	FM140
2N3972	2NC3972		FETJ	N	FM140
2N3977		2NC2944	SST	P	SL41
2N3978		2NC2945A	SST	P	SL41
2N3980	2NC3980		UJT		TL58/59

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N3993	2NC3993		FETJ	P	FM129
2N3994	2NC3994		FETJ	P	FM129
2N4013	2NC4013		SST	N	SL27
2N4014	2NC4014		SST	N	SL27
2N4066	2NC4066		FETM(D)	P	FM109
2N4067	2NC4067		FETM(D)	P	FM109
2N4072		2NC4073	RF	N	
2N4073	2NC4073		RF	N	RF82
2N4091	2NC4091		FETJ	N	FM140
2N4092	2NC4092		FETJ	N	FM140
2N4093	2NC4093		FETJ	N	FM140
2N4117	2NC4117		FETJ	N	FM148
2N4118	2NC4118		FETJ	N	FM148
2N4119	2NC4119		FETJ	N	FM148
2N4123		MPSC6512	SST	N	EL220
2N4124		MPSC6514	SST	N	EL220
2N4125		MPSC6516	SST	P	EL271
2N4126		MPSC6518	SST	P	EL271
2N4151	2NC4151	MCRC3101	SCR		310
2N4152	2NC4152	MCRC3101	SCR		310
2N4153	2NC4153	MCRC3101	SCR		310
2N4154	2NC4154	MCRC3102	SCR		310
2N4155	2NC4155	MCRC3103	SCR		310
2N4156	2NC4156	MCRC3104	SCR		310
2N4157	2NC4157	MCRC3105	SCR		310
2N4158	2NC4158	MCRC3106	SCR		310
2N4159	2NC4159	MCRC3101	SCR		310
2N4160	2NC4160	MCRC3101	SCR		310
2N4161	2NC4161	MCRC3101	SCR		310
2N4162	2NC4162	MCRC3102	SCR		310
2N4163	2NC5163	MCRC3103	SCR		310
2N4164	2NC4164	MCRC3104	SCR		310
2N4165	2NC4165	MCRC3105	SCR		310
2N4166	2NC5166	MCRC3106	SCR		310
2N4167	2NC4167	MCRC3101	SCR		310
2N4168	2NC4168	MCRC3101	SCR		310
2N4169	2NC4169	MCRC3101	SCR		310
2N4170	2NC4170	MCRC3102	SCR		310
2N4171	2NC4171	MCRC3103	SCR		310
2N4172	2NC4172	MCRC3104	SCR		310
2N4173	2NC4173	MCRC3105	SCR		310
2N4174	2NC4174	MCRC3106	SCR		310
2N4175	2NC4175	MCRC3101	SCR		310
2N4176	2NC4176	MCRC3101	SCR		310
2N4177	2NC4177	MCRC3101	SCR		310
2N4178	2NC4178	MCRC3102	SCR		310
2N4179	2NC4179	MCRC3103	SCR		310
2N4180	2NC4180	MCRC3104	SCR		310
2N4181	2NC4181	MCRC3105	SCR		310
2N4182	2NC4182	MCRC3106	SCR		310
2N4183	2NC4183	MCRC3101	SCR		310
2N4184	2NC4184	MCRC3101	SCR		310
2N4185	2NC4185	MCRC3101	SCR		310
2N4186	2NC4186	MCRC3102	SCR		310
2N4187	2NC4187	MCRC3103	SCR		310
2N4188	2NC4188	MCRC3104	SCR		310
2N4189	2NC4189	MCRC3105	SCR		310
2N4190	2NC4190	MCRC3106	SCR		310
2N4191	2NC4191	MCRC3101	SCR		310
2N4192	2NC4192	MCRC3101	SCR		310
2N4193	2NC4193	MCRC3101	SCR		310
2N4194	2NC4194	MCRC3102	SCR		310
2N4195	2NC4195	MCRC3103	SCR		310
2N4196	2NC4196	MCRC3104	SCR		310
2N4197	2NC4197	MCRC3105	SCR		310
2N4198	2NC4198	MCRC3106	SCR		310
2N4208	2NC4208		SST	P	EL251
2N4209	2NC4209		SST	P	EL251
2N4209A	2NC4209A		SST	P	EL251
2N4212	2NC4212	MCRC6381	SCR		638
2N4213	2NC4213	MCRC6381	SCR		638
2N4214	2NC4214	MCRC6381	SCR		638
2N4215	2NC4215	MCRC6382	SCR		638

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N4216	2NC4216	MCRC6382	SCR		638
2N4217	2NC4217	MCRC6383	SCR		638
2N4218	2NC4218	MCRC6383	SCR		638
2N4219	2NC4219	MCRC6384	SCR		638
2N4220	2NC4220		FETJ	N	FM131
2N4220A	2NC4220		FETJ	N	FM131
2N4221	2NC4221		FETJ	N	FM131
2N4221A	2NC4221		FETJ	N	FM131
2N4222	2NC4222		FETJ	N	FM131
2N4222A	2NC4222		FETJ	N	FM131
2N4223	2NC4223		FETJ	N	FM130
2N4224	2NC4224		FETJ	N	FM130
2N4231A	2NC4231A		PWR	N	5HE-C
2N4232A	2NC4232A		PWR	N	5HE-C
2N4233A	2NC4233A		PWR	N	5HE-C
2N4234	2NC4234		PWR	P	CF
2N4235	2NC4235		PWR	P	CF
2N4236	2NC4236		PWR	P	CF
2N4237	2NC4237		PWR	N	CF
2N4238	2NC4238		PWR	N	CF
2N4239S	2NC4239S		PWR	N	CF
2N4240	2NC4240		PWR	N	4RW-C
2N4260	2NC4261		SST	P	SL65
2N4261	2NC4261		SST	P	SL65
2N4264	2NC4264		SST	N	EL77
2N4265	2NC4265		SST	N	EL77
2N4342	2NC4342		FETJ	P	FM125
2N4348	2NC4348		PWR	N	6KB-C
2N4351	2NC4351		FETM	N	FM122
2N4352	2NC4352		FETM	P	FM123
2N4354	MPSC4354		SST	P	EL664
2N4355	MPSC4355		SST	P	EL664
2N4356	MPSC4356		SST	P	EL664
2N4359		2NC3799	SST	P	SL55
2N4360	2NC4360		FETJ	P	FM125
2N4391	2NC4391		FETJ	N	FM140
2N4392	2NC4392		FETJ	N	FM140
2N4393	2NC4393		FETJ	N	FM140
2N4398	2NC4398		PWR	P	A5G-C
2N4399	2NC4399		PWR	P	A5G-C
2N4400	2NC4400		SST	N	EL210
2N4401	2NC4401		SST	N	EL210
2N4402	2NC4402		SST	P	SL333
2N4403	2NC4403		SST	P	SL333
2N4404	2NC4404		SST	P	SL50
2N4405	2NC4405		SST	P	SL50
2N4406	2NC4406		SST	P	SL56
2N4407	2NC4407		SST	P	SL56
2N4409	2NC4410		SST	N	EL613
2N4416	2NC4416		FETJ	N	FM146
2N4416A	2NC4416A		FETJ	N	FM146
2N4418	2NC4410		SST	N	EL613
2N4427	2NC4427		RF	N	RF161
2N4428	2NC4428		RF	N	RF192
2N4441	2NC4441	MCRC3101	SCR		310
2N4442	2NC4442	MCRC3102	SCR		310
2N4443	2NC4443	MCRC3104	SCR		310
2N4444	2NC4444	MCRC3106	SCR		310
2N4449	2NC2369A		SST	N	SL73
2N4450		2NC2222	SST	N	SL2
2N4453		2NC869A	SST	P	SL44
2N4789	2NC5062		SCR	P	TL62
2N4790	2NC5064		SCR	P	TL62
2N4851	2NC4851		UJT		TL58/59
2N4852	2NC4852		UJT		TL58/59
2N4853	2NC4853		UJT		TL58/59
2N4856	2NC4856A		FETJ	N	FM140
2N4856A	2NC4856A		FETJ	N	FM140
2N4857	2NC4857A		FETJ	N	FM140
2N4857A	2NC4857A		FETJ	N	FM140
2N4858	2NC4858A		FETJ	N	FM140
2N4858A	2NC4858A		FETJ	N	FM140
2N4859	2NC4856A		FETJ	N	FM140

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N4859A	2NC4856A		FETJ	N	FM140
2N4860	2NC4857A		FETJ	N	FM140
2N4860A	2NC4857A		FETJ	N	FM140
2N4861	2NC4858A		FETJ	N	FM140
2N4861A	2NC4858A		FETJ	N	FM140
2N4870	2NC4870		UJT		TL58/59
2N4871	2NC4871		UJT		TL58/59
2N4877	2NC4877		PWR	N	4PD-G
2N4890	2NC4890		SST	P	SL50
2N4891	MUC4891		UJT		TL58/59
2N4892	MUC4892		UJT		TL58/59
2N4893	MUC4893		UJT		TL58/59
2N4894	MUC4894		UJT		TL58/59
2N4898	2NC4898		PWR	P	6KL-C
2N4899	2NC4899		PWR	P	6KL-C
2N4900	2NC4900		PWR	P	6KL-C
2N4901	2NC4901		PWR	P	4WH-C
2N4902	2NC4902		PWR	P	4WH-C
2N4903	2NC4903		PWR	P	4WH-C
2N4904	2NC4904		PWR	P	4WH-C
2N4905	2NC4905		PWR	P	4WH-C
2N4906	2NC4906		PWR	P	4WH-C
2N4910	2NC4910		PWR	N	5HE-C
2N4911	2NC4911		PWR	N	5HE-C
2N4912	2NC4912		PWR	N	5HE-C
2N4913	2NC4913		PWR	N	4WH-C
2N4914	2NC4914		PWR	N	4WH-C
2N4915	2NC4915		PWR	N	4WH-C
2N4918	2NC4918		PWR	P	4JE-GN
2N4919	2NC4919		PWR	P	4JE-GN
2N4920	2NC4920		PWR	P	4JE-GN
2N4921	2NC4921		PWR	N	4JE-GN
2N4922	2NC4922		PWR	N	4JE-GN
2N4923	2NC4923		PWR	N	4JE-GN
2N4924		2NC3498	SST	N	SL26
2N4925		2NC3500	SST	N	SL26
2N4926		2NC6515	SST	N	EL644
2N4927		2NC6515	SST	N	EL644
2N4928	2NC4928		SST	P	SL47
2N4929		2NC3636	SST	P	SL54
2N4930		2NC6518	SST	P	EL694
2N4931		2NC6518	SST	P	EL694
2N4948	2NC4948		UJT		TL58/59
2N4949	2NC4949		UJT		TL58/59
2N4957	2NC4957		RF	P	RF57
2N4958		2NC4957	RF	P	
2N4959		2NC4957	RF	P	
2N4987	MUSC4987		SUS		TL70
2N4988	MUSC4988		SUS		TL70
2N4991	MBSC4991		SBS		TL71
2N4992	MBSC4992		SBS		TL71
2N4993		MBSC4991	SBS		TL71
2N5031	2NC5031		RF	N	RF191
2N5050	2NC5050		PWR	N	4RW-C
2N5051	2NC5051		PWR	N	4RW-C
2N5052	2NC5052		PWR	N	4RW-C
2N5058	2NC5058		SST	N	EL644
2N5059	2NC5058		SST	N	EL644
2N5060	2NC5060		SCR		TL60
2N5061	2NC5061		SCR		TL60
2N5062	2NC5062		SCR		TL62
2N5063	2NC5063		SCR		TL62
2N5064	2NC5064		SCR		TL62
2N5067	2NC5067		PWR	N	4WH-C
2N5068	2NC5068		PWR	N	4WH-C
2N5069	2NC5069		PWR	N	4WH-C
2N5086	2NC5086		SST	P	SL55
2N5087	2NC5087		SST	P	SL55
2N5088	2NC5088		SST	N	EL233
2N5089	2NC5089		SST	N	EL233
2N5090		2NC3866	RF	N	
2N5108	2NC5108		RF	N	RF192
2N5109	2NC5109		RF	N	RF172

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N5157	2NC5157		PWR	N	6KB-N
2N5160	2NC5160		RF	P	RF310
2N5164	2NC5164	MCRC3201	SCR		320
2N5165	2NC5165	MCRC3202	SCR		320
2N5166	2NC5166	MCRC3204	SCR		320
2N5167	2NC5167	MCRC3206	SCR		320
2N5168	2NC5168	MCRC3201	SCR		320
2N5169	2NC5169	MCRC3202	SCR		320
2N5170	2NC5170	MCRC3204	SCR		320
2N5171	2NC5171	MCRC3206	SCR		320
2N5172		MPSC6575	SST	N	EL403
2N5179		2NC2857	RF	N	
2N5190	2NC5190		PWR	N	5HE-G
2N5191	2NC5191		PWR	N	5HE-G
2N5192	2NC5192		PWR	N	5HE-G
2N5193	2NC5193		PWR	N	5HE-G
2N5194	2NC5194		PWR	N	5HE-G
2N5195	2NC5195		PWR	N	5HE-G
2N5208	2NC5208		SST	P	EL281
2N5209	2NC5209		SST	N	EL238
2N5210	2NC5210		SST	N	EL238
2N5219		MPSC3396	SST	N	EL220
2N5220		2NC5225	SST	N	EL210
2N5221		2NC5226	SST	P	SL333
2N5222		MPSC6548	SST	N	EL426
2N5223		MPSC3396	SST	N	EL220
2N5224		2NC2369	SST	N	SL73
2N5225	2NC5225		SST	N	EL210
2N5226	2NC5226		SST	P	SL333
2N5227		2NC3250	SST	P	EL271
2N5228	2NC5228		SST	P	EL251
2N5229	2NC5229		SST	P	SL41
2N5230	2NC5230		SST	P	SL41
2N5231	2NC5231		SST	P	SL41
2N5241	2NC5241		PWR	N	6KB-CN
2N5271	2NC5271		SST	N	SL19
2N5301	2NC5301		PWR	N	A5G-C
2N5302	2NC5302		PWR	N	A5G-C
2N5303	2NC5303		PWR	N	A5G-C
2N5304	2NC5304		PWR	N	CF
2N5336	2NC5336		PWR	N	4PD-G
2N5337	2NC5337		PWR	N	4PD-G
2N5338	2NC5338		PWR	N	4PD-G
2N5339	2NC5339		PWR	N	4PD-G
2N5344	2NC5344		PWR	P	1LF-G
2N5345	2NC5345		PWR	P	1LF-G
2N5346	2NC5346		PWR	N	4PD-G
2N5347	2NC5347		PWR	N	4PD-G
2N5348	2NC5348		PWR	N	4PD-G
2N5349	2NC5349		PWR	N	4PD-G
2N5400	2NC5400		SST	P	EL263
2N5401	2NC5401		SST	P	EL263
2N5427	2NC5427		PWR	N	4PD-G
2N5428	2NC5428		PWR	N	4PD-G
2N5429	2NC5429		PWR	N	4PD-G
2N5430	2NC5430		PWR	N	4PD-G
2N5431	2NC5431		UJT		TL58/59
2N5441	2NC5441	MACC4402A	TRIAC		440
2N5442	2NC5442	MACC4404A	TRIAC		440
2N5443	2NC5443	MACC4406A	TRIAC		440
2N5444	2NC5444	MACC4402A	TRIAC		440
2N5445	2NC5445	MACC4404A	TRIAC		440
2N5446	2NC5446	MACC4406A	TRIAC		440
2N5550	2NC5550		SST	N	EL613
2N5551	2NC5551		SST	N	EL613
2N5457	2NC5457		FETJ	N	FM131
2N5458	2NC5458		FETJ	N	FM131
2N5459	2NC5459		FETJ	N	FM131
2N5460	2NC5460		FETJ	P	FM125
2N5461	2NC5461		FETJ	P	FM125
2N5462	2NC5462		FETJ	P	FM125
2N5463	2NC5463		FETJ	P	FM125
2N5464	2NC5464		FETJ	P	FM125

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N5465	2NC5465		FETJ	P	FM125
2N5484	2NC5484		FETJ	N	FM146
2N5485	2NC5485		FETJ	N	FM146
2N5486	2NC5486		FETJ	N	FM146
2N5555	2NC5555		FETJ	N	FM146
2N5556		2NC4220	FETJ	N	FM131
2N5557		2NC4221	FETJ	N	FM131
2N5558		2NC4222	FETJ	N	FM131
2N5567	2NC5567	MACC4202A	TRIAC		420
2N5568	2NC5568	MACC4204A	TRIAC		420
2N5569	2NC5569	MACC4202A	TRIAC		420
2N5570	2NC5570	MACC4204A	TRIAC		420
2N5571	2NC5571	MACC4202A	TRIAC		420
2N5572	2NC5572	MACC4204A	TRIAC		420
2N5573	2NC5573	MACC4202A	TRIAC		420
2N5574	2NC5574	MACC4204A	TRIAC		420
2N5581	2NC2221A		SST	N	SL2
2N5582	2NC2222A		SST	N	SL2
2N5583	2NC5583		RF	P	RF59
2N5629	2NC5629		PWR	N	A5G-C
2N5630	2NC5630		PWR	N	4KW-C
2N5631	2NC5631		PWR	N	4KW-C
2N5632	2NC5632		PWR	N	6KB-C
2N5633	2NC5633		PWR	N	6KB-C
2N5634	2NC5634		PWR	N	6KB-C
2N5638	2NC5638		FETJ	N	FM140
2N5639	2NC5639		FETJ	N	FM140
2N5640	2NC5640		FETJ	N	FM140
2N5653	2NC5653		FETJ	N	FM140
2N5654	2NC5654		FETJ	N	FM140
2N5655	2NC5655		PWR	N	2AN-G
2N5656	2NC5656		PWR	N	2AN-G
2N5657	2NC5657		PWR	N	2AN-G
2N5668	2NC5668		FETJ	N	FM130
2N5669	2NC5669		FETJ	N	FM130
2N5670	2NC5670		FETJ	N	FM130
2N5683	2NC5683		PWR	P	1JK-C
2N5684	2NC5684		PWR	P	1JK-C
2N5685	2NC5685		PWR	N	1JK-C
2N5686	2NC5686		PWR	N	1JK-C
2N5716	2NC5716		FETJ	N	FM124
2N5717	2NC5717		FETJ	N	FM124
2N5718	2NC5718		FETJ	N	FM124
2N5745	2NC5745		PWR	P	A5G-C
2N5758	2NC5758		PWR	N	6KB-C
2N5759	2NC5759		PWR	N	6KB-C
2N5760	2NC5760		PWR	N	6KB-C
2N5777		MRDC8	PDTR	N	L19
2N5778		MRDC8	PDTR	N	L19
2N5779		MRDC8	PDTR	N	L19
2N5780		MRDC8	PDTR	N	L19
2N5777		MRDC8	PDTR	N	L19
2N5778		MRDC8	PDTR	N	L19
2N5779		MRDC8	PDTR	N	L19
2N5780		MRDC8	PDTR	N	L19
2N5787	2NC5060		SCR		TL60
2N5788	2NC5061		SCR		TL60
2N5829	2NC5829	2NC4957	RF	P	RF57
2N5835	2NC5835		RF	N	RF191
2N5836	2NC5836		RF	N	RF198
2N5837		2NC5836	RF	N	
2N5838	2NC5838		PWR	N	1TE-C
2N5839	2NC5839		PWR	N	1TE-C
2N5840	2NC5840		PWR	N	1TE-C
2N5841	2NC5841		SST	N	ML204
2N5842	2NC5842		SST	N	ML204
2N5845	2NC5845A		SST	N	SL27
2N5845A	2NC5845A		SST	N	SL27
2N5859	2NC5859		SST	N	SL27
2N5861	2NC5861		SST	N	SL27
2N5864		2NC4404	SST	P	SL50
2N5865		2NC4404	SST	P	SL50
2N5867	2NC5867		PWR	P	4WH-C

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N5868	2NC5868		PWR	P	4WH-C
2N5875	2NC5875		PWR	P	3FR-C
2N5876	2NC5876		PWR	P	3FR-C
2N5877	2NC5877		PWR	N	4WH-C
2N5878	2NC5878		PWR	N	4WH-C
2N5879	2NC5879		PWR	P	6KB-C
2N5880	2NC5880		PWR	P	6KB-C
2N5881	2NC5881		PWR	N	6KB-C
2N5882	2NC5882		PWR	N	6KB-C
2N5883	2NC5883		PWR	P	A5G-C
2N5884	2NC5884		PWR	P	A5G-C
2N5885	2NC5885		PWR	N	A5G-C
2N5886	2NC5886		PWR	N	A5G-C
2N5943	2NC5943		RF	N	RF172
2N5947		2NC5943	RF	N	
2N5974	2NC5974		PWR	P	4JN-GN
2N5975	2NC5975		PWR	P	4JN-GN
2N5976	2NC5976		PWR	P	4JN-GN
2N5977	2NC5977		PWR	N	4JN-GN
2N5978	2NC5978		PWR	N	4JN-GN
2N5979	2NC5979		PWR	N	4JN-GN
2N5980	2NC5980		PWR	P	3FR-GN
2N5981	2NC5981		PWR	P	3FR-GN
2N5982	2NC5982		PWR	P	3FR-GN
2N5983	2NC5983		PWR	N	3FR-GN
2N5984	2NC5984		PWR	N	3FR-GN
2N5985	2NC5985		PWR	N	3FR-GN
2N5986	2NC5986		PWR	P	9JL-CN
2N5987	2NC5987		PWR	P	9JL-CN
2N5988	2NC5988		PWR	P	9JL-CN
2N5989	2NC5989		PWR	N	9JL-CN
2N5990	2NC5990		PWR	N	9JL-CN
2N5991	2NC5991		PWR	N	9JL-CN
2N6027	2NC6027		PUT		TL83
2N6028	2NC6028		PUT		TL83
2N6029	2NC6029		PWR	P	A5G-C
2N6030	2NC6030		PWR	P	4KW-C
2N6031	2NC6031		PWR	P	4KW-C
2N6034	2NC6034		PWR	P	5TB-GN
2N6035	2NC6035		PWR	P	5TB-GN
2N6036	2NC6036		PWR	P	5TB-GN
2N6037	2NC6037		PWR	N	5TB-GN
2N6038	2NC6038		PWR	N	5TB-GN
2N6039	2NC6039		PWR	N	5TB-GN
2N6040	2NC6040		PWR	P	2KS-G
2N6041	2NC6041		PWR	P	2KS-G
2N6042	2NC6042		PWR	P	2KS-G
2N6043	2NC6043		PWR	N	2KS-G
2N6044	2NC6044		PWR	N	2KS-G
2N6045	2NC6045		PWR	N	2KS-G
2N6049	2NC6049		PWR	P	4WH-C
2N6050	2NC6050		PWR	P	8JA-C
2N6051	2NC6051		PWR	P	8JA-C
2N6052	2NC6052		PWR	P	8JA-C
2N6053	2NC6053		PWR	P	7JA-C
2N6054	2NC6054		PWR	P	7JA-C
2N6055	2NC6055		PWR	N	7JA-C
2N6056	2NC6056		PWR	N	7JA-C
2N6057	2NC6057		PWR	N	8JA-C
2N6058	2NC6058		PWR	N	8JA-C
2N6059	2NC6059		PWR	N	8JA-C
2N6067	2NC6067		SST	P	EL656
2N6068	2NC6068	MACC4011	TRIAC		401
2N6068A	2NC6068A	MACC4011A	TRIAC		401
2N6068B	2NC6068B	MACC4011A	TRIAC		401
2N6069	2NC6069	MACC4011	TRIAC		401
2N6069A	2NC6069A	MACC4011A	TRIAC		401
2N6069B	2NC6069B	MACC4011A	TRIAC		401
2N6070	2NC6070	MACC4011	TRIAC		401
2N6070A	2NC6070A	MACC4011A	TRIAC		401
2N6070B	2NC6070B	MACC4011A	TRIAC		401
2N6071	2NC6071	MACC4012	TRIAC		401
2N6071A	2NC6071A	MACC4012A	TRIAC		401

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N6071B	2NC6071B	MACC4012A	TRIAC		401
2N6072	2NC6072	MACC4013	TRIAC		401
2N6072A	2NC6072A	MACC4013A	TRIAC		401
2N6072B	2NC6072B	MACC4013A	TRIAC		401
2N6073	2NC6073	MACC4014	TRIAC		401
2N6073A	2NC6073A	MACC4014A	TRIAC		401
2N6073B	2NC6073B	MACC4014A	TRIAC		401
2N6074	2NC6074	MACC4015	TRIAC		401
2N6074A	2NC6074A	MACC4015A	TRIAC		401
2N6074B	2NC6074B	MACC4015A	TRIAC		401
2N6075	2NC6075	MACC4016	TRIAC		401
2N6075A	2NC6075A	MACC4016A	TRIAC		401
2N6075B	2NC6075B	MACC4016A	TRIAC		401
2N6077	2NC6077		PWR	N	8MW-C
2N6078	2NC6078		PWR	N	8MW-C
2N6116	2NC6116		PUT		TL72/75
2N6117	2NC6117		PUT		TL72/75
2N6118	2NC6118		PUT		TL72/75
2N6145	2NC6145	MACC4202A	TRIAC		420
2N6146	2NC6146	MACC4204A	TRIAC		420
2N6147	2NC6147	MACC4206A	TRIAC		420
2N6151	2NC6151	MACC4202A	TRIAC		420
2N6152	2NC6152	MACC4204A	TRIAC		420
2N6153	2NC6153	MACC4206A	TRIAC		420
2N6154	2NC6154	MACC4202	TRIAC		420
2N6155	2NC6155	MACC4204	TRIAC		420
2N6156	2NC6156	MACC4206	TRIAC		420
2N6157	2NC6157	MACC4402A	TRIAC		440
2N6158	2NC6158	MACC4404A	TRIAC		440
2N6159	2NC6159	MACC4406A	TRIAC		440
2N6160	2NC6160	MACC4402A	TRIAC		440
2N6161	2NC6161	MACC4404A	TRIAC		440
2N6162	2NC6162	MACC4406A	TRIAC		440
2N6163	2NC6163	MACC4402A	TRIAC		440
2N6164	2NC6164	MACC4404A	TRIAC		440
2N6165	2NC6165	MACC4406A	TRIAC		440
2N6167	2NC6167	MCRC3201	SCR		320
2N6168	2NC6168	MCRC3202	SCR		320
2N6169	2NC6169	MCRC3204	SCR		320
2N6170	2NC6170	MCRC3206	SCR		320
2N6171	2NC6171	MCRC3201	SCR		320
2N6172	2NC6172	MCRC3202	SCR		320
2N6173	2NC6173	MCRC3204	SCR		320
2N6174	2NC6174	MCRC3206	SCR		320
2N6186	2NC6186		PWR	P	4PD-G
2N6187	2NC6187		PWR	P	4PD-G
2N6188	2NC6188		PWR	P	4PD-G
2N6189	2NC6189		PWR	P	4PD-G
2N6190	2NC6190		PWR	P	4PD-G
2N6191	2NC6191		PWR	P	4PD-G
2N6192	2NC6192		PWR	P	4PD-G
2N6193	2NC6193		PWR	P	4PD-G
2N6211	2NC6211		PWR	P	4RW-C
2N6212	2NC6212		PWR	P	4RW-C
2N6213	2NC6213		PWR	P	4RW-C
2N6226	2NC6226		PWR	P	6KB-C
2N6227	2NC6227		PWR	P	6KB-C
2N6228	2NC6228		PWR	P	6KB-C
2N6229	2NC6229		PWR	P	6KB-C
2N6230	2NC6230		PWR	P	6KB-C
2N6231	2NC6231		PWR	P	6KB-C
2N6234	2NC6234		PWR	N	8MW-C
2N6235	2NC6235		PWR	N	8MW-C
2N6236	2NC6236	MCRC0361	SCR		036
2N6237	2NC6237	MCRC0361	SCR		036
2N6238	2NC6238	MCRC0361	SCR		036
2N6239	2NC6239	MCRC0362	SCR		036
2N6240	2NC6240	MCRC0364	SCR		036
2N6241	2NC6241	MCRC0366	SCR		036
2N6256		2NC3948	RF	N	
2N6263	2NC6263		PWR	N	8MW-C
2N6274	2NC6274		PWR	N	8KJ-G
2N6275	2NC6275		PWR	N	8KJ-G

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N6276	2NC6276		PWR	N	8KJ-G
2N6277	2NC6277		PWR	N	8KJ-G
2N6278	2NC6278		PWR	N	8KJ-G
2N6279	2NC6279		PWR	N	8KJ-G
2N6280	2NC6280		PWR	N	8KJ-G
2N6281	2NC6281		PWR	N	8KJ-G
2N6282	2NC6282		PWR	N	4LE-C
2N6283	2NC6283		PWR	N	4LE-C
2N6284	2NC6284		PWR	N	4LE-C
2N6285	2NC6285		PWR	P	4LE-C
2N6286	2NC6286		PWR	P	4LE-C
2N6287	2NC6287		PWR	P	4LE-C
2N6294	2NC6294		PWR	N	4KB-C
2N6295	2NC6295		PWR	N	4KB-C
2N6296	2NC6296		PWR	P	4KB-C
2N6297	2NC6297		PWR	P	4KB-C
2N6298	2NC6298		PWR	P	7JA-C
2N6299	2NC6299		PWR	P	7JA-C
2N6300	2NC6300		PWR	N	7JA-C
2N6301	2NC6301		PWR	N	7JA-C
2N6303	2NC6303		PWR	P	J34-G
2N6304	2NC6304	BFYC90	RF	N	RF199
2N6305		2NC6304	RF	N	
2N6306	2NC6306		PWR	N	8EF-NC
2N6307	2NC6307		PWR	N	8EF-NC
2N6308	2NC6308		PWR	N	8EF-NC
2N6312	2NC6312		PWR	P	4WH-C
2N6313	2NC6313		PWR	P	4WH-C
2N6314	2NC6314		PWR	P	4WH-C
2N6315	2NC6315		PWR	N	5HE-C
2N6316	2NC6316		PWR	N	5HE-C
2N6317	2NC6317		PWR	P	4WH-C
2N6318	2NC6318		PWR	P	4WH-C
2N6338	2NC6338		PWR	N	5MP-G
2N6339	2NC6339		PWR	N	5MP-G
2N6340	2NC6340		PWR	N	5MP-G
2N6341	2NC6341		PWR	N	5MP-G
2N6342	2NC6342	MACC4202	TRIAC		420
2N6342A	2NC6342A	MCRC4202	TRIAC		420
2N6343	2NC6343	MACC4204	TRIAC		420
2N6343A	2NC6343A	MCRC4204	TRIAC		420
2N6344	2NC6344	MACC4206	TRIAC		420
2N6344A	2NC6344A	MCRC4206	TRIAC		420
2N6345	2NC6345	MACC4208	TRIAC		420
2N6345A	2NC6345A	MCRC4208	TRIAC		420
2N6346	2NC6346	MACC4202A	TRIAC		420
2N6346A	2NC6346A	MCRC4202A	TRIAC		420
2N6347	2NC6347	MACC4204A	TRIAC		420
2N6347A	2NC6347A	MCRC4204A	TRIAC		420
2N6348	2NC6348	MACC4206A	TRIAC		420
2N6348A	2NC6348A	MCRC4206A	TRIAC		420
2N6349	2NC6349	MACC4208A	TRIAC		420
2N6349A	2NC6349A	MCRC4208A	TRIAC		420
2N6377	2NC6377		PWR	P	8KJ-G
2N6378	2NC6378		PWR	P	8KJ-G
2N6379	2NC6379		PWR	P	8KJ-G
2N6380	2NC6380		PWR	P	8KJ-G
2N6381	2NC6381		PWR	P	8KJ-G
2N6382	2NC6382		PWR	P	8KJ-G
2N6383	2NC6383		PWR	N	7JA-C
2N6384	2NC6384		PWR	N	7JA-C
2N6385	2NC6385		PWR	N	7JA-C
2N6394	2NC6394	MCRC3101	SCR		310
2N6395	2NC6395	MCRC3101	SCR		310
2N6396	2NC6396	MCRC3102	SCR		310
2N6397	2NC6397	MCRC3104	SCR		310
2N6398	2NC6398	MCRC3106	SCR		310
2N6399	2NC6399	MCRC3108	SCR		310
2N6400	2NC6400	MCRC3201	SCR		320
2N6401	2NC6401	MCRC3201	SCR		320
2N6402	2NC6402	MCRC3202	SCR		320
2N6403	2NC6403	MCRC3204	SCR		320
2N6404	2NC6404	MCRC3206	SCR		320

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
2N6405	2NC6405	MCRC3208	SCR		320
2N6410	2NC6410		PWR	N	2WE-G
2N6411	2NC6411		PWR	P	2WE-G
2N6412	2NC6412		PWR	N	2WE-G
2N6413	2NC6413		PWR	N	2WE-G
2N6414	2NC6414		PWR	P	2WE-G
2N6415	2NC6415		PWR	P	2WE-G
2N6416	2NC6416		PWR	N	2WE-G
2N6417	2NC6417		PWR	N	2WE-G
2N6418	2NC6418		PWR	P	2WE-G
2N6419	2NC6419		PWR	P	2WE-G
2N6420	2NC6420		PWR	P	4RW-C
2N6421	2NC6421		PWR	P	4RW-C
2N6422	2NC6422		PWR	P	4RW-C
2N6423	2NC6423		PWR	P	4RW-C
2N6424	2NC6424		PWR	P	1FF-C
2N6425	2NC6425		PWR	P	1FF-C
2N6426	2NC6426		SSTR	N	EL645
2N6427	2NC6427		SSTR	N	EL645
2N6436	2NC6436		PWR	P	5MP-G
2N6437	2NC6437		PWR	P	5MP-G
2N6438	2NC6438		PWR	P	5MP-G
2N6495	2NC6495		PWR	N	4WH-C
2N6497	2NC6497		PWR	N	4JN-G
2N6498	2NC6498		PWR	N	4JN-G
2N6499	2NC6499		PWR	N	4JN-G
2N6515	2NC6515		SST	N	EL644
2N6516	2NC6516		SST	N	EL644
2N6517	2NC6517		SST	N	EL644
2N6518	2NC6518		SST	P	EL694
2N6519	2NC6519		SST	P	EL694
2N6520	2NC6520		SST	P	EL694
2N6542	2NC6542		PWR	N	1TE-NC
2N6543	2NC6543		PWR	N	1TE-NC
2N6544	2NC6544		PWR	N	6KB-NC
2N6545	2NC6545		PWR	N	6KB-NC
2N6546	2NC6546		PWR	N	4TC-C
2N6547	2NC6547		PWR	N	4TC-C
2N6548		2NC6426	SSTR	N	EL645
2N6549		2NC6427	SSTR	N	EL645
2N6551		MPSUC05	SST	N	EL504
2N6552		MPSUC06	SST	N	EL504
2N6553		MPSUC07	SST	N	EL504
2N6554		MPSUC55	SST	N	EL554
2N6555		MPSUC56	SST	N	EL554
2N6556		MPSUC57	SST	N	EL554
2N6557		2NC6515	SST	N	EL644
2N6558		2NC6516	SST	N	EL644
2N6559		2NC6517	SST	N	EL644
2N6569	2NC6569		PWR	N	4WH-C
2N6576	2NC6576		PWR	N	7JA-C
2N6577	2NC6577		PWR	N	7JA-C
2N6578	2NC6578		PWR	N	7JA-C
2N6594	2NC6594		PWR	P	4WH-C
3N124	3NC124		FETJ	N	FM120
3N125	3NC125		FETJ	N	FM120
3N126	3NC126		FETJ	N	FM120
3N128	3NC128		FETM	N	FM112
3N155	3NC155A		FETM	P	FM123
3N155A	3NC155A		FETM	P	FM123
3N156	3NC156A		FETM	P	FM123
3N156A	3NC156A		FETM	P	FM123
3N157	3NC157		FETM	P	FM123
3N157A	3NC157A		FETM	P	FM123
3N158	3NC158		FETM	P	FM123
3N158A	3NC158A		FETM	P	FM123
3N169	3NC169		FETM	N	FM122
3N170	3NC169		FETM	N	FM122
3N171	3NC169		FETM	N	FM122
3N201	3NC201		FETMDG	N	FM877
3N202	3NC202		FETMDG	N	FM877
3N203	3NC203		FETMDG	N	FM877
3N209	3NC209		FETMDG	N	FM877

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
3N210	3NC209		FETMDG	N	FM877
3N211	3NC211		FETMDG	N	FM881
3N212	3NC212		FETMDG	N	FM881
3N213	3NC213		FETMDG	N	FM881
BB105A	BBC105A		TDHA		VL534
BB105B	BBC105B		TDHA		VL534
BB105G	BBC105G		TDHA		VL534
BFR90	BFRC90		RF	N	RF103
BFR91		MRFC911	RF	N	RF104
BFR96		MRFC961	RF	N	RF105
BFT24		MRFC931	RF	N	
BFX89		BFYC90	RF	N	
BFY90	BFYC90	2NC6304	RF	N	RF199
BU108	BUC108		PWR	N	5RV-NC
BU126	BUC126		PWR	N	1TE-NC
BU205	BUC205		PWR	N	5TD-NC
MAC10-1	MACC10-1	MACC4201A	TRIAC		420
MAC10-2	MACC10-2	MACC4201A	TRIAC		420
MAC10-3	MACC10-3	MACC4201A	TRIAC		420
MAC10-4	MACC10-4	MACC4202A	TRIAC		420
MAC10-5	MACC10-5	MACC4203A	TRIAC		420
MAC10-6	MACC10-6	MACC4204A	TRIAC		420
MAC10-7	MACC10-7	MACC4205A	TRIAC		420
MAC10-8	MACC10-8	MACC4206A	TRIAC		420
MAC11-1	MACC11-1	MACC4201	TRIAC		420
MAC11-2	MACC11-2	MACC4201	TRIAC		420
MAC11-3	MACC11-3	MACC4201	TRIAC		420
MAC11-4	MACC11-4	MACC4202	TRIAC		420
MAC11-5	MACC11-5	MACC4203	TRIAC		420
MAC11-6	MACC11-6	MACC4204	TRIAC		420
MAC11-7	MACC11-7	MACC4205	TRIAC		420
MAC11-8	MACC11-8	MACC4206	TRIAC		420
MAC35-1	MACC35-1	MACC4401A	TRIAC		440
MAC35-2	MACC35-2	MACC4401A	TRIAC		440
MAC35-3	MACC35-3	MACC4401A	TRIAC		440
MAC35-4	MACC35-4	MACC4402A	TRIAC		440
MAC35-5	MACC35-5	MACC4403A	TRIAC		440
MAC35-6	MACC35-6	MACC4404A	TRIAC		440
MAC35-7	MACC35-7	MACC4405A	TRIAC		440
MAC35-8	MACC35-8	MACC4406A	TRIAC		440
MAC35-10	MACC35-10	MACC4408A	TRIAC		440
MAC36-1	MACC35-1	MACC4401A	TRIAC		440
MAC36-2	MACC35-2	MACC4401A	TRIAC		440
MAC36-3	MACC35-3	MACC4401A	TRIAC		440
MAC36-4	MACC35-4	MACC4402A	TRIAC		440
MAC36-5	MACC35-5	MACC4403A	TRIAC		440
MAC36-6	MACC35-6	MACC4404A	TRIAC		440
MAC36-7	MACC35-7	MACC4405A	TRIAC		440
MAC36-8	MACC35-8	MACC4406A	TRIAC		440
MAC36-10	MACC35-10	MACC4408A	TRIAC		440
MAC37-1	MACC37-1	MACC4401	TRIAC		440
MAC37-2	MACC37-2	MACC4401	TRIAC		440
MAC37-3	MACC37-3	MACC4401	TRIAC		440
MAC37-4	MACC37-4	MACC4402	TRIAC		440
MAC37-5	MACC37-5	MACC4403	TRIAC		440
MAC37-6	MACC37-6	MACC4404	TRIAC		440
MAC37-7	MACC37-7	MACC4405	TRIAC		440
MAC37-8	MACC37-8	MACC4406	TRIAC		440
MAC37-10	MACC37-10	MACC4408	TRIAC		440
MAC38-1	MACC37-1	MACC4401	TRIAC		440
MAC38-2	MACC37-2	MACC4401	TRIAC		440
MAC38-3	MACC37-3	MACC4401	TRIAC		440
MAC38-4	MACC37-4	MACC4402	TRIAC		440
MAC38-5	MACC37-5	MACC4403	TRIAC		440
MAC38-6	MACC37-6	MACC4404	TRIAC		440
MAC38-7	MACC37-7	MACC4405	TRIAC		440
MAC38-8	MACC37-8	MACC4406	TRIAC		440
MAC38-10	MACC37-10	MACC4408	TRIAC		440
MAC92-1	MACC92-1	MACC4011	TRIAC		401
MAC92A-1	MACC92A-1	MACC4011A	TRIAC		401
MAC92-2	MACC92-2	MACC4011	TRIAC		401
MAC92A-2	MACC92A-2	MACC4011A	TRIAC		401
MAC92-3	MACC92-3	MACC4011	TRIAC		401

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MAC92A-3	MACC92A-3	MACC4011A	TRIAC		401
MAC92-4	MACC92-4	MACC4012	TRIAC		401
MAC92A-4	MACC92A-4	MACC4012A	TRIAC		401
MAC92-5	MACC92-5	MACC4013	TRIAC		401
MAC92A-5	MACC92A-5	MACC4013A	TRIAC		401
MAC92-6	MACC92-6	MACC4014	TRIAC		401
MAC92A-6	MACC92A-6	MACC4014A	TRIAC		401
MAC220-2	MACC220-2	MACC4201	TRIAC		420
MAC220-3	MACC220-3	MACC4201	TRIAC		420
MAC220-5	MACC220-5	MACC4203	TRIAC		420
MAC220-7	MACC220-7	MACC4205	TRIAC		420
MAC220-9	MACC220-9	MACC4207	TRIAC		420
MAC221-2	MACC221-2	MACC4201A	TRIAC		420
MAC221-3	MACC221-3	MACC4201A	TRIAC		420
MAC221-5	MACC221-5	MACC4203A	TRIAC		420
MAC221-7	MACC221-7	MACC4205A	TRIAC		420
MAC221-9	MACC221-9	MACC4207A	TRIAC		420
MAC4688	MACC4688	MACC4402A	TRIAC		440
MAC4689	MACC4689	MACC4404A	TRIAC		440
MAC4690	MACC4690	MACC4406A	TRIAC		440
MAC5441	MACC5441	MACC4402A	TRIAC		440
MAC5442	MACC5442	MACC4404A	TRIAC		440
MAC5443	MACC5443	MACC4406A	TRIAC		440
MAC5444	MACC5444	MACC4402A	TRIAC		440
MAC5445	MACC5445	MACC4404A	TRIAC		440
MAC5446	MACC5446	MACC4406A	TRIAC		440
MAC6400-80	MACC6400-80	MACC4408A	TRIAC		440
MAC6410-80	MACC6410-80	MACC4408A	TRIAC		440
MAC6420-80	MACC6420-80	MACC4408A	TRIAC		440
MAC40688	MACC40688	MACC4402A	TRIAC		440
MAC40689	MACC40689	MACC4404A	TRIAC		440
MAC40690	MACC40690	MACC4406A	TRIAC		440
MAC40795	MACC40795	MACC4206A	TRIAC		420
MAC40796	MACC40795	MACC4206A	TRIAC		420
MAC40797	MACC40797	MACC4206A	TRIAC		420
MAC40798	MACC40797	MACC4206A	TRIAC		420
MAC40799	MACC40799	MACC4202A	TRIAC		420
MAC40800	MACC40800	MACC4204A	TRIAC		420
MAC40801	MACC40801	MACC4206A	TRIAC		420
MBD101	MBDC101		SBD		VL285
MBD102	MBDC101		SBD		VL285
MBD103	MBDC101		SBD		VL285
MBD201	MBDC201		SBD		VL284
MBD301	MBDC301		SBD		VL284
MBD501	MBDC501		SBD		VL282
MBD502	MBDC501		SBD		VL282
MBD701	MBDC701		SBD		VL282
MBD702	MBDC701		SBD		VL282
MBI101	MBDC101		SBD		VL285
MBR320,M	1NC5820		SBR		RL755
MBR330,M	1NC5821		SBR		RL755
MBR335,M	CF		SBR		RL755
MBR340,M	CF		SBR		RL755
MBR1520	1NC5826		SBR		RL756
MBR1530	1NC5827		SBR		RL756
MBR1535	CF		SBR		RL756
MBR1540	CF		SBR		RL756
MBR2520	1NC5832		SBR		RL760
MBR2530	1NC5833		SBR		RL760
MBR2535	CF		SBR		RL760
MBR2540	CF		SBR		RL760
MBR4020,PF	1NC5832		SBR		RL760
MBR4030,PF	1NC5833		SBR		RL760
MBR4035	CF		SBR		RL760
MBR4040	CF		SBR		RL760
MBS4991	MBSC4991		SBS		TL71
MBS4992	MBSC4992		SBS		TL71

Chip No.	Family	Function	Geometry
MCC8T13	LINEAR	Dual Line Driver	9LF
MCC8T14	LINEAR	Triple Line Receiver	4MW
MCC8T23	LINEAR	Dual Line Driver	9LF
MCC8T24	LINEAR	Triple Line Receiver	4MW
MCC8T26	LINEAR	Quad Three-State Bus Transceiver	5NE
MCC400	MTTL	Dual 4-Input NAND Gate	2BN
MCC401	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	58E
MCC402	MTTL	8-Input NAND Gate	6DN
MCC403	MTTL	2-W 3-Input AOI Gate w/Comp.	30F
MCC404	MTTL	Exp. 3-W 3-Input AOI Gate	89A
MCC405	MTTL	Exp. 2-W 4-Input AOI Gate	4DA
MCC406	MTTL	Expandable 8-Input NAND Gate	6DN
MCC407	MTTL	Line Driver	76P
MCC408	MTTL	Quad 2-Input NAND Gate	8DB
MCC409	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC410	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC411	MTTL	Dual 4-Input Exp. for NAND Gates	4DA
MCC412	MTTL	Triple 3-Input NAND Gate	45V
MCC413	MTTL	R-S Flip Flop	24A
MCC414	MTTL	Gated R-S Flip Flop	03A
MCC415	MTTL	AND J-K Flip Flop	8EX
MCC416	MTTL	OR J-K Flip Flop	8EX
MCC419	MTTL	Triple 2-Input Buss Driver	78E
MCC420	MTTL	Exp. Dual 2-W 2-Input AOI Gate	9RW
MCC421	MTTL	AC Coupled R-S Flip Flop	03A
MCC422	MTTL	Dual Type D Flip-Flop	80V
MCC423	MTTL	Dual J-K Flip-Flop (separate clock)	2TJ
MCC424	MTTL	Dual J-K Flip-Flop (common clock)	2TJ
MCC425	MTTL	Hex Inverter	80E
MCC426	MTTL	Dual 3-I Pulse Shaper/Delay AND Gate	76E
MCC427	MTTL	OR Exp. Dual 4-Input AND Gate	76E
MCC428	MTTL	Dual 2-Wide 2-3 Input OR Expander	76E
MCC429	MTTL	Hex Inverter	79M
MCC450	MTTL	Dual 4-Input NAND Gate	2BN
MCC451	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	58E
MCC452	MTTL	8-Input NAND Gate	6DN
MCC453	MTTL	2-W 3-Input AOI Gate w/Comp.	30F
MCC454	MTTL	Exp. 3-W 3-Input AOI Gate	89A
MCC455	MTTL	Exp. 2-W 4-Input AOI Gate	4DA
MCC456	MTTL	Expandable 8-Input NAND Gate	6DN
MCC457	MTTL	Line Driver	76P
MCC458	MTTL	Quad 2-Input NAND Gate	8DB
MCC459	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC460	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC461	MTTL	Dual 4-Input Exp. for NAND Gates	4DA
MCC462	MTTL	Triple 3-Input NAND Gate	45V
MCC463	MTTL	R-S Flip Flop	24A
MCC464	MTTL	Gated R-S Flip Flop	03A
MCC465	MTTL	AND J-K Flip Flop	8EX
MCC466	MTTL	OR J-K Flip Flop	8EX
MCC469	MTTL	Triple 2-Input Buss Driver	78E
MCC470	MTTL	Exp. Dual 2-W 2-Input AOI Gate	9RW
MCC471	MTTL	AC Coupled R-S Flip Flop	03A
MCC472	MTTL	Dual Type D Flip-Flop	80V
MCC473	MTTL	Dual J-K Flip-Flop (separate clock)	2TJ
MCC474	MTTL	Dual J-K Flip-Flop (common clock)	2TJ
MCC475	MTTL	Hex Inverter	80E
MCC476	MTTL	Dual 3-I Pulse Shaper/Delay AND Gate	76E
MCC477	MTTL	OR Exp. Dual 4-Input AND Gate	76E
MCC478	MTTL	Dual 2-Wide 2-3 Input OR Expander	76E
MCC479	MTTL	Hex Inverter	79M
MCC500	MTTL	Dual 4-Input NAND Gate	2BN
MCC501	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	58E
MCC502	MTTL	8-Input NAND Gate	6DN
MCC503	MTTL	2-W 3-Input AOI Gate w/Comp.	30F
MCC504	MTTL	Exp. 3-W 3-Input AOI Gate	89A
MCC505	MTTL	Exp. 2-W 4-Input AOI Gate	4DA
MCC506	MTTL	Expandable 8-Input NAND Gate	6DN
MCC507	MTTL	Line Driver	76P
MCC508	MTTL	Quad 2-Input NAND Gate	8DB
MCC509	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC510	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC511	MTTL	Dual 4-Input Exp. for NAND Gates	4DA

Chip No.	Family	Function	Geometry
MCC512	MTTL	Triple 3-Input NAND Gate	45V
MCC513	MTTL	R-S Flip Flop	24A
MCC514	MTTL	Gated R-S Flip Flop	03A
MCC515	MTTL	AND J-K Flip Flop	8EX
MCC516	MTTL	OR J-K Flip Flop	8EX
MCC519	MTTL	Triple 2-Input Buss Driver	78E
MCC520	MTTL	Exp. Dual 2-W 2-Input AOI Gate	9RW
MCC521	MTTL	AC Coupled R-S Flip Flop	03A
MCC522	MTTL	Dual Type D Flip-Flop	80V
MCC523	MTTL	Dual J-K Flip-Flop (separate clock)	2TJ
MCC524	MTTL	Dual J-K Flip-Flop (common clock)	2TJ
MCC525	MTTL	Hex Inverter	80E
MCC526	MTTL	Dual 3-I Pulse Shaper/Delay AND Gate	76E
MCC527	MTTL	OR Exp. Dual 4-Input AND Gate	76E
MCC528	MTTL	Dual 2-Wide 2-3 Input OR Expander	76E
MCC529	MTTL	Hex Inverter	79M
MCC550	MTTL	Dual 4-Input NAND Gate	2BN
MCC551	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	58E
MCC552	MTTL	8-Input NAND Gate	6DN
MCC553	MTTL	2-W 3-Input AOI Gate w/Comp.	30F
MCC554	MTTL	Exp. 3-W 3-Input AOI Gate	89A
MCC555	MTTL	Exp. 2-W 4-Input AOI Gate	4DA
MCC556	MTTL	Expandable 8-Input NAND Gate	6DN
MCC557	MTTL	Line Driver	76P
MCC558	MTTL	Quad 2-Input NAND Gate	8DB
MCC559	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC560	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC561	MTTL	Dual 4-Input Exp. for NAND Gates	4DA
MCC562	MTTL	Triple 3-Input NAND Gate	45V
MCC563	MTTL	R-S Flip Flop	24A
MCC564	MTTL	Gated R-S Flip Flop	03A
MCC565	MTTL	AND J-K Flip Flop	8EX
MCC566	MTTL	OR J-K Flip Flop	8EX
MCC569	MTTL	Triple 2-Input Buss Driver	78E
MCC570	MTTL	Exp. Dual 2-W 2-Input AOI Gate	9RW
MCC571	MTTL	AC Coupled R-S Flip Flop	03A
MCC572	MTTL	Dual Type D Flip-Flop	80V
MCC573	MTTL	Dual J-K Flip-Flop (separate clock)	2TJ
MCC574	MTTL	Dual J-K Flip-Flop (common clock)	2TJ
MCC575	MTTL	Hex Inverter	80E
MCC576	MTTL	Dual 3-I Pulse Shaper/Delay AND Gate	76E
MCC577	MTTL	OR Exp. Dual 4-Input AND Gate	76E
MCC578	MTTL	Dual 2-Wide 2-3 Input OR Expander	76E
MCC579	MTTL	Hex Inverter	79M
MCC660	MHTL	Expandable Dual 4-Input Gate (active pullup)	8MG
MCC661	MHTL	Expandable Dual 4-Input Gate (passive pullup)	8MG
MCC662	MHTL	Expandable Dual 4-Input Line Driver	1TT
MCC663	MHTL	Dual J-K Flip-Flop	2EA
MCC664	MHTL	Master Slave R-S Flip-Flop	85M
MCC665	MHTL	Triple Level Translator	5MG
MCC666	MHTL	Triple Level Translator	4MF
MCC667	MHTL	Dual Monostable Multivibrator	1GD
MCC668	MHTL	Quad 2-Input Gate (passive pullup)	8MG
MCC669	MHTL	Dual 4-Input Expander	59H
MCC670	MHTL	Triple 3-Input Gate (passive pullup)	76H
MCC671	MHTL	Triple 3-Input Gate (active pullup)	76H
MCC672	MHTL	Quad 2-Input Gate (active pullup)	8MG
MCC673	MHTL	Dual 2-Input AND-OR-INVERT Gate	8MG
MCC674	MHTL	Dual 2-Input AND-OR-INVERT Gate	8MG
MCC675	MHTL	Dual Pulse Stretcher	1MH
MCC676	MHTL	BCD-To-Decimal Decoder Driver	2ME
MCC677	MHTL	Hex Inverter With Strobe (active pullup)	95R
MCC678	MHTL	Hex Inverter With Strobe (without output resistors)	95R
MCC679	MHTL	Dual Lamp Driver	6BE
MCC680	MHTL	Hex Inverter	95R
MCC681	MHTL	Hex Inverter (open collector)	95R
MCC682	MHTL	Quad Latch	2AP
MCC683	MHTL	Quad 2-Input Exclusive OR	8TJ
MCC684	MHTL	Decade Counter	3TA
MCC685	MHTL	Binary Counter	3TA
MCC686	MHTL	4-Bit Shift Register	3TA
MCC688	MHTL	Dual J-K Flip-Flop	9TW
MCC689	MHTL	Hex Inverter (high voltage)	48W

Chip No.	Family	Function	Geometry
MCC690	MHTL	Hex Inverter (active pullup)	48W
MCC691	MHTL	Hex nverter/Translator	48W
MCC696	MHTL	Dual Line Driver Receiver	9DD
MCC697	MHTL	Hex Inverter (passive pullup)	95R
MCC699	MHTL	Dual 2-Input Power AND Gate	3NB
MCC700	MRTL	Buffer	67D
MCC701	MRTL	Counter Adapter	5MH
MCC702	MRTL	R-S Flip-Flop	6ML
MCC703	MRTL	3-Input NOR Gate	2MH
MCC704	MRTL	Half Adder	6JC
MCC705	MRTL	Half Shift Register	C02
MCC706	MRTL	Half Shift Register (w/o inverter)	8ME
MCC707	MRTL	4-Input NOR Gate	B77
MCC708	MRTL	Half Adder	3JB
MCC709	MRTL	2-Input Buffer	C15
MCC710	MRTL	Dual 2-Input NOR Gate	7JC
MCC711	MRTL	4-Input OR/NOR Gate	4JC
MCC712	MRTL	Half Adder	3JB
MCC713	MRTL	Type D Flip-Flop	1JD
MCC714	MRTL	Dual 2-Input NOR Gate	9KM
MCC715	MRTL	Dual 3-Input NOR Gate	1MF
MCC717	MRTL	Quad 2-Input NOR Gate	2KD
MCC718	MRTL	Dual 3-Input NOR Gate	1MF
MCC719	MRTL	Dual 4-Input NOR Gate	1MF
MCC720	MRTL	J-K Flip-Flop	81O
MCC721	MRTL	Dual 2-Input Gate Expander	7JC
MCC722	MRTL	J-K Flip-Flop	87A
MCC723	MRTL	J-K Flip-Flop	78M
MCC724	MRTL	Quad 2-Input NOR Gate	2KD
MCC725	MRTL	Dual 4-Input NOR Gate	1MF
MCC726	MRTL	J-K Flip Flop	12C
MCC727	MRTL	Quad Inverter	12L
MCC728	MRTL	5-Input NOR Gate	774
MCC729	MRTL	5-Input NOR Gate	B86
MCC764	MRTL	Dual Exclusive OR/NOR Gate	31A
MCC767	MRTL	Quad Latch	69A
MCC770	MRTL	BCD to Decimal Decoder	88G
MCC771	MRTL	Quad Exclusive OR Gate	30A
MCC774	MRTL	J-K Flip Flop	12C
MCC775	MRTL	Dual Half Adder	19K
MCC776	MRTL	Dual J-K Flip Flop	E90
MCC777	MRTL	Binary Up Counter	80D
MCC778	MRTL	Dual Type D Flip Flop	49D
MCC779	MRTL	1 J-K Flip Flop, 1 Expander, 2 Buffers	2MK
MCC780	MRTL	Decade Up Counter	80D
MCC781	MRTL	Dual Buffer	37B
MCC782	MRTL	J-K Flip Flop	28C
MCC783	MRTL	Dual Half Shift Register	54K
MCC784	MRTL	Dual Half Shift Register (w/inverter)	E24
MCC785	MRTL	Quad 2-Input Expander	2KD
MCC786	MRTL	Dual 4-Input Expander	1MF
MCC787	MRTL	1 J-K Flip Flop, 1 Inverter, 2 Buffers	2MK
MCC788	MRTL	Dual 3-Input Buffer, non-inverting	19H
MCC789	MRTL	Hex Inverter	3KD
MCC790	MRTL	Dual J-K Flip Flop	9KE
MCC791	MRTL	Dual J-K Flip Flop	08K
MCC792	MRTL	Triple 3-Input NOR Gate	90G
MCC793	MRTL	Triple 3-Input NOR Gate	90G
MCC794	MRTL	Serial-Parallel Shift Register	2EF
MCC796	MRTL	Dual Full Adder	94D
MCC797	MRTL	Dual Full Subtractor	94D
MCC798	MRTL	Dual 2-Input Buffer	A66
MCC799	MRTL	Dual Buffer	85H
MCC800	MRTL	Buffer	67D
MCC801	MRTL	Counter Adapter	5MH
MCC802	MRTL	R-S Flip-Flop	6ML
MCC803	MRTL	3-Input NOR Gate	2MH
MCC804	MRTL	Half Adder	6JC
MCC805	MRTL	Half Shift Register	C02
MCC806	MRTL	Half Shift Register (w/o inverter)	8ME
MCC807	MRTL	4-Input NOR Gate	B77
MCC808	MRTL	Half Adder	3JB
MCC809	MRTL	2-Input Buffer	C15

Chip No.	Family	Function	Geometry
MCC810	MRTL	Dual 2-Input NOR Gate	7JC
MCC811	MRTL	4-Input OR/NOR Gate	4JC
MCC812	MRTL	Half Adder	3JB
MCC813	MRTL	Type D Flip-Flop	1JD
MCC814	MRTL	Dual 2-Input NOR Gate	9KM
MCC815	MRTL	Dual 3-Input NOR Gate	1MF
MCC816	MRTL	J-K Flip-Flop	78M
MCC817	MRTL	Quad 2-Input NOR Gate	2KD
MCC818	MRTL	Dual 3-Input NOR Gate	1MF
MCC819	MRTL	Dual 4-Input NOR Gate	1MF
MCC820	MRTL	J-K Flip-Flop	810
MCC821	MRTL	Dual 2-Input Gate Expander	7JC
MCC822	MRTL	J-K Flip-Flop	87A
MCC824	MRTL	Quad 2-Input NOR Gate	2KD
MCC825	MRTL	Dual 4-Input NOR Gate	1MF
MCC826	MRTL	J-K Flip Flop	12C
MCC827	MRTL	Quad Inverter	12L
MCC828	MRTL	5-Input NOR Gate	774
MCC829	MRTL	5-Input NOR Gate	B86
MCC830	MDTL	Exp. Dual 4-Input NAND Gate	18N
MCC831	MDTL	Clocked Flip Flop	56H
MCC832	MDTL	Exp. Dual 4-Input Buffer	84N
MCC833	MDTL	Dual 4-Input Expander	32H
MCC834	MDTL	Hex Inverter	57H
MCC835	MDTL	Hex Inverter (w/o Output resistors)	4AE
MCC836	MDTL	Hex Inverter	4AE
MCC837	MDTL	Hex Inverter	4AE
MCC838	MDTL	Decade Counter	84L
MCC839	MDTL	Divide by Sixteen Counter	84L
MCC840	MDTL	Hex Inverter (w/o input diodes)	4AE
MCC841	MDTL	Hex Inverter (w/o output resistors and input diodes	4AE
MCC842	MDTL	Type D FF Plus Gates	72A
MCC844	MDTL	Exp. Dual 4-Input Power Gate	84N
MCC845	MDTL	Clocked Flip Flop	47P
MCC846	MDTL	Quad 2-Input NAND Gate	98M
MCC847	MDTL	Quad 2-Input Gate Expander	86D
MCC848	MDTL	Clocked Flip Flop	47P
MCC849	MDTL	Quad 2-Input NAND Gate (2K pullups)	98M
MCC850	MDTL	Pulse Triggered Binary	B93
MCC851	MDTL	Monostable Multivibrator	29H
MCC852	MDTL	Dual J-K FF (common Clock and CD)	45N
MCC853	MDTL	Dual J-K FF (separate Clock and SD)	45N
MCC855	MDTL	Dual J-K FF (2K pullup resistor)	45N
MCC856	MDTL	Dual J-K FF (2K pullup resistor)	45N
MCC857	MDTL	Quad 2-Input Buffer	14P
MCC858	MDTL	Quad 2-Input NAND Power Gate	14P
MCC861	MDTL	Exp. Dual 4-Input NAND Gate (2k pullup)	18N
MCC862	MDTL	Triple 3-Input NAND Gate	83N
MCC863	MDTL	Triple 3-Input NAND Gate (2k pullups)	83N
MCC864	MRTL	Dual Exclusive OR/NOR Gate	31A
MCC867	MRTL	Quad Latch	69A
MCC870	MRTL	BCD to Decimal Decoder	88G
MCC871	MRTL	Quad Exclusive OR Gate	30A
MCC874	MRTL	J-K Flip Flop	12C
MCC875	MRTL	Dual Half Adder	19K
MCC876	MRTL	Dual J-K Flip Flop	E90
MCC877	MRTL	Binary Up Counter	80D
MCC878	MRTL	Dual Type D Flip Flop	49D
MCC879	MRTL	1 J-K Flip Flop, 1 Expander, 2 Buffers	2MK
MCC880	MRTL	Decade Up Counter	80D
MCC881	MRTL	Dual Buffer	37B
MCC882	MRTL	J-K Flip Flop	28C
MCC883	MRTL	Dual Half Shift Register	54K
MCC884	MRTL	Dual Half Shift Register (w/inverter)	E24
MCC885	MRTL	Quad 2-Input Expander	2KD
MCC886	MRTL	Dual 4-Input Expander	1MF
MCC887	MRTL	1 J-K Flip Flop, 1 Inverter, 2 Buffers	2MK
MCC888	MRTL	Dual 3-Input Buffer, non-inverting	19H
MCC889	MRTL	Hex Inverter	3KD
MCC890	MRTL	Dual J-K Flip Flop	9KE
MCC891	MRTL	Dual J-K Flip Flop	08K
MCC892	MRTL	Triple 3-Input NOR Gate	90G
MCC893	MRTL	Triple 3-Input NOR Gate	90G

Chip No.	Family	Function	Geometry
MCC894	MRTL	Serial-Parallel Shift Register	2EF
MCC896	MRTL	Dual Full Adder	94D
MCC897	MRTL	Dual Full Subtractor	94D
MCC898	MRTL	Dual 2-Input Buffer	A66
MCC899	MRTL	Dual Buffer	85H
MCC900	MRTL	Buffer	67D
MCC901	MRTL	Counter Adapter	5MH
MCC902	MRTL	R-S Flip-Flop	6ML
MCC903	MRTL	3-Input NOR Gate	2MH
MCC904	MRTL	Half Adder	6JC
MCC905	MRTL	Half Shift Register	C02
MCC906	MRTL	Half Shift Register (w/o inverter)	8ME
MCC907	MRTL	4-Input NOR Gate	B77
MCC908	MRTL	Half Adder	3JB
MCC909	MRTL	2-Input Buffer	C15
MCC910	MRTL	Dual 2-Input NOR Gate	7JC
MCC911	MRTL	4-Input OR/NOR Gate	4JC
MCC912	MRTL	Half Adder	3JB
MCC913	MRTL	Type D Flip-Flop	1JD
MCC914	MRTL	Dual 2-Input NOR Gate	9KM
MCC915	MRTL	Dual 3-Input NOR Gate	1MF
MCC916	MRTL	J-K Flip-Flop	78M
MCC917	MRTL	Quad 2-Input NOR Gate	2KD
MCC918	MRTL	Dual 3-Input NOR Gate	1MF
MCC919	MRTL	Dual 4-Input NOR Gate	1MF
MCC920	MRTL	J-K Flip-Flop	81O
MCC921	MRTL	Dual 2-Input Gate Expander	7JC
MCC922	MRTL	J-K Flip-Flop	87A
MCC924	MRTL	Quad 2-Input NOR Gate	2KD
MCC925	MRTL	Dual 4-Input NOR Gate	1MF
MCC926	MRTL	J-K Flip Flop	12C
MCC927	MRTL	Quad Inverter	12L
MCC928	MRTL	5-Input NOR Gate	774
MCC929	MRTL	5-Input NOR Gate	B86
MCC930	MDTL	Exp. Dual 4-Input NAND Gate	18N
MCC931	MDTL	Clocked Flip Flop	56H
MCC932	MDTL	Exp. Dual 4-Input Buffer	84N
MCC933	MDTL	Dual 4-Input Expander	32H
MCC934	MDTL	Hex Inverter	57H
MCC935	MDTL	Hex Inverter (w/o Output resistors)	4AE
MCC936	MDTL	Hex Inverter	4AE
MCC937	MDTL	Hex Inverter	4AE
MCC938	MDTL	Decade Counter	84L
MCC939	MDTL	Divide by Sixteen Counter	84L
MCC940	MDTL	Hex Inverter (w/o input diodes)	4AE
MCC941	MDTL	Hex Inverter (w/o output resistors and input diodes	4AE
MCC942	MDTL	Type D FF Plus Gates	72A
MCC944	MDTL	Exp. Dual 4-Input Power Gate	84N
MCC945	MDTL	Clocked Flip Flop	47P
MCC946	MDTL	Quad 2-Input NAND Gate	98M
MCC947	MDTL	Quad 2-Input Gate Expander	86D
MCC948	MDTL	Clocked Flip Flop	47P
MCC949	MDTL	Quad 2-Input NAND Gate (2K pullups)	98M
MCC950	MDTL	Pulse Triggered Binary	B93
MCC951	MDTL	Monostable Multivibrator	29H
MCC952	MDTL	Dual J-K FF (common Clock and CD)	45N
MCC953	MDTL	Dual J-K FF (separate Clock and SD)	45N
MCC955	MDTL	Dual J-K FF (2K pullup resistor)	45N
MCC956	MDTL	Dual J-K FF (2K pullup resistor)	45N
MCC957	MDTL	Quad 2-Input Buffer	14P
MCC958	MDTL	Quad 2-Input NAND Power Gate	14P
MCC961	MDTL	Exp. Dual 4-Input NAND Gate (2k pullup)	18N
MCC962	MDTL	Triple 3-Input NAND Gate	83N
MCC963	MDTL	Triple 3-Input NAND Gate (2k pullups)	83N
MCC964	MRTL	Dual Exclusive OR/NOR Gate	31A
MCC967	MRTL	Quad Latch	69A
MCC970	MRTL	BCD to Decimal Decoder	88G
MCC971	MRTL	Quad Exclusive OR Gate	30A
MCC974	MRTL	J-K Flip Flop	12C
MCC975	MRTL	Dual Half Adder	19K
MCC976	MRTL	Dual J-K Flip Flop	E90
MCC977	MRTL	Binary Up Counter	80D
MCC978	MRTL	Dual Type D Flip Flop	49D

Chip No.	Family	Function	Geometry
MCC979	MRTL	1 J-K Flip Flop, 1 Expander, 2 Buffers	2MK
MCC980	MRTL	Decade Up Counter	80D
MCC981	MRTL	Dual Buffer	37B
MCC982	MRTL	J-K Flip Flop	28C
MCC983	MRTL	Dual Half Shift Register	54K
MCC984	MRTL	Dual Half Shift Register (w/inverter)	E24
MCC985	MRTL	Quad 2-Input Expander	2KD
MCC986	MRTL	Dual 4-Input Expander	1MF
MCC987	MRTL	1 J-K Flip Flop, 1 Inverter, 2 Buffers	2MK
MCC988	MRTL	Dual 3-Input Buffer, non-inverting	19H
MCC989	MRTL	Hex Inverter	3KD
MCC990	MRTL	Dual J-K Flip Flop	9KE
MCC991	MRTL	Dual J-K Flip Flop	08K
MCC992	MRTL	Triple 3-Input NOR Gate	90G
MCC993	MRTL	Triple 3-Input NOR Gate	90G
MCC994	MRTL	Serial-Parallel Shift Register	2EF
MCC996	MRTL	Dual Full Adder	94D
MCC997	MRTL	Dual Full Subtractor	94D
MCC998	MRTL	Dual 2-Input Buffer	A66
MCC999	MRTL	Dual Buffer	85H
MCC1201	MECL	Single 6-Input Gate	41E
MCC1204	MECL	Dual 4-Input Gate	25D
MCC1206	MECL	Dual 4-Input Gate	25D
MCC1207	MECL	Triple 3-Input Gate	9EG
MCC1210	MECL	Quad 2-Input Gate	05N
MCC1211	MECL	Quad 2-Input Gate	05N
MCC1212	MECL	Quad 2-Input Gate	05N
MCC1213	MECL	AC Coupled J-K FF (85 MHz typ)	31D
MCC1214	MECL	Dual R-S FF (Positive Clock)	23D
MCC1215	MECL	Dual R-S FF (Negative Clock)	23D
MCC1216	MECL	Dual R-S FF (Single Rail)	23D
MCC1217	MECL	Level Translator (Saturated Logic to MECL)	83B
MCC1218	MECL	Level Translator (MECL to Saturated Logic)	22D
MCC1219	MECL	Full Adder	80K
MCC1220	MECL	Quad Line Receiver	28D
MCC1221	MECL	Full Subtractor	80K
MCC1222	MECL	Type D Flip-Flop	31B
MCC1223	MECL	Dual 4-Input OR/NOR Clock Driver	6DT
MCC1224	MECL	Dual 2-Input Expandable Gate	25D
MCC1225	MECL	Dual 4 and 5-Input Expander	36D
MCC1226	MECL	Dual 3-4-Input Transmission Line and Clock Driver	6DM
MCC1227	MECL	AC Coupled J-K FF (120 MHz typ)	31D
MCC1228	MECL	Dual 4-Channel Data Selector	59E
MCC1230	MECL	Quad Exclusive OR Gate	73A
MCC1231	MECL	Quad Exclusive NOR Gate	73A
MCC1232	MECL	100-MHz AC Coupled Dual J-K FF	6EH
MCC1233	MECL	Dual R-S FF (Single Rail, Negative Clock)	23D
MCC1234	MECL	Type D Flip-Flop	26K
MCC1235	MECL	Dual Schmitt Trigger/Triple Line Receiver	48B
MCC1236	MECL	16-Bit Coincident Memory	32G
MCC1239	MECL	Quad Level Translator (MECL to Sat. Logic)	41C
MCC1240	MECL	Quad Latch	61T
MCC1245	MECL	Decoder-Nixie ® Driver	99F
MCC1247	MECL	Quad 2-Input AND Gates	73A
MCC1248	MECL	Quad 2-Input NAND Gates	73A
MCC1259	MECL	Dual Full Adder	9FC
MCC1262	MECL	Quad 2-Input NOR Gate	2KB
MCC1263	MECL	Quad 2-Input NOR Gate	2KB
MCC1266	MECL	Dual Schmitt Trigger/Triple Line Receiver	2KB
MCC1267	MECL	Quad MTTL to MECL Trans. W/Strobe	2CR
MCC1268	MECL	Quad MECL to MTTL Trans. W/Totem Pole Outputs	7CF
MCC1270	MECL	Quad Latch	61T
MCC1405	LINEAR	A-to-D Converter Subsystem	1GM
MCC1406	LINEAR	Six Bit, Multiplying D-to-A Converter	6HR
MCC1407	LINEAR	A-to-D Control Circuit	9AR
MCC1408	LINEAR	Eight Bit Multiplying D-to-A Converter	1EE
MCC1410	LINEAR	Video Amplifier	60C
MCC1411	LINEAR	Darlington Transistor Array	8TN
MCC1412	LINEAR	Darlington Transistor Array	8TN
MCC1413	LINEAR	Darlington Transistor Array	8TN
MCC1414	LINEAR	Dual Voltage Comparator	70D
MCC1420	LINEAR	Differential Output Op Amp	6HF
MCC1430	LINEAR	Op Amp	20C

Chip No.	Family	Function	Geometry
MCC1431	LINEAR	Op Amp (Darlington Inputs)	20C
MCC1433	LINEAR	Op Amp	19C
MCC1435	LINEAR	Dual Op Amp	47C
MCC1436	LINEAR	High Voltage Op Amp	02K
MCC1437	LINEAR	Dual MCC1709C Op Amp	78W
MCC1438	LINEAR	Op Amp/Power Booster	36F
MCC1439	LINEAR	Uncompensated Op Amp	42P
MCC1440	LINEAR	Core Memory Sense Amplifier	42D
MCC1444	LINEAR	AC-Coupled Four-Channel Sense Amp	64R
MCC1445	LINEAR	Gate Controlled Wideband Amplifier	52D
MCC1454	LINEAR	1-Watt Power Amplifier	82D
MCC1455	LINEAR	Timing Circuit	3EK
MCC1456	LINEAR	High Performance Op Amp	8NC
MCC1458	LINEAR	Dual MC1741 High Performance Op Amp	3NH
MCC1458S	LINEAR	High Slew Rate Op Amp	9MV
MCC1463	LINEAR	Negative Power Supply Voltage Regulator	80H
MCC1466	LINEAR	Precision Voltage and Current Regulator	56G
MCC1468	LINEAR	Dual ±15 Volt Tracking Regulator	4CH
MCC1469	LINEAR	Positive Voltage Regulator	93C
MCC1488	LINEAR	Quad MDTL Line Driver	7NA
MCC1489	LINEAR	Quad MDTL Line Receiver	62L
MCC1489A	LINEAR	Quad MDTL Line Receiver	62L
MCC1494	LINEAR	Four-Quadrant Multiplier	15M
MCC1495	LINEAR	Four-Quadrant Multiplier	3TC
MCC1496	LINEAR	Balanced Modulator-Demodulator	6PV
MCC1505	LINEAR	A-to-D Converter Subsystem	1GM
MCC1506	LINEAR	Six Bit, Multiplying D-to-A Converter	6HR
MCC1507	LINEAR	A-to-D Control Circuit	9AR
MCC1508	LINEAR	Eight Bit Multiplying D-to-A Converter	1EE
MCC1510	LINEAR	Video Amplifier	60C
MCC1514	LINEAR	Dual Voltage Comparator	70D
MCC1520	LINEAR	Differential Output Op Amp	6HF
MCC1530	LINEAR	Op Amp	20C
MCC1531	LINEAR	Op Amp (Darlington Inputs)	20C
MCC1533	LINEAR	Op Amp	19C
MCC1535	LINEAR	Dual Op Amp	47C
MCC1536	LINEAR	High Voltage Op Amp	02K
MCC1537	LINEAR	Dual MCC1709 Op Amp	78W
MCC1538	LINEAR	Op Amp/Power Booster	36F
MCC1539	LINEAR	Uncompensated Op Amp	42P
MCC1540	LINEAR	Core Memory Sense Amplifier	42D
MCC1544	LINEAR	AC-Coupled Four-Channel Sense Amp	64R
MCC1545	LINEAR	Gate Controlled Wideband Amplifier	52D
MCC1550	LINEAR	RF-IF Amplifier	10D
MCC1552	LINEAR	High Frequency Video Amplifier (Low Gain)	70C
MCC1553	LINEAR	High Frequency Video Amplifier (High Gain)	70C
MCC1554	LINEAR	1-Watt Power Amplifier	82D
MCC1555	LINEAR	Timing Circuit	3EK
MCC1556	LINEAR	High Performance Op Amp	8NC
MCC1558	LINEAR	Dual MC1741 High Performance Op Amp	3NH
MCC1558S	LINEAR	High Slew Rate Op Amp	9MV
MCC1563	LINEAR	Negative Power Supply Voltage Regulator	80H
MCC1566	LINEAR	Precision Voltage and Current Regulator	56G
MCC1568	LINEAR	Dual ±15 Volt Tracking Regulator	4CH
MCC1569	LINEAR	Positive Voltage Regulator	93C
MCC1590	LINEAR	Wideband Amplifier With AGC	62B
MCC1594	LINEAR	Four Quadrant Multiplier	15M
MCC1595	LINEAR	Four Quadrant Multiplier	3TC
MCC1596	LINEAR	Balanced Modulator-Demodulator	6PV
MCC1648	PLL	Voltage Controlled Oscillator	7TC
MCC1648	MECL	Voltage Controlled Oscillator	7TC
MCC1650	MECL	Dual A-D Comparator	4NG
MCC1651	MECL	Dual A-D Comparator	4NG
MCC1654	MECL	Binary Counter (High Z)	4TG
MCC1658	MECL	Voltage Controlled Multivibrator	5WJ
MCC1660	MECL	Dual 4-Input OR/NOR Gate (High Z)	3TW
MCC1662	MECL	Quad 2-Input NOR Gate (High Z)	1NJ
MCC1664	MECL	Quad 2-Input OR Gate (High Z)	1NJ
MCC1666	MECL	Dual Clocked R-S FF (High Z)	8TT
MCC1668	MECL	Dual Clocked Latch (High Z)	8TT
MCC1670	MECL	Master-Slave Type D FF (High Z)	A1L
MCC1672	MECL	Triple 2-Input Exclusive OR Gate (High Z)	68F
MCC1674	MECL	Triple 2-Input Exclusive NOR Gate (High Z)	68F

Chip No.	Family	Function	Geometry
MCC1678	MECL	Bi-Quinary Counter (High Z)	4TG
MCC1688	MECL	Dual 4-5 Input OR/NOR Gate	9NF
MCC1690	MECL	UHF Prescater Type D Flip-Flop	6WK
MCC1692	MECL	Quad Line Receiver	1NJ
MCC1694	MECL	4-Bit Shift Register (High Z)	8WJ
MCC1709	LINEAR	Op Amp	21C
MCC1709A	LINEAR	Op Amp	21C
MCC1709C	LINEAR	Op Amp	21C
MCC1710	LINEAR	Differential Voltage Comparator	6TR
MCC1710C	LINEAR	Differential Voltage Comparator	6TR
MCC1711	LINEAR	Dual Differential Voltage Comparator	2BH
MCC1711C	LINEAR	Dual Differential Voltage Comparator	2BH
MCC1712	LINEAR	Wideband DC Amplifier	18C
MCC1712C	LINEAR	Wideband DC Amplifier	18C
MCC1723	LINEAR	Voltage Regulator	3PB
MCC1723C	LINEAR	Voltage Regulator	3PB
MCC1733	LINEAR	Differential Video Wideband Amplifier	O2R
MCC1733C	LINEAR	Differential Video Wideband Amplifier	O2R
MCC1741	LINEAR	High Performance Op Amp	7NL
MCC1741C	LINEAR	High Performance Op Amp	7NL
MCC1741S	LINEAR	High Slew Rate Op Amp	3DW
MCC1741SC	LINEAR	High Slew Rate Op Amp	3DW
MCC1747	LINEAR	Dual MC1741 High Performance Op Amp	9KF
MCC1747C	LINEAR	Dual MC1741 High Performance Op Amp	9KF
MCC1748	LINEAR	High Performance Op Amp	6OP
MCC1748C	LINEAR	High Performance Op Amp	6OP
MCC1776	LINEAR	Micropower Programmable Op Amp	9CF
MCC1776C	LINEAR	Micropower Programmable Op Amp	9CF
MCC1800	MDTL	Dual 6-Input NAND Gate	62C
MCC1801	MDTL	Dual 5-Input NAND Gate (2k pullups)	62C
MCC1802	MDTL	Exp. 8-Input NAND Gate	62C
MCC1803	MDTL	Exp. 8-Input NAND Gate (2k pullups)	62C
MCC1804	MDTL	10 Input NAND Gate	62C
MCC1805	MDTL	10 Input NAND Gate (2k pullup resistor)	62C
MCC1806	MDTL	Quad 2-Input AND Gate	7DM
MCC1807	MDTL	Quad 2-Input AND Gate (2k pullup resistor)	7DM
MCC1808	MDTL	Quad 2-Input OR Gate	7DM
MCC1809	MDTL	Quad 2-Input OR Gate (2k pullup resistor)	7DM
MCC1810	MDTL	Quad 2-Input NOR Gate	7DM
MCC1811	MDTL	Quad 2-Input NOR Gate (2k pullup resistor)	7DM
MCC1812	MDTL	Quad 2-Input Exclusive OR Gate	2AB
MCC1813	MDTL	Quad Latch	16C
MCC1814	MDTL	Quad Latch	16C
MCC1818	MDTL	Quad 2-Input NAND Gate	98M
MCC1820	MDTL	High Voltage Hex Inverter	4AE
MCC1900	MDTL	Dual 6-Input NAND Gate	62C
MCC1901	MDTL	Dual 5-Input NAND Gate (2k pullups)	62C
MCC1902	MDTL	Exp. 8-Input NAND Gate	62C
MCC1903	MDTL	Exp. 8-Input NAND Gate (2k pullups)	62C
MCC1904	MDTL	10 Input NAND Gate	62C
MCC1905	MDTL	10 Input NAND Gate (2k pullup resistor)	62C
MCC1906	MDTL	Quad 2-Input AND Gate	7DM
MCC1907	MDTL	Quad 2-Input AND Gate (2k pullup resistor)	7DM
MCC1908	MDTL	Quad 2-Input OR Gate	7DM
MCC1909	MDTL	Quad 2-Input OR Gate (2k pullup resistor)	7DM
MCC1910	MDTL	Quad 2-Input NOR Gate	7DM
MCC1911	MDTL	Quad 2-Input NOR Gate (2k pullup resistor)	7DM
MCC1912	MDTL	Quad 2-Input Exclusive OR Gate	2AB
MCC1913	MDTL	Quad Latch	16C
MCC1914	MDTL	Quad Latch	16C
MCC1918	MDTL	Quad 2-Input NAND Gate	98M
MCC2000	MTTL	Exp. 2-Wide 4-Input AOI Gate	4DA
MCC2001	MTTL	Quad 2-Input NAND Gate	8DB
MCC2002	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC2003	MTTL	Dual 4-Input NAND Gate	2BN
MCC2004	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	89A
MCC2005	MTTL	8-Input NAND Gate	85N
MCC2006	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC2007	MTTL	Triple 3-Input NAND Gate	45V
MCC2011	MTTL	Expandable 8-Input NAND Gate	85N
MCC2012	MTTL	Exp. 3-Wide 3-Input AOI Gate	89A
MCC2013	MTTL	Exp. Dual 2-Wide 2-Input AOI Gate	9RW
MCC2016	MTTL	Hex Inverter	79M

Chip No.	Family	Function	Geometry
MCC2018	MTTL	Quad 2-I Lamp/Line Driver(open collector)	4RR
MCC2023	MTTL	Dual J-K Flip Flop (separate clock)	2TJ
MCC2024	MTTL	Dual J-K Flip Flop (common clock)	2TJ
MCC2025	MTTL	AND J-K Flip Flop	47E
MCC2026	MTTL	OR J-K Flip Flop	47E
MCC2028	MTTL	OR J-K Flip Flop	47E
MCC2050	MTTL	Exp. 2-Wide 4-Input AOI Gate	4DA
MCC2051	MTTL	Quad 2-Input NAND Gate	8DB
MCC2052	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC2053	MTTL	Dual 4-Input NAND Gate	2BN
MCC2054	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	89A
MCC2055	MTTL	8-Input NAND Gate	85N
MCC2056	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC2057	MTTL	Triple 3-Input NAND Gate	45V
MCC2061	MTTL	Expandable 8-Input NAND Gate	85N
MCC2062	MTTL	Exp. 3-Wide 3-Input AOI Gate	89A
MCC2063	MTTL	Exp. Dual 2-Wide 2-Input AOI Gate	9RW
MCC2065	MTTL	Quad 2-Input Lamp/Line Driver	5PJ
MCC2066	MTTL	Hex Inverter	79M
MCC2068	MTTL	Quad 2-I Lamp/Line Driver(open collector)	4RR
MCC2073	MTTL	Dual J-K Flip Flop (separate clock)	2TJ
MCC2074	MTTL	Dual J-K Flip Flop (common clock)	2TJ
MCC2075	MTTL	AND J-K Flip Flop	47E
MCC2076	MTTL	OR J-K Flip Flop	47E
MCC2078	MTTL	OR J-K Flip Flop	47E
MCC2100	MTTL	Exp. 2-Wide 4-Input AOI Gate	4DA
MCC2101	MTTL	Quad 2-Input NAND Gate	8DB
MCC2102	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC2103	MTTL	Dual 4-Input NAND Gate	2BN
MCC2104	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	89A
MCC2105	MTTL	8-Input NAND Gate	85N
MCC2106	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC2107	MTTL	Triple 3-Input NAND Gate	45V
MCC2111	MTTL	Expandable 8-Input NAND Gate	85N
MCC2112	MTTL	Exp. 3-Wide 3-Input AOI Gate	89A
MCC2113	MTTL	Exp. Dual 2-Wide 2-Input AOI Gate	9RW
MCC2116	MTTL	Hex Inverter	79M
MCC2118	MTTL	Quad 2-I Lamp/Line Driver(open collector)	4RR
MCC2123	MTTL	Dual J-K Flip Flop (separate clock)	2TJ
MCC2124	MTTL	Dual J-K Flip Flop (common clock)	2TJ
MCC2125	MTTL	AND J-K Flip Flop	47E
MCC2126	MTTL	OR J-K Flip Flop	47E
MCC2128	MTTL	OR J-K Flip Flop	47E
MCC2150	MTTL	Exp. 2-Wide 4-Input AOI Gate	4DA
MCC2151	MTTL	Quad 2-Input NAND Gate	8DB
MCC2152	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	89A
MCC2153	MTTL	Dual 4-Input NAND Gate	2BN
MCC2154	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	89A
MCC2155	MTTL	8-Input NAND Gate	85N
MCC2156	MTTL	Dual 4-Input Exp. for AOI Gates	4DA
MCC2157	MTTL	Triple 3-Input NAND Gate	45V
MCC2161	MTTL	Expandable 8-Input NAND Gate	85N
MCC2162	MTTL	Exp. 3-Wide 3-Input AOI Gate	89A
MCC2163	MTTL	Exp. Dual 2-Wide 2-Input AOI Gate	9RW
MCC2165	MTTL	Quad 2-Input Lamp/Line Driver	5PJ
MCC2166	MTTL	Hex Inverter	79M
MCC2168	MTTL	Quad 2-I Lamp/Line Driver(open collector)	4RR
MCC2173	MTTL	Dual J-K Flip Flop (separate clock)	2TJ
MCC2174	MTTL	Dual J-K Flip Flop (common clock)	2TJ
MCC2175	MTTL	AND J-K Flip Flop	47E
MCC2176	MTTL	OR J-K Flip Flop	47E
MCC2178	MTTL	OR J-K Flip Flop	47E
MCC3000/74H00	MTTL	Quad 2-Input NAND Gate	5CA
MCC3001/74H08	MTTL	Quad 2-Input AND Gate	5CA
MCC3002	MTTL	Quad 2-Input NOR Gate	59N
MCC3003	MTTL	Quad 2-Input OR Gate	59N
MCC3004/74H01	MTTL	Quad 2-Input NAND Gate (O.C.)	16K
MCC3005/74H10	MTTL	Triple 3-Input NAND Gate	35T
MCC3006/74H11	MTTL	Triple 3-Input AND Gate	35T
MCC3007	MTTL	Triple 3-Input NAND Gate (O.C.)	35T
MCC3008/74H04	MTTL	Hex Inverter	09L
MCC3009/74H05	MTTL	Hex Inverter (O.C.)	09L
MCC3010/74H20	MTTL	Dual 4-Input NAND Gate	1GH

Chip No.	Family	Function	Geometry
MCC3011/74H21	MTTL	Dual 4-Input AND Gate	1GH
MCC3012/74H22	MTTL	Dual 4-Input NAND Gate (O.C.)	1GH
MCC3015	MTTL	8-Input NAND Gate	6GH
MCC3016/74H30	MTTL	8-Input NAND Gate	88K
MCC3018/74H62	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	98K
MCC3019/74H61	MTTL	Triple 3-Input Exp. for AND-OR Gates	99K
MCC3020/74H50	MTTL	Exp. Dual 2-W 2-Input AOI Gate	27W
MCC3021	MTTL	Quad 2-Input Exclusive OR Gate	53H
MCC3022	MTTL	Quad 2-Input Exclusive NOR Gate	53H
MCC3023/74H51	MTTL	Dual 2-W 2-Input AOI Gate	27W
MCC3024/74H40	MTTL	Dual 4-Input NAND Buffer Gate	6AL
MCC3025	MTTL	Dual 4-Input NAND Power Gate	6AL
MCC3026	MTTL	Dual 4-Input AND Power Gate	6AL
MCC3028	MTTL	Dual 3-I 3-Output AND Series Term. Line Driver	32A
MCC3029	MTTL	Dual 3-I 3-Output NAND Series Term. Line Driver	32A
MCC3030	MTTL	Dual 4-Input Exp. for AOI Gates	63A
MCC3031/74H52	MTTL	Exp. 4-W 2-2-2-3 Input AND-OR Gate	97K
MCC3032/74H53	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	48K
MCC3033/74H54	MTTL	4-W 2-2-2-3 Input AOI Gate	48K
MCC3034/74H55	MTTL	Exp. 2-W 4-Input AOI Gate	93K
MCC3050	MTTL	AND J-K Flip Flop	68A
MCC3051	MTTL	AND Input J-K Flip Flop	58D
MCC3052	MTTL	AND Input JJ-KK Flip Flop	55B
MCC3053	MTTL	Double Edge Triggered Master Slave Type D FF	84D
MCC3054/74H71	MTTL	OR Input J-K Flip Flop	43H
MCC3055/74H72	MTTL	AND Input J-K Flip Flop	43H
MCC3060	MTTL	Dual Type D Flip-Flop	80V
MCC3061	MTTL	Dual J-K Flip-Flop	9CW
MCC3062	MTTL	Dual J-K Flip-Flop	9CW
MCC3063	MTTL	Dual J-K Flip-Flop	60N
MCC3064/74H74	MTTL	Dual D Flip-Flop	80V
MCC3065/74H101	MTTL	J-K Flip-Flop	8AD
MCC3100/54H00	MTTL	Quad 2-Input NAND Gate	5CA
MCC3101/54H08	MTTL	Quad 2-Input AND Gate	5CA
MCC3102	MTTL	Quad 2-Input NOR Gate	59N
MCC3103	MTTL	Quad 2-Input OR Gate	59N
MCC3104/54H01	MTTL	Quad 2-Input NAND Gate (O.C.)	16K
MCC3105/54H10	MTTL	Triple 3-Input NAND Gate	35T
MCC3106/54H11	MTTL	Triple 3-Input AND Gate	35T
MCC3107	MTTL	Triple 3-Input NAND Gate (O.C.)	35T
MCC3108/54H04	MTTL	Hex Inverter	09L
MCC3109/54H05	MTTL	Hex Inverter (O.C.)	09L
MCC3110/54H20	MTTL	Dual 4-Input NAND Gate	1GH
MCC3111/54H21	MTTL	Dual 4-Input AND Gate	1GH
MCC3112/54H22	MTTL	Dual 4-Input NAND Gate (O.C.)	1GH
MCC3115	MTTL	8-Input NAND Gate	6GH
MCC3116/54H30	MTTL	8-Input NAND Gate	88K
MCC3118/54H62	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	98K
MCC3119/54H61	MTTL	Triple 3-Input Exp. for AND-OR Gates	99K
MCC3120/54H50	MTTL	Exp. Dual 2-W 2-Input AOI Gate	27W
MCC3121	MTTL	Quad 2-Input Exclusive OR Gate	53H
MCC3122	MTTL	Quad 2-Input Exclusive NOR Gate	53H
MCC3123/54H51	MTTL	Dual 2-W 2-Input AOI Gate	27W
MCC3124/54H40	MTTL	Dual 4-Input NAND Buffer Gate	6AL
MCC3125	MTTL	Dual 4-Input NAND Power Gate	6AL
MCC3126	MTTL	Dual 4-Input AND Power Gate	6AL
MCC3128	MTTL	Dual 3-I 3-Output AND Series Term. Line Driver	32A
MCC3129	MTTL	Dual 3-I 3-Output NAND Series Term. Line Driver	32A
MCC3130	MTTL	Dual 4-Input Exp. for AOI Gates	63A
MCC3131/54H52	MTTL	Exp. 4-W 2-2-2-3 Input AND-OR Gate	97K
MCC3132/54H53	MTTL	Exp. 4-W 2-2-2-3 Input AOI Gate	48K
MCC3133/54H54	MTTL	4-W 2-2-2-3 Input AOI Gate	48K
MCC3134/54H55	MTTL	Exp. 2-W 4-Input AOI Gate	93K
MCC3150	MTTL	AND J-K Flip Flop	68A
MCC3151	MTTL	AND Input J-K Flip Flop	58D
MCC3152	MTTL	AND Input JJ-KK Flip Flop	55B
MCC3153	MTTL	Double Edge Triggered Master Slave Type D FF	84D
MCC3154/54H71	MTTL	OR Input J-K Flip Flop	43H
MCC3155/54H72	MTTL	AND Input J-K Flip Flop	43H
MCC3160	MTTL	Dual Type D Flip-Flop	80V
MCC3161	MTTL	Dual J-K Flip-Flop	9CW
MCC3162	MTTL	Dual J-K Flip-Flop	9CW
MCC3163	MTTL	Dual J-K Flip-Flop	60N

Chip No.	Family	Function	Geometry
MCC3164/54H74	MTTL	Dual D Flip-Flop	80V
MCC3165/54H101	MTTL	J-K Flip-Flop	8AD
MCC3301	LINEAR	Quad Single Supply Op Amp	2LM
MCC3302	LINEAR	Quad Single Supply Op Amp	4CC
MCC3303	LINEAR	Quad Differential Input Op Amp	1PP
MCC3346	LINEAR	Five Transistor General Purpose Array	3EJ
MCC3358	LINEAR	Dual Differential Input Op Amp	1TJ
MCC3401	LINEAR	Quad Single Supply Op Amp	2LM
MCC3403	LINEAR	Quad Differential Input Op Amp	1PP
MCC3410	LINEAR	10 Bit D-to-A Converter	1MJ
MCC3416	LINEAR	4x4x2 Crosspoint Switch	8NL
MCC3430	LINEAR	Quad High Speed Voltage Comparator	2FT
MCC3431	LINEAR	Quad High Speed Voltage Comparator	2FT
MCC3432	LINEAR	Quad High Speed Voltage Comparator	2FT
MCC3433	LINEAR	Quad High Speed Voltage Comparator	2FT
MCC3437	LINEAR	Hex Unified Bus Receiver	6KD
MCC3438	LINEAR	Quad Bus Transceiver	2JS
MCC3440	LINEAR	Quad General Purpose Interface Bus Transceiver	4MM
MCC3441	LINEAR	Quad General Purpose Interface Bus Transceiver	4MM
MCC3443	LINEAR	Quad General Purpose Interface Bus Transceiver	4MM
MCC3446	LINEAR	Quad General Purpose Interface Bus Transceiver	5PR
MCC3450	LINEAR	Quad Line Receiver	2FT
MCC3452	LINEAR	Quad Line Receiver	2FT
MCC3453	LINEAR	Quad Line Driver	7GS
MCC3456	LINEAR	Dual Timing Circuit	7MA
MCC3458	LINEAR	Dual Differential Input Op Amp	1TJ
MCC3459	LINEAR	Quad NMOS Address Line Driver	7KR
MCC3460	LINEAR	Four Channel MOS Clock Driver	8MR
MCC3461	LINEAR	Dual NMOS Memory Sense Amplifier	4LN
MCC3466	LINEAR	Four Channel MOS Clock Driver	8MR
MCC3467	LINEAR	Triple Preamplifier	1PJ
MCC3468	LINEAR	Magnetic Tape Read Amplifier	1TF
MCC3476	LINEAR	Micropower Programmable Op Amp	9CF
MCC3490	LINEAR	Seven Digit Gas Discharge Display Driver	9MW
MCC3491	LINEAR	Segment Driver for Gas Discharge Displays	1JF
MCC3494	LINEAR	Seven Digit Gas Discharge Display Driver	9MW
MCC3503	LINEAR	Quad Differential Input Op Amp	1PP
MCC3510	LINEAR	10 Bit D-to-A Converter	1MJ
MCC3556	LINEAR	Dual Timing Circuit	7MA
MCC3558	LINEAR	Dual Differential Input Op Amp	1TJ
MCC4000	MTTL	Dual 4 Channel Data Selector	18E
MCC4002	MTTL	Dual Data Distributor	59B
MCC4003	MTTL	Dual Binary to NBCD Converter	06T
MCC4004	MTTL	16-Bit Scratch Pad Memory Cell	1PR
MCC4005	MTTL	16-Bit Scratch Pad Memory Cell	1PR
MCC4006	MTTL	Binary to one of eight Line Decoder	31C
MCC4007	MTTL	Dual Binary to one of four Line Decoder	31C
MCC4008/74408	MTTL	8-Bit Parity Tree	8HT
MCC4010	MTTL	Dual 4-Bit Parity Tree	94F
MCC4012	MTTL	4-Bit Shift Register	43L
MCC4015	MTTL	Quad Type D Flip-Flop	87N
MCC4016/74416	MTTL	Prog. Modulo-N Decade Counter	30P
MCC4017/74417	MTTL	Modulo 2, Modulo 5 Prog. Counter	30P
MCC4018/74418	MTTL	Prog. Modulo-N Hexadecimal Counter	30P
MCC4019/74419	MTTL	Dual Modulo 4 Prog. Counter	30P
MCC4021	MTTL	Dual 4-Bit Comparator (O.C.)	04R
MCC4022	MTTL	Dual 4-Bit Comparator	04R
MCC4023	MTTL	4-Bit Universal Counter	74H
MCC4024	MTTL	Dual Voltage Controlled Multi.	54H
MCC4026	MTTL	Full Adder	33K
MCC4027	MTTL	Full Adder	33K
MCC4028	MTTL	Adder (Dependent Carry)	33K
MCC4029	MTTL	Adder (Dependent Carry)	33K
MCC4030	MTTL	Adder (Independent Carry)	33K
MCC4031	MTTL	Adder (Independent Carry)	33K
MCC4032	MTTL	Carry Decoder	50K
MCC4035	MTTL	Quad Latch (O.C.)	1DB
MCC4037	MTTL	Quad Latch	1DB
MCC4042	MTTL	Quad Predriver	31E
MCC4043	MTTL	Dual Line Selector	32E
MCC4044	MTTL	Phase Frequency Detector	46K
MCC4050/74450	MTTL	Counter-Latch Decoder/Driver	09R
MCC4051	MTTL	Counter-Latch Decoder/Driver	09R

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Chip No.	Family	Function	Geometry
MCC4052/74452	MTTL	Dual Decade Counter	91R
MCC4053/74453	MTTL	Dual Hexadecimal Counter	91R
MCC4054/74454	MTTL	Dual Decade Up/Down Counter	66W
MCC4055/74455	MTTL	Dual Binary Up/Down Counter	66W
MCC4056/74456	MTTL	NBCD Adder	74V
MCC4058/74458	MTTL	Nines Compliment/Zero Element	1DK
MCC4060/74460	MTTL	Bus Transfer Switch	38T
MCC4062	MTTL	Dual Majority Logic Gate	62T
MCC4068/74468	MTTL	Dual MOS to TTL Level Translator	2AG
MCC4300	MTTL	Dual 4 Channel Data Selector	18E
MCC4302	MTTL	Dual Data Distributor	59B
MCC4303	MTTL	Dual Binary to NBCD Converter	06T
MCC4304	MTTL	16-Bit Scratch Pad Memory Cell	1PR
MCC4305	MTTL	16-Bit Scratch Pad Memory Cell	1PR
MCC4306	MTTL	Binary to one of eight Line Decoder	31C
MCC4307	MTTL	Dual Binary to one of four Line Decoder	31C
MCC4308	MTTL	8-Bit Parity Tree	8HT
MCC4310	MTTL	Dual 4-Bit Parity Tree	94F
MCC4312	MTTL	4-Bit Shift Register	43L
MCC4315	MTTL	Quad Type D Flip-Flop	87N
MCC4316	MTTL	Prog. Modulo-N Decade Counter	30P
MCC4317	MTTL	Modulo 2, Modulo 5 Prog. Counter	30P
MCC4318	MTTL	Prog. Modulo-N Hexadecimal Counter	30P
MCC4319	MTTL	Dual Modulo 4 Prog. Counter	30P
MCC4321	MTTL	Dual 4-Bit Comparator (O.C.)	04R
MCC4322	MTTL	Dual 4-Bit Comparator	04R
MCC4323	MTTL	4-Bit Universal Counter	74H
MCC4324	MTTL	Dual Voltage Controlled Multi.	54H
MCC4326	MTTL	Full Adder	33K
MCC4327	MTTL	Full Adder	33K
MCC4328	MTTL	Adder (Dependent Carry)	33K
MCC4329	MTTL	Adder (Dependent Carry)	33K
MCC4330	MTTL	Adder (Independent Carry)	33K
MCC4331	MTTL	Adder (Independent Carry)	33K
MCC4332	MTTL	Carry Decoder	50K
MCC4335	MTTL	Quad Latch (O.C.)	1DB
MCC4337	MTTL	Quad Latch	1DB
MCC4342	MTTL	Quad Predriver	31E
MCC4343	MTTL	Dual Line Selector	32E
MCC4344	MTTL	Phase Frequency Detector	46K
MCC4350	MTTL	Counter-Latch Decoder/Driver	09R
MCC4351	MTTL	Counter-Latch Decoder/Driver	09R
MCC4352	MTTL	Dual Decade Counter	91R
MCC4353	MTTL	Dual Hexadecimal Counter	91R
MCC4354	MTTL	Dual Decade Up/Down Counter	66W
MCC4355	MTTL	Dual Binary Up/Down Counter	66W
MCC4356	MTTL	NBCD Adder	74V
MCC4358	MTTL	Nines Compliment/Zero Element	1DK
MCC4360	MTTL	Bus Transfer Switch	38T
MCC4362	MTTL	Dual Majority Logic Gate	62T
MCC4368	MTTL	Dual MOS to TTL Level Translator	2AG
MCC4741	LINEAR	Quad MC1741 Op Amp	7TP
MCC4741C	LINEAR	Quad MC1741 Op Amp	7TP
MCC5090	MTTL	Fixed Frequency Decade Divider	12V
MCC5092	MTTL	Fixed Frequency Decade Divider	12V
MCC5111	MTTL	4-Bit Shift Register	13V
MCC5113	MTTL	4-Bit Shift Register	13V
MCC5121	MTTL	Dual 4-Bit Parity Generator Checker	14V
MCC5123	MTTL	Dual 4-Bit Parity Generator Checker	14V
MCC5131	MTTL	Dual 4-Bit Comparator	14V
MCC5133	MTTL	Dual 4-Bit Comparator	14V
MCC5141	MTTL	Binary Programmable Divider	15V
MCC5143	MTTL	Binary Programmable Divider	15V
MCC5151	MTTL	BCD Programmable Divider	4LW
MCC5153	MTTL	BCD Programmable Divider	4LW
MCC5173	MTTL	4-Bit BCD Counter	16V
MCC5163	MTTL	4-Bit Binary Counter	16V
MCC5181	MTTL	4-Bit Binary up/Down Counter	17V
MCC5183	MTTL	4-Bit Binary up/Down Counter	17V
MCC5191	MTTL	4-Bit BCD Up/Down Counter	17V
MCC5193	MTTL	4-Bit BCD Up/Down Counter	17V
MCC54H00	MTTL	Quad 2-Input NAND Gate	5CA
MCC54H00F	MTTL	Quad 2-Input NAND Gate	06L

Chip No.	Family	Function	Geometry
MCC54H01	MTTL	Quad 2-Input NAND Gate (O.C.)	16K
MCC54H01F	MTTL	Quad 2-Input NAND Gate (O.C.)	06L
MCC54H04	MTTL	Hex Inverter	09L
MCC54H05	MTTL	Hex Inverter	09L
MCC54H08	MTTL	Quad 2-Input AND Gate	5CA
MCC54H10	MTTL	Triple 3-Input NAND Gate	35T
MCC54H10F	MTTL	Triple 3-Input NAND Gate	67M
MCC54H11	MTTL	Triple 3-Input AND Gate	35T
MCC54H11F	MTTL	Triple 3-Input AND Gate	72H
MCC54H20	MTTL	Dual 4-Input NAND Gate	1GH
MCC54H20F	MTTL	Dual 4-Input NAND Gate	31L
MCC54H21	MTTL	Dual 4-Input AND Gate	1GH
MCC54H21F	MTTL	Dual 4-Input AND Gate	72H
MCC54H22	MTTL	Dual 4-Input NAND Gate (O.C.)	1GH
MCC54H22F	MTTL	Dual 4-Input NAND Gate (O.C.)	31L
MCC54H30	MTTL	8-Input NAND Gate	88K
MCC54H40	MTTL	Dual 4-Input NAND Buffer Gate	6AL
MCC54H40F	MTTL	Dual 4-Input NAND Buffer Gate	12M
MCC54H50	MTTL	Exp. Dual 2-W 2-Input AOI Gate	27W
MCC54H51	MTTL	Dual 2-Wide 2-Input AOI Gate	27W
MCC54H52	MTTL	Exp. 4-W 2-2-2-3 Input AND-OR Gate	97K
MCC54H53	MTTL	Exp. 4-Wide 2-2-2-3 Input AOI Gate	48K
MCC54H54	MTTL	4 Wide 2-2-2-3 Input AOI Gate	48K
MCC54H55	MTTL	Exp. 2-W 4-Input AOI Gate	93K
MCC54H60	MTTL	Dual 4-Input Exp. for AOI Gates	63A
MCC54H61	MTTL	Triple 3-Input Exp. for AND-OR Gates	99K
MCC54H62	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	98K
MCC54H71	MTTL	OR Input J-K Flip Flop	43H
MCC54H72	MTTL	AND Input J-K Flip Flop	43H
MCC54H73	MTTL	Dual J-K Flip Flop	60N
MCC54H74A	MTTL	Dual D positive edge triggered FF	80V
MCC54H87	MTTL	4-Bit True/Compl. Zero/One Element	8GM
MCC54H101	MTTL	AND-OR Gated J-K neg. edge triggered FF w/preset	8AD
MCC54H103	MTTL	Dual J-K neg. edge triggered FF	6AD
MCC5400	MTTL	Quad 2-Input NAND Gate	16K
MCC5400F	MTTL	Quad 2-Input NAND Gate	81L
MCC5401	MTTL	Quad 2-Input NAND Gate (O.C.)	22K
MCC5402	MTTL	Quad 2-Input NOR Gate	53T
MCC5403	MTTL	Quad 2-Input NAND Gate (O.C.)	16K
MCC5404	MTTL	Hex Inverter	1CR
MCC5405	MTTL	Hex Inverter (O.C.)	1CR
MCC5406	MTTL	Hex Inverter Buffer/Driver (O.C.)	2AW
MCC5407	MTTL	Hex Buffer/Driver (O.C.)	2AW
MCC5408	MTTL	Quad 2-Input AND Gate	23T
MCC5409	MTTL	Quad 2-Input AND Gate (O.C.)	23T
MCC5410	MTTL	Triple 3-Input NAND Gate	11N
MCC5410F	MTTL	Triple 3-Input NAND Gate	61N
MCC5411	MTTL	Triple 3-Input AND Gate	85W
MCC5412	MTTL	Triple 3-Input NAND Gate (O.C.)	11N
MCC5413	MTTL	Dual 4-I NAND Gate Schmitt Trigger	7KB
MCC5414	MTTL	Hex Schmitt Trigger Inverter	2JA
MCC5416	MTTL	Hex Inverter Buffer/Driver (O.C.)	2AW
MCC5417	MTTL	Hex Buffer/Driver	2AW
MCC5420	MTTL	Dual 4-Input NAND Gate	51N
MCC5420F	MTTL	Dual 4-Input NAND Gate	90L
MCC5423	MTTL	Dual 4-Input NOR Gate w/Strobe (exp.)	5AG
MCC5425	MTTL	Dual 4-Input NOR Gate w/Strobe	5AG
MCC5426	MTTL	Quad 2-Input Interface NAND Gate	16K
MCC5427	MTTL	Triple 3-input NOR Gate	75W
MCC5430	MTTL	8-Input NAND Gate	98L
MCC5437	MTTL	Quad 2-Input Positive NAND Buffer	1AF
MCC5438	MTTL	Quad 2-Input Positive NAND Buffer (O.C.)	1AF
MCC5440	MTTL	Dual 4-Input NAND Buffer	10N
MCC5440F	MTTL	Dual 4-Input NAND Buffer	12M
MCC5441A	MTTL	BCD to Decimal Decoder/High Level Driver	17F
MCC5442	MTTL	BCD to Decimal Decoder	6FE
MCC5443	MTTL	Excess Three-to-Decimal Decoder	29R
MCC5444	MTTL	Excess Three Gray to Decimal Decoder	29R
MCC5445	MTTL	BCD to Decimal Decoder/Driver	96M
MCC5446	MTTL	BCD to seven Segment Decoder/Driver	83M
MCC5447	MTTL	BCD to seven Segment Decoder/Driver	83M
MCC5448	MTTL	BCD to seven Segment Decoder/Driver	01L
MCC5449	MTTL	BCD to seven Segment Decoder/Driver	01L

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Chip No.	Family	Function	Geometry
MCC5450	MTTL	Exp. Dual 2-W 2-Input AOI Gate	03R
MCC5451	MTTL	Dual 2-W 2-Input AOI Gate	03R
MCC5453	MTTL	Exp. 4-W 2-Input AOI Gate	11P
MCC5454	MTTL	4-W 2-Input AOI Gate	11P
MCC5460	MTTL	Dual 4-Input Exp. for AOI Gates	90B
MCC5470	MTTL	AND Gated J-K FF Pos. edge triggered	12N
MCC5472	MTTL	AND Gated J-K Master Slave FF	56C
MCC5473	MTTL	Dual J-K Flip Flop	91M
MCC5474	MTTL	Dual Pos. edge triggered FF	80V
MCC5475	MTTL	Quad Latch	7AJ
MCC5476	MTTL	Dual J-K Flip Flop	86N
MCC5479	MTTL	Dual D Pos. edge triggered FF	80V
MCC5480	MTTL	Gated Full Adder (1-Bit)	10L
MCC5481	MTTL	16-Bit Scratch Pad Memory	1PR
MCC5483	MTTL	4-Bit Full Adder	10M
MCC5484	MTTL	16-Bit Scratch Pad Memory	1PR
MCC5485	MTTL	4-Bit Magnitude Comparator	7GK
MCC5486	MTTL	Quadruple 2-Input Exclusive OR Gate	8GM
MCC5490A	MTTL	Decade Counter	3HT
MCC5491A	MTTL	8-Bit Shift Register	05R
MCC5492A	MTTL	Divide by 12 Counter	3HT
MCC5493A	MTTL	4-Bit Binary Counter	3HT
MCC5494	MTTL	4-Bit Shift Register	66N
MCC5495A	MTTL	4-Bit Shift Register (Parallel Access)	6RP
MCC5496	MTTL	5-Bit Shift Register	8BG
MCC5497	MTTL	Synchronous 6-Bit Binary Rate Multi.	7MG
MCC5524	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5525	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5528	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5529	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5534	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5535	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5538	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC5539	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC6880	LINEAR	Quad Three-State Bus Transceiver	5NE
MCC7200	MTTL	Dual 5-Bit Buffer Register	2JT
MCC7201	MTTL	Dual 5-Bit Buffer Register w/D Comp.	2JT
MCC7202	MTTL	10-Bit Buffer Register	2JT
MCC7203	MTTL	10-Bit Buffer Register w/D Comp.	2JT
MCC7233	MTTL	2-Input, 4-Bit, digital Multiplexer	7EE
MCC7234	MTTL	2-Input, 4-Bit, digital Multi. (O.C.)	7EE
MCC7235	MTTL	2-Input, 4-Bit, digital Multi. (O.C.)	79T
MCC7241	MTTL	Quad Exclusive OR Gate	57T
MCC7242	MTTL	Quad Exclusive NOR Gate (O.C.)	57T
MCC7250	MTTL	Binary to Octal Decoder	04P
MCC7251	MTTL	BCD to Decimal Decoder	04P
MCC7260	MTTL	Arithmetic Logic Element	40N
MCC7261	MTTL	Fast Carry Extender	66P
MCC7266	MTTL	2-Input, 4-Bit Data Selector	79T
MCC7267	MTTL	2-Input, 4-Bit Data Selector (O.C.)	79T
MCC7270	MTTL	4-Bit Shift Register	3RA
MCC7271	MTTL	4-Bit Shift Register	3RA
MCC7280	MTTL	Presettable Decade Counter	5GD
MCC7281	MTTL	Presettable Binary Counter	5GD
MCC7284	MTTL	Binary Up/Down Counter	51T
MCC7285	MTTL	Decade Up/Down Counter	51T
MCC7288	MTTL	Divide by 12 Counter	39N
MCC7290	MTTL	High Speed Presettable Decade Counter	5GD
MCC7291	MTTL	High Speed Presettable Binary Counter	5GD
MCC74H00	MTTL	Quad 2-Input NAND Gate	5CA
MCC74H00F	MTTL	Quad 2-Input NAND Gate	06L
MCC74H01	MTTL	Quad 2-Input NAND Gate (O.C.)	16K
MCC74H01F	MTTL	Quad 2-Input NAND Gate (O.C.)	06L
MCC74H04	MTTL	Hex Inverter	09L
MCC74H05	MTTL	Hex Inverter	09L
MCC74H08	MTTL	Quad 2-Input AND Gate	5CA
MCC74H10	MTTL	Triple 3-Input NAND Gate	35T
MCC74H10F	MTTL	Triple 3-Input NAND Gate	67M
MCC74H11	MTTL	Triple 3-Input AND Gate	35T
MCC74H11F	MTTL	Triple 3-Input AND Gate	72H
MCC74H20	MTTL	Dual 4-Input NAND Gate	1GH
MCC74H20F	MTTL	Dual 4-Input NAND Gate	31L
MCC74H21	MTTL	Dual 4-Input AND Gate	1GH

Chip No.	Family	Function	Geometry
MCC74H21F	MTTL	Dual 4-Input AND Gate	72H
MCC74H22	MTTL	Dual 4-Input NAND Gate (O.C.)	1GH
MCC74H22F	MTTL	Dual 4-Input NAND Gate (O.C.)	31L
MCC74H30	MTTL	8-Input NAND Gate	88K
MCC74H40	MTTL	Dual 4-Input NAND Buffer Gate	6AL
MCC74H40F	MTTL	Dual 4-Input NAND Buffer Gate	12M
MCC74H50	MTTL	Exp. Dual 2-W 2-Input AOI Gate	27W
MCC74H51	MTTL	Dual 2-Wide 2-Input AOI Gate	27W
MCC74H52	MTTL	Exp. 4-W 2-2-2-3 Input AND-OR Gate	97K
MCC74H53	MTTL	Exp. 4-Wide 2-2-2-3 Input AOI Gate	48K
MCC74H54	MTTL	4 Wide 2-2-2-3 Input AOI Gate	48K
MCC74H55	MTTL	Exp. 2-W 4-Input AOI Gate	93K
MCC74H60	MTTL	Dual 4-Input Exp. for AOI Gates	63A
MCC74H61	MTTL	Triple 3-Input Exp. for AND-OR Gates	99K
MCC74H62	MTTL	4-W 3-2-2-3 Input Exp. for AOI Gates	98K
MCC74H71	MTTL	OR Input J-K Flip Flop	43H
MCC74H72	MTTL	AND Input J-K Flip Flop	43H
MCC74H73	MTTL	Dual J-K Flip Flop	60N
MCC74H74A	MTTL	Dual D positive edge triggered FF	80V
MCC74H87	MTTL	4-Bit True/Compl. Zero/One Element	8GM
MCC74H101	MTTL	AND-OR Gated J-K neg. edge triggered FF w/preset	8AD
MCC74H103	MTTL	Dual J-K neg. edge triggered FF	6AD
MCC7400	MTTL	Quad 2-Input NAND Gate	16K
MCC7400F	MTTL	Quad 2-Input NAND Gate	81L
MCC7401	MTTL	Quad 2-Input NAND Gate (O.C.)	22K
MCC7402	MTTL	Quad 2-Input NOR Gate	53T
MCC7403	MTTL	Quad 2-Input NAND Gate (O.C.)	16K
MCC7404	MTTL	Hex Inverter	1CR
MCC7405	MTTL	Hex Inverter (O.C.)	1CR
MCC7406	MTTL	Hex Inverter Buffer/Driver (O.C.)	2AW
MCC7407	MTTL	Hex Buffer/Driver (O.C.)	2AW
MCC7408	MTTL	Quad 2-Input AND Gate	23T
MCC7409	MTTL	Quad 2-Input AND Gate (O.C.)	23T
MCC7410	MTTL	Triple 3-Input NAND Gate	11N
MCC7410F	MTTL	Triple 3-Input NAND Gate	61N
MCC7411	MTTL	Triple 3-Input AND Gate	85W
MCC7412	MTTL	Triple 3-Input NAND Gate (O.C.)	11N
MCC7413	MTTL	Dual 4-I NAND Gate Schmitt Trigger	7KB
MCC7414	MTTL	Hex Schmitt Trigger Inverter	2JA
MCC7416	MTTL	Hex Inverter Buffer/Driver (O.C.)	2AW
MCC7417	MTTL	Hex Buffer/Driver	2AW
MCC7420	MTTL	Dual 4-Input NAND Gate	51N
MCC7420F	MTTL	Dual 4-Input NAND Gate	90L
MCC7423	MTTL	Dual 4-Input NOR Gate w/Strobe (exp.)	5AG
MCC7425	MTTL	Dual 4-Input NOR Gate w/Strobe	5AG
MCC7426	MTTL	Quad 2-Input Interface NAND Gate	16K
MCC7427	MTTL	Triple 3-input NOR Gate	75W
MCC7430	MTTL	8-Input NAND Gate	98L
MCC7437	MTTL	Quad 2-Input Positive NAND Buffer	1AF
MCC7438	MTTL	Quad 2-Input Positive NAND Buffer (O.C.)	1AF
MCC7440	MTTL	Dual 4-Input NAND Buffer	10N
MCC7440F	MTTL	Dual 4-Input NAND Buffer	12M
MCC7441A	MTTL	BCD to Decimal Decoder/High Level Driver	17F
MCC7442	MTTL	BCD to Decimal Decoder	6FE
MCC7443	MTTL	Excess Three-to-Decimal Decoder	29R
MCC7444	MTTL	Excess Three Gray to Decimal Decoder	29R
MCC7445	MTTL	BCD to Decimal Decoder/Driver	96M
MCC7446	MTTL	BCD to seven Segment Decoder/Driver	83M
MCC7447	MTTL	BCD to seven Segment Decoder/Driver	83M
MCC7448	MTTL	BCD to seven Segment Decoder/Driver	01L
MCC7449	MTTL	BCD to seven Segment Decoder/Driver	01L
MCC7450	MTTL	Exp. Dual 2-W 2-Input AOI Gate	03R
MCC7451	MTTL	Dual 2-W 2-Input AOI Gate	03R
MCC7453	MTTL	Exp. 4-W 2-Input AOI Gate	11P
MCC7454	MTTL	4-W 2-Input AOI Gate	11P
MCC7460	MTTL	Dual 4-Input Exp. for AOI Gates	90B
MCC7470	MTTL	AND Gated J-K FF Pos. edge triggered	12N
MCC7472	MTTL	AND Gated J-K Master Slave FF	56C
MCC7473	MTTL	Dual J-K Flip Flop	91M
MCC7474	MTTL	Dual Pos. edge triggered FF	80V
MCC7475	MTTL	Quad Latch	7AJ
MCC7476	MTTL	Dual J-K Flip Flop	86N
MCC7479	MTTL	Dual D Pos. edge triggered FF	80V

Chip No.	Family	Function	Geometry
MCC7480	MTTL	Gated Full Adder (1-Bit)	10L
MCC7481	MTTL	16-Bit Scratch Pad Memory	1PR
MCC7483	MTTL	4-Bit Full Adder	10M
MCC7484	MTTL	16-Bit Scratch Pad Memory	1PR
MCC7485	MTTL	4-Bit Magnitude Comparator	7GK
MCC7486	MTTL	Quadruple 2-Input Exclusive OR Gate	8GM
MCC7490A	MTTL	Decade Counter	3HT
MCC7491A	MTTL	8-Bit Shift Register	05R
MCC7492A	MTTL	Divide by 12 Counter	3HT
MCC7493A	MTTL	4-Bit Binary Counter	3HT
MCC7494	MTTL	4-Bit Shift Register	66N
MCC7495A	MTTL	4-Bit Shift Register (Parallel Access)	6RP
MCC7496	MTTL	5-Bit Shift Register	8BG
MCC7497	MTTL	Synchronous 6-Bit Binary Rate Multi.	7MG
MCC7524	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7525	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7528	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7529	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7534	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7535	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7538	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7539	LINEAR	Dual High Speed Sense Amplifier	2ET
MCC7705C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7706C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7708C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7712C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7715C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7718C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7720C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7724C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78L05C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L05AC	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L08C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L08AC	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L12C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L12AC	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L15C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L15AC	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L18C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L18AC	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L24C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78L24AC	LINEAR	Three Terminal Positive Fixed Voltage Regulator	6TA
MCC78M05	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M06	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M08	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M12	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M15	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M18	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M20	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC78M24	LINEAR	Three Terminal Positive Fixed Voltage Regulator	8HH
MCC7805C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC7806C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC7808C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC7812C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC7815C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC7818C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC7824C	LINEAR	Three Terminal Positive Fixed Voltage Regulator	4DG
MCC79L03C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L03AC	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L05C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L05AC	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L12C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L12AC	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L15C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L15AC	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L18C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L18AC	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L24C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC79L24AC	LINEAR	Three Terminal Negative Fixed Voltage Regulator	5TA
MCC7902C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7905C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7905.2C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7906C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL

Chip No.	Family	Function	Geometry
MCC7908C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7912C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7915C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7918C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC7924C	LINEAR	Three Terminal Negative Fixed Voltage Regulator	1GL
MCC8200	MTTL	Dual 5-Bit Buffer Register	2JT
MCC8201	MTTL	Dual 5-Bit Buffer Register w/D Comp.	2JT
MCC8202	MTTL	10-Bit Buffer Register	2JT
MCC8203	MTTL	10-Bit Buffer Register w/D Comp.	2JT
MCC8233	MTTL	2-Input, 4-Bit, digital Multiplexer	7EE
MCC8234	MTTL	2-Input, 4-Bit, digital Multi. (O.C.)	7EE
MCC8235	MTTL	2-Input, 4-Bit, digital Multi. (O.C.)	79T
MCC8241	MTTL	Quad Exclusive OR Gate	57T
MCC8242	MTTL	Quad Exclusive NOR Gate (O.C.)	57T
MCC8250	MTTL	Binary to Octal Decoder	04P
MCC8251	MTTL	BCD to Decimal Decoder	04P
MCC8260	MTTL	Arithmetic Logic Element	40N
MCC8261	MTTL	Fast Carry Extender	66P
MCC8266	MTTL	2-Input, 4-Bit Data Selector	79T
MCC8267	MTTL	2-Input, 4-Bit Data Selector (O.C.)	79T
MCC8270	MTTL	4-Bit Shift Register	3RA
MCC8271	MTTL	4-Bit Shift Register	3RA
MCC8280	MTTL	Presettable Decade Counter	5GD
MCC8281	MTTL	Presettable Binary Counter	5GD
MCC8284	MTTL	Binary Up/Down Counter	51T
MCC8285	MTTL	Decade Up/Down Counter	51T
MCC8288	MTTL	Divide by 12 Counter	39N
MCC8290	MTTL	High Speed Presettable Decade Counter	5GD
MCC8291	MTTL	High Speed Presettable Binary Counter	5GD
MCC8300	MTTL	Universal 4-Bit Shift Register	99T
MCC8301	MTTL	BCD-to-Decimal Decoder	77H
MCC8304	MTTL	Dual Full Adder	10T
MCC8306	MTTL	Presettable Decade Up/Down Counter	43P
MCC8307	MTTL	BCD to Seven Segment Decoder	94M
MCC8308	MTTL	Dual 4-Bit Latch	44P
MCC8309	MTTL	Dual 4-Channel Data Selector	09T
MCC8310	MTTL	Presettable Decade Counter	96R
MCC8311	MTTL	One of 16 Decoder	11T
MCC8312	MTTL	8-Channel Data Selector	21L
MCC8314	MTTL	Quad Latch	69P
MCC8316	MTTL	Presettable 4-Bit Binary Counter	96R
MCC8317	MTTL	Seven Segment Decoder/Driver	12T
MCC8318	MTTL	8-Input Priority Encoder	90P
MCC8322	MTTL	Quad 2-Input Data Selector/Multi.	62V
MCC8324	MTTL	5-Bit Comparator	8CM
MCC8328	MTTL	Dual 8-Bit Shift Register	13M
MCC8500	LSI	CRCC Generator	MAB6DP
MCC8501	LSI	Error Pattern Register	MAB6DP
MCC8502	LSI	LRCC/Data Register	MAA6DP
MCC8503	LSI	Universal Polynomial Generator	MAE6DP
MCC8504	LSI	Universal Preset. Polynomial Gen.	M054JT
MCC8505	LSI	Mos Dynamic Memory Address Refresh	MAH6DP
MCC8506	LSI	Polynomial Generator	MAI6DP
MCC8520	LSI	Deskew/Queve Register	MAB4JV
MCC8601	MTTL	Retriggerable Monostable Multi.	70K
MCC8602	MTTL	Dual Retriggerable Resettable Mono. Multi.	41R
MCC9300	MTTL	Universal 4-Bit Shift Register	99T
MCC9301	MTTL	BCD-to-Decimal Decoder	77H
MCC9304	MTTL	Dual Full Adder	10T
MCC9306	MTTL	Presettable Decade Up/Down Counter	43P
MCC9307	MTTL	BCD to Seven Segment Decoder	94M
MCC9308	MTTL	Dual 4-Bit Latch	44P
MCC9309	MTTL	Dual 4-Channel Data Selector	09T
MCC9310	MTTL	Presettable Decade Counter	96R
MCC9311	MTTL	One of 16 Decoder	11T
MCC9312	MTTL	8-Channel Data Selector	21L
MCC9314	MTTL	Quad Latch	69P
MCC9316	MTTL	Presettable 4-Bit Binary Counter	96R
MCC9317	MTTL	Seven Segment Decoder/Driver	12T
MCC9318	MTTL	8-Input Priority Encoder	90P
MCC9322	MTTL	Quad 2-Input Data Selector/Multi.	62V
MCC9324	MTTL	5-Bit Comparator	8CM
MCC9328	MTTL	Dual 8-Bit Shift Register	13M

Chip No.	Family	Function	Geometry
MCC9601	MTTL	Retriggerable Monostable Multi.	70K
MCC9602	MTTL	Dual Retriggerable Resettable Mono. Multi.	41R
MCC9701	MRTL	Dual 4 Channel Data Selector	35F
MCC9702	MRTL	Dual J-K Flip Flop	07P
MCC9704	MRTL	4-Bit Parallel Full Adder	87H
MCC9707	MRTL	Dual 4 Channel Data Distributor	85F
MCC9709	MRTL	Quad Schmitt Trigger	47F
MCC9713	MRTL	Quad 2-Input AND Gate	26G
MCC9714	MRTL	Quad 2-Input NAND Gate	26G
MCC9715	MRTL	Quad 2-Input OR Gate	1MK
MCC9718	MRTL	Hex Inverter	87C
MCC9719	MRTL	Hex Expander	3KD
MCC9720	MRTL	Hex Expander	87C
MCC9721	MRTL	Quad 2-Input Expander	2KD
MCC9722	MRTL	Dual J-K Flip Flop	98A
MCC9723	MRTL	Quad 2-Input AND Gate	27K
MCC9724	MRTL	Quad 2-Input NAND Gate	27K
MCC9725	MRTL	Quad 2-Input OR Gate	29K
MCC9801	MRTL	Dual 4 Channel Data Selector	35F
MCC9802	MRTL	Dual J-K Flip Flop	07P
MCC9804	MRTL	4-Bit Parallel Full Adder	87H
MCC9807	MRTL	Dual 4 Channel Data Distributor	85F
MCC9809	MRTL	Quad Schmitt Trigger	47F
MCC9813	MRTL	Quad 2-Input AND Gate	26G
MCC9814	MRTL	Quad 2-Input NAND Gate	26G
MCC9815	MRTL	Quad 2-Input OR Gate	1MK
MCC9818	MRTL	Hex Inverter	87C
MCC9819	MRTL	Hex Expander	3KD
MCC9820	MRTL	Hex Expander	87C
MCC9821	MRTL	Quad 2-Input Expander	2KD
MCC9822	MRTL	Dual J-K Flip Flop	98A
MCC9823	MRTL	Quad 2-Input AND Gate	27K
MCC9824	MRTL	Quad 2-Input NAND Gate	27K
MCC9825	MRTL	Quad 2-Input OR Gate	29K
MCC9901	MRTL	Dual 4 Channel Data Selector	35F
MCC9902	MRTL	Dual J-K Flip Flop	07P
MCC9904	MRTL	4-Bit Parallel Full Adder	87H
MCC9907	MRTL	Dual 4 Channel Data Distributor	85F
MCC9909	MRTL	Quad Schmitt Trigger	47F
MCC9913	MRTL	Quad 2-Input AND Gate	26G
MCC9914	MRTL	Quad 2-Input NAND Gate	26G
MCC9915	MRTL	Quad 2-Input OR Gate	1MK
MCC9918	MRTL	Hex Inverter	87C
MCC9919	MRTL	Hex Expander	3KD
MCC9920	MRTL	Hex Expander	87C
MCC9921	MRTL	Quad 2-Input Expander	2KD
MCC9922	MRTL	Dual J-K Flip Flop	98A
MCC9923	MRTL	Quad 2-Input AND Gate	27K
MCC9924	MRTL	Quad 2-Input NAND Gate	27K
MCC9925	MRTL	Quad 2-Input OR Gate	29K
MCC10100	MECL	Quad NOR Gate W/Strobe	3MR
MCC10101	MECL	Quad OR/NOR Gate	3MR
MCC10102	MECL	Quad NOR Gate	3MR
MCC10103	MECL	Quad 2-Input OR Gate	3MR
MCC10104	MECL	Quad AND Gate	1KN
MCC10105	MECL	Triple 2-3-2 OR/NOR Gate	6MT
MCC10106	MECL	Triple 4-3-3 NOR Gate	6MT
MCC10107	MECL	Triple Exclusive OR/NOR Gate	1TD
MCC10109	MECL	Dual 4-5 Input OR/NOR Gate	9KN
MCC10110	MECL	Dual 3-Input/3-Output OR Gate	9KK
MCC10113	MECL	Quad Exclusive OR Gate	9NA
MCC10114	MECL	Triple Line Receiver	3TR
MCC10115	MECL	Quad Line Receiver	1KP
MCC10116	MECL	Triple Line Receiver	4MJ
MCC10117	MECL	Dual 2-Wide AND/OR-AND-INVERT Gate	7NE
MCC10118	MECL	Dual 2-Wide 3-Input OR-AND Gate	7NE
MCC10119	MECL	4-Wide 4-3-3-3 Input OR-AND Gate	1NF
MCC10121	MECL	4-Wide OR-AND/OR-AND-INVERT Gate	1NF
MCC10123	MECL	Triple 4-3-3-Input Bus Driver	1ND
MCC10124	MECL	Quad TTL-to-MECL Translator	7KS
MCC10125	MECL	Quad MECL-to-TTL Translator	3KV
MCC10128	MECL	Dual Bus Driver	7NC
MCC10129	MECL	Quad Bus Receiver	6LS

Chip No.	Family	Function	Geometry
MCC10130	MECL	Dual D Latch	3NF
MCC10131	MECL	Dual D Flip-Flop	9NB
MCC10132	MECL	Dual MUX W/Latch (Common Reset)	2TG
MCC10133	MECL	Quad Latch	1MV
MCC10134	MECL	Dual MUX W/Latch (Separate Select)	2TG
MCC10135	MECL	Dual J-K Master-Slave Flip-Flop	5LD
MCC10136	MECL	Universal Binary Counter	5KR
MCC10137	MECL	Universal Decade Counter	5KR
MCC10138	MECL	Bi-Quinary Counter	3NA
MCC10141	MECL	4-Bit Universal Shift Register	5KA
MCC10153	MECL	Quad Latch (Negative Clock)	1MV
MCC10158	MECL	Quad 2-I Multi. (Non-Inverting Output)	6LB
MCC10159	MECL	Quad 2-I Multi. (Inverting Output)	6LB
MCC10160	MECL	12-Bit Parity Generator/Checker	1MS
MCC10161	MECL	Binary to 1-8 Line Decoder (Low)	9MT
MCC10162	MECL	Binary to 1-8 Line Decoder (High)	9MT
MCC10163	MECL	Error Detection/Corr. Ckt. (IBM Pattern)	5ND
MCC10164	MECL	8-Line Multiplexer	8MA
MCC10165	MECL	Priority Encoder	6MG
MCC10166	MECL	5-Bit Comparator	1TH
MCC10168	MECL	Quad Latch (Common Clock)	1MV
MCC10170	MECL	9 + 2 Bit Parity Checker	3RF
MCC10171	MECL	Dual 4-Line Decoder (Low)	9MT
MCC10172	MECL	Dual 4-Line Decoder (High)	9MT
MCC10173	MECL	Quad 2-Input MUX W/Latch	6LB
MCC10174	MECL	Dual 4-to-1 Multiplexer	3KR
MCC10175	MECL	Quint Latch	2MW
MCC10176	MECL	Hex D Flip-Flop	4NC
MCC10177	MECL	Triple MECL-to-MOS Translator (N-Channel)	5TR
MCC10178	MECL	Binary Counter	3NA
MCC10179	MECL	Look Ahead Carry Block	8MV
MCC10180	MECL	Dual High-Speed Adder/Subtractor	1NE
MCC10181	MECL	4-Bit Arithmetic Logic Unit	4EF
MCC10182	MECL	16-Pin 2-Bit ALU	2TT
MCC10183	MECL	4 x 2 (2s complement) Multiplier	1PB
MCC10186	MECL	Hex D Flip-Flop W/Common Reset	4NC
MCC10190	MECL	Quad IBM-to-MECL Translator	5TG
MCC10191	MECL	Hex MECL-to-IBM Translator	3TG
MCC10193	MECL	Error Detection/Corr. Ckt. (Motorola Pattern)	5ND
MCC10194	MECL	Dual Simulaneous Bus Transceiver	5LP
MCC10195	MECL	Hex Inverter/Buffer	7TR
MCC10197	MECL	Hex AND Gate	7TR
MCC10198	MECL	Retriggerable 1-Shot Multivibrator	3NG
MCC10210	MECL	High-Speed Dual 3-I/3-Output OR Gate	B2F
MCC10211	MECL	High-Speed Dual 3-I/3-Output NOR Gate	B2F
MCC10212	MECL	High-Speed Dual 2-NOR/1-OR Gate	
MCC10216	MECL	High-Speed Triple Line Receiver	4NE
MCC10231	MECL	High-Speed Dual D Flip-Flop	3WE
MCC10237	MECL	High-Speed 2-Bit Multiplier	3TT
MCC10500	MECL	Quad NOR Gate W/Strobe	3MR
MCC10501	MECL	Quad OR/NOR Gate	3MR
MCC10502	MECL	Quad NOR Gate	3MR
MCC10503	MECL	Quad 2-Input OR Gate	3MR
MCC10504	MECL	Quad AND Gate	1KN
MCC10505	MECL	Triple 2-3-2 OR/NOR Gate	6MT
MCC10506	MECL	Triple 4-3-3 NOR Gate	6MT
MCC10507	MECL	Triple Exclusive OR/NOR Gate	1TD
MCC10509	MECL	Dual 4-5 Input OR/NOR Gate	9KN
MCC10111	MECL	Dual 3-Input/3-Output NOR Gate	9KK
MCC10513	MECL	Quad Exclusive OR Gate	9NA
MCC10514	MECL	Triple Line Receiver	3TR
MCC10515	MECL	Quad Line Receiver	1KP
MCC10516	MECL	Triple Line Receiver	4MJ
MCC10517	MECL	Dual 2-Wide AND/OR-AND-INVERT Gate	7NE
MCC10518	MECL	Dual 2-Wide 3-Input OR-AND Gate	7NE
MCC10519	MECL	4-Wide 4-3-3-3 Input OR-AND Gate	1NF
MCC10521	MECL	4-Wide OR-AND/OR-AND-INVERT Gate	1NF
MCC10524	MECL	Quad TTL-to-MECL Translator	7KS
MCC10525	MECL	Quad MECL-to-TTL Translator	3KV
MCC10530	MECL	Dual D Latch	3NF
MCC10531	MECL	Dual D Flip-Flop	9NB
MCC10532	MECL	Dual MUX W/Latch (Common Reset)	2TG
MCC10533	MECL	Quad Latch	1MV

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Chip No.	Family	Function	Geometry
MCC10534	MECL	Dual MUX W/Latch (Separate Select)	2TG
MCC10535	MECL	Dual J-K Master-Slave Flip-Flop	5LD
MCC10536	MECL	Universal Binary Counter	5KR
MCC10537	MECL	Universal Decade Counter	5KR
MCC10538	MECL	Bi-Quinary Counter	3NA
MCC10541	MECL	4-Bit Universal Shift Register	5KA
MCC10553	MECL	Quad Latch (Negative Clock)	1MV
MCC10558	MECL	Quad 2-I Multi. (Non-Inverting Output)	6LB
MCC10559	MECL	Quad 2-I Multi. (Inverting Output)	6LB
MCC10560	MECL	12-Bit Parity Generator/Checker	1MS
MCC10561	MECL	Binary to 1-8 Line Decoder (Low)	9MT
MCC10562	MECL	Binary to 1-8 Line Decoder (High)	9MT
MCC10564	MECL	8-Line Multiplexer	8MA
MCC10565	MECL	Priority Encoder	6MG
MCC10566	MECL	5-Bit Comparator	1TH
MCC10568	MECL	Quad Latch (Common Clock)	1MV
MCC10570	MECL	9 + 2 Bit Parity Checker	3RF
MCC10571	MECL	Dual 4-Line Decoder (Low)	9MT
MCC10572	MECL	Dual 4-Line Decoder (High)	9MT
MCC10573	MECL	Quad 2-Input MUX W/Latch	6LB
MCC10574	MECL	Dual 4-to-1 Multiplexer	3KR
MCC10575	MECL	Quint Latch	2MW
MCC10576	MECL	Hex D Flip-Flop	4NC
MCC10578	MECL	Binary Counter	3NA
MCC10579	MECL	Look Ahead Carry Block	8MV
MCC10580	MECL	Dual High-Speed Adder/Subtractor	1NE
MCC10581	MECL	4-Bit Arithmetic Logic Unit	4EF
MCC10582	MECL	16-Pin 2-Bit ALU	2TT
MCC10583	MECL	4 x 2 (2s complement) Multiplier	1PB
MCC10586	MECL	Hex D Flip-Flop W/Common Reset	4NC
MCC10590	MECL	Quad IBM-to-MECL Translator	5TG
MCC10591	MECL	Hex MECL-to-IBM Translator	3TG
MCC10594	MECL	Dual Simulaneous Bus Transceiver	5LP
MCC10595	MECL	Hex Inverter/Buffer	7TR
MCC10597	MECL	Hex AND Gate	7TR
MCC10610	MECL	High-Speed Dual 3-I/3-Output OR Gate	B2F
MCC10611	MECL	High-Speed Dual 3-I/3-Output NOR Gate	B2F
MCC10612	MECL	High-Speed Dual 2-NOR/1-OR Gate	
MCC10616	MECL	High-Speed Triple Line Receiver	4NE
MCC10631	MECL	High-Speed Dual D Flip-Flop	3WE
MCC12000	PLL	Digital Mixer/Translator	6WT
MCC12002	PLL	Analog Mixer	8MT
MCC12012	PLL	Two Modulus Prescaler	8WJ
MCC12013	PLL	Two Modulus Prescaler	3PS
MCC12014	PLL	Counter Control Logic	3TP
MCC12020	PLL	Offset Control	1WB
MCC12021	PLL	Offset Programmer	5WE
MCC12030	PLL	To Be Introduced	7TW
MCC12040	PLL	Phase Frequency Detector	37L
MCC12060	PLL	Crystal Oscillator	7WJ(3EG)
MCC12061	PLL	Crystal Oscillator	8RH
MCC12502	PLL	Analog Mixer	8MT
MCC12513	PLL	Two Modulus Prescaler	3PS
MCC12520	PLL	Offset Control	1WB
MCC12521	PLL	Offset Programmer	5WE
MCC12560	PLL	Crystal Oscillator	7WI(3EG)
MCC12561	PLL	Crystal Oscillator	8RH
MCC14000 Series	McMOS	See Chapter 8	
MCC14046	PLL	McMos Phase-Locked Loop	
MCC15482	MTTL	2-Bit Full Adder	13E
MCC17482	MTTL	2-Bit Full Adder	13E
MCC25482	MTTL	2-Bit Full Adder	13E
MCC27482	MTTL	2-Bit Full Adder	13E
MCC54100	MTTL	Dual 4-Bit Latch	31R
MCC54107	MTTL	Dual J-K Master Slave FF	45P
MCC54120	MTTL	Dual Pulse Synchronizers/Drivers	7HG
MCC54121	MTTL	Monostable Multivibrator	97M
MCC54122	MTTL	Retriggerable Monostable Multi.	6GR
MCC54123	MTTL	Dual Retriggerable Monostable Multi.	3HA
MCC54132	MTTL	Quadruple 2-Input NAND Schmitt Trigger	1KD
MCC54136	MTTL	Quadruple 2-Input Exc. OR Gate (O.C.)	8GM
MCC54141	MTTL	BCD to Decimal Decoder/Driver	8HF
MCC54145	MTTL	BCD to Decimal Decoder/Driver	96M

Chip No.	Family	Function	Geometry
MCC54150	MTTL	16 Channel Data Selector/Multiplexer	68N
MCC54151	MTTL	8 Channel Data Selector/Multiplexer	13W
MCC54152	MTTL	8 Channel Data Selector/Multiplexer	13W
MCC54153	MTTL	Dual 4 line to 1 line Data Sel./Multi.	02T
MCC54154	MTTL	4 line to 16 line Decoder/Demulti.	11T
MCC54155	MTTL	Dual 2-to-4 Line Dec./1-to-4 Line Demul.	66V
MCC54156	MTTL	Dual 2-to-4 Line Dec./1-to-4 Line Demul.	66V
MCC54157	MTTL	Quad 2-Input Data Selector/Multiplexer	62V
MCC54160	MTTL	Decade Synchronous Counter	8GK
MCC54161	MTTL	Synchronous 4-Bit Binary Counter	8GK
MCC54162	MTTL	Synchronous Decade Counter	8GK
MCC54163	MTTL	Synchronous 4-Bit Binary Counter	8GK
MCC54164A	MTTL	8-Bit Parallel-Out Serial Shift Reg.	20T
MCC54165	MTTL	Parallel-Load 8-Bit Shift Reg.	5ET
MCC54167	MTTL	Decade Rate Multiplier (Synchronous)	7MG
MCC54174	MTTL	Hex Type D Flip-Flop	5KS
MCC54175	MTTL	Quadruple D Type Flip-Flop	5KS
MCC54176	MTTL	35MHz preset. decade counter/latch	5GD
MCC54177	MTTL	35MHz preset. decade counter/latch	5GD
MCC54180	MTTL	8-Bit Odd/Even Parity Gen./Checker	17R
MCC54181	MTTL	4-Bit ALU/Function Generator	4DW
MCC54182	MTTL	Look Ahead Carry Generator	37V
MCC54190	MTTL	BCD Synchronous Up/Down Counter	9GK
MCC54191	MTTL	4-Bit Binary Syn. Up/Down Counter	8RV
MCC54192	MTTL	Preset. Decade Up/Down Counter	8RV
MCC54193	MTTL	Preset. 4-Bit Binary Up/Down Counter	8RV
MCC54194	MTTL	4-Bit Bidirectional Univ. Shift Reg.	8FP
MCC54195	MTTL	4-Bit Parallel Access Shift Reg.	8FP
MCC54196	MTTL	Preset. Decade or Binary Counter/Latch	5GD
MCC54197	MTTL	Preset. Decade or Binary Counter/Latch	5GD
MCC54221	MTTL	Dual Mono. Multiv. w/Schmitt-Trigger Inputs	5NG
MCC54290	MTTL	Decade Counter	3HT
MCC54293	MTTL	4-Bit Binary Counter	3HT
MCC54298	MTTL	Quadruple 2-Input Multi. w/Storage	8FP
MCC55107	LINEAR	Dual Line Receiver	6DJ
MCC55108	LINEAR	Dual Line Receiver	6DJ
MCC55325	LINEAR	Dual Memory Driver	6PJ
MCC74100	MTTL	Dual 4-Bit Latch	31R
MCC74107	MTTL	Dual J-K Master Slave FF	45P
MCC74120	MTTL	Dual Pulse Synchronizers/Drivers	7HG
MCC74121	MTTL	Monostable Multivibrator	97M
MCC74122	MTTL	Retriggerable Monostable Multi.	6GR
MCC74123	MTTL	Dual Retriggerable Monostable Multi.	3HA
MCC74132	MTTL	Quadruple 2-Input NAND Schmitt Trigger	1KD
MCC74136	MTTL	Quadruple 2-Input Exc. OR Gate (O.C.)	8GM
MCC74141	MTTL	BCD to Decimal Decoder/Driver	8HF
MCC74145	MTTL	BCD to Decimal Decoder/Driver	96M
MCC74150	MTTL	16 Channel Data Selector/Multiplexer	68N
MCC74151	MTTL	8 Channel Data Selector/Multiplexer	13W
MCC74152	MTTL	8 Channel Data Selector/Multiplexer	13W
MCC74153	MTTL	Dual 4 line to 1 line Data Sel./Multi.	02T
MCC74154	MTTL	4 line to 16 line Decoder/Demulti.	11T
MCC74155	MTTL	Dual 2-to-4 Line Dec./1-to-4 Line Demul.	66V
MCC74156	MTTL	Dual 2-to-4 Line Dec./1-to-4 Line Demul.	66V
MCC74157	MTTL	Quad 2-Input Data Selector/Multiplexer	62V
MCC74160	MTTL	Decade Synchronous Counter	8GK
MCC74161	MTTL	Synchronous 4-Bit Binary Counter	8GK
MCC74162	MTTL	Synchronous Decade Counter	8GK
MCC74163	MTTL	Synchronous 4-Bit Binary Counter	8GK
MCC74164A	MTTL	8-Bit Parallel-Out Serial Shift Reg.	20T
MCC74165	MTTL	Parallel-Load 8-Bit Shift Reg.	5ET
MCC74167	MTTL	Decade Rate Multiplier (Synchronous)	7MG
MCC74174	MTTL	Hex Type D Flip-Flop	5KS
MCC74175	MTTL	Quadruple D Type Flip-Flop	5KS
MCC74176	MTTL	35MHz preset. decade counter/latch	5GD
MCC74177	MTTL	35MHz preset. decade counter/latch	5GD
MCC74180	MTTL	8-Bit Odd/Even Parity Gen./Checker	17R
MCC74181	MTTL	4-Bit ALU/Function Generator	4DW
MCC74182	MTTL	Look Ahead Carry Generator	37V
MCC74190	MTTL	BCD Synchronous Up/Down Counter	9GK
MCC74191	MTTL	4-Bit Binary Syn. Up/Down Counter	8RV
MCC74192	MTTL	Preset. Decade Up/Down Counter	8RV
MCC74193	MTTL	Preset. 4-Bit Binary Up/Down Counter	8RV

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Chip No.	Family	Function	Geometry
MCC74194	MTTL	4-Bit Bidirectional Univ. Shift Reg.	8FP
MCC74195	MTTL	4-Bit Parallel Access Shift Reg.	8FP
MCC74196	MTTL	Preset. Decade or Binary Counter/Latch	5GD
MCC74197	MTTL	Preset. Decade or Binary Counter/Latch	5GD
MCC74221	MTTL	Dual Mono. Multiv. w/Schmitt-Trigger Inputs	5NG
MCC74290	MTTL	Decade Counter	3HT
MCC74293	MTTL	4-Bit Binary Counter	3HT
MCC74298	MTTL	Quadruple 2-Input Multi. w/Storage	8FP
MCC75107	LINEAR	Dual Line Receiver	6DJ
MCC75108	LINEAR	Dual Line Receiver	6DJ
MCC75110	LINEAR	Dual Line Driver	1AW
MCC75140	LINEAR	Dual Line Receiver	1ET
MCC75325	LINEAR	Dual Memory Driver	6PJ
MCC75358	LINEAR	Dual MECL-to-MOS Driver	3KT
MCC75365	LINEAR	Quad MOS Clock Driver	8MR
MCC75368	LINEAR	Dual MECL-to-MOS Driver	3KT
MCC75450	LINEAR	Dual Peripheral Positive "AND" Driver	8CV
MCC75451	LINEAR	Dual Peripheral Driver	8CV
MCC75452	LINEAR	Dual Peripheral Driver	1HT
MCC75453	LINEAR	Dual Peripheral Driver	1HT
MCC75454	LINEAR	Dual Peripheral Driver	1HT
MCC75461	LINEAR	Dual Peripheral Driver	8CV
MCC75462	LINEAR	Dual Peripheral Driver	1HT
MCC75463	LINEAR	Dual Peripheral Driver	1HT
MCC75464	LINEAR	Dual Peripheral Driver	1HT
MCC75491	LINEAR	Quad Led Segment Driver	2FE
MCC75492	LINEAR	Hex Led Digit Driver	8FD
MCCF1458	FC	Dual Operational Amplifier	3AE
MCCF1709	FC	Operational Amplifier	77W
MCCF1741	FC	Comsensated Operational Amplifier	9AB
MCCF3346	FC	Transistor Assembly	
MCCF3386	FC	Transistor Assembly	
MCCF3403	FC	Quad Operational Amplifier	6TJ
MCCF3503	FC	Quad Operational Amplifier	6TJ

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MCL1300	MCLC1300		ZCL		G
MCL1301	MCLC1301		ZCL		G
MCL1302	MCLC1302		ZCL		G
MCL1303	MCLC1303		ZCL		G
MCL1304	MCLC1304				

Chip No.	Family	Function	Geometry
MCMC5003	MEM	512-Bit Programmable ROM	5RP
MCMC5004	MEM	512-Bit Programmable ROM	5RP
MCMC10143	MEM	8x12 Multiport Register File	6MW
MCMC10144	MEM	256-Bit Random Access Memory	6WM
MCMC10145	MEM	64-Bit Register File (RAM)	A8A
MCMC10146	MEM	1024-Bit Random Access Memory	9TR
MCMC10147	MEM	128-Bit Random Access Memory	7PH
MCMC10149	MEM	1024-Bit Programmable ROM	9TN

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MCR101	MCRC101		SCR		TL60
MCR102		2NC5060	SCR		TL60
MCR103		2NC5061	SCR		TL60
MCR104		2NC5062	SCR		TL62
MCR106-1	MCRC106-1	MCRC0361	SCR		036

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MCR106-2	MCRC106-2	MCRC0361	SCR		036
MCR106-3	MCRC106-3	MCRC0361	SCR		036
MCR106-4	MCRC106-4	MCRC0362	SCR		036
MCR106-5	MCRC106-5	MCRC0363	SCR		036
MCR106-6	MCRC106-6	MCRC0364	SCR		036
MCR106-7	MCRC106-7	MCRC0365	SCR		036
MCR106-8	MCRC106-8	MCRC0366	SCR		036
MCR106-9	MCRC106-9	MCRC0367	SCR		036
MCR106-10	MCRC106-10	MCRC0368	SCR		036
MCR107-1	MCRC107-1	MCRC0361	SCR		036
MCR107-2	MCRC107-2	MCRC0361	SCR		036
MCR107-3	MCRC107-3	MCRC0361	SCR		036
MCR107-4	MCRC107-4	MCRC0362	SCR		036
MCR107-5	MCRC107-5	MCRC0363	SCR		036
MCR107-6	MCRC107-6	MCRC0364	SCR		036
MCR107-7	MCRC107-7	MCRC0365	SCR		036
MCR107-8	MCRC107-8	MCRC0366	SCR		036
MCR115		2NC5063	SCR		TL62
MCR120		2NC5064	SCR		TL62
MCR201	MCRC101		SCR		TL60
MCR202		2NC5060	SCR		TL60
MCR203		2NC5061	SCR		TL60
MCR204		2NC5062	SCR		TL62
MCR205		2NC5063	SCR		TL62
MCR206		2NC5064	SCR		TL62
MCR220-5	MCRC220-5	MCRC3103	SCR		310
MCR220-7	MCRC220-7	MCRC3103	SCR		310
MCR220-9	MCRC220-9	MCRC3107	SCR		310
MCR221-5	MCRC221-5	MCRC3203	SCR		320
MCR221-7	MCRC221-7	MCRC3205	SCR		320
MCR221-9	MCRC221-9	MCRC3207	SCR		320
MCR406-1	MCRC406-1	MCRC0361	SCR		036
MCR406-2	MCRC406-2	MCRC0361	SCR		036
MCR406-3	MCRC406-3	MCRC0361	SCR		036
MCR406-4	MCRC406-4	MCRC0362	SCR		036
MCR407-1	MCRC407-1	MCRC0361	SCR		036
MCR407-2	MCRC407-2	MCRC0361	SCR		036
MCR407-3	MCRC407-3	MCRC0361	SCR		036
MCR407-4	MCRC407-4	MCRC0362	SCR		036
MCR649AP-1	MCRC649AP-1	MCRC3201	SCR		320
MCR649AP-2	MCRC649AP-2	MCRC3201	SCR		320
MCR649AP-3	MCRC649AP-3	MCRC3201	SCR		320
MCR649AP-4	MCRC649AP-4	MCRC3202	SCR		320
MCR649AP-5	MCRC649AP-5	MCRC3203	SCR		320
MCR649AP-6	MCRC649AP-6	MCRC3204	SCR		320
MCR649AP-7	MCRC649AP-7	MCRC3205	SCR		320
MCR649AP-8	MCRC649AP-8	MCRC3206	SCR		320
MCR649AP-9	MCRC649AP-9	MCRC3207	SCR		320
MCR649AP-10	MCRC649AP-10	MCRC3208	SCR		320
MCR1330		2NC6116	PUT		TL72/75
MCR1350		2NC6118	PUT		TL72/75
MCR1906-1	MCRC1906-1	MCRC6381	SCR		638
MCR1906-2	MCRC1906-2	MCRC6381	SCR		638
MCR1906-3	MCRC1906-3	MCRC6381	SCR		638
MCR1906-4	MCRC1906-4	MCRC6382	SCR		638
MCR2305-1	MCRC2305-1	MCRC3101	SCR		310
MCR2305-2	MCRC2305-2	MCRC3101	SCR		310
MCR2305-3	MCRC2305-3	MCRC3101	SCR		310
MCR2305-4	MCRC2305-4	MCRC3102	SCR		310
MCR2305-5	MCRC2305-5	MCRC3103	SCR		310
MCR2305-6	MCRC2305-6	MCRC3104	SCR		310
MCR2305-8	MCRC2305-8	MCRC3106	SCR		310
MCR2305-10	MCRC2305-10	MCRC3108	SCR		310
MCR2604L-1	MCRC2604L-1	MCRC3101	SCR		310
MCR2604L-2	MCRC2604L-2	MCRC3101	SCR		310
MCR2604L-3	MCRC2604L-3	MCRC3101	SCR		310
MCR2604L-4	MCRC2604L-4	MCRC3102	SCR		310
MCR2604L-5	MCRC2604L-5	MCRC3103	SCR		310
MCR2604L-6	MCRC2604L-6	MCRC3104	SCR		310
MCR2604L-8	MCRC2604L-8	MCRC3106	SCR		310
MCR2604L-10	MCRC2604L-10	MCRC3108	SCR		310
MCR3000-1	MCRC3000-1	MCRC3101	SCR		310
MCR3000-2	MCRC3000-2	MCRC3101	SCR		310

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MCR3000-3	MCRC3000-3	MCRC3101	SCR		310
MCR3000-4	MCRC3000-4	MCRC3102	SCR		310
MCR3000-5	MCRC3000-5	MCRC3103	SCR		310
MCR3000-6	MCRC3000-6	MCRC3104	SCR		310
MCR3000-7	MCRC3000-7	MCRC3105	SCR		310
MCR3000-8	MCRC3000-8	MCRC3106	SCR		310
MCR3000-9	MCRC3000-9	MCRC3107	SCR		310
MCR3000-10	MCRC3000-10	MCRC3108	SCR		310
MCR3818-1	MCRC3818-1	MCRC3201	SCR		320
MCR3818-3	MCRC3818-3	MCRC3201	SCR		320
MCR3818-5	MCRC3818-5	MCRC3203	SCR		320
MCR3818-7	MCRC3818-7	MCRC3205	SCR		320
MCR3818-10	MCRC3818-10	MCRC3208	SCR		320
MCR3835-1	MCRC3835-1	MCRC3201	SCR		320
MCR3835-2	MCRC3835-2	MCRC3201	SCR		320
MCR3835-5	MCRC3835-5	MCRC3203	SCR		320
MCR3835-7	MCRC3835-7	MCRC3205	SCR		320
MCR3835-8	MCRC3835-8	MCRC3206	SCR		320
MCR3835-9	MCRC3835-9	MCRC3207	SCR		320
MCR3835-10	MCRC3835-10	MCRC3208	SCR		320
MCR3918-1	MCRC3918-1	MCRC3201	SCR		320
MCR3918-3	MCRC3918-3	MCRC3201	SCR		320
MCR3918-5	MCRC3918-5	MCRC3203	SCR		320
MCR3918-7	MCRC3918-7	MCRC3205	SCR		320
MCR3918-10	MCRC3918-10	MCRC3208	SCR		320
MCR3935-1	MCRC3935-1	MCRC3201	SCR		320
MCR3935-2	MCRC3935-2	MCRC3201	SCR		320
MCR3935-5	MCRC3935-5	MCRC3203	SCR		320
MCR3935-7	MCRC3935-7	MCRC3205	SCR		320
MCR3935-8	MCRC3935-8	MCRC3206	SCR		320
MCR3935-9	MCRC3935-9	MCRC3207	SCR		320
MCR3935-10	MCRC3935-10	MCRC3208	SCR		320
MD4957		2NC4957	RF	P	
MFE120	MFEC120		FETMDG	N	FM819
MFE121	MFEC121		FETMDG	N	FM819
MFE122	MFEC122		FETMDG	N	FM819
MFE130	MFEC130		FETMDG	N	FM877
MFE131	MFEC131		FETMDG	N	FM877
MFE132	MFEC132		FETMDG	N	FM877
MFE521	MFEC521		FETMDG	N	FM890
MFE823	MFEC823		FETM	P	FM123
MFE824	MFEC824		FETM	N	FM110
MFE2000	MFEC2000		FETJ	N	FM146
MFE2001	MFEC2001		FETJ	N	FM146
MFE2004	MFEC2004		FETJ	N	FM140
MFE2005	MFEC2005		FETJ	N	FM140
MFE2006	MFEC2006		FETJ	N	FM140
MFE2010	MFEC2010		FETJ	N	FM136
MFE2011	MFEC2011		FETJ	N	FM136
MFE2012	MFEC2012		FETJ	N	FM136
MFE2093	MFEC2093		FETJ	N	FM124
MFE2094	MFEC2094		FETJ	N	FM124
MFE2095	MFEC2095		FETJ	N	FM124
MFE3001	MFEC3001		FETM	N	FM110
MFE3002	MFEC3002		FETM	N	FM114
MFE3003	MFEC3003		FETM	P	FM115
MFE3004	MFE3004		FETM	N	FM112
MFE3020	2NC4066		FETM(D)	P	FM109
MFE3021	2NC4067		FETM(D)	P	FM109
MJ205	MJC205		PWR	N	5TD-CN
MJ400	MJC400		PWR	N	2AN-C
MJ410	MJC410		PWR	N	6KB-CN
MJ411	MJC411		PWR	N	6KB-CN
MJ413	MJC413		PWR	N	6KB-CN
MJ420	MJC420		PWR	N	4SB-G
MJ421	MJC421		PWR	N	4SB-G
MJ423	MJC423		PWR	N	6KB-CN
MJ424	MJC424		PWR	N	6KB-CN
MJ425	MJC425		PWR	N	6KB-CN
MJ430S	MJC430S		PWR	P	6KL-C
MJ431	MJC431		PWR	N	6KB-CN
MJ440S	MJC440S		PWR	N	6KL-C
MJ450	MJC450		PWR	P	A5G-C

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MJ480	MJC480		PWR	N	4WH-C
MJ481	MJC481		PWR	N	4WH-C
MJ490	MJC490		PWR	P	4WH-C
MJ491	MJC491		PWR	P	4WH-C
MJ701	MJC701		PWR	N	5TD-CN
MJ702	MJC702		PWR	N	5TD-CN
MJ704	MJC704		PWR	N	5TD-CN
MJ721	MJC721		PWR	N	5TD-CN
MJ723	MJC723		PWR	N	5TD-CN
MJ802	MJC802		PWR	N	A5G-C
MJ804	MJC804		PWR	N	5RV-CN
MJ900	MJC900		PWR	P	7JA-C
MJ901	MJC901		PWR	P	7JA-C
MJ1000	MJC1000		PWR	N	7JA-C
MJ1001	MJC1001		PWR	N	7JA-C
MJ1800	MJC1800		PWR	N	1TE-CN
MJ2249	MJC2249		PWR	N	7MH-C
MJ2250	MJC2250		PWR	N	7MH-C
MJ2251	MJC2251		PWR	N	2AN-C
MJ2252	MJC2252		PWR	N	2AN-C
MJ2253	MJC2253		PWR	P	6KL-C
MJ2254	MJC2254		PWR	P	6KL-C
MJ2267	MJC2267		PWR	P	3FR-C
MJ2268	MJC2268		PWR	P	3FR-C
MJ2500	MJC2500		PWR	P	8JA-C
MJ2501	MJC2501		PWR	P	8JA-C
MJ2801	MJC2801		PWR	N	4WH-C
MJ2802	MJC2802		PWR	N	4WH-C
MJ2840	MJC2840		PWR	N	4WH-C
MJ2841	MJC2841		PWR	N	4WH-C
MJ2901	MJC2901		PWR	P	3FR-C
MJ2940	MJC2940		PWR	P	3FR-C
MJ2941	MJC2941		PWR	P	3FR-C
MJ2955	MJC2955		PWR	P	3FR-C
MJ3000	MJC3000		PWR	N	8JA-C
MJ3001	MJC3001		PWR	N	8JA-C
MJ3010	MJC3010		PWR	N	6KB-C
MJ3011	MJC3011		PWR	N	6KB-C
MJ3012	MJC3012		PWR	N	6KB-C
MJ3026	MJC3026		PWR	N	7TB-C
MJ3027	MJC3027		PWR	N	7TB-C
MJ3030	MJC3030		PWR	N	6KB-CN
MJ3040	MJC3040		PWR	N	9RF-CN
MJ3041	MJC3041		PWR	N	9RF-CN
MJ3042	MJC3042		PWR	N	9RF-CN
MJ3055	MJC3055		PWR	N	4WH-C
MJ3101	MJC3101		PWR	N	7MH-C
MJ3201	MJC3201		PWR	N	2AN-C
MJ3202	MJC3202		PWR	N	2AN-C
MJ3260	MJC3260		PWR	N	1TE-CN
MJ3430	MJC3430		PWR	N	6KB-CN
MJ3480	MJC3480		PWR	N	5RV-CN
MJ3701	MJC3701		PWR	P	6KL-C
MJ3702	MJC3702		PWR	P	6KL-C
MJ3703	MJC3703		PWR	P	6KL-C
MJ3704	MJC3704		PWR	P	6KL-C
MJ3738	MJC3738		PWR	P	1FF-C
MJ3739	MJC3739		PWR	P	1FF-CN
MJ3760	MJC3760		PWR	N	6KB-C
MJ3761	MJC3761		PWR	N	6KB-C
MJ3771	MJC3771		PWR	N	A5G-C
MJ3772	MJC3772		PWR	N	A5G-C
MJ3773	MJC3773		PWR	N	4KW-C
MJ4030	MJC4030		PWR	P	4LE-C
MJ4031	MJC4031		PWR	P	4LE-C
MJ4032	MJC4032		PWR	P	4LE-C
MJ4033	MJC4033		PWR	N	4LE-C
MJ4034	MJC4034		PWR	N	4LE-C
MJ4035	MJC4035		PWR	N	4LE-C
MJ4502	MJC4502		PWR	P	A5G-C
MJ4645	MJC4645		PWR	P	1LF-G
MJ4646	MJC4646		PWR	P	1LF-G
MJ4647	MJC4647		PWR	P	1LF-G

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MJ4648	MJC4648		PWR	P	1LF-G
MJ5038	MJC5038		PWR	N	8MW-C
MJ5039	MJC5039		PWR	N	8MW-C
MJ5415	MJC5415		PWR	P	4SB-C
MJ5416	MJC5416		PWR	P	4SB-C
MJ6302	MJC6302		PWR	N	4KW-C
MJ6700	MJC6700		PWR	P	4PD-G
MJ6701	MJC6701		PWR	P	4PD-G
MJ7000	MJC7000		PWR	N	8KJ-G
MJ7160	MJC7160		PWR	N	9KH-C
MJ7161	MJC7161		PWR	N	9KH-C
MJ7260	MJC7260		PWR	N	1TC-C
MJ7261	MJC7261		PWR	N	1TC-C
MJ8020	MJC8020		PWR	N	5RV-C
MJ8100	MJC8100		PWR	P	4PD-G
MJ8101	MJC8101		PWR	P	4PD-G
MJ9000	MJC9000		PWR	N	6KB-C
MJ10000	MJC10000		PWR	N	9RT-C
MJ10001	MJC10001		PWR	N	9RT-C
MJ10002	MJC10002		PWR	N	9RF-C
MJ10003	MJC10003		PWR	N	9RF-C
MJ11011	MJC11011		PWR	P	4LE-C
MJ11012	MJC11012		PWR	N	4LE-C
MJ11013	MJC11013		PWR	P	4LE-C
MJ11014	MJC11014		PWR	N	4-LEC
MJ11015	MJC11015		PWR	P	4-LEC
MJ11016	MJC11016		PWR	N	4-LEC
MJ15001	MJC15001		PWR	N	6KB-C
MJ15002	MJC15002		PWR	P	6KB-C
MJ15003	MJC15003		PWR	N	4KW-C
MJ15004	MJC15004		PWR	P	4KW-C
MJE29	MJEC29		PWR	N	5HE-G
MJE30	MJEC30		PWR	P	5HE-G
MJE31	MJEC31		PWR	N	5HE-G
MJE32	MJEC32		PWR	P	5HE-G
MJE33	MJEC33		PWR	N	3FR-G
MJE34	MJEC34		PWR	P	3FR-GN
MJE41	MJEC41		PWR	N	4JN-GN
MJE42	MJEC42		PWR	P	4JN-GN
MJE47	MJEC47		PWR	N	8MS-G
MJE48	MJEC48		PWR	N	8MS-G
MJE49	MJEC49		PWR	N	8MS-G
MJE51	MJEC51		PWR	N	4JN-G
MJE52	MJEC52		PWR	N	4JN-G
MJE53	MJEC53		PWR	N	4JN-G
MJE101	MJEC101		PWR	P	4JN-GN
MJE102	MJEC102		PWR	P	4JN-GN
MJE103	MJEC103		PWR	P	4JN-GN
MJE104	MJEC104		PWR	P	4JN-GN
MJE105	MJEC105		PWR	P	4JN-GN
MJE170	MJEC170		PWR	P	2WE-G
MJE171	MJEC171		PWR	P	2WE-G
MJE172	MJEC172		PWR	P	2WE-G
MJE180	MJEC180		PWR	N	2WE-G
MJE181	MJEC181		PWR	N	2WE-G
MJE182	MJEC182		PWR	N	2WE-G
MJE200	MJEC200		PWR	N	2WE-G
MJE201	MJEC201		PWR	N	4JN-GN
MJE202	MJEC202		PWR	N	4JN-GN
MJE203	MJEC203		PWR	N	4JN-GN
MJE204	MJEC204		PWR	N	4JN-GN
MJE205	MJEC205		PWR	N	4JN-GN
MJE210	MJEC210		PWR	P	2WE-G
MJE220	MJEC220		PWR	N	2WE-G
MJE221	MJEC221		PWR	N	2WE-G
MJE222	MJEC222		PWR	N	2WE-G
MJE223	MJEC223		PWR	N	2WE-G
MJE224	MJEC224		PWR	N	2WE-G
MJE225	MJEC225		PWR	N	2WE-G
MJE230	MJEC230		PWR	P	2WE-G
MJE231	MJEC231		PWR	P	2WE-G
MJE232	MJEC232		PWR	P	2WE-G
MJE233	MJEC233		PWR	P	2WE-G

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MJE234	MJEC234		PWR	P	2WE-G
MJE235	MJEC235		PWR	N	2WE-G
MJE240	MJEC240		PWR	N	2WE-G
MJE241	MJEC241		PWR	N	2WE-G
MJE242	MJEC242		PWR	N	2WE-G
MJE243	MJEC243		PWR	N	2WE-G
MJE244	MJEC244		PWR	N	2WE-G
MJE250	MJEC250		PWR	P	2WE-G
MJE251	MJEC251		PWR	P	2WE-G
MJE252	MJEC252		PWR	P	2WE-G
MJE253	MJEC253		PWR	P	2WE-G
MJE254	MJEC254		PWR	P	2WE-G
MJE340	MJEC340		PWR	N	1FF-G
MJE341	MJEC341		PWR	N	1FF-G
MJE344	MJEC344		PWR	N	1FF-G
MJE345	MJEC345		PWR	N	P26-G
MJE350	MJEC350		PWR	P	1FF-G
MJE370	MJEC370		PWR	P	4JE-GN
MJE371	MJEC371		PWR	P	5HE-G
MJE520	MJEC520		PWR	N	4JE-GN
MJE521	MJEC521		PWR	N	5HE-G
MJE700	MJEC700		PWR	P	5TB-GN
MJE701	MJEC701		PWR	P	5TB-GN
MJE702	MJEC702		PWR	P	5TB-GN
MJE703	MJEC703		PWR	P	5TB-GN
MJE710	MJEC710		PWR	P	4JE-CN
MJE711	MJEC711		PWR	P	4JE-CN
MJE712	MJEC712		PWR	P	4JE-CN
MJE720	MJEC720		PWR	N	4JE-CN
MJE721	MJEC721		PWR	N	4JE-CN
MJE722	MJEC722		PWR	N	4JE-CN
MJE800	MJEC800		PWR	N	5TB-GN
MJE801	MJEC801		PWR	N	5TB-GN
MJE802	MJEC802		PWR	N	5TB-GN
MJE803	MJEC803		PWR	N	5TB-GN
MJE1090	MJEC1090		PWR	P	2KS-G
MJE1091	MJEC1091		PWR	P	2KS-G
MJE1092	MJEC1092		PWR	P	2KS-G
MJE1093	MJEC1093		PWR	P	2KS-G
MJE1100	MJEC1100		PWR	N	2KS-G
MJE1101	MJEC1101		PWR	N	2KS-G
MJE1102	MJEC1102		PWR	N	2KS-G
MJE1103	MJEC1103		PWR	N	2KS-G
MJE1290	MJEC1290		PWR	P	9JL-CN
MJE1291	MJEC1291		PWR	P	9JL-CN
MJE1660	MJEC1660		PWR	N	9JL-CN
MJE1661	MJEC1661		PWR	N	9JL-CN
MJE2010	MJEC2010		PWR	P	4JN-GN
MJE2011	MJEC2011		PWR	P	4JN-GN
MJE2020	MJEC2020		PWR	N	4JN-GN
MJE2021	MJEC2021		PWR	N	4JN-GN
MJE2050	MJEC2050		PWR	N	2WE-G
MJE2055	MJEC2055		PWR	N	4JN-GN
MJE2090	MJEC2090		PWR	P	2KS-G
MJE2091	MJEC2091		PWR	P	2KS-G
MJE2092	MJEC2092		PWR	P	2KS-G
MJE2093	MJEC2093		PWR	P	2KS-G
MJE2100	MJEC2100		PWR	N	2KS-G
MJE2101	MJEC2101		PWR	N	2KS-G
MJE2102	MJEC2102		PWR	N	2KS-G
MJE2103	MJEC2103		PWR	N	2KS-G
MJE2150	MJEC2150		PWR	P	2WE-G
MJE2160	MJEC2160		PWR	N	8MS-G
MJE2360	MJEC2360		PWR	N	2AN-G
MJE2361	MJEC2361		PWR	N	2AN-G
MJE2370	MJEC2370		PWR	P	5HE-G
MJE2480	MJEC2480		PWR	N	5HE-G
MJE2481	MJEC2481		PWR	N	5HE-G
MJE2482	MJEC2482		PWR	N	5HE-G
MJE2483	MJEC2483		PWR	N	5HE-G
MJE2490	MJEC2490		PWR	P	5HE-G
MJE2491	MJEC2491		PWR	P	5HE-G
MJE2520	MJEC2520		PWR	N	5HE-G

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MJE2801	MJEC2801		PWR	N	3FR-GN
MJE2901	MJEC2901		PWR	P	3FR-GN
MJE2955	MJEC2955		PWR	P	3FR-GN
MJE3055	MJEC3055		PWR	N	3FR-GN
MJE3300	MJEC3300		PWR	N	7WW-GN
MJE3301	MJEC3301		PWR	N	7WW-GN
MJE3302	MJEC3302		PWR	N	7WW-GN
MJE3310	MJEC3310		PWR	P	7WW-GN
MJE3311	MJEC3311		PWR	P	7WW-GN
MJE3312	MJEC3312		PWR	P	7WW-GN
MJE3370	MJEC3370		PWR	P	5HE-G
MJE3371	MJEC3371		PWR	P	5HE-G
MJE3439	MJEC3439		PWR	N	P26-G
MJE3440	MJEC3440		PWR	N	P26-G
MJE3520	MJEC3520		PWR	N	4JE-GN
MJE3521	MJEC3521		PWR	N	5HE-G
MJE3738	MJEC3738		PWR	N	2AN-G
MJE3739	MJEC3739		PWR	N	2AN-G
MJE4918	MJEC4918		PWR	P	5HE-G
MJE4919	MJEC4919		PWR	P	5HE-G
MJE4920	MJEC4920		PWR	P	5HE-G
MJE4921	MJEC4921		PWR	N	5HE-G
MJE4922	MJEC4922		PWR	N	5HE-G
MJE4923	MJEC4923		PWR	N	5HE-G
MJE5190	MJEC5190		PWR	N	5HE-G
MJE5191	MJEC5191		PWR	N	5HE-G
MJE5192	MJEC5192		PWR	N	5HE-G
MJE5193	MJEC5193		PWR	P	5HE-G
MJE5194	MJEC5194		PWR	P	5HE-G
MJE5195	MJEC5195		PWR	P	5HE-G
MJE5655	MJEC5655		PWR	N	2AN-G
MJE5656	MJEC5656		PWR	N	2AN-G
MJE5657	MJEC5657		PWR	N	2AN-G
MJE5974	MJEC5974		PWR	P	4JN-GN
MJE5975	MJEC5975		PWR	P	4JN-GN
MJE5976	MJEC5976		PWR	P	4JN-GN
MJE5977	MJEC5977		PWR	N	4JN-GN
MJE5978	MJEC5978		PWR	N	4JN-GN
MJE5979	MJEC5979		PWR	N	4JN-GN
MJE5980	MJEC5980		PWR	P	3FR-GN
MJE5981	MJEC5981		PWR	P	3FR-GN
MJE5982	MJEC5982		PWR	P	3FR-GN
MJE5983	MJEC5983		PWR	N	3FR-GN
MJE5984	MJEC5984		PWR	N	3FR-GN
MJE5985	MJEC5985		PWR	N	3FR-GN
MJE6040	MJEC6040		PWR	P	2KS-G
MJE6041	MJEC6041		PWR	P	2KS-G
MJE6042	MJEC6042		PWR	P	2KS-G
MJE6043	MJEC6043		PWR	N	2KS-G
MJE6044	MJEC6044		PWR	N	2KS-G
MJE6045	MJEC6045		PWR	N	2KS-G
MJE13002	MJEC13002		PWR	N	9TC-G
MJE13003	MJEC13003		PWR	N	9TC-G
MJE13004	MJEC13004		PWR	N	9TC-G
MJE13005	MJEC13005		PWR	N	9TC-G
MJE13006	MJEC13006		PWR	N	9TC-G
MJE13007	MJEC13007		PWR	N	9TC-G
MJE13008	MJEC13008		PWR	N	9TC-G
MJE13009	MJEC13009		PWR	N	9TC-G
MLED60		MLDC2	IRED		L91
MLED90		MLDC2	IRED		L91
MLED92		MLDC2	IRED		L91
MLED900		MLDC2	IRED		L91
MLED910		MLDC2	IRED		L91
MLED930		MLDC2	IRED		L91

Chip No.	Family	Function	Geometry
MLM565	PLL	Linear Phase-Locked Loop	3PJ
MLMC101A	LINEAR	Op Amp	3CP
MLMC104	LINEAR	Negative Voltage Regulator	3FB
MLMC105	LINEAR	Positive Voltage Regulator	7DB
MLMC107	LINEAR	Internally Compensated Op Amp	3CP
MLMC108	LINEAR	Precision Op Amp	8TE
MLMC108A	LINEAR	Precision Op Amp	8TE
MLMC109	LINEAR	Positive Voltage Regulator	2FJ
MLMC110	LINEAR	Op Amp Voltage Follower	6ED
MLMC111	LINEAR	High Performance Voltage Comparator	1FG
MLMC124	LINEAR	Quad Differential Input Op Amp	1PP
MLMC139	LINEAR	Quad Comparator	5NA
MLMC139A	LINEAR	Quad Comparator	5NA
MLMC158	LINEAR	Quad Differential Input Op Amp	1TJ
MLMC201A	LINEAR	Op Amp	3CP
MLMC204	LINEAR	Negative Voltage Regulator	3FB
MLMC205	LINEAR	Positive Voltage Regulator	7DB
MLMC207	LINEAR	Internally Compensated Op Amp	3CP
MLMC208	LINEAR	Precision Op Amp	8TE
MLMC208A	LINEAR	Precision Op Amp	8TE
MLMC209	LINEAR	Positive Voltage Regulator	2FJ
MLMC210	LINEAR	Op Amp Voltage Follower	6ED
MLMC211	LINEAR	High Performance Voltage Comparator	1FG
MLMC224	LINEAR	Quad Differential Input Op Amp	1PP
MLMC239	LINEAR	Quad Comparator	5NA
MLMC239A	LINEAR	Quad Comparator	5NA
MLMC258	LINEAR	Quad Differential Input Op Amp	1TJ
MLMC301A	LINEAR	Op Amp	3CP
MLMC304	LINEAR	Negative Voltage Regulator	3FB
MLMC305	LINEAR	Positive Voltage Regulator	7DB
MLMC307	LINEAR	Internally Compensated Op Amp	3CP
MLMC308	LINEAR	Precision Op Amp	8TE
MLMC308A	LINEAR	Precision Op Amp	8TE
MLMC309	LINEAR	Positive Voltage Regulator	2FJ
MLMC310	LINEAR	Op Amp Voltage Follower	6ED
MLMC311	LINEAR	High Performance Voltage Comparator	1FG
MLMC324	LINEAR	Quad Differential Input Op Amp	1PP
MLMC339	LINEAR	Quad Comparator	5NA
MLMC339A	LINEAR	Quad Comparator	5NA
MLMC358	LINEAR	Quad Differential Input Op Amp	1TJ
MLMC2902	LINEAR	Quad Differential Input Op Amp	4PV
MLMCF124	FC	Quad Operational Amplifier	
MLMCF139	FC	Quad Comparator	
MLMCF324	FC	Quad Operational Amplifier	
MLMCF339	FC	Quad Comparator	

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MM1505		2NC3011	SST	N	SL73
MM1748		2NC2368	SST	N	SL73
MM1748A		2NC2369	SST	N	SL73
MM1941	MMC1941		SST	N	SL75
MM2005-2		2NC2907	SST	P	SL333
MM2258		MPSUC03	SST	N	EL503
MM2259		MPSUC04	SST	N	EL503
MM2260		MPSUC04	SST	N	EL503
MM3000		MPSUC03	SST	N	EL503
MM3001		MPSUC04	SST	N	EL503
MM3002		MPSAC43	SST	N	EL644
MM3003		MPSAC42	SST	N	EL644
MM3005		MPSUC05	SST	N	EL504
MM3006		MPSUC06	SST	N	EL504
MM3007		MPSUC07	SST	N	EL504
MM3008		2NC5550	SST	N	EL613
MM3009		2NC5551	SST	N	EL613
MM3053		2NC3053A	SST	N	SL98
MM3726		2NC3245	SST	P	SL337
MM3734		2NC3734	SST	N	SL27
MM3735		2NC3735	SST	N	SL27

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MM3736		2NC3734	SST	N	SL27
MM3737		2NC3735	SST	N	SL27
MM3903		2NC3903	SST	N	SL221
MM3904		2NC3904	SST	N	SL221
MM3905		2NC3905	SST	P	SL271
MM3906		2NC3906	SST	P	SL271
MM4000		2NC3497	SST	P	SL47
MM4001		2NC5401	SST	P	EL263
MM4002		MPSAC93	SST	P	EL694
MM4003		MPSAC92	SST	P	EL694
MM4005		MPSUC55	SST	P	EL554
MM4006		MPSUC56	SST	P	EL554
MM4007		MPSUC57	SST	P	EL554
MM4008		MPSUC55	SST	P	EL554
MM4009		MPSUC56	SST	P	EL554
MM4010		MPSUC57	SST	P	EL554
MM4018		2NC5160	RF	P	RF310
MM4030		2NC4406	SST	P	SL56
MM4031		2NC4406	SST	P	SL56
MM4032		2NC4407	SST	P	SL56
MM4033		2NC4407	SST	P	SL56
MM4036		2NC4404	SST	P	SL50
MM4037	2NC4890		SST	P	SL50
MM4049	MMC4049		RF	P	RF327
MM4052	MMC4052		SST	P	SL40
MM4208		2NC4208	SST	P	SL345
MM4208A		2NC4208	SST	P	SL345
MM4209		2NC4209	SST	P	SL345
MM4209A		2NC4209	SST	P	SL345
MM4257		2NC4208	SST	P	SL345
MM4258		2NC4208	SST	P	SL345
MM4261A	2NC4261		SST	P	SL65
MM5005		MPSUC55	SST	P	EL554
MM5006		MPSUC56	SST	P	EL554
MM5007		MPSUC57	SST	P	EL554
MM5189		2NC5859	SST	N	SL27
MM5262		2NC3725	SST	N	SL27
MM6427		2NC6427	SSTR	N	EL645
MM8001		2NC5943	RF	N	
MM8002		2NC5943	RF	N	
MM8003		MRFC905	RF	N	
MM8006		2NC5031	RF	N	
MM8007		2NC5031	RF	N	
MM8008		MRFC905	RF	N	
MM8009		MRFC905	RF	N	
MM8010		MRFC905	RF	N	
MM8011		MRFC905	RF	N	

Chip No.	Family	Function	Geometry
MMCF708	FC	Switching Transistor	N34
MMCF929	FC	Amplifier Transistor	N30
MMCF930	FC	Amplifier Transistor	N30
MMCF2221	FC	Switching and Amplifier Transistor	N00
MMCF2221A	FC	Switching and Amplifier Transistor	N00
MMCF2222	FC	Switching and Amplifier Transistor	N00
MMCF2222A	FC	Switching and Amplifier Transistor	N00
MMCF2369	FC	Switching Transistor	N34
MMCF2484	FC	Amplifier Transistor	N30
MMCF2857	FC		N34
MMCF2906	FC	Switching and Amplifier Transistor	P00
MMCF2906A	FC	Switching and Amplifier Transistor	P00
MMCF2907	FC	Switching and Amplifier Transistor	P00
MMCF2907A	FC	Switching and Amplifier Transistor	P00
MMCF3227	FC	Switching Transistor	N34
MMCF3250	FC	Switching and Amplifier Transistor	P34
MMCF3250A	FC	Switching and Amplifier Transistor	P34
MMCF3251	FC	Switching and Amplifier Transistor	P34
MMCF3251A	FC	Switching and Amplifier Transistor	P34

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Chip No.	Family	Function	Geometry
MMCF3798	FC	Amplifier Transistor	P30
MMCF3799	FC	Amplifier Transistor	P30
MMCF4223	FC	N-Channel J-FET Transistor	N44
MMCF4224	FC	N-Channel J-FET Transistor	N44
MMCF4338	FC	N-Channel J-FET Transistor	FCF45
MMCF4339	FC	N-Channel J-FET Transistor	FCF45
MMCF5179	FC	RF Small Signal Transistor	FCN35
MMCFA43	FC	NPN High Voltage Transistor	
MMCFA93	FC	PNP High Voltage Transistor	
MMCFD914	FC	Switching Diode	N41

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MMCM918		2NC918	SST	N	SL75
MMCM930		2NC930A	SST	N	SL18
MMCM2222		2NC2222	SST	N	SL2
MMCM2369		2NC2369	SST	N	SL73
MMCM2484		2NC2484	SST	N	SL18
MMCM2857		2NC2857	RF	N	RF153
MMCM2907		2NC2907	SST	P	SL333
MMCM3798		2NC3798	SST	P	SL55
MMCM3799		2NC3799	SST	P	SL55
MMCM3903		2NC3903	SST	N	EL221
MMCM3904		2NC3904	SST	N	EL221
MMCM3905		2NC3905	SST	P	EL271
MMCM3906		2NC3906	SST	P	EL271
MMCM3960A		2NC3960	RF	N	RF93
†MMCSO122	2NC4351		FETM	N	FM122
†MMCSO123	2NC4352		FETM	P	FM123
†MMCSO125		2NC5462	FETJ	P	FM125
†MMCSO130		2NC3823	FETJ	N	FM130
†MMCSO131		2NC5558	FETJ	N	FM131
†MMCSO134		MFEC2004	FETJ	N	FM140
†MMCSO159	2NC5841		SST	N	ML204
MMDC70		1NC914	SWD		EL241
MMDC6050		1NC914	SWD		EL241
MMDC6100		MSDC6100	SWD		EL240
MMDC6150		MSDC6150	SWD		EL290
MMDC7000		1NC914	SWD		EL241
MMDC7001		1NC914	SWD		EL241

†Obsolete Device Type

Chip No.	Family	Function	Geometry
MMHC0026	LINEAR	Dual MOS Clock Driver	5DT
MMHC0026C	LINEAR	Dual MOS Clock Driver	5DT

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MMT70		2NC2483	SST	N	SL18
MMT71		2NC5086	SST	P	SL55
MMT72		2NC3011	SST	N	SL73
MMT73		2NC869A	SST	P	SL44
MMT74		MPSC6543	SST	N	EL229
MMT75		2NC4125	SST	P	EL271
MMT76		2NC4123	SST	N	EL221
MMT806	MMTC806		SST	N	ML101
MMT807	MMTC807		SST	N	ML101
MMT808	MMTC808		SST	P	ML104
MMT809	MMTC809		SST	P	ML104
MMT918		2NC918	SST	N	SL75

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MMT930		2NC930A	SST	N	SL18
MMT2222		2NC2222	SST	N	SL2
MMT2369		2NC2369	SST	N	SL73
MMT2484		2NC2484	SST	N	SL18
MMT2857		2NC2857	RF	N	RF153
MMT2907		2NC2907	SST	P	SL333
MMT3014		2NC3014	SST	N	SL76
MMT3546		2NC3546	SST	P	SL45
MMT3798		2NC3798	SST	P	SL55
MMT3799		2NC3799	SST	P	SL55
MMT3903		2NC3903	SST	N	EL221
MMT3904		2NC3904	SST	N	EL221
MMT3905		2NC3905	SST	P	EL271
MMT3906		2NC3906	SST	P	EL271
MMT3960	2NC3960		RF	N	ML204
MMT3960A		2NC3960	RF	N	ML204
MMT4261		2NC4261	SST	P	SL65
MMT8015		2NC5031	RF	N	RF191
MPF102	MPFC102		FETJ	N	FM130
MPF108	MPFC108		FETJ	N	FM130
MPF109	MPFC109		FETJ	N	FM131
MPF111	MPFC111		FETJ	N	FM131
MPF112	MPFC112		FETJ	N	FM130
MPF120	MFEC120		FETMDG	N	FM819
MPF121	MFEC121		FETMDG	N	FM819
MPF122	MFEC122		FETMDG	N	FM819
MPF130	MFEC130		FETMDG	N	FM877
MPF131	MFEC131		FETMDG	N	FM877
MPF132	MFEC132		FETMDG	N	FM877
MPF161	MPFC161		FETJ	P	FM125
MPF256	MPFC256		FETJ	N	FM146
MPF820	MPFC820		FETJ	N	FM140
MPF970	MPFC970		FETJ	P	FM129
MPF971	MPFC971		FETJ	P	FM129
MPF4391	MPFC4391		FETJ	N	FM140
MPF4392	MPFC4392		FETJ	N	FM140
MPF4393	MPFC4393		FETJ	N	FM140
MPI3401	MPNC3401		PIN		VL522
MPN3401	MPNC3401		PIN		VL522
MPN3402	MPNC3402		PIN		VL522
MPN3403	MPNC3401		PIN		VL522
MPN3404	MPNC3404		PIN		VL222
MPN3411	MPNC3411		PIN		VL523
MPN3412	MPNC3411		PIN		VL523
MPN3601	MPNC3401		PIN		VL522
MPS404	MPSC404		SST	P	EL255
MPS404A	MPSC404A		SST	P	EL255
MPS706	2NC706		SST	N	SL73
MPS706A	2NC706B		SST	N	SL73
MPS708	2NC708		SST	N	SL73
MPS753	2NC753		SST	N	SL73
MPS834	MPSC834		SST	N	SL73
MPS835	2NC835		SST	N	SL73
MPS914		2NC914	SST	N	SL73
MPS918	2NC918		SST	N	SL75
MPS2369	2NC2369		SST	N	SL73
MPS2501		2NC2501	SST	N	SL76
MPS2712	MPSC2716		SST	N	EL220
MPS2714	MPSC2714		SST	N	SL73
MPS2716	MPSC2716		SST	N	EL220
MPS2923	MPSC2923		SST	N	EL220
MPS2924	MPSC2924		SST	N	EL220
MPS2925	MPSC2925		SST	N	EL220
MPS2926		MPSC2923/4/5	SST	N	EL220
MPS3390	MPSC3390		SST	N	EL220
MPS3391	MPSC3391		SST	N	EL220
MPS3392	MPSC3392		SST	N	EL220
MPS3393	MPSC3393		SST	N	EL220
MPS3394	MPSC3394		SST	N	EL220
MPS3395	MPSC3395		SST	N	EL220
MPS3396	MPSC3396		SST	N	EL220
MPS3397		MPSC3396	SST	N	EL220
MPS3398		MPSC3396	SST	N	EL220

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MPS3563	MPSC3563		SST	N	SL75
MPS3638	MPSC3638		SST	P	SL333
MPS3638A	MPSC3638A		SST	P	SL333
MPS3639	MPSC3639		SST	P	EL251
MPS3640	MPSC3640		SST	P	EL251
MPS3646	MPSC3646		SST	N	EL77
MPS3693	MPSC3693		SST	N	EL235
MPS3694	MPSC3694		SST	N	EL235
MPS3702	MPSC3702		SST	P	SL333
MPS3703	MPSC3703		SST	P	SL333
MPS3704	MPSC3704		SST	N	SL2
MPS3705	MPSC3705		SST	N	SL2
MPS3706		MPSC3705	SST	N	SL2
MPS3707	MPSC3707		SST	N	EL220
MPS3709	MPSC3709		SST	N	EL220
MPS3710	MPSC3710		SST	N	EL220
MPS3711	MPSC3711		SST	N	EL220
MPS3725	2NC3725		SST	N	SL27
MPS3826		MPSC6565	SST	N	EL221
MPS3827		MPSC6566	SST	N	EL221
MPS4354	MPSC4354		SST	P	EL664
MPS4355	MPSC4355		SST	P	EL664
MPS4356	MPSC4356		SST	P	EL664
MPS5172		MPSC6575	SST	N	EL403
MPS6507	MPSC6507		SST	N	SL75
MPS6511	MPSC6511		SST	N	SL75
MPS6512	MPSC6512		SST	N	EL220
MPS6513	MPSC6513		SST	N	EL220
MPS6514	MPSC6514		SST	N	EL220
MPS6515	MPSC6515		SST	N	EL220
MPS6516	MPSC6516		SST	P	EL271
MPS6517	MPSC6517		SST	P	EL271
MPS6518	MPSC6518		SST	P	EL271
MPS6519	MPSC6519		SST	P	EL271
MPS6520	MPSC6520		SST	N	EL220
MPS6521	MPSC6521		SST	N	EL220
MPS6522	MPSC6522		SST	P	SL55
MPS6523	MPSC6523		SST	P	SL55
MPS6530	MPSC6530		SST	N	EL210
MPS6531	MPSC6531		SST	N	EL210
MPS6532		MPSC6530	SST	N	EL210
MPS6533	MPSC6533		SST	P	SL333
MPS6534	MPSC6534		SST	P	SL333
MPS6535		MPSC6533	SST	P	SL333
MPS6539		MPSC6548	SST	N	EL426
MPS6540	MPSC6540		SST	N	EL627
MPS6541	MPSC6541		SST	N	SL75
MPS6543	MPSC6543		SST	N	EL229
MPS6544	MPSC6545		SST	N	EL627
MPS6545	MPSC6545		SST	N	EL627
MPS6546	MPSC6547		SST	N	EL229
MPS6547	MPSC6547		SST	N	EL229
MPS6548	MPSC6548		SST	N	EL426
MPS6560	MPSC6560		SST	N	EL611
MPS6561		MPSC6560	SST	N	EL662
MPS6562	MPSC6562		SST	P	EL662
MPS6563		MPSC6562	SST	P	EL662
MPS6565	MPSC6565		SST	N	EL221
MPS6566	MPSC6566		SST	N	EL221
MPS6567	MPSC6567		SST	N	EL627
MPS6568		MPSHC30	SST	N	EL231
MPS6568A		MPSHC30	SST	N	EL231
MPS6569		MPSHC30	SST	N	EL231
MPS6569A		MPSHC30	SST	N	EL231
MPS6570		MPSHC30	SST	N	EL231
MPS6570A		MPSHC30	SST	N	EL231
MPS6571		2NC5088	SST	N	EL233
MPS6573		MPSC6575	SST	N	EL403
MPS6574		MPSC6575	SST	N	EL403
MPS6575	MPSC6575		SST	N	EL403
MPS6576		MPSC6575	SST	N	EL403
MPS6579		2NC5208	SST	P	EL281
MPS6580		2NC5208	SST	P	EL281

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Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MPS8000		MPSAC05	SST	N	EL614
MPS8001	MPSC8001		SST	N	SL75
MPS8097	MPSC8097		SST	N	SL18
MPS8098	MPSC8098		SST	N	EL416
MPS8099	MPSC8099		SST	N	EL416
MPS8598	MPSC8598		SST	P	EL466
MPS8599	MPSC8599		SST	P	EL466
MPSA05		MPSUC05	SST	N	EL504
MPSA06		MPSUC06	SST	N	EL504
MPSA09	MPSAC09		SST	N	EL233
MPSA12		2NC6426	SSTR	N	EL645
MPSA13		2NC6427	SSTR	N	EL645
MPSA14		2NC6427	SSTR	N	EL645
MPSA16	MPSAC16		SST	N	EL406
MPSA17	MPSAC17		SST	N	EL406
MPSA18	MPSAC18		SST	N	SL18
MPSA20		MPSC6575	SST	N	EL403
MPSA42	MPSAC42		SST	N	EL644
MPSA43	MPSAC43		SST	N	EL644
MPSA55		MPSUC55/ MPSC4355	SST	P	EL554
MPSA56		MPSUC56/ MPSC4356	SST	P	EL554
MPSA65	MPSAC65		SSTR	P	EL695
MPSA66	MPSAC66		SSTR	P	EL695
MPSA70		MPSAC70GREEN	SSTR	P	EL453
MPSA92	MPSAC92		SST	P	EL694
MPSA93	MPSAC93		SST	P	EL694
MPSD01	MPSAC43		SST	N	EL644
MPSD02		2NC5550	SST	N	EL613
MPSD03		2NC5550	SST	N	EL613
MPSD04		2NC6427	SSTR	N	EL645
MPSD05		2NC2222	SST	N	SL2
MPSD06		MPSC6575	SST	N	EL403
MPSD51	MPSAC93		SST	P	EL694
MPSD52		2NC5401	SST	P	EL263
MPSD53		2NC5400	SST	P	EL263
MPSD54		MPSAC65	SSTR	P	EL695
MPSD55		2NC2907	SST	P	SL333
MPSD56		MPSAC70GREEN	SST	P	EL453
MPSH02	MPSHC02		SST	N	EL231
MPSH04	MPSHC04		SST	N	EL434
MPSH05	MPSHC04		SST	N	EL434
MPSH07	MPSHC07		SST	N	EL335
MPSH08		MPSHC07	SST	N	EL335
MPSH10	MPSHC10		SST	N	EL426
MPSH11	MPSHC11		SST	N	EL219
MPSH17	MPSHC17		SST	N	EL617
MPSH19		MPSHC11	SST	N	EL219
MPSH20		MPSHC37/ MPSC6567	SST	N	EL627
MPSH24	MPSHC24		SST	N	EL318
MPSH30	MPSHC30		SST	N	EL231
MPSH31		MPSHC30	SST	N	EL231
MPSH32	MPSHC32		SST	N	EL336
MPSH34	MPSHC34		SST	N	EL318
MPSH37	MPSHC37		SST	N	EL627
MPSH54	MPSHC54		SST	P	EL484
MPSH55		MPSHC54	SST	P	EL484
MPSH81	MPSHC81		SST	P	EL274
MPSH83	MPSHC83		SST	P	EL383
MPSH85		MPSHC83	SST	P	EL383
MPSL01		2NC5550	SST	N	EL613
MPSL51		2NC5400	SST	P	EL263
MPSU01	MPSUC01A		SST	N	EL501
MPSU01A	MPSUC01A		SST	N	EL501
MPSU02	MPSUC02		SST	N	EL501
MPSU03	MPSUC03		SST	N	EL503
MPSU04	MPSUC04		SST	N	EL503
MPSU05	MPSUC05		SST	N	EL504
MPSU06	MPSUC06		SST	N	EL504
MPSU07	MPSUC07		SST	N	EL504
MPSU10		MPSAC42	SST	N	EL644

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MPSU31	MPSUC31		SST	N	EL531
MPSU45	MPSUC45		SSTR	N	EL645
MPSU51	MPSUC51A		SST	P	EL551
MPSU51A	MPSUC51A		SST	P	EL551
MPSU52	MPSUC52		SST	P	EL551
MPSU55	MPSUC55		SST	P	EL554
MPSU56	MPSUC56		SST	P	EL554
MPSU57	MPSUC57		SST	P	EL554
MPSU60		MPSAC92	SST	P	EL694
MPSU95	MPSUC95		SSTR	P	EL595
MPT20	1NC5758		DIAC		TL51/53
MPT24	1NC5759		DIAC		TL51/53
MPT28	1NC5760		DIAC		TL51/53
MPT32	1NC5761		DIAC		TL51/53
MPT36	1NC5762		DIAC		TL51/53
MPU131	2NC6116		PUT		TL72/75
MPU132	2NC6117		PUT		TL72/75
MPU133	2NC6118		PUT		TL72/75
MPU231	2NC6116		PUT		TL72/75
MPU232	2NC6117		PUT		TL72/75
MPU233	2NC6118		PUT		TL72/75
MPU6027	2NC6027		PUT		TL83
MPU6028	2NC6028		PUT		TL83
MRD120		MRDC6	PDT	N	L100
MRD121		MRDC5	PDT	N	L100
MRD150		MRDC6	PDT	N	L100
MRD300		MRDC6	PDT	N	L100
MRD310		MRDC5	PDT	N	L100
MRD360		MRDC8	PDTR	N	L19
MRD370		MRDC8	PDTR	N	L19
MRD450		MRDC5	PDT	N	L100
MRD500		MRDC7	PDD		L85
MRD510		MRDC7	PDD		L85
MRD601		MRDC4	PDT	N	L100
MRD602		MRDC5	PDT	N	L100
MRD603		MRDC5	PDT	N	L100
MRD604		MRDC6	PDT	N	L100
MRD1413		MRDC8	PDTR	N	L19
MRD3050		MRDC4	PDT	N	L100
MRD3051		MRDC4	PDT	N	L100
MRD3052		MRDC4	PDT	N	L100
MRD3053		MRDC4	PDT	N	L100
MRD3054		MRDC4	PDT	N	L100
MRD3055		MRDC5	PDT	N	L100
MRD3056		MRDC5	PDT	N	L100
MRF50l, 502		2NC2857	RF	N	
MRF207		2NC4427	RF	N	
MRF511		MRFC515	RF	N	
MRF515	MRFC515		RF	N	RF83
MRF531	MRFC531		RF	N	RF91
MRF604		2NC4427	RF	N	
MRF626		MRFC515	RF	N	
MRF627		MRFC515	RF	N	
MRF816		MRFC515	RF	N	
MRF901	MRFC901		RF	N	RF100
MRF902		MRFC901	RF	N	
MRF904		MRFC901	RF	N	
MRF905	MRFC905		RF	N	RF90
MRF910		MRFC911	RF	N	
MRF911	MRFC911		RF	N	RF104
MRF912		MRFC911	RF	N	
MRF914		MRFC911	RF	N	
MRF931	MRFC931		RF	N	RF106
MRF960		MRFC961	RF	N	
MRF961	MRFC961		RF	N	RF105
MRF962		MRFC961	RF	N	
MRF965		MRFC961	RF	N	
MRF966		MRFC961	RF	N	
MSD6100	MSDC6100		SWD		EL240
MSD6101		MSDC6100	SWD		EL240
MSD6102		MSDC6100	SWD		EL240
MSD6150	MSDC6150		SWD		EL240
MSD7000		1NC914	SWD		EL241

2

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MU10	MUC10		UJT		TL58/59
MU20	MUC20		UJT		TL58/59
MU851	2NC4851		UJT		TL58/59
MU852	2NC4852		UJT		TL58/59
MU853	2NC4853		UJT		TL58/59
MU4891	MUC4891		UJT		TL58/59
MU4892	MUC4892		UJT		TL58/59
MU4893	MUC4893		UJT		TL58/59
MU4894	MUC4894		UJT		TL58/59
MUS4987	MUSC4987		SUS		TL58/59
MUS4988	MUSC4988		SUS		TL58/59
MV104	MVC104		TD-D		VL431
MV109	MVC109		TD		VL539
MV205	MVC205		TD		VL534
MV206	MVC206		TD		VL534
MV209	MVC209		TD		VL539
MV830	MVC830		TD		VL48-59
thru	thru				
MV840	MVC840		TD		VL48-59
MV1401	MVC1401		TDHA		VL276
MV1403	MVC1403		TDHA		VL73
MV1404	MVC1404		TDHA		VL271
MV1405	MVC1405		TDHA		VL74
MV1620	MVC1620		TD		VL44-59
thru	thru				
MV1650	MVC1650		TD		VL44-59
MV1652	MVC1652		TD		VL140-147
thru	thru				
MV1666	MVC1666		TD		VL140-147
MV1858A, B, D	MVC1858A, B, D		TD		VL700-708
thru	thru				
MV1870A, B, D	MBC1858A, B, D		TD		VL700-708
MV1866	MVC1866		TD		VL21-30
thru	thru				
MV1878	MVC1878		TD		VL21-30
MV2101	MVC2101		TD		VL229-233
thru	thru				
MV2105	MVC2105		TD		VL229-233
MV2106	MVC2106		TD		VL234-236
thru	thru				
MV2108	MVC2108		TD		VL234-236
MV2109	MVC2109		TD		VL237
MV2110	MVC2110		TD		VL238-241
thru	thru				
MV2113	MVC2113		TD		VL238-241
MV2114	MVC2114		TD		VL242
MV2115	MVC2115		TD		VL243
MV2201	MVC2201		TD		VL229
MV2203	MVC2203		TD		VL231
MV2205	MVC2205		TD		VL233
MV2209	MVC2209		TD		VL237
MV2301	MVC2301		TD		VL260-267
thru	thru				
MV2308	MVC2308		TD		VL260-267
MV3102	MVC3102		TDHA		VL538
MV3103	MVC3103		TDHA		VL538
MV3140	MVC3140		TDHA		VL534
MV3141	MVC3141		TDHA		VL534
MV3142	MVC3142		TDHA		VL534
MV3501	MVC3501		TD		VL229-233
thru	thru				
MV3505	MVC3505		TD		VL229-233
MV3506	MVC3506		TD		VL234
MV3507	MVC3507		TD		VL235
MVAM-2	MVAMC-2		TD-D		VL1002
MVI2097	MVIC2097		TD		VL225-233
thru	thru				
MVI2105	MVIC2105		TD		VL225-233
MVI2106	MVIC2106		TD		VL234-236
thru	thru				
MVI2108	MVIC2108		TD		VL234-236
MVI2109	MVIC2109		TD		VL237

Device Type	Chip No.	Alternate Chip	Family	Pol.	Geometry
MZ821,A	CF		ZREF		
thru					
MZ827,A	CF		ZREF		
MZ935,A,B	CF		ZREF		
thru					
MZ938,A,B	CF		ZREF		
MZ941,A,B	CF		ZREF		
thru					
MZ944,A,B	CF		ZREF		
MZ3154,A	CF		ZREF		
thru					
MZ3156,A	CF		ZREF		
MZ4614	MZC4614		Z		B-A
MZ4615	MZC4615		Z		B-A
MZ4616	MZC4616		Z		B-A
MZ4617	MZC4617		Z		B-A
MZ4618	MZC4618		Z		B-A
MZ4619	MZC4619		Z		B-A
MZ4620	MZC4620		Z		B-A
MZ4621	MZC4621		Z		B-A
MZ4622	MZC4622		Z		B-A
MZ4623	MZC4623		Z		B-A
MZ4624	MZC4624		Z		B-A
MZ4625	MZC4625		Z		B-A
MZ4626	MZC4626		Z		
MZ4627	MZC4627				
U309	UC309		FETJ	N	FM145
U310	UC310		FETJ	N	FM145

2

CHAPTER 3
Discrete Devices

3

Note: Each section includes general information such as chip size and metallization, probe capabilities, packaging, visual inspection, and other criteria unique to the product, as well as geometry identification.

SILICON POWER TRANSISTOR CHIPS

The entire Motorola family of silicon low-frequency power transistor devices is included in the Index. This family is designated with PWR.

GEOMETRY IDENTIFICATION AND DESCRIPTION

The Geometry column of the Index provides information on back side metal and passivation as well as identifying the exact geometry.

Each geometry is identified with two groups of letters and numbers, for example: 4JE-GN. The first group specifies an exact geometry.

The second group, separated by a dash, consists of one or two letters. The first letter is either C or G and indicates the back metal: C = Chrome-Silver, G = Gold.

The second letter, when it appears, is N, indicating exposed junctions with no passivation.

4JE - GN

- N — Exposed Junction (no glass)
- G = Gold back metal or C = Chrome-silver back metal
- 4JE — Identifies geometry

CHIP SIZE, METALLIZATIONS AND BONDING

Chip Size—The dimensions of each chip are given on the geometry itself. Chip thickness is typically 10 mils. Any chip having a different thickness will have the actual thickness noted on the geometry.

Metallization and Bonding—All of these power transistor chips have aluminum front metal and either gold or chrome-silver back metal. Each chip comes standard with the back metal indicated in the Index. In most cases, the other back metal can be supplied on special request.

The aluminum front metal adapts readily to most wire bonding techniques. Gold-backed transistor chips are primarily designed for applications that require eutectic bonding. Chips with chrome-silver back metal utilize solder preforms in the bonding technique. Solder preforms consisting of lead (92.5%), indium (2.5%), and silver (5.0%) are commercially available.

HANDLING PRECAUTIONS ON MESA TYPE CHIPS

The chips designated in the Index as having exposed junctions (N in the suffix) are of mesa construction. Mesa transistor chips have exposed collector-base junctions, therefore, it is important that the following procedures be implemented:

a. Properly clean the die, prior to encapsulation, i.e., ultrasonic cleaning in a solvent such as Xylene or Trichloroethylene.

b. Completely coat the exposed junction area with a suitable semiconductor coating.

Motorola's engineering staff is available for consultation in the event of correlation or processing problems encountered in the use of Motorola semiconductor chips. For assistance of this nature, please contact your nearest Motorola sales representative.

PROBE CAPABILITIES

All Silicon Power Chips are 100% probed to ensure meeting the dc electrical specifications presented on the Motorola standard data sheets. Due to probe limitations and power restrictions in handling silicon power chips, certain parameters, e.g., h_{FE}, must be read at low current values which are correlated to high current specifications.

Leakage currents and breakdown voltages are 100% probed to the specified limits, although the BV_{CEO} test current is limited to 20 mA or less.

Current gain, h_{FE}, is probed 100% if the specified collector current is 5 A or less and if the specified collector voltage is from 2 to 10 V. When h_{FE} is specified at conditions outside these boundaries, the values are correlated to a current and voltage condition within the above limits by evaluation of finished product. In special cases h_{FE} can be measured to collector currents of 20 A; consult your Motorola Sales Office for details.

Saturation voltages are dependent on mounting techniques, and therefore cannot be guaranteed.

Since the unit probe parameters, limits, and conditions are correlated to the standard device specifications, the actual unit probe specifications are of little value when applied to the silicon power chip. Unit probe parameters will be supplied upon request.

QUALITY ASSURANCE PROVISIONS

All Motorola silicon power chips are 100% tested at unit probe with the intent of meeting the specifications of the transistor properly mounted on a standard header. Probe testing is limited to the conditions described above. AC and dc parameters which cannot be tested directly to limits and conditions as specified on standard data sheets, are guaranteed to an LTPD of 20. These limits are valid only when the chips are properly assembled and normal surface coating precautions are observed. Functional ratings such as Power and Safe Operating Area are dependent upon mounting techniques, and as such cannot be guaranteed.

When required, samples may be mounted in standard packages permitting complete electrical testing. Test results and/or generic data can be made available upon request for an additional charge.

VISUAL INSPECTION

All Motorola power chips are 100% visually inspected to meet an LTPD of 10 when Multi-Pak packaged. Motorola document 12MRB03061A defines the accept/reject criteria.

MOUNTING OPTIONS

The following mounting options are available on special order as aids to circuit design and assembly:

1. Chip on Button — silicon power transistor chip properly mounted on a copper button designed for ease in handling or where equipment limitations are a problem. Dimensions of the copper button are shown in Figure 1. Chip size is limited to 200 mils square by the diameter of the button.

2. Chip on Button with Wires — aluminum wires are attached to the chip after mounting on the copper button. The copper button is then soldered to the assembly and wires are attached to the appropriate bonding pads or posts. The attached wire is of sufficient size to accommodate the current ratings for the specific chip (minimum wire length is 0.5"). (See Figure 2.)

3. Power Pill — the "power pill" consists of the transistor chip mounted on a copper or molybdenum pad. The "moly" pad is brazed to a copper button for ease in mounting to the circuit assembly. Wires are attached to the chip and to isolated contacts. Dimensions of the power pill are shown in Figure 3; the chip and wire bonds are not to exceed a height of 100 mils.

The buttons and power pills are nickel or nickel-gold plated. Any common solder technique may be used to bond them to the circuit assembly.

PACKAGING AND ORDERING INFORMATION

Most of the silicon power chips are available in all stages of chip processing from unit probed, unscribed wafer to individual chips in Multi-Pak. The chip packaging designations system described in the General Information section applies with the addition of the letter C or G to the suffix to indicate back side metallization. The complete chip designation suffix is then: (C or G) (package). An example is 2NC3055-CPV, where the suffix C indicates chrome-silver metal and PV indicates Vial packaging. The entire suffix is separated from the specific device indicated by a dash (-).

Chips on Button and Power Pill, mounting options 1, 2, and 3, are available on special order. Contact the nearest Motorola Sales Office for ordering information.

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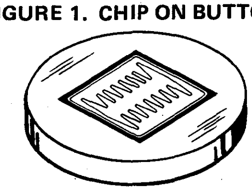
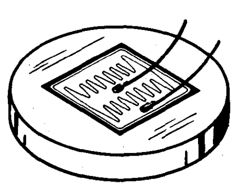
Dimensions Include Thickness of Die

FIGURE 1. CHIP ON BUTTON



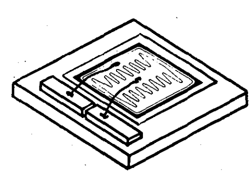
Diameter of button — 330 mils
Height of button — 75 mils

FIGURE 2. CHIP ON BUTTON WITH WIRES



Add 25 mils for chip and wires

FIGURE 3. POWER PILL



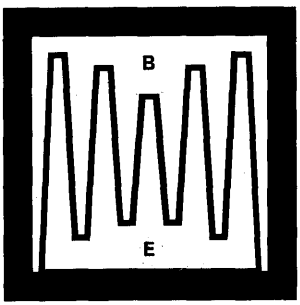
375 mils square
100 mils thick (includes wire and isolation pads)

CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

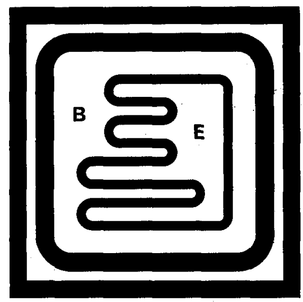
Chip Geometries not scaled to size.

1CN (100x100)



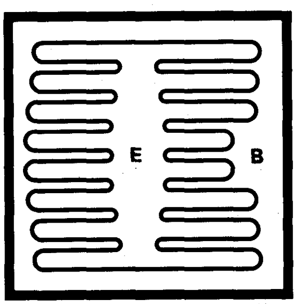
E—15x40
B—20x25

1FF (60x60)



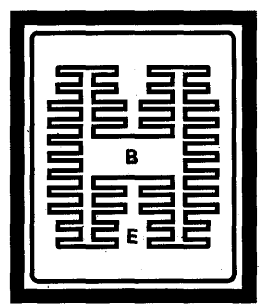
E—10x21
B— 8x20

1JK (270x270)



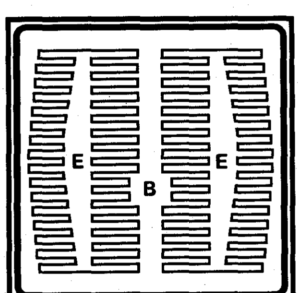
E—36x42
B—40x58

1LF (82x98)



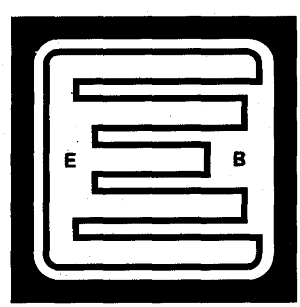
E—11x20
B— 7x20

1TC (220x220)



E—20x30
B—25x30

1TE (132x132)

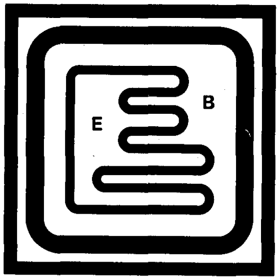


E—20x54
B—26x29

E — EMITTER PAD SIZE
B — BASE PAD SIZE

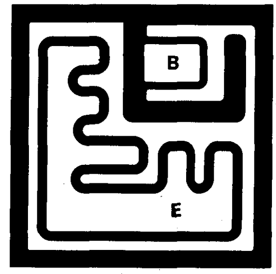
SILICON POWER TRANSISTOR CHIPS (continued)

2AN (60x60)



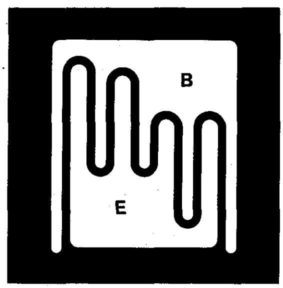
E—10x20
B— 8x18

2KS (108x108)



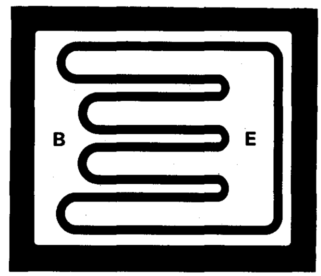
E—12x40
B—14x22

2WE (46x52)



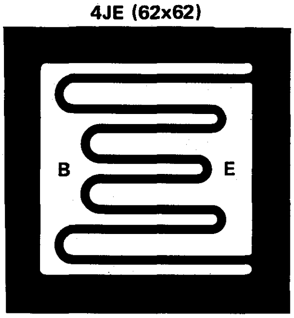
E—10x15
B—10x15

3FR (110x130)



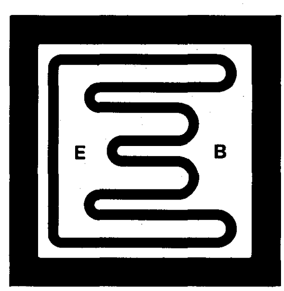
E—20x60
B—18x48

4JE (62x62)



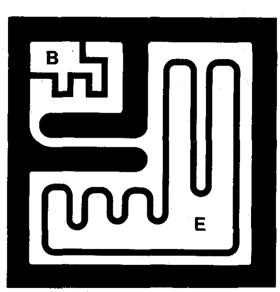
E—6x14
B—9x24

4JN (100x100)



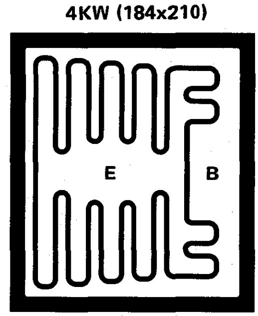
E—16x27
B—20x44

4KB (86x86)



E—13x17
B— 8x14

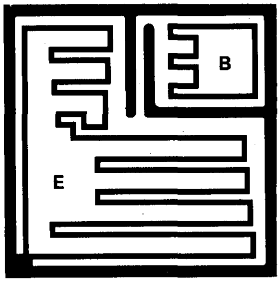
4KW (184x210)



E—40x60
B—35x70

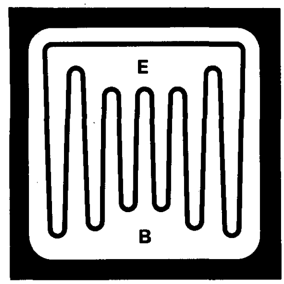
SILICON POWER TRANSISTOR CHIPS (continued)

4LE (200x200)



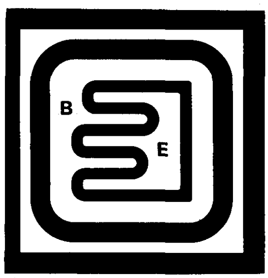
E–38x46
B–44x44

4PD (112x112)



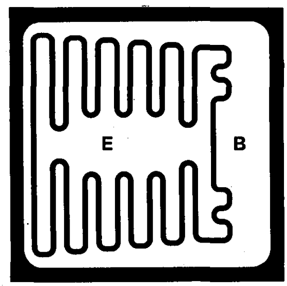
E–15x47
B–15x30

4SB (45x45)



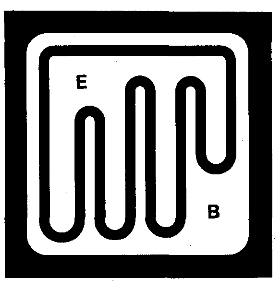
E–6x10
B–7x14

4TC (202x202)



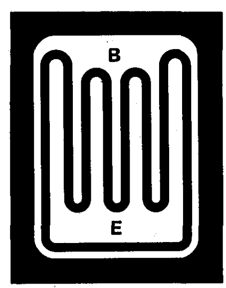
E–40x75
B–40x60

4WH (100x100)



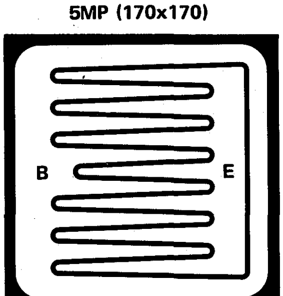
E–18x28
B–23x30

5HE (69x89)



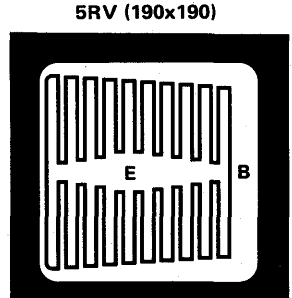
E–10x30
B–10x30

5MP (170x170)



E–18x130
B– 30x30

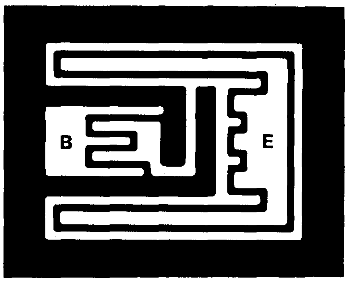
5RV (190x190)



E–25x45
B–20x100

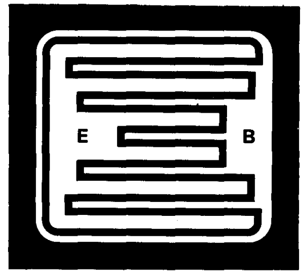
SILICON POWER TRANSISTOR CHIPS (continued)

5TB (72x90)



E–11x25
B–11x20

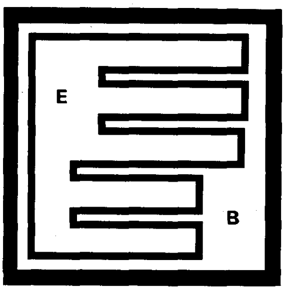
5TD (113x124)



E–20x25
B–20x30

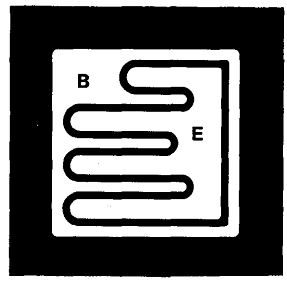
3

6KB (156x156)



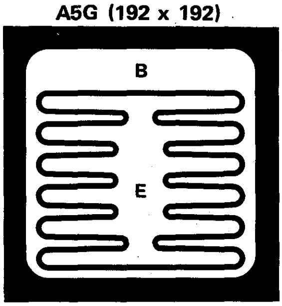
E–25x60
B–34x55

6KL (60x60)



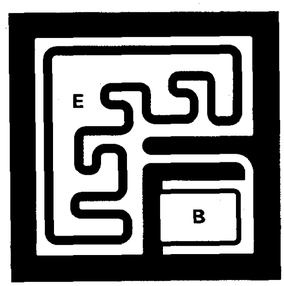
E–10x14
B–12x15

7DF (200 x 200)
A5G (192 x 192)



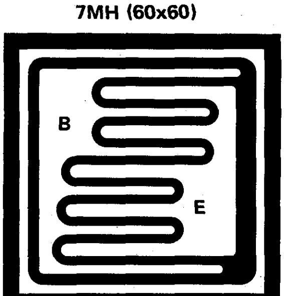
E–25x70
B–20x140

7JA (114x114)



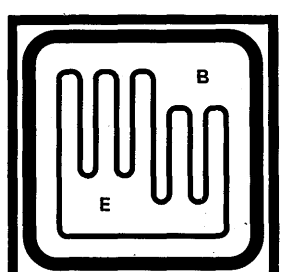
E–20x30
B–20x30

7MH (60x60)



E–11x20
B–11x20

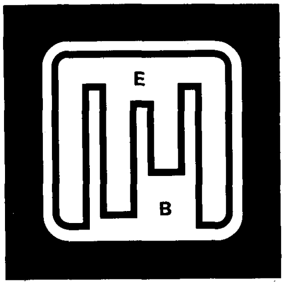
7MS (100x100)



E–15x30
B–20x30

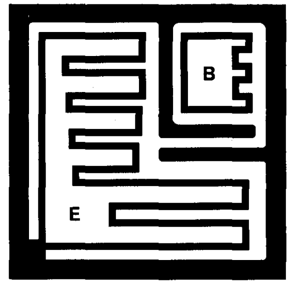
SILICON POWER TRANSISTOR CHIPS (continued)

7TB (110x110)



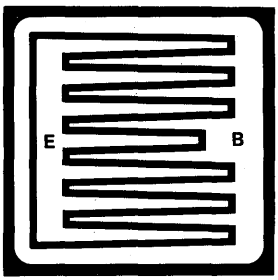
E–20x30
B–27x30

8JA (156x156)



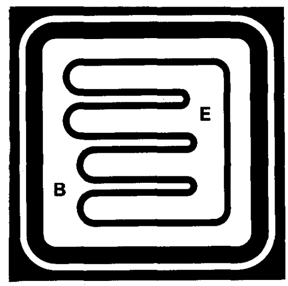
E–10x10
B–15x15

8KJ (230x230)



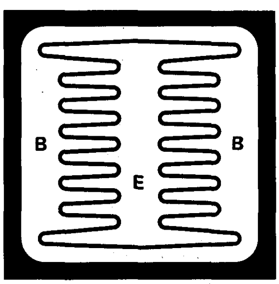
E–20x170
B–35x45

8MS (80x80)



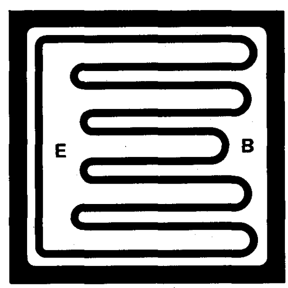
E–8x15
B–8x30

8MW (145x145)



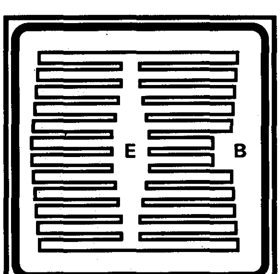
E–18x100
B–15x90

9JL (142x142)



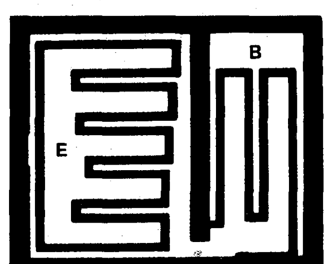
E–12x55
B–17x28

9KH (174x174)



E–16x32
B–25x25

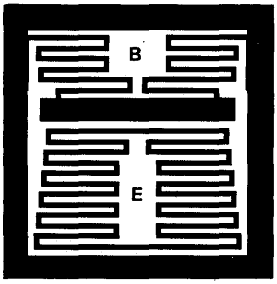
9RF (140x167)



E–20x30
B–18x50

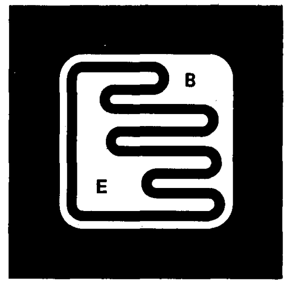
SILICON POWER TRANSISTOR CHIPS (continued)

9RT (200x205)



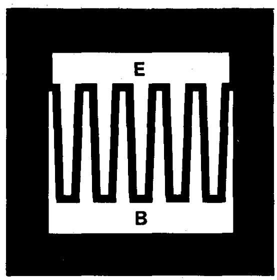
E—15x60
B—36x44

9TC (70x70)



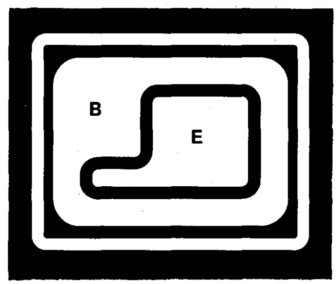
E—15x18
B—14x19

J34 (70x70)



E—8x40
B—8x40

P26 (40x50)



E—13x15
B—12x15

RF TRANSISTOR CHIPS

The RF Transistor product line includes small-signal RF amplifiers, oscillators, switches and general purpose transistors. They are designated in the Master Index by RF.

CHIP SIZE AND METALLIZATION

The overall dimensions of each chip are shown with the geometry. All of these chips have gold back metal and aluminum top metal and bonding pads except the following four, which have gold top metal and bonding pads: RF100, RF103, RF104, RF105. All of the chips are planar with all active junctions passivated (protected with a layer of SiO_2).

Some of the chips are glassivated; that is, the entire surface of the chip, including the metallization is covered with a layer of glass, except for the bonding pads. Check with your Motorola representative for details on this process and to determine which devices are glassivated. Any of the devices can be provided with glassivation on special order.

BONDING

The gold backing is designed for eutectic die bonding. Standard TC or ultrasonic wire bonding with gold or aluminum wire is most commonly used.

PROBE CAPABILITIES

Probe capabilities and limitations on RF chips are the same as presented in the General Information section.

As RF performance cannot be determined or guaranteed by any dc probes, a variety of sampling procedures are available for assuring the user of desired performance. These procedures are negotiated with each user around his specific needs and application.

Most standard devices have had samples assembled for confirmation of functional performance. Traceability to encapsulated sample data may be achieved through the lot and wafer identification found on all RF chip packages.

PACKAGING AND VISUAL INSPECTION

All of these chips are available in any stage of processing from unscribed, unit probed wafer to individual chips in Multi-Pak carriers. These packaging forms, associated inspection levels, and general ordering information are presented in the General Information section.

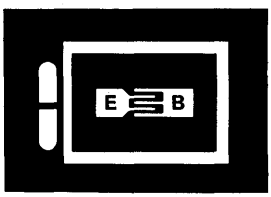
RF TRANSISTOR CHIPS

CHIP GEOMETRIES

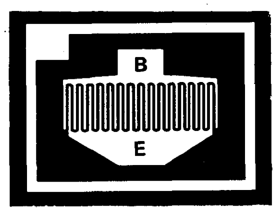
Geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

Chip Geometries not scaled to size.

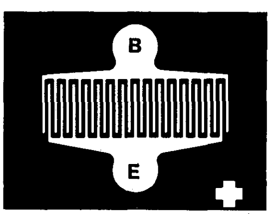
RF57 (10x15)



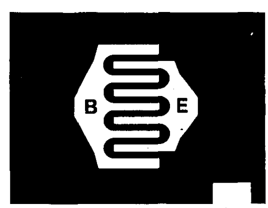
RF59 (15x20)



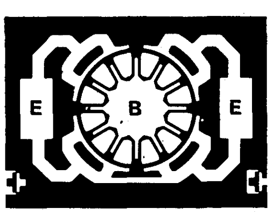
RF80 (16x17)



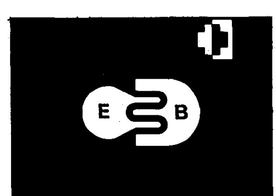
RF82 (20x20)



RF83 (14x18)



RF86 (15x15)

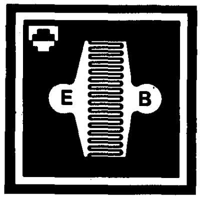


E — EMITTER
B — BASE

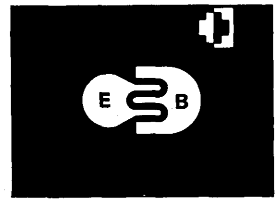
RF TRANSISTOR CHIPS (continued)

3

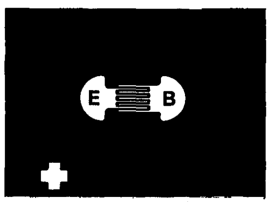
RF91 (19x19)



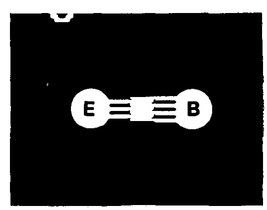
RF93 (15x15)



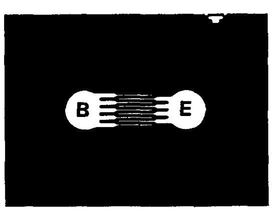
RF100 (15x15)



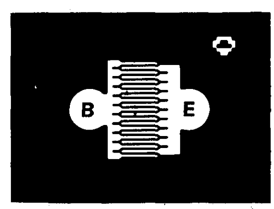
RF103 (14x16)



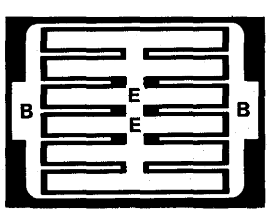
RF104 (14x16)



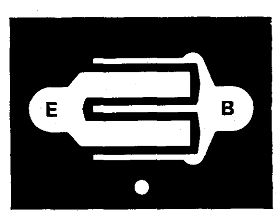
RF105 (13x16)



RF140 (30x30)

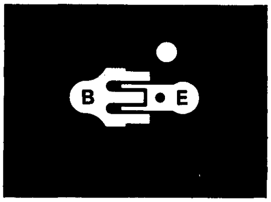


RF151 (15x20)

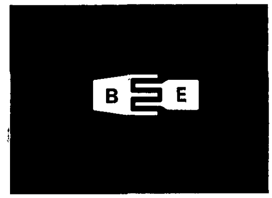


RF TRANSISTOR CHIPS (continued)

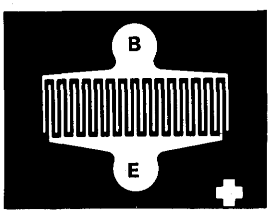
RF153 (10x12)



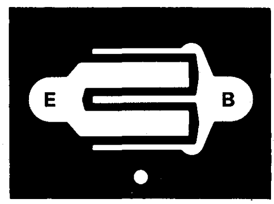
RF159 (12x12)



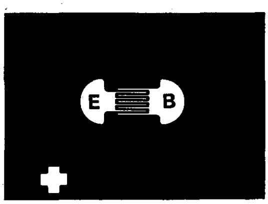
RF161 (16x17)



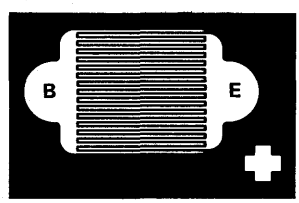
RF172 (15x20)



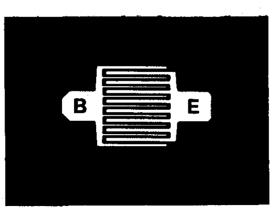
RF191 (15x15)



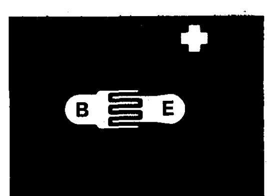
RF192 (12x17)



RF198 (20x20)

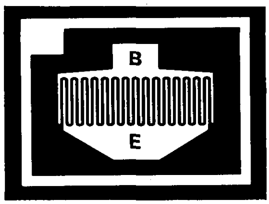


RF199 (15x15)

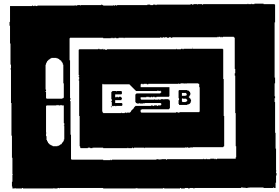


RF TRANSISTOR CHIPS (continued)

RF310 (15x20)



RF327 (10x15)



3

SMALL-SIGNAL TRANSISTOR CHIPS

Transistor chips included in this section are from the Motorola broad line of silicon small-signal transistors encapsulated in metal (e.g. TO-18, TO-5), plastic (e.g. TO-92, Uniwatt, Duowatt), Micro-T, dual and quad packages. Electrical ratings are up to 350 V, 3.0 A, f_T to 3000 MHz, and C_{ob} less than 0.65 pF. Some Darlington configurations are also included. These chips are listed in the Master Index as:

SST — Small signal transistors

SST(D) — Duals

SSTR — Darlingtons

3

DUALS AND QUADS

Most dual and quad encapsulated devices are manufactured by bonding adjacent chips from the same silicon wafer and testing for matching characteristics on encapsulated devices. Matching characteristics cannot be guaranteed in chip form, but adjacent chips can be ordered on a special basis packaged in pairs, trios, or quads. Parameters such as h_{FE}, $V_{BE(sat)}$, $V_{CE(sat)}$ and Breakdown Voltages (BV) are generally quite consistent on adjacent chips.

CHIP SIZE AND METALLIZATION

All of the transistors included in this section are epitaxial with passivated junctions (SiO_2). Chip sizes are included in the referenced geometries—with emitter (E) and base (B) indicated. Chip thickness is 4 to 6 mils. In all cases the collector is the bottom side of the chip, but where metallized annular rings are included in the chip design (nearly all PNP types and some high-voltage NPN types) the metallized ring on the chip surface is connected to the collector and care must be used not to short the metal ring to another metallized area or to a bonding wire. Front metallization is aluminum with a minimum thickness of 8,000 Å. Back metallization is gold-silicon eutectic. Back metallization may be a one-step process in which a minimum gold thickness of 3,000 Å is evaporated and then alloyed to form the eutectic, or a two-step process which is the same as the one-step process except that an additional thin layer of gold is evaporated over the one-step eutectic. Visual appearance of the two processes is nearly identical.

GLASSIVATION

Covering the active surface of the device with glassivation (deposited SiO_2 of 6,000 Å minimum) except for exposed bonding pads is standard processing for many of the chips included in this section. Glassivation can be ordered on a special basis for nearly all types.

BONDING

Chip attachment may be accomplished with either conductive epoxy or eutectic. Epoxy chip attachment is often used because the lower temperature requirement facilitates process control. Eutectic bonding requires no preform assuming a normal gold thickness on the substrate (≈100 μin.).

Wire bonding may employ either gold or aluminum wire with ultrasonic or thermocompression wedge or ball bonding. One mil wire is normally used unless otherwise noted on the geometry.

PROBE CAPABILITIES

Probe capabilities and limitations are presented in the General Information section.

PACKAGING AND VISUAL INSPECTION

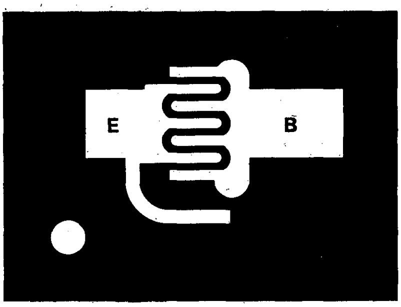
All of the chips are available in any state of processing from unscribed, unit or class probed wafer to individual chips in Multi-Pak carriers. These packaging forms, associated inspection levels, and ordering information are presented in detail in the General Information Section.

CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils.
Chip geometries are subject to change without notice as modifications are made.

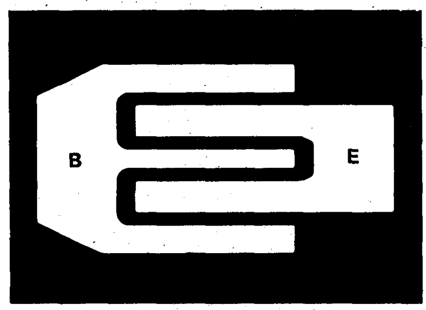
Chip Geometries not scaled to size.

EL219 (11x13)



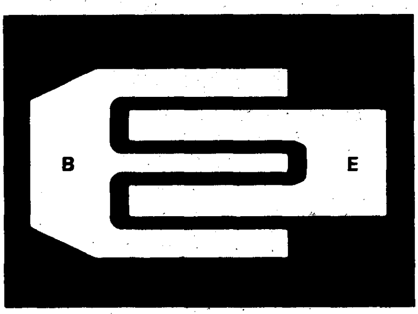
E-2.0x2.0
B-2.0x3.0

EL220 (11x16)



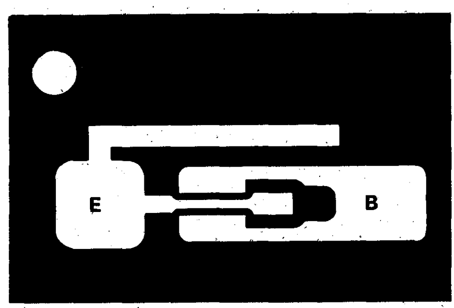
E-2.5x3.6
B-2.4x4x6 (Trapezoid)

EL221 (11x16)



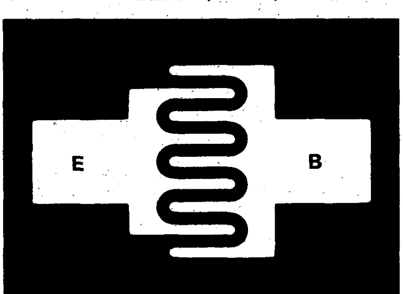
E-2.5x3.6
B-2.4x4x6 (Trapezoid)

EL229 (11x13)



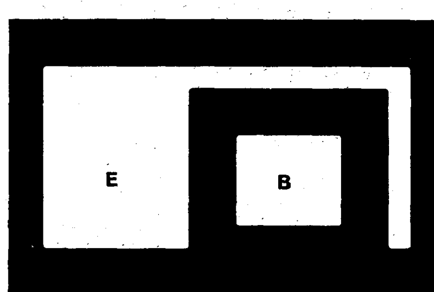
E-2.0x2.0
B-2.0x2.0

EL231 (11x13)



E-1.5x2.0
B-1.5x2.0

EL233 (11x16)

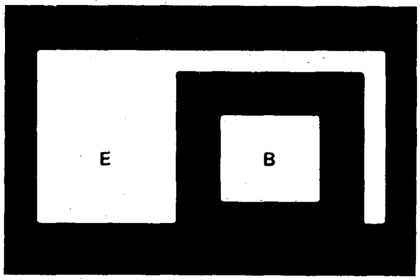


E-2x2.3
B-3.2x4

E — EMITTER PAD SIZE
B — BASE PAD SIZE

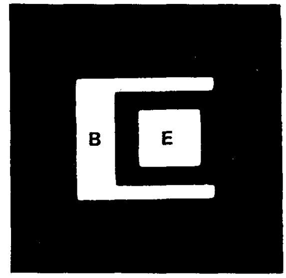
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

EL235 (11x16)



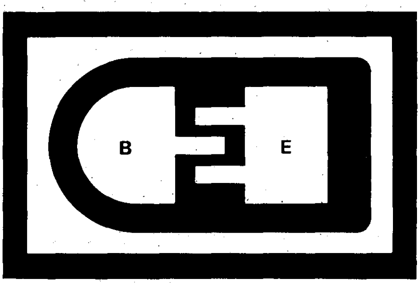
E-2x2.3
B-3.2x4

EL238 (20x20)



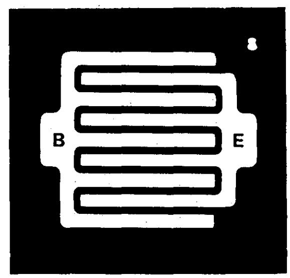
E-2.6x2.8
B-6.0x2.0

EL251 (10x15)



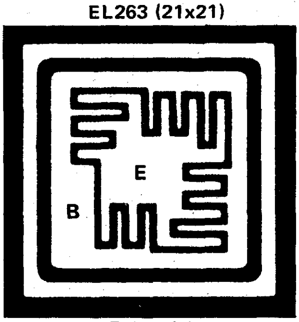
E-2.8x4.0
B-3.3x4.0

EL255 (20x21)



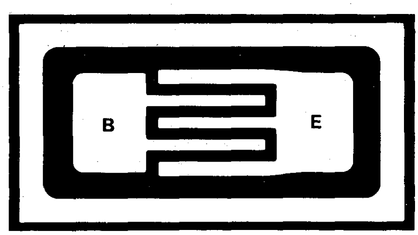
E-2.5x4
B-2.5x4

EL263 (21x21)



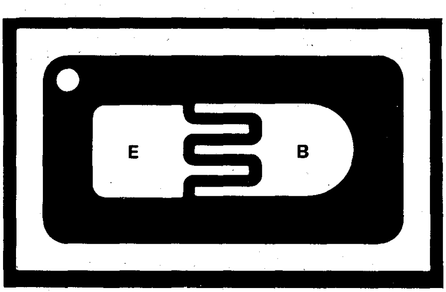
E-4.6x4.6
B-2.7x7

EL271 (11x19)



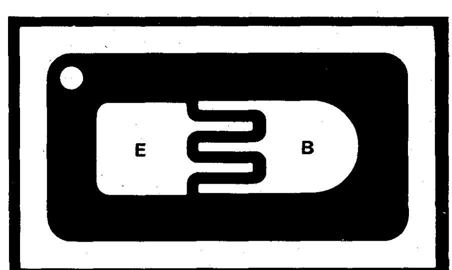
E-3.4x3.4
B-3.5x4.3

EL274 (11x16)



E-2.5x2.5
B-2.5x2.5

EL281 (11x16)

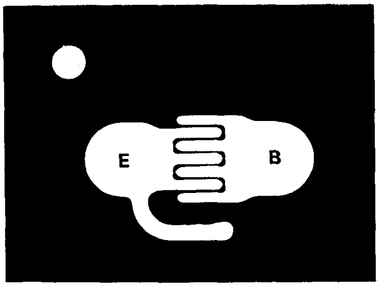


E-2.5x2.5
B-2.5x2.5

SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

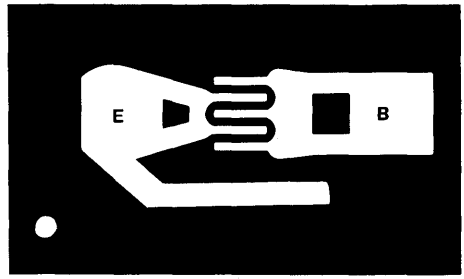
3

EL318 (11x13)



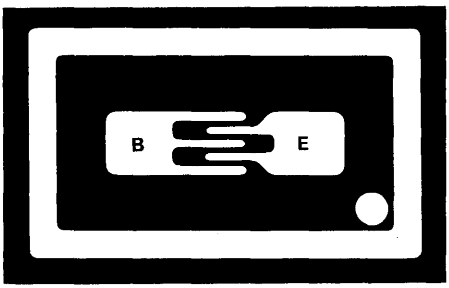
E-2.5x2.5
B-2.5x2.5

EL336 (11x13)



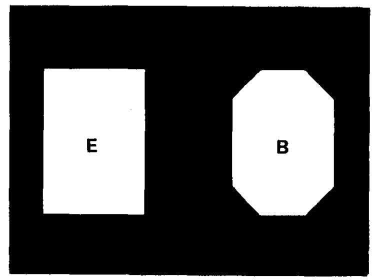
E-3.0x2.0
B-3.0x2.0

EL383 (11x16)



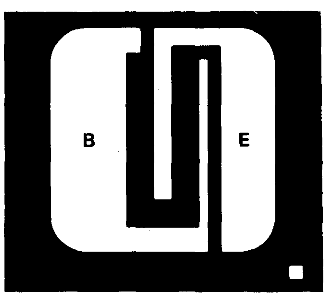
E-2.0x2.0
B-2.0x2.0

EL403 (11x16)



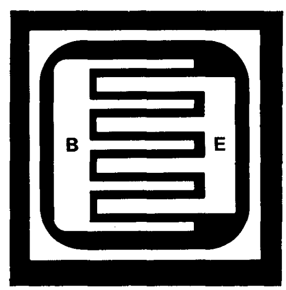
E-4.6x3.0
B-4.6x3.0

EL406 (18x18)



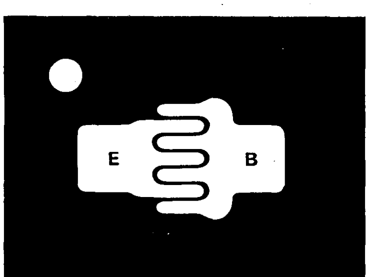
E-3.0x12.4
B-4.2x12.4

EL416 (20x20)



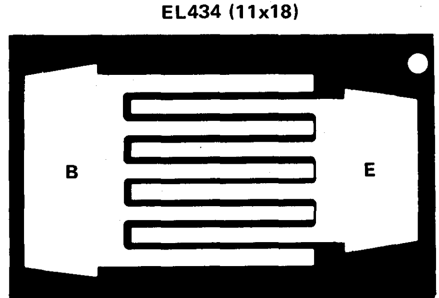
E-2.7x10
B-2.7x12.6

EL426 (11x13)



E-2.0x2.0
B-2.0x2.0

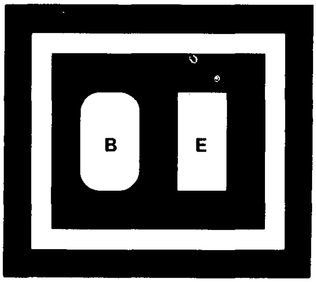
EL434 (11x18)



E-2.5x4
B-2.5x5.4

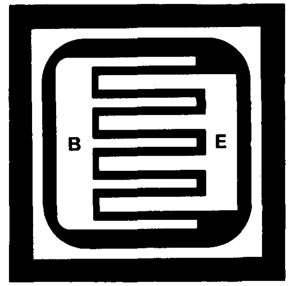
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

EL453 (14x16)



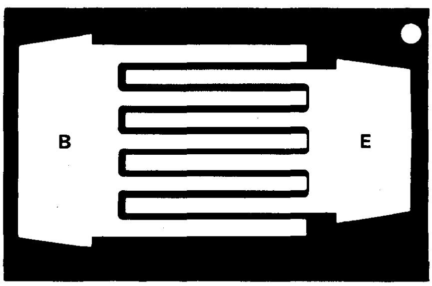
E-3x5.5
B-3.5x5.5

EL466 (20x20)



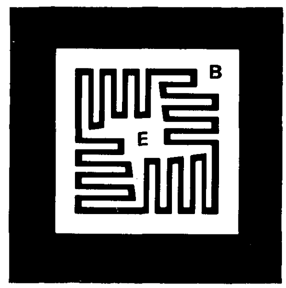
E-2.7x10
B-2.7x12.6

EL484 (11x18)



E-2.5x4
B-2.5x5.4

EL501 (26x26)

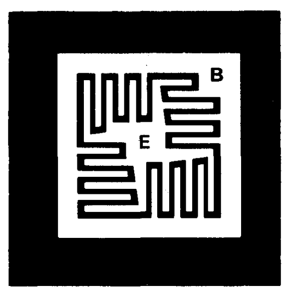


E-4.5x4.5
B-4.6x4.6

EL503 (36x36)

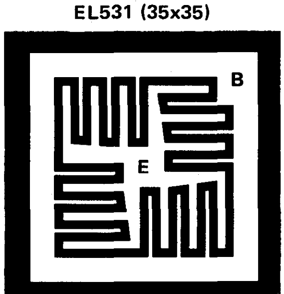
E-4.4 Dia.
B-8x8x8 Triangle

EL504 (26x26)



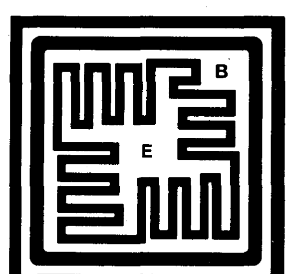
E-4.5x4.5
B-4.6x4.6

EL531 (35x35)



E-5.0x5.0
B-5.0x6.5 1.5 mil Wire

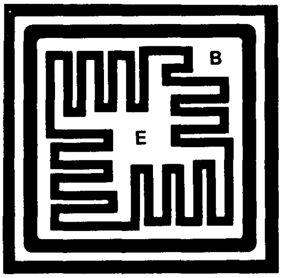
EL551 (31x31)



E-6x6.5
B-4.5x5.5

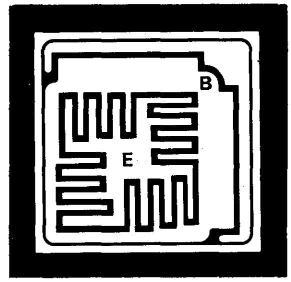
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

EL554 (31x31)



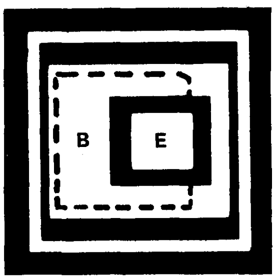
E-6x6.5
B-4.5x5.5

EL595 (36x36)



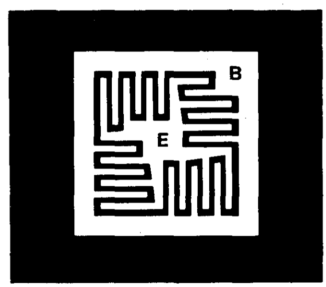
E-6x6
B-6.4x6.4

EL613 (20x20)



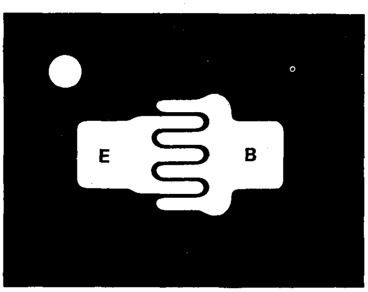
E-4.2x4.6
B-2.8x9

EL614 (26x26)



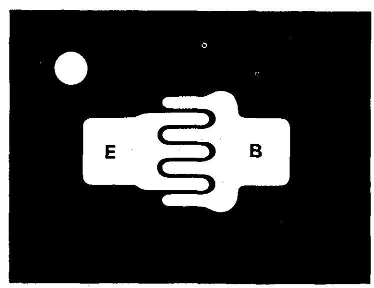
E-4.5x4.5
B-4.6x4.6

EL617 (11x13)



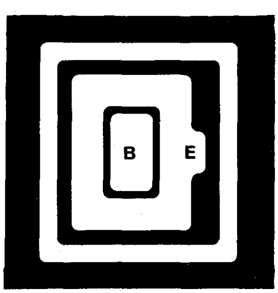
E-2.0x2.0
B-2.0x2.0

EL627 (11x13)



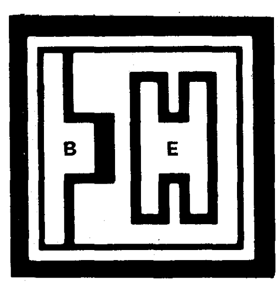
E-2.0x2.0
B-2.0x2.0

EL644 (31x34)



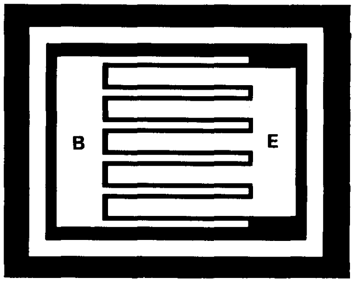
E-3x6
B-6x11

EL645 (25x25)



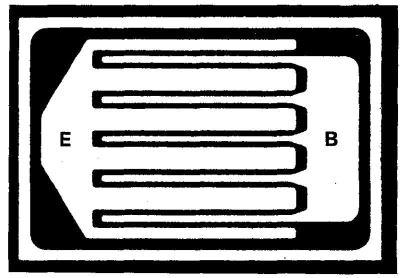
E-5x6.5
B-5x5

EL656 (24x30)



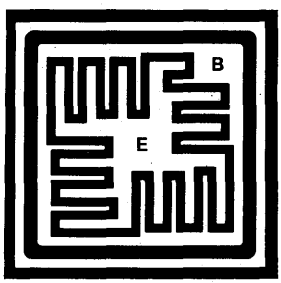
E-3.6x13
B-3.6x15

EL662 (20x29)



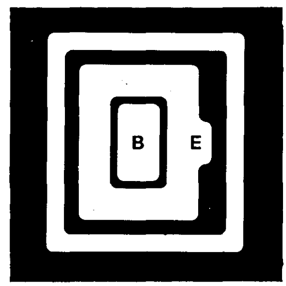
E-3.6x8
B-3.6x12 1.5 mil Wire

EL664 (31x31)



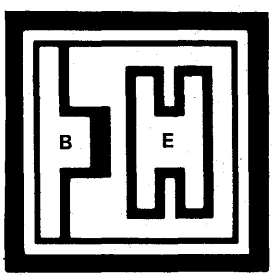
E-6x6.5
B-4.5x5.5

EL694 (31x34)



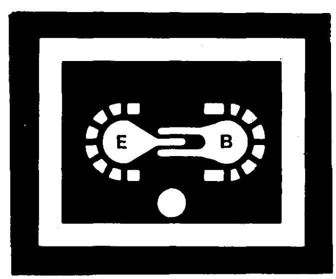
E-3x6
B-6x11

EL695 (25x25)



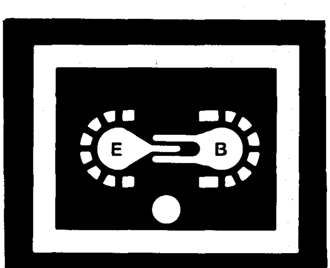
E-5x6.5
B-5x5

ML101 (10.12)



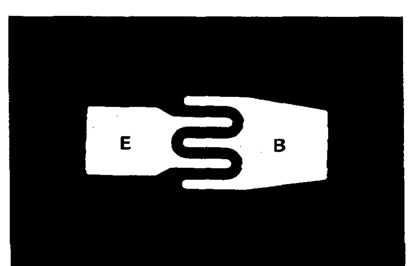
E-1.5 Dia.
B-1.5 Dia.

ML104 (10x12)



E-1.5 Dia.
B-1.5 Dia.

ML204 (10x12)

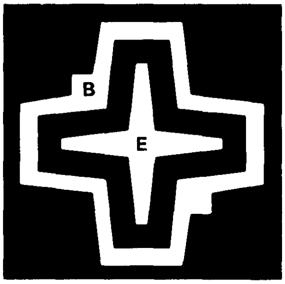


E-2x2
B-2.2x2.5 1 mil Wire

3

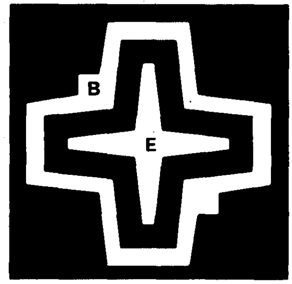
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

SL2 (20x20)



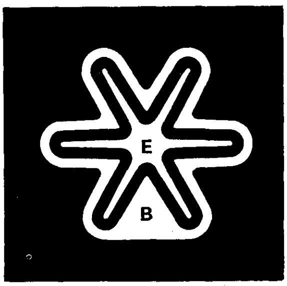
E-3.6x1.6
B-2.2x2.2 1 mil Wire

SL4 (20x20)



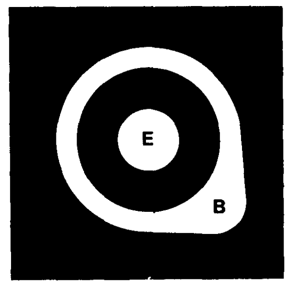
E-3.6x1.6
B-2.2x2.2 1mil Wire

SL17 (36x36)



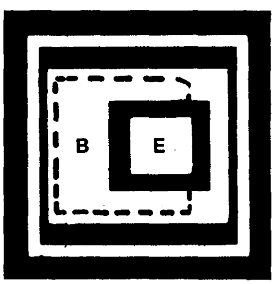
E-4.4
1.5 mil Wire B-8x8x8 Triangle

SL18 (19x19)



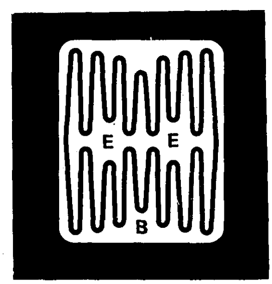
E-3 Dia.
B-3x3 1 mil Wire

SL19 (20x20)



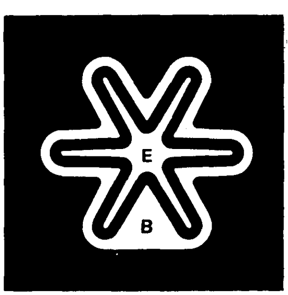
E-4.2x4.6
B-2.8x9

SL22 (60x60)



E-6.0x3.7
B-6.0x3.0 2 mil Wire

SL26 (36x36)



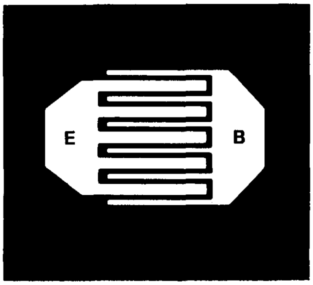
E-4.4 Dia.
1.5 mil Wire B-8x8x8 Triangle

SL27 (24x24)

E-4x4
B-4x4 2 mil Wire

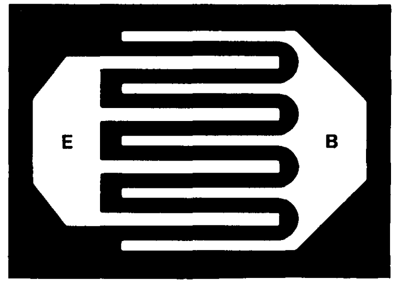
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

SL28 (20x20)



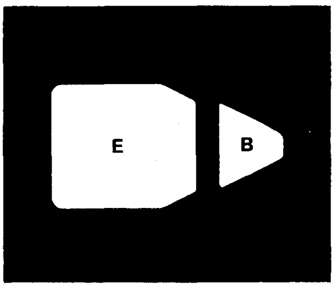
E-3.5x4.0
B-3.5x4.0 2 mil Wire

SL40 (16x20)



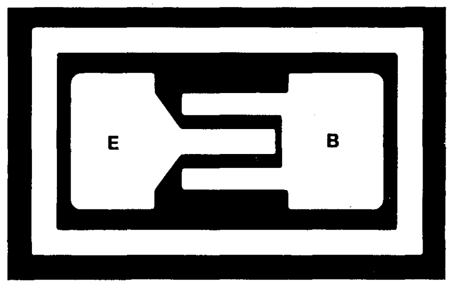
E-2.2x6.4
B-2.2x6.0 1 mil Wire

SL41 (15x20)



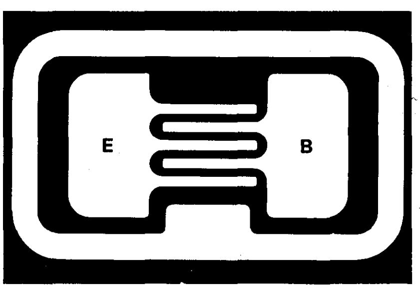
E-6x7
1 mil Wire B-3x3x3 Triangle

SL44 (10x15)



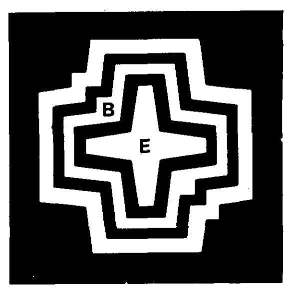
E-2.5x4
B-2.5x4 1 mil Wire

SL45 (10x15)



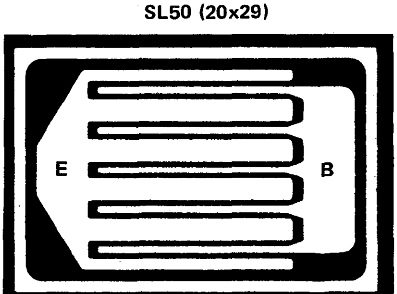
E-2.4x4
B-2.4x4 1 mil Wire

SL47 (25x25)



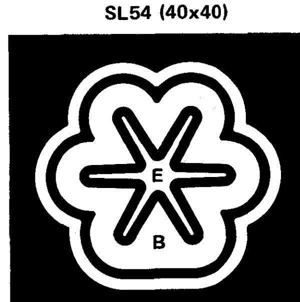
E-2.2x2.2
B-2.2x2.2 1 mil Wire

SL50 (20x29)



E-3.6x8
B-3.6x12 1 mil Wire

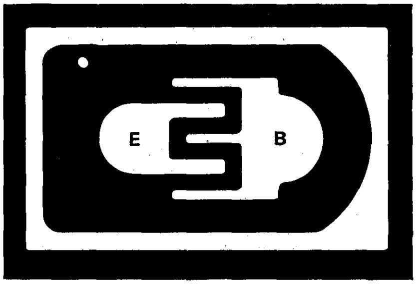
SL54 (40x40)



E-4 Dia.
2 mil Wire B-8x8x8 Triangle

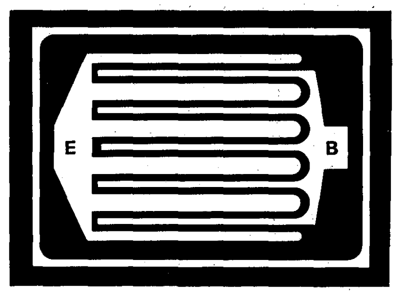
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

SL55 (11x16)



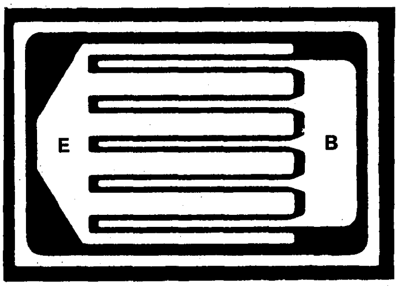
E-2.5x2.5
B-2.6x2.8 1 mil Wire

SL56 (25x34)



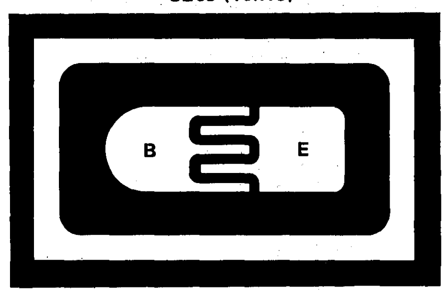
E-3.2x3.8
B-3.2x3.8 1.5 mil Wire

SL60 (20x29)



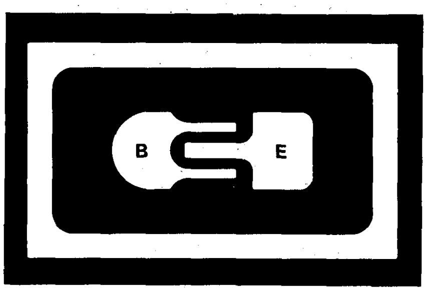
E-3.6x8
B-3.6x12 1.5 mil Wire

SL63 (10x15)



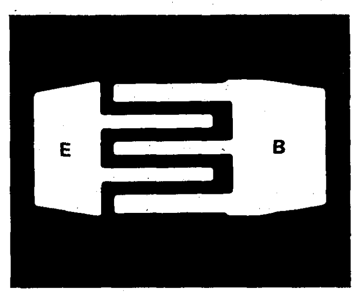
E-2.7x3
B-2.9x3 1 mil Wire

SL65 (10x15)



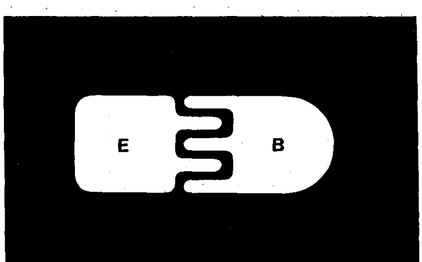
E-2.2x2.3
B-2.2x2.3 1 mil Wire

SL73 (10x15)



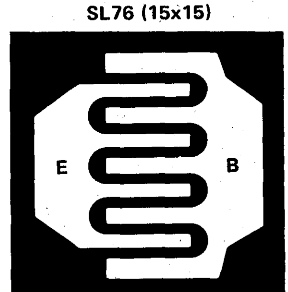
E-2x3.4
B-5.6x7 1 mil Wire

SL75 (11x16)



E-3.0x3.0
B-3.0x3.0 1 mil Wire

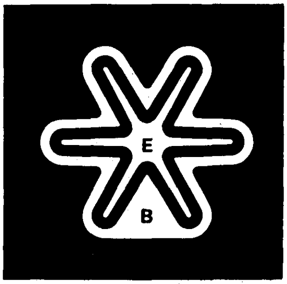
SL76 (15x15)



E-2x3.6
B-2x4.4 1 mil Wire

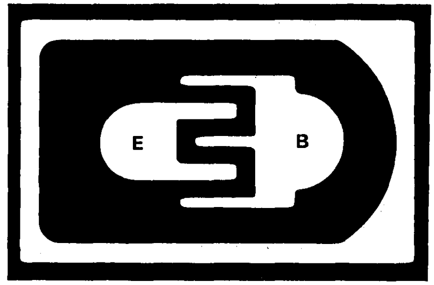
SILICON SMALL-SIGNAL TRANSISTOR CHIPS (continued)

SL98 (36x36)



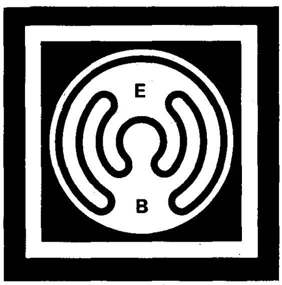
E-4.4 Dia.
1.5 mil Wire B-8x8x8 Triangle

SL333 (20x20)



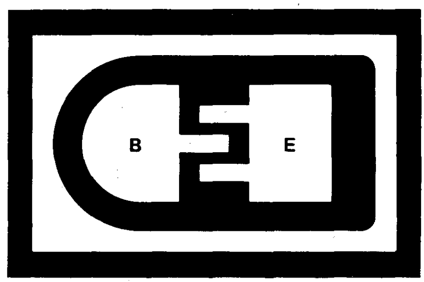
E-2.8x6
B-2.8x6 1 mil Wire

SL337 (26x26)



E-4.6x5.2
B-5.2x5.6 1.5 mil Wire

SL345 (10x15)



E-2.8x4.0
B-3.3x4.0 1 mil Wire

FIELD-EFFECT TRANSISTOR (FET) CHIPS

The families shown in the Index as making up the FET product line are:

FETJ – Junction FET

FETM – MOSFET

FETM (D) – Dual MOSFET

FETMDG – Dual Gate MOSFET

FETMQ – Monolithic Quad MOSFET

3

CHIP SIZE AND METALLIZATION

All of the FET chips included in this section have passivated junctions. Chip sizes are included in the geometry section with gate (G), source (S), and drain (D) indicated. Chip thickness is 4 to 6 mils.

Metallization processing is the same for all FET chips. Front metallization is aluminum with a minimum thickness of 8,000 Å prior to alloy. Back metallization is gold-silicon eutectic. Gold metallization layer is minimum 3000 Å prior to alloy.

Glassivation—Front metallization covered by glassivation (deposited SiO_2 min. 6000 Å), except for exposed bonding pads, is standard processing for most of the chips included in this section. Glassivation can be ordered on a special basis for nearly all types. Assembly processing is the same with or without glassivation.

Passivation—The silicon-nitride passivation process now being employed on all Motorola MOSFETs has greatly improved MOSFET threshold stability with aging and temperature changes. All Motorola single-gate MOSFETs have transient gate breakdown voltages of greater than ±100 Vdc peak.

BONDING

Chip attachment may be either conductive epoxy or eutectic. Epoxy chip attachment is recommended because of the lower temperature requirement which facilitates process control; eutectic bonding requires no preform assuming a normal gold thickness (≈100 μin.).

Wire bonding may be either gold or aluminum wire with ultrasonic or thermocompression wedge or ball bonding. Wire size is normally 1-mil diameter unless otherwise indicated on reference geometry.

PROBE CAPABILITIES

Probe capabilities and limitations are presented in the General Information section (see page 1-12).

PACKAGING AND VISUAL INSPECTION

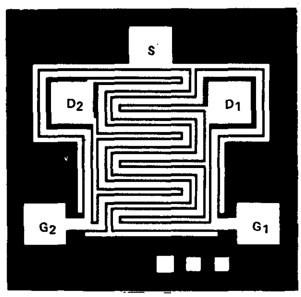
All of the FET chips are available in any stage of processing from unscribed, unit probed wafer to individual chips in Multi-Pak carriers. These packaging forms, associated inspection levels and ordering information are presented in detail on page 1-8.

CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

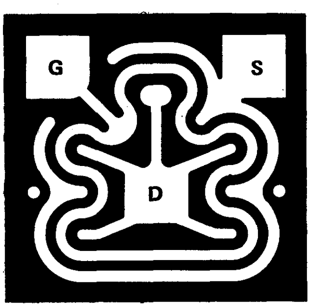
Chip Geometries not scaled to size.

FM109 (22x23)



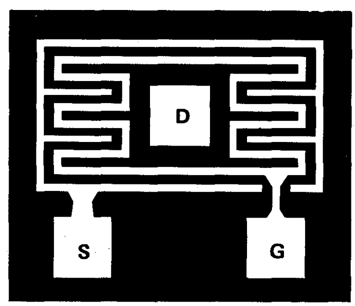
S-3.2x3.3 — G_1-4.0x3.7, G_2-4.0x3.7 — D_1-3.8x3.8, D_2-3.8x3.8

FM110 (15x15)



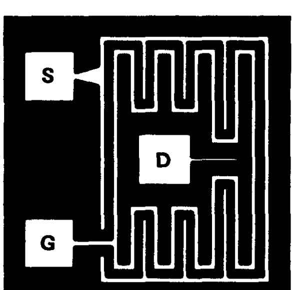
S-3.0x3.0 G-3.0x3.0 D-2.6x3.0

FM112 (14x16)



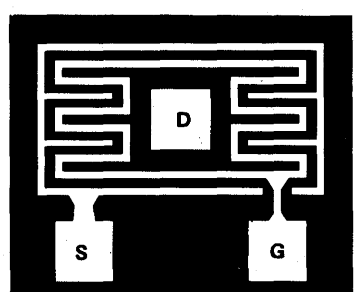
S-2.3x2.4 G-2.3x2.4 D-2.4x2.4

FM114 (15x15)



S-2.3x2.3 G-2.3x2.3 D-2.5x2.4

FM115 (14x16)



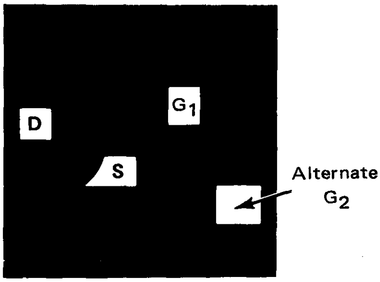
S-2.3x2.4 G-2.3x2.4 D-2.4x2.4

G-Gate
S-Source
D-Drain

All dimensions in mils

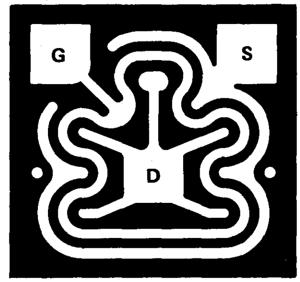
SILICON FIELD-EFFECT TRANSISTOR CHIPS (continued)

FM120 (13x9)



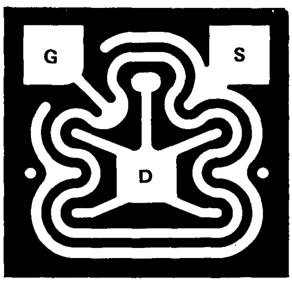
S-1.9x1.8x3.1 G_1-1.2x1.9   D-1.9x1.9
G_2-Substrate

FM122 (15x15)



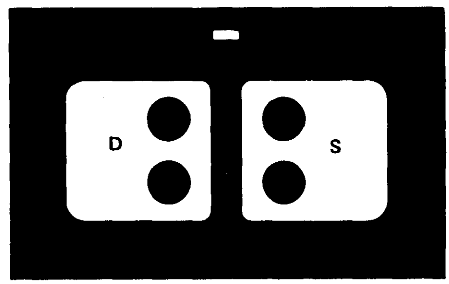
S-3.0x3.0   G-3.0x3.0   D-2.6x3.0

FM123 (15x15)



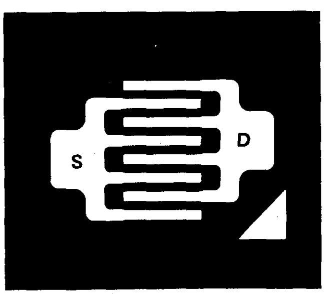
S-3.0x3.0   G-3.0x3.0   D-2.6x3.0

FM124 (10x15)



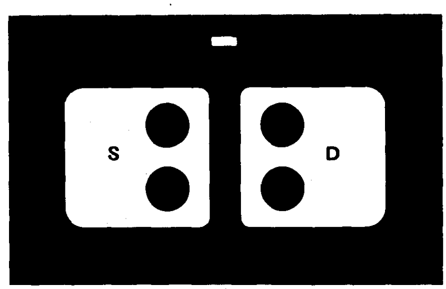
S-4.4x2.5   G-Substrate   D-4.4x2.5

FM125 (12x16)



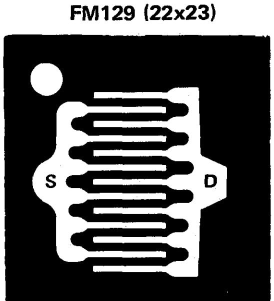
S-3.0x2.8   G-Substrate   D-3.0x2.8

FM127 (10x15)



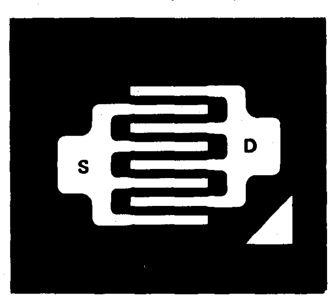
S-4.4x2.5   G-Substrate   D-4.4x2.5

FM129 (22x23)



S-2.6x4.6x2.5   G-Substrate   D-2.0 Radius

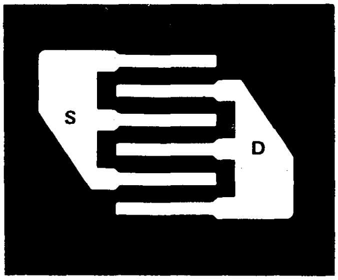
FM130 (12x16)



S-3.8x2.8   G-Substrate   D-3.0x2.8

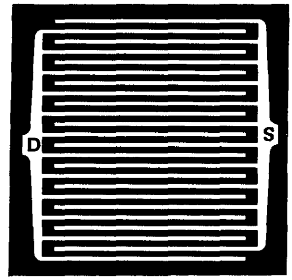
SILICON FIELD-EFFECT TRANSISTOR CHIPS (continued)

FM131 (12x15)



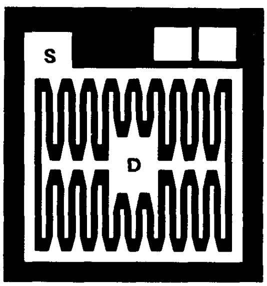
S-2.3x3.0 G-Substrate D-2.3x3.0

FM136 (40x40)



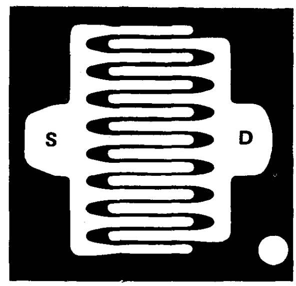
S-4.6x4.6 G-Substrate D-4.6x4.6

FM140 (19x19)



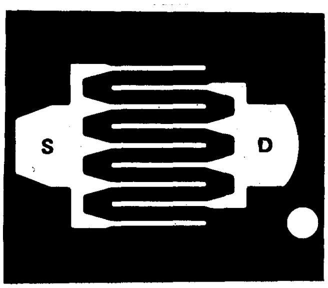
S-2.6x2.6 G-Substrate D-3.2x2.7

FM145 (17x18)



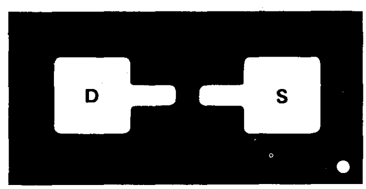
S-2.8x2.3x1.7 G-Substrate D-2.8x1.7x2.2

FM146 (12x17)



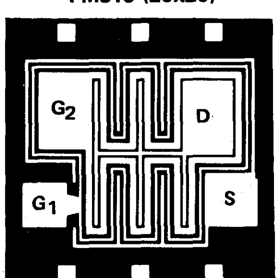
S-2.3x2.8x1.9 G-Substrate D-2.8x2.2x1.8)

FM148 (10x15)



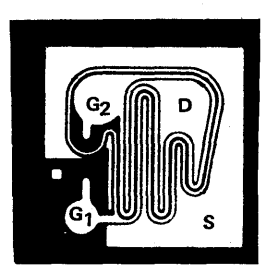
S-2.3x2.3 G-Substrate D-2.3x2.3

FM819 (20x20)



S-2.8x2.8 G_1-2.4x2.6 G_2-4.8x2.9 D-4.2x2.6

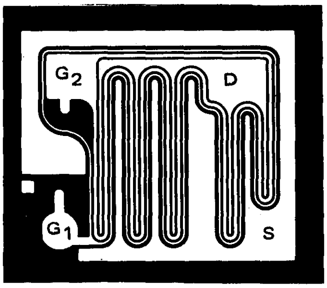
FM877 (19x19)



S-Substrate & 4.8x3.5 G_1-1.3 Radius G_2-1.5 Radius D-3.1x3.5

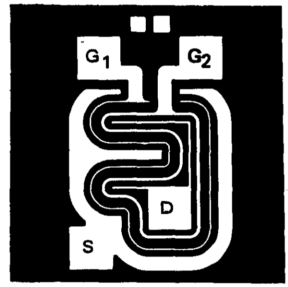
SILICON FIELD-EFFECT TRANSISTOR CHIPS (continued)

FM881 (21x25)



S-Substrate & 3.3x3.3 G_1-1.5 Radius G_2-3.5x3.5 D-4.5x3.3

FM890 (14x20)



S-Substrate & 2.6x2.6 G_1-2.6x2.6 G_2-2.6x2.6 D-2.6x2.6

OPTO CHIPS

The chips included in this family are:

IRED — Infrared-Emitting Diode

PDD — PIN Photodiode Detector

PDT — Phototransistor Detector

PDTR — Photodarlington Detector

3

GENERAL DESCRIPTION

There are two types of opto chips offered by Motorola — Infrared-Emitting Diodes (IRED) and Detectors.

All detector chips are silicon with silicon nitride passivation for improved aging characteristics. Detector chips are available in three types.

1. PIN Photodiode
2. NPN Phototransistor
3. NPN Photodarlington

Detectors utilize large areas of exposed silicon (no metal) to maximize the photoelectric effect (transformation of photons into current carrying hole-electron pairs). All of the detectors are sensitive to light and infrared radiation in wavelengths from 400 to 1100 nanometers with peak response typically occurring at 800 nm wavelength.

IRED chips are gallium-arsenide diodes with zinc diffused junctions. Radiation is emitted in the range of 800 to 1000 nm with peak output typically occurring at 900 nm.

CHIP SIZE AND METALLIZATION

Chip geometry and chip size is shown for each device presented in the following pages. All have the same metallization.

Back — Gold
Front — Aluminum

BONDING TECHNIQUES

Gold eutectic die-bonding is normal for all these chips. Wire bonding is accomplished using thermocompression or ultrasonic techniques with 1 to 1-1/2 mil diameter aluminum or gold wire.

PROBE CAPABILITIES

All dc parameters for both IREDs and Detectors are 100% unit probed except for sensitivity (detectors) and light output (IREDs). Leakage measurements on detector chips must be made in darkness for valid readings to be obtained.

CHIP SELECTION

Selecting an optoelectronic chip is fundamentally different from selecting a chip for almost any other device type. The reason for this is the lens used in the opto package takes an active part in determining the performance of the packaged device. In other words, the performance of the opto chip is not the performance of the finished device. This makes selection of an opto chip more difficult than other chips. However, there are also some factors which contribute to making the job easier. Since the package is an active part of the device, opto devices come in many package styles but use only a few chip types. There is only one PIN photodiode chip, one NPN phototransistor, and one NPN photodarlington chip to consider when selecting a detector chip. Selecting which one of these three to use entails only selecting the switching speed required. The photodiode has the least amount of gain but has the fastest switching times (in the order of nanoseconds). The phototransistor has medium gain and medium switching times (in the order of microseconds). The photodarlington has the highest gain with switching times in the hundreds of microseconds.

For more detailed information, two excellent application notes (AN-440 and AN-508) are available upon request.

PACKAGING AND VISUAL INSPECTION

All of these opto chips are available in any stage of processing, from unscribed unit probed wafer to indiual chips in Multi-Pak carriers. These packaging forms, associated inspection levels and ordering information are presented in the General Information section.

PHOTODIODE SPECIFICATION
MRDC7

Parameter	Symbol	Min	Typ	Max	Unit
Reverse Current @ V_R = 20 V, R_L = 1.0 MΩ	I_R	–	–	2.0	nA
Reverse Breakdown Voltage @ I_R = 10 μA	BV_R	100	200	–	Volts
Junction Capacitance @ V_R = 20 V, f = 1.0 MHz	C_J	–	3.0	–	pF
Bare Chip Radiation Current @ V_R = 20 V, H = 5.0 mW/cm^2 from Tungsten Lamp Source @ 2870°K Color Temperature	I_L	–	2.5	–	μA
Response Time @ V_R = 20 V, R_L = 50 Ω	t_{rr}	–	1.0	–	ns

PHOTOTRANSISTOR SPECIFICATION
MRDC4, 5, 6

Parameter	Symbol	Min	Typ	Max	Unit
Leakage Current @ V_{CE} = 20 V, H = 0, R_L = 1.0 MΩ under Dark Conditions	I_{CEO}	–	–	100	nA
Collector-Emitter Breakdown Voltage @ I_C = 1.0 mA	BV_{CEO}	40	–	–	Volts
Emitter-Collector Breakdown Voltage @ I_C = 10 μA	BV_{ECO}	6.0	–	–	Volts
Beta @ V_{CE} = 10 V, I_B = 10 μA	h_{FE}				–
MRDC4		80	–	300	
MRDC5		300	–	550	
MRDC6		550	–	850	
Bare Chip Collector-Base Radiation Current @ V_{CB} = 20 V, H = 5.0 mW/cm^2 from Tungsten Source @ 2870°K Color Temperature	I_{CBL}*	–	1.5	–	μA
Rise Time, Fall Time @ I_C = 1.0 mA, R_L = 100 Ω	t_r, t_f	–	4.0	–	μs

*$I_{CBL} \times h_{FE} = I_L$ (Collector-Emitter Radiation Current specified for finished device)

I_{CBL} is consistently within a ±20% range of typical value on 95% of devices sampled—however, since this parameter cannot be measured on a chip until it has been scribed, broken and mounted on a header, it is not tested in chip form.

PHOTODARLINGTON SPECIFICATION
MRDC8

Parameter	Symbol	Min	Typ	Max	Unit
Leakage Current @ V_{CE} = 10 V under Dark Conditions	I_{CEO}	–	–	500	nA
Collector-Emitter Breakdown Voltage @ I_C = 10 mA	BV_{CEO}	25	–	–	Volts
Emitter-Base Breakdown Voltage @ I_C = 100 μA	BV_{EBO}	5.0	–	–	Volts
Beta @ V_{CE} = 10 V, I_B = 1.0 μA	h_{FE}	1000	–	–	–
Bare Chip Collector-Base Radiation Current @ H = 5.0 mW/cm^2 from Tungsten Lamp @ 2870°K Color Temperature, V_{CB} = 20 V	I_{CBL}*	–	0.5	–	μA
Rise Time, Fall Time @ I_C = 1.0 mA, R_L = 100 Ω	t_r, t_f	–	60	–	μs

*$I_{CBL} \times h_{FE} = I_L$ (Collector-Emitter Radiation Current specified for finished device)

I_{CBL} is consistently within a ±20% range of typical value of 95% of devices sampled–however, since this parameter cannot be measured on a chip until it has been scribed, broken and mounted on a header, it is not tested in chip form.

INFRARED EMITTER SPECIFICATION
MLDC2

Parameter	Symbol	Min	Typ	Max	Unit
Reverse Breakdown @ I_R = 100 μA	BV_R	3.0	–	–	Volts
Forward Voltage @ I_F = 50 mA	V_F	–	–	1.5	Volts
Radiated Power Output @ I_F = 50 mA	P_o*	–	400	–	μW

*P_o cannot be measured in chip form until after mounting on a header. This value typically varies from 100 to 1000 microwatts @ I_F = 50 mA.

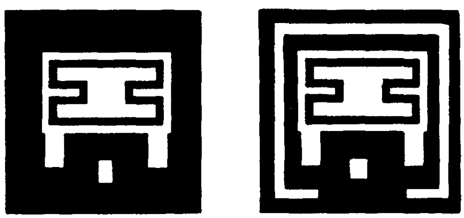
3

CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils.
Chip geometries are subject to change without notice as modifications are made.

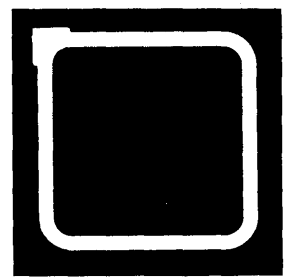
Chip Geometries not scaled to size.

L19 (25x25)



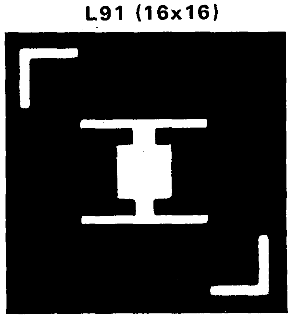
E-5x6½ (Middle of H)
B-2x3
C-Substrate

L85 (30x30)



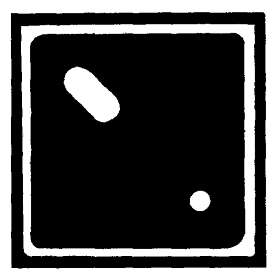
A-4x4 on sides
4 mils long arrowhead
C-Substrate (Back)

L91 (16x16)



A-3x3 (Middle of H)
C-Substrate

L100 (27x27)



E-4x7½ (Oval)
B-3 Dia.
C-Substrate

E-Emitter A-Anode
B-Base C-Cathode
C-Collector

THYRISTOR AND TRIGGER CHIPS

The thyristor and trigger product family consists of:

Diac — **Bilateral Trigger**
PUT — **Programmable UJT (Trigger)**
SBS — **Silicon Bidirectional Switch (Trigger)**
SCR — **Silicon Controlled Rectifier**
SUS — **Silicon Unidirectional Switch (Trigger)**
Triac — **Bilateral SCR**
UJT — **Unijunction Transistor (Trigger)**

CHIP SPECIFICATIONS

SCR and Triac devices listed in the Index are often shown with both "chip" and "alternate" selections.

The chips shown in the Chip number column are actually probed to the data sheet specification limits and conditions for Blocking Voltage, Gate Voltage, Gate Current and Holding Current at room temperature only. The other data sheet parameters cannot be probed on the wafer and thus cannot be guaranteed.

ALTERNATE CHIP SPECIFICATIONS

The devices in the Chip number column utilize the same chip or geometry as the data sheet chip (column 2) but are tested to a simple specification presented below. Only Blocking Voltage, I_{GT} and V_{GT} are tested and guaranteed. These alternate chips are offered at a substantial cost savings over the data sheet chips.

Voltage is probed and guaranteed to an LTPD = 10. V_{GT}, I_{GT} and I_H are sampled and guaranteed to an LTPD = 20.

ALTERNATE CHIP SPECIFICATIONS

Chip (SCR)	V_{DRM} V_{RRM} @ .020 mA-25°C	I_{GT} Max (mA)	V_{GT} Max (Volts)
MCRC0361	100	.5	1.0
MCRC0362	200		
MCRC0363	300		
MCRC0364	400		
MCRC0365	500		
MCRC0366	600		
MCRC0367	700		
MCRC0368	800		
MCRC6381	100	1.0	1.5
MCRC6382	200		
MCRC6383	300		
MCRC6384	400		
MCRC6391	100	30	
MCRC6392	200		
MCRC6393	300		
MCRC6394	400		
MCRC3101	100	30	1.5
MCRC3102	200		
MCRC3103	300		
MCRC3104	400		
MCRC3105	500		
MCRC3106	600		
MCRC3107	700		
MCRC3108	800		
MCRC3201	100	30	1.5
MCRC3202	200		
MCRC3203	300		
MCRC3204	400		
MCRC3205	500		
MCRC3206	600		
MCRC3207	700		
MCRC3208	800		

Chip (Triac)	V_{DRM} V_{RRM} @ .020 mA-25°C	I_{GT} Max (mA) Q1	Q2	Q3	Q4	V_{GT} Max (Volts) Q1	Q2	Q3	Q4
MACC4011	100	10		10		1.5		1.5	
MACC4012	200								
MACC4013	300								
MACC4014	400								
MACC4015	500								
MACC4016	600								
MACC4011A	100	10	10	10	15	1.5	1.5	1.5	2.0
MACC4012A	200								
MACC4013A	300								
MACC4014A	400								
MACC4015A	500								
MACC4016A	600								
MACC4201	100	50		50		2.0		2.0	
MACC4202	200								
MACC4203	300								
MACC4204	400								
MACC4205	500								
MACC4206	600								
MACC4207	700								
MACC4208	800								
MACC4201A	100	50	75	50	75	2.0	2.5	2.0	2.5
MACC4202A	200								
MACC4203A	300								
MACC3204A	400								
MACC3205A	500								
MACC4206A	600								
MACC4207A	700								
MACC4208A	800								
MACC4401	100	60		60		2.5		2.5	
MACC4402	200								
MACC4403	300								
MACC4404	400								
MACC4405	500								
MACC4406	600								
MACC4408	800								
MACC4401A	100	60	85	60	85	2.5	3.0	2.5	3.0
MACC4402A	200								
MACC4403A	300								
MACC4404A	400								
MACC4405A	500								
MACC4406A	600								
MACC4408A	800								

Diac, UJT, SUS, SBS and PUT chips are probed for the following parameters. These parameters and limits are guaranteed to an LTPD of 10.

DIAC	switching voltage	V_S
	switching current	I_S
	switchback voltage	ΔV
	leakage current	I_B
UJT	intrinsic standoff ratio	η
	emitter reverse current	I_{EB20}
	valley point current	I_V
	interbase voltage	V_{B2B1}

Peak point emitter current I_P is not probed but is guaranteed to an LTPD of 20.

SUS	switching voltage	V_S
	switching current	I_S
	holding current	I_H
	forward blocking current	I_B
	reverse voltage	V_R
SBS	switching voltage	V_S
	switching current	I_S
	holding current	I_H
	forward voltage	V_F
	forward blocking current	I_B

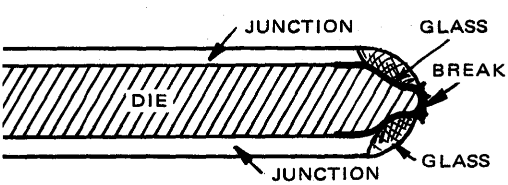
Switching voltage differential (V_{S1} - V_{S2}) absolutely cannot be probed.

PUT	leakage current	I_{GAO}
	valley current	I_V
	forward voltage	V_F
	anode-to-cathode forward voltage	V_{AKF}
	anode-to-cathode reverse voltage	V_{AKR}
	offset voltage	V_T (@ 1 MΩ, 10 kΩ)

CHIP SIZE AND METALLIZATION

Passivation — All chips shown in the Thyristor family are planar passivated or glassed and have no exposed junctions.

Chip Structure and Metallization — Most of the larger SCR and Triac chips are edge-glass passivated and require some special attention. The glass covers the active junctions near the top and bottom of the chips as shown in the following figure.



The glass is continuous and extends around all four sides of the chip. A 95/5 lead-tin solder is recommended for die attach and care must be taken to keep the solder from flowing onto and past the glass—keep the solder only under the metallized area. Solder on the glass could cause shorting and arcing. A temperature of 400°C should not be exceeded during the die attachment process. After processing and cleaning, a die coat should be added around the edges to further inhibit shorting and arcing. Typical construction of these SCR and Triac die is illustrated in the following sketches.

Figure TH1. Corner Fire Cathode Side (Top) (Back side is anode)

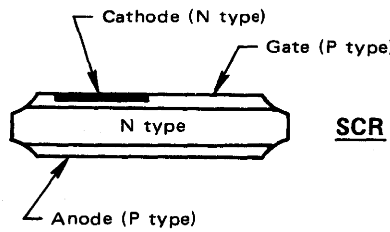
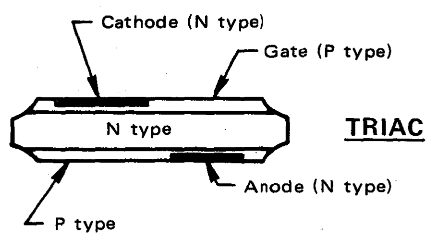


Figure TH2. Center Fire Cathode Side (Top) (Back side is anode)



BONDING

Die bonding methods in normal usage:
- Gold — Eutectic
- CCA — Solder, Epoxy

Wire bonding methods in normal usage:
- Aluminum — Thermocompression, Ultrasonic
- CCA — Solder, Thermocompression

PROBE TEST CAPABILITIES

Parameters which can and will be probed are itemized in the Chip Specifications section. Voltages can be probed through 800 volts. The general probe limitations presented in the General Information section provide guidance on what can be probed on a chip.

Data sheet power and current ratings are useful only as a guide to chip performance since both are dependent upon the type of die bond and heat sink.

Method of Passivation and Metallization				
Geometry	Planar	Edge-Glass	Top Metal	Back Metal
036		X	AL	CCA
638	X		AL	CCA
639	X		AL	CCA
310		X	CCA	CCA
320		X	CCA	CCA
401		X	AL	CCA
420		X	CCA	CCA
440		X	CCA	CCA
TL51/53	X		AL	G
TL58/59	X		AL	G
TL60	X		AL	G
TL62	X		AL	G
TL70	X		AL	G
TL71	X		AL	G
TL72/75	X		AL	G
TL78	X		AL	G
TL83	X		AL	G

AL — Aluminum
G — Gold
CCA — Chrome/Copper/Gold

PACKAGING AND VISUAL INSPECTION

The planar chips are available in any stage of processing from unscribed, unit probed wafer to individual chips in Multi-Pak. Visual inspection is generally in accordance with the criteria of 12M54725F. The edge-glass chips are only available in individual chip form. The standard packaging option is Vial, designated with the PV suffix. Chips are inspected to the criteria of 12M55344L. These edge-glass die are also available in Multi-Pak with the L suffix.

GEOMETRIES

Geometries referenced in the Index are presented in alphanumeric order.

The following symbols are used

C — Cathode	MT1 — Main Terminal 1
G — Gate	MT2 — Main Terminal 2
A — Anode	B1 — Base 1
E — Emitter	B2 — Base 2

Size of metallized area on anode side (back of Figure TH1 and TH2) is the same as C1, C2. The area is square with no separate gate region.

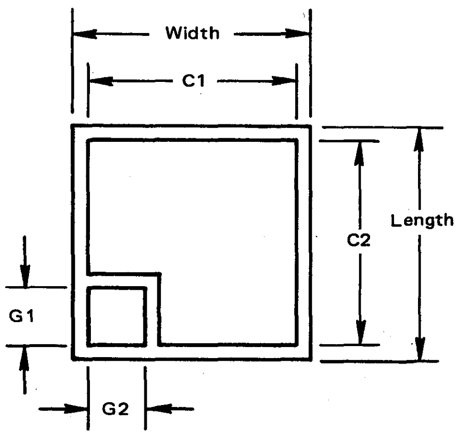


Figure TH1. Corner Fire Cathode Side (Top)
(Back side is anode)

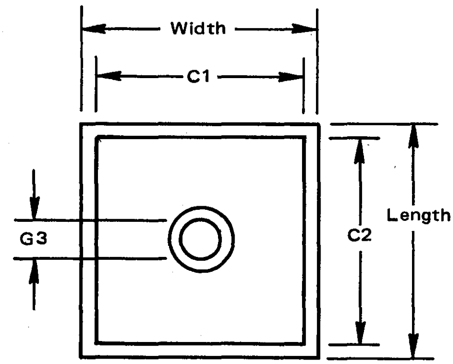
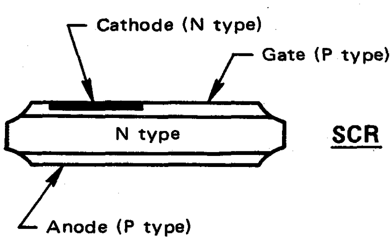
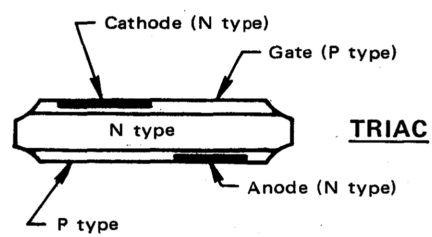


Figure TH2. Center Fire Cathode Side (Top)
(Back side is anode)





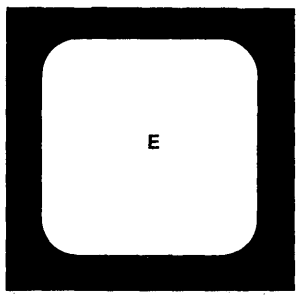
All dimensions in mils

Geometry	Figure	Length	Width	C-1	C-2	G-1	G-2	G-3
036	TH1	90	90	50	50	20	20	–
638	TH1	65	65	29	29	13	9	–
639	TH1	65	65	29	29	13	9	–
310	TH2	110	110	76	76	–	–	28
320	TH2	150	150	128	128	–	–	26
401	TH1	90	90	60	60	20	20	–
420	TH2	150	150	128	128	–	–	26
440	TH2	210	210	190	190	–	–	46

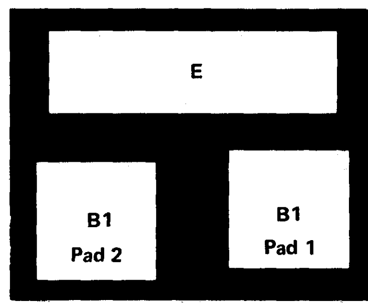
CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils.
Chip geometries are subject to change without notice as modifications are made.
Chip Geometries not scaled to size.

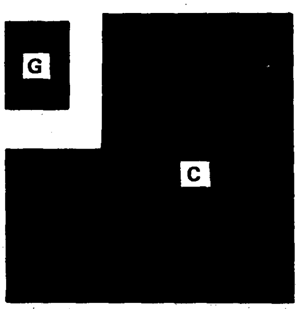
TL51/53 (20x20)



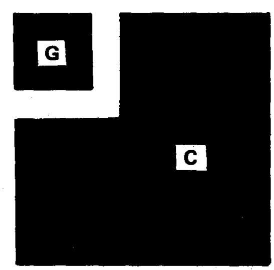
TL58/59 (15x20)



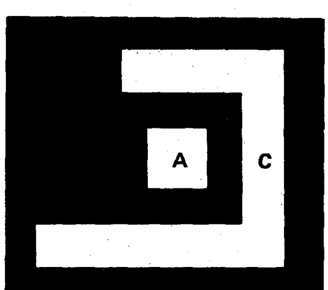
TL60 (24x24)



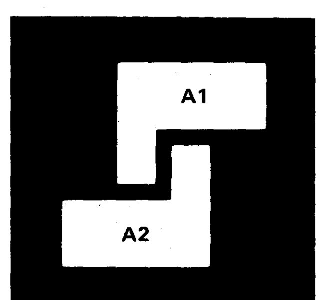
TL62 (32x32)



TL70 (20x20)



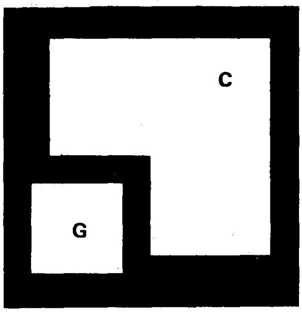
TL71 (20x20)



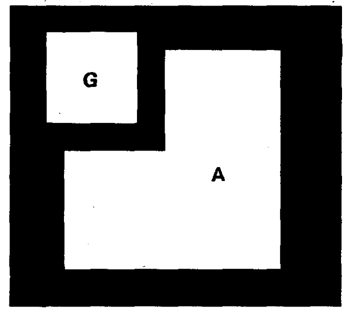
E—Emitter C—Collector
B—Base G—Gate

THYRISTOR CHIPS (continued)

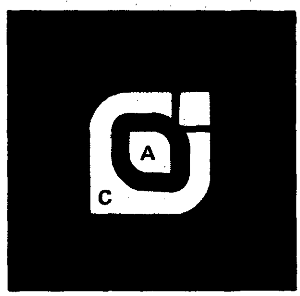
TL72/75 (20x20)



TL78 (38x38)



TL83 (20x20)



ZENER DIODE CHIPS

The zener diode product line includes voltage regulator, voltage reference and current regulator (limiter) devices.
In the Index, these devices are indicated by:

Z — zener voltage regulator diodes.

ZREF — precision voltage reference diodes (zero TC).

ZCL — field-effect current regulator diodes.

INDEX

The presentation of zener diode devices and chips in the Index is designed to direct the reader to the proper chip for a specific application. To reiterate a few salient points:

Chip No. (Column 2) is the chip used in the designated device (Column 1) and tested to the Column 1 data sheet limits and conditions wherever possible.

Alternate Chip (Column 3) for each zener diode 500 mW and under is the **Preferred** chip. It is preferred over the Column 2 chip for the following reasons:

1) Aluminum/Gold metallization instead of Chrome/Silver/Gold top and bottom
2) Smaller size
3) Lower cost
4) Immediate availability for most voltages.

GEOMETRY

When only one geometry is shown it applies to both the Column 2 and Column 3 devices. When two geometries are shown, the first applies to Column 2 and the second to Column 3.

CAUTION

If specific performance is critical to an application, be sure to compare the specifications of the **Chip** and **Alternate Chip** before ordering.

MZC2.4AX — MZC200AX Series (High Level)
MZC1.8BX — MZC200BX Series (Low Level)

In all cases the Alternate Chip shown in the **Index** is from one of these two series.

MZC1.8B10 thru MZC200B10 (Low Level Series)

Type Number (Note 1)	Nearest 1N Equivalent
MZC1.8B10	1N4614
MZC2.0B10	1N4615
MZC2.2B10	1N4616
MZC2.4B10	1N4617
MZC2.7B10	1N4618
MZC3.0B10	1N4619
MZC3.3B10	1N4620
MZC3.6B10	1N4621
MZC3.9B10	1N4622
MZC4.3B10	1N4623
MZC4.7B10	1N4624
MZC5.1B10	1N4625
MZC5.6B10	1N4626
MZC6.2B10	1N4627
MZC6.8B10	1N4099
MZC7.5B10	1N4100
MZC8.2B10	1N4101
MZC8.7B10	1N4102
MZC9.1B10	1N4103
MZC10B10	1N4104
MZC11B10	1N4105
MZC12B10	1N4106
MZC13B10	1N4107
MZC14B10	1N4108
MZC15B10	1N4109
MZC16B10	1N4110
MZC17B10	1N4111
MZC18B10	1N4112
MZC19B10	1N4113
MZC20B10	1N4114

Type Number (Note 1)	Nearest 1N Equivalent
MZC22B10	1N4115
MZC24B10	1N4116
MZC25B10	1N4117
MZC27B10	1N4118
MZC28B10	1N4119
MZC30B10	1N4120
MZC33B10	1N4121
MZC36B10	1N4122
MZC39B10	1N4123
MZC43B10	1N4124
MZC47B10	1N4125
MZC51B10	1N4126
MZC56B10	1N4127
MZC60B10	1N4128
MZC62B10	1N4129
MZC68B10	1N4130
MZC75B10	1N4131
MZC82B10	1N4132
MZC87B10	1N4133
MZC91B10	1N4134
MZC100B10	1N4135
MZC110B10	—
MZC120B10	—
MZC130B10	—
MZC140B10	—
MZC150B10	—
MZC160B10	—
MZC170B10	—
MZC180B10	—
MZC190B10	—
MZC200B10	—

Note 1: See next page.

MZC2.4A10 thru MZC200A10 (High Level Series)

Type Number (Note 1)	Nearest 1N Equivalent (Note 2)
MZC2.4A10	1N5221, 1N4370
MZC2.5A10	1N5222
MZC2.7A10	1N5223, 1N4371
MZC2.8A10	1N5224
MZC3.0A10	1N5225, 1N4372
MZC3.3A10	1N5226, 1N746
MZC3.6A10	1N5227, 1N747
MZC3.9A10	1N5228, 1N748
MZC4.3A10	1N5229, 1N749
MZC4.7A10	1N5230, 1N750
MZC5.1A10	1N5231, 1N751
MZC5.6A10	1N5232, 1N752
MZC6.0A10	1N5233
MZC6.2A10	1N5234, 1N753
MZC6.8A10	1N5235, 1N754
MZC7.5A10	1N5236, 1N755
MZC8.2A10	1N5237, 1N756
MZC8.7A10	1N5238
MZC9.1A10	1N5239, 1N757
MZC10A10	1N5240, 1N758
MZC11A10	1N5241, 1N962
MZC12A10	1N5242, 1N759
MZC13A10	1N5243, 1N964
MZC14A10	1N5244
MZC15A10	1N5245, 1N965
MZC16A10	1N5246, 1N966
MZC17A10	1N5247
MZC18A10	1N5248, 1N967
MZC19A10	1N5249
MZC20A10	1N5250, 1N968
MZC22A10	1N5251, 1N969

Type Number (Note 1)	Nearest 1N Equivalent (Note 2)
MZC24A10	1N5252, 1N970
MZC25A10	1N5253
MZC27A10	1N5254, 1N971
MZC28A10	1N5255
MZC30A10	1N5256, 1N972
MZC33A10	1N5257, 1N973
MZC36A10	1N5258, 1N974
MZC39A10	1N5259, 1N975
MZC43A10	1N5260, 1N976
MZC47A10	1N5261, 1N977
MZC51A10	1N5262, 1N978
MZC56A10	1N5263, 1N979
MZC60A10	1N5264
MZC62A10	1N5265, 1N980
MZC68A10	1N5266, 1N981
MZC75A10	1N5267, 1N982
MZC82A10	1N5268, 1N983
MZC87A10	1N5269
MZC91A10	1N5270, 1N984
MZC100A10	1N5271, 1N985
MZC110A10	1N5272, 1N986
MZC120A10	1N5273, 1N987
MZC130A10	1N5274, 1N988
MZC140A10	1N5275
MZC150A10	1N5276, 1N989
MZC160A10	1N5277, 1N990
MZC170A10	1N5278
MZC180A10	1N5279, 1N991
MZC190A10	1N5280
MZC200A10	1N5281, 1N992

Note 1: Tolerance Designation—The device type numbers have a tolerance of ±10%. For ±5%, 3%, 2%, or 1%, change the suffix "10" to the desired tolerance.

Note 2: The MZC2.4A10 Series is tested at a 50 Milliwatt dissipation level and not at the higher test currents of the nearest "1N" equivalents. This procedure is used to minimize correlation problems encountered when probe testing. Zener voltage is guaranteed correlated when the die is mounted on a 1" x 1" x 0.010" aluminum heat sink at T_A = 30°C ±1°C after 90 seconds.

3

CHIP SIZE AND METALLIZATION

In general, all of these zener diode chips are planar with the diode junction completely protected with silicon oxide. The entire top surface (anode side) is covered with silicon oxide except for the metal bonding pad.

All of these zener diodes have either aluminum top metal and gold back metal or chrome-silver-gold top and back. All are square and symmetrical with square anode bonding pads (except ZCL which is shown below). The nominal thickness of all diode chips is 8 mils.

Z — Zener Voltage Regulator Chips; Geometries A, B, C, D, E.

The following pages show the die construction and corresponding dimensions pertinent to geometries A thru E. Metallization for geometries A thru E is as follows:

	GEOMETRY	
	A	B, C, D, E
Top-anode	Aluminum	Chrome-Silver-Gold
Back-cathode	Gold	Chrome-Silver-Gold

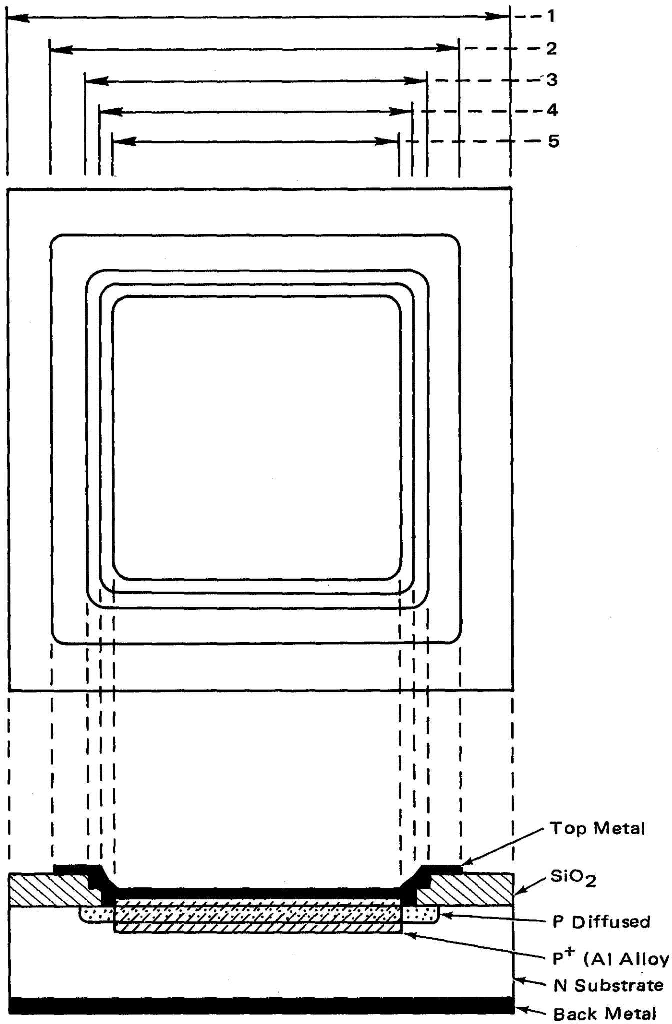
ZREF — Precision Voltage Reference Diodes; Geometry F

Chip construction, metallization and dimensions are shown on drawing F.

ZCL — Current Regulator Diodes; Geometry G

Chip construction, metallization and dimensions are shown on drawing G.

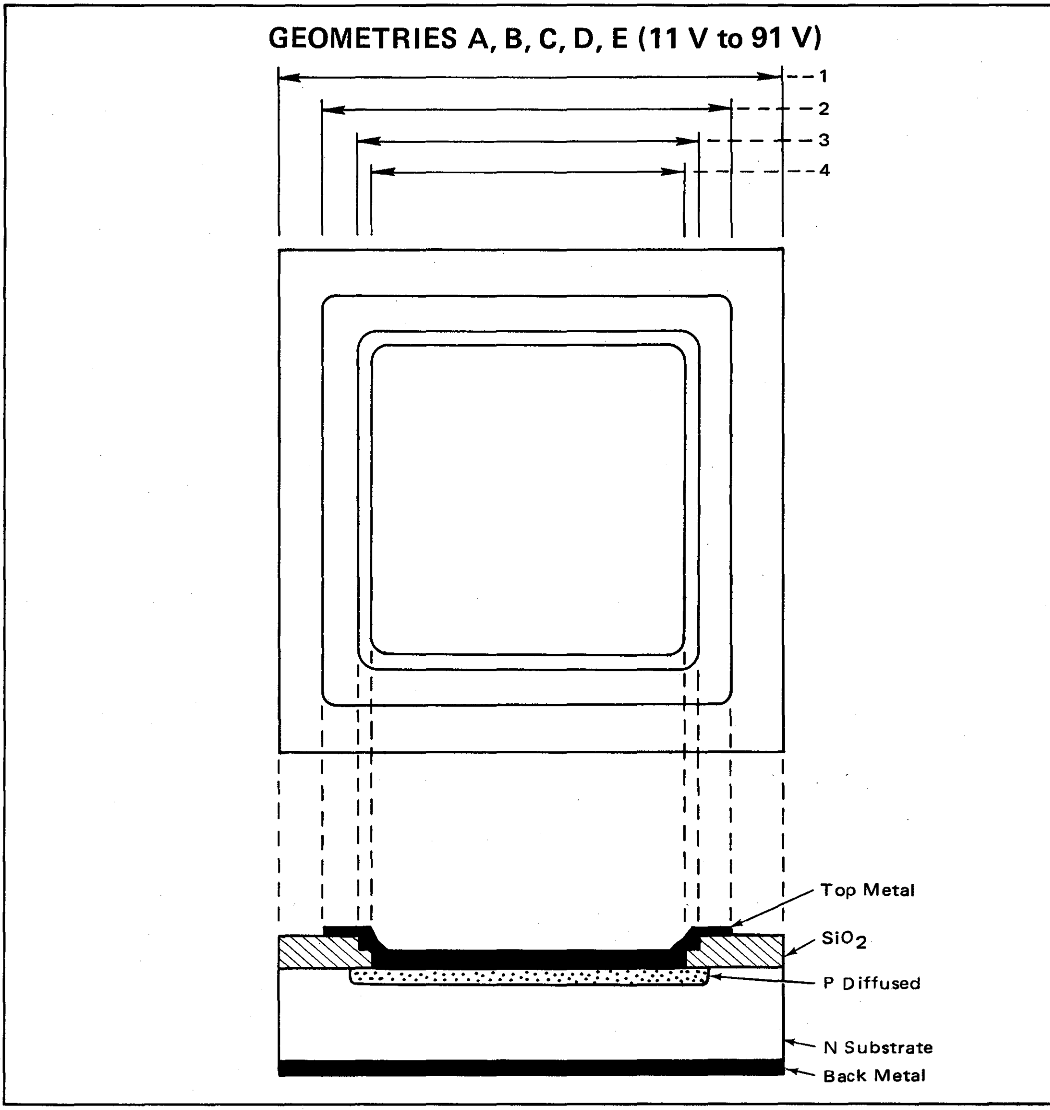
GEOMETRIES A, B, C, D, E (2.4 V to 10 V)



GEOMETRY DIMENSIONS (MILS)
(Die Thickness — 8 mils ± 2)

Dimension	Geometry A*		B	C	D	E
1	20	25	37	60	90	120
2	15	18	30	52	80	112
3	12	13	25	46	78	106
4	10	11	23	44	76	103
5	8	9	21	42	74	100

*Geometry A — Available in two sizes; 20 x 20 mils and 25 x 25 mils. All current and future manufacture is the 20 x 20 mil die, but due to the inventory of 25 x 25 mil die in nearly all voltages, either or both sizes may be delivered against an order.



GEOMETRY DIMENSIONS (MILS)
(Die Thickness – 8 mils ±2)

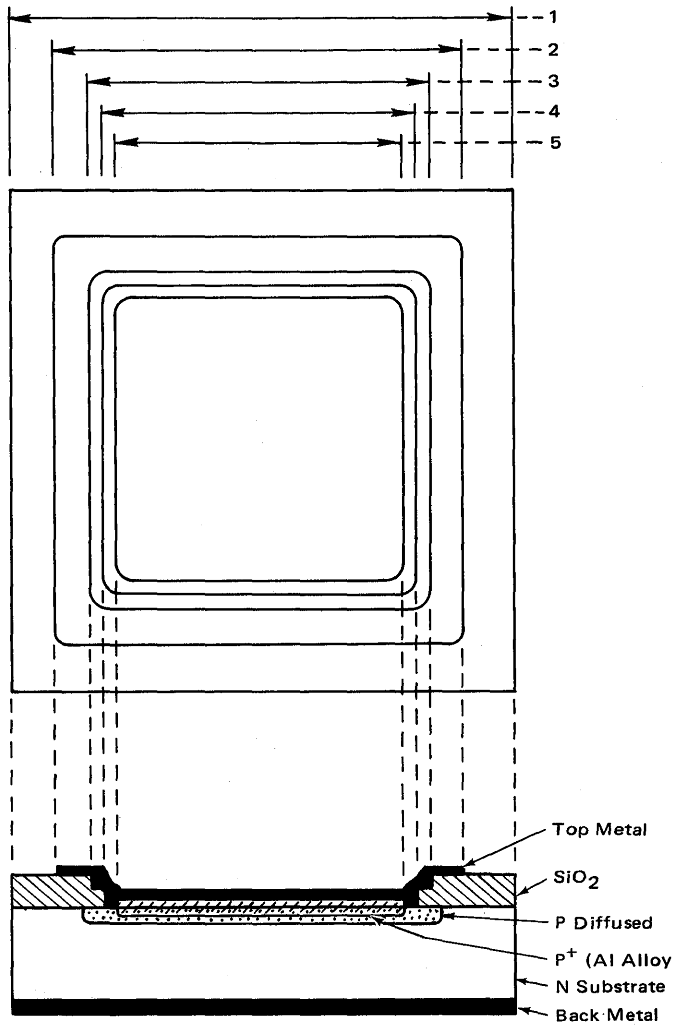
Dimension	Geometry A*		B	C	D	E
1	20	25	37	60	90	120
2	15	18	30	52	80	112
3	12	13	25	46	78	106
4	10	11	23	44	76	103

*Geometry A – Available in two sizes; 20 x 20 mils and 25 x 25 mils. All current and future manufacture is the 20 x 20 mil die, but due to the inventory of 25 x 25 mil die in nearly all voltages, either or both sizes may be delivered against an order.

3

3

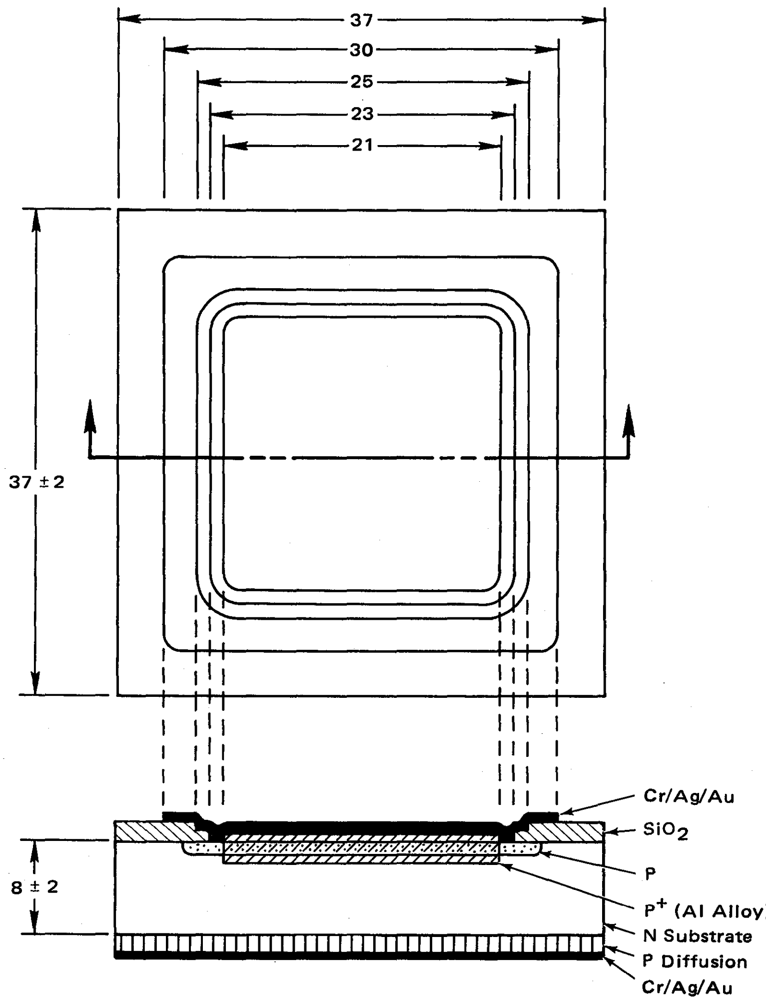
GEOMETRIES A, B, C, D, E (100 V to 200 V)



GEOMETRY DIMENSIONS (MILS) (Die Thickness — 8 mils ±2)						
	Geometry					
Dimension	A*		B	C	D	E
1	20	25	37	60	90	120
2	15	18	30	52	80	112
3	12	13	25	46	78	106
4	10	11	23	44	76	103
5	8	9	21	42	74	100

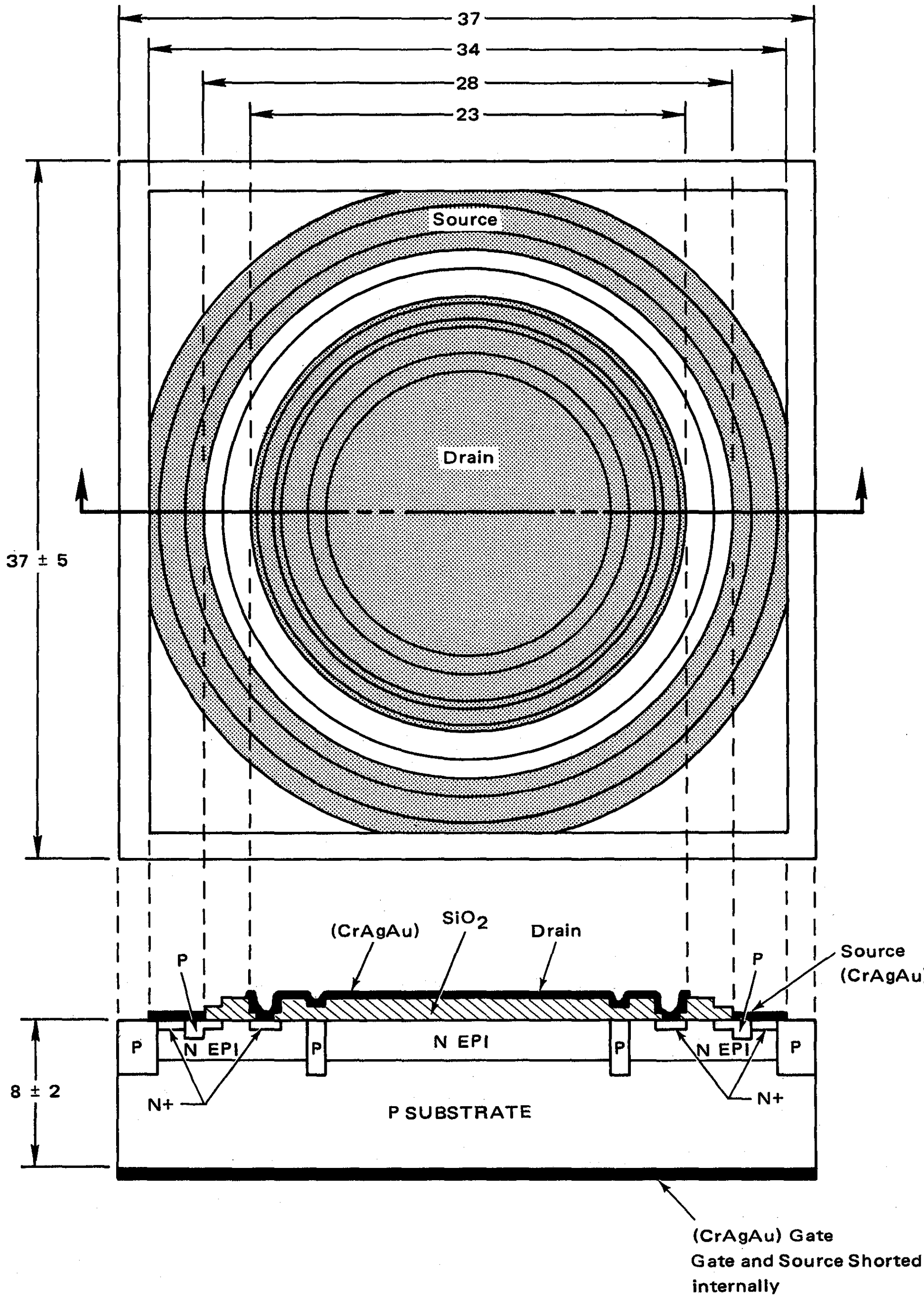
*Geometry A — Available in two sizes; 20 x 20 mils and 25 x 25 mils. All current and future manufacture is the 20 x 20 mil die, but due to the inventory of 25 x 25 mil die in nearly all voltages, either or both sizes may be delivered against an order.

GEOMETRY F – SINGLE CHIP PRECISION REFERENCE DIODES (OTC)
(Dimensions in mils)



3

GEOMETRY G – CURRENT LIMITER DIE
(Dimensions in mils)



SILICON SWITCHING DIODE CHIPS

Single and dual switching diode chips presented in this section are designed for small-signal, high-speed switching applications.

CHIP SIZE AND METALLIZATION

All junctions on switching diode chips are passivated (SiO_2). Chip sizes are included in the referenced geometries with anode (A) and cathode (C) indicated. Chip thickness is 4 to 6 mils.

Front metallization is aluminum with a minimum thickness of 8,000 Å. Back metallization is gold-silicon eutectic. The gold metallization layer is 3,000 Å minimum prior to alloy.

BONDING

Chip attachment may be either conductive epoxy or eutectic. Epoxy chip attachment is recommended because of the lower temperature requirement which facilitates process control. Eutectic bonding requires no preform assuming a normal gold thickness (≈100 μin.).

Wirebonding may be either gold or aluminum wire with ultrasonic or thermocompression wedge or ball bonding.

PROBE CAPABILITIES

Probe capabilities and limitations are presented in the General Information section (see page 1-12).

PACKAGING AND VISUAL INSPECTION

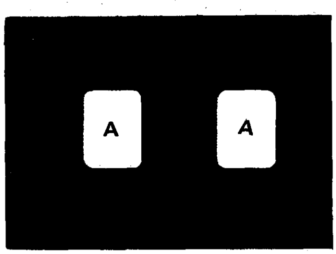
All of the switching diode chips are available in any stage of processing from unscribed, unit probed wafer to individual chips in Multi-Pak carriers. These packaging forms, associated inspection levels and ordering information are presented in detail on page 1-8.

CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils.
Chip geometries are subject to change without notice as modifications are made.

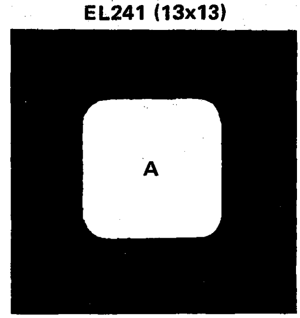
Chip Geometries not scaled to size.

EL240 (12x18)



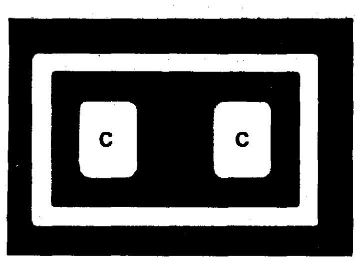
Cathode is back of chip.

EL241 (13x13)



Cathode is back of chip.

EL290 (12x18)



Anode is back of chip.

A=Anode
C=Cathode

TUNING DIODE CHIPS

The Tuning Diode product line includes:

TD — Abrupt junction tuning diodes

TD-D — Monolithic dual diodes

TDHA — Hyper-abrupt junction tuning diodes

SBD — Schottky barrier low level diodes

PIN — PIN switching diodes

CHIP SIZE AND METALLIZATION

All of the diodes included in this section are epitaxial and passivated; that is, the p-n junction comes out on the top surface of the chip and is completely covered with a protective layer of SiO_2. All chips are square and have square anode bonding pads centered on the chip.

In all cases the back of the chip is the cathode and is completely covered with gold. The top metal-anode bonding pad is either aluminum, chrome/silver/gold or gold.

Chip size and top metal are shown in the following table for each geometry listed in the Index.

BONDING

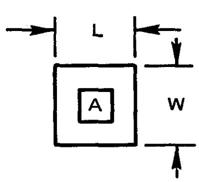
Standard chip and wire bonding methods are used on these chips. Eutectic die bonding and TC or ultrasonic wire bonding are recommended.

PROBE CAPABILITIES

Special equipment is being used to probe each chip for C_T, Diode Capacitance, and C_R, Capacitance Ratio, at f = 1.0 MHz. These parameters are guaranteed along with the standard BV_R and I_R performance.

PACKAGING AND VISUAL INSPECTION

All of the chips are available in any stage of processing from unscribed, unit probed wafer to individual chips in Multi-Pak carriers. These packaging forms, associated inspection levels and ordering information are presented in detail in the General Information section.



Timing Diode Geometries and Top Metallization

Geometry	Size LxW (Mils) (1)	Top Metal(2)
VL19-30	37x37	CSG
VL44-59	37x37	CSG
VL73	37x37	CSG
VL74	37x37	CSG
VL140-147	57x57	CSG
VL222	14x14	Al
VL225-233	20x20	Al
VL234-236	25x25	Al
VL237	30x30	Al
VL238-241	37x37	Al
VL242-243	40x40	Al
VL260-267	57x57	Al
VL271	37x37	Al
VL276	57x57	Al
VL282	15x15	Gold
VL284	15x15	Gold
VL285	12x12	Gold
VL431	37x37	Al
VL522	14x14	Al
VL523	20x20	Al
VL534	14x14	Al
VL538	20x20	Al
VL539	20x20	Al
VL700-708	20x20	Al
VL1002	35x67	Al

(1) Nominal thickness of all chips is 5 mils.
(2) CSG—chrome/silver/gold, Al—aluminum, Gold—Moly Gold.

RECTIFIER CHIPS

The only Rectifiers shown in the Index are: SBR-Schottky Barrier Rectifier chips.

Although Motorola offers a broad line of packaged silicon rectifiers (standard recovery and fast recovery rectifiers) they utilize chips with exposed junctions. Leakage and voltage breakdown characteristics are extremely unstable until the exposed junction chips are correctly encapsulated. Experience has shown that processing required for exposed junction rectifier chips is not compatible with hybrid assembly, therefore, hybrid manufacturers are encouraged to use rectifiers in some of the various packaged forms available, or in some cases, zener diode chips (all of which are passivated) or transistor junctions may be substituted.

3

CHIP SIZE AND METALLIZATION

Schottky barrier rectifier chips are passivated and offered for hybrid circuit applications. These chips feature state-of-the-art geometry with epitaxial construction, oxide passivation and metal overlap contacts.

Schottky barrier rectifier chips are square and chip sizes are included in the geometry reference. Chip thickness is nominally 7 mils and the anode is the top (smaller metallized area).

Metallization on both sides of the chip is the same and consists of three layers. The bottom layer is a thin barrier layer such as Cr or Moly. The next layer is Nickel (Ni) and the top layer is thin gold (Au) about 1,500 to 2,500 Å. The function of the gold layer is to facilitate soldering and protect the underlying Ni layer.

BONDING

Schottky barrier rectifier chips are designed for solder connections on both sides. Conductive epoxy could be substituted. The metallization is wire bondable using thermocompression or ultrasonic techniques, but adjustments in the machine settings may be necessary because of the metallization system.

PROBE CAPABILITIES

Reverse leakage and breakdown voltages and forward voltages are probed within the capabilities and limitations presented in the General Information section (see page 1-12).

PACKAGING AND VISUAL INSPECTION

All of the Schottky barrier rectifier chips are available in any stage of processing from unscribed, unit probed wafer to individual chips in Multi-Pak carriers. These packaging forms, associated inspection levels and ordering information are presented in detail on page 1-8.

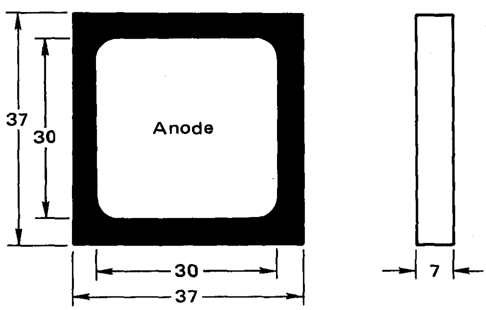
SCHOTTKY BARRIER RECTIFIER GEOMETRIES-SBR

CHIP GEOMETRIES

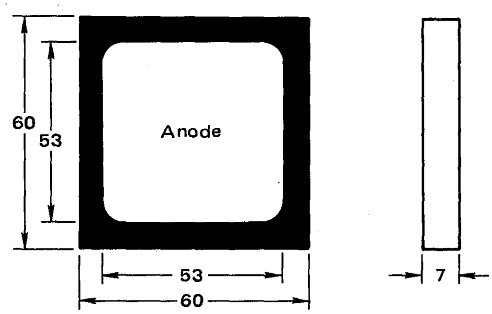
Geometry and chip size are shown for each chip. All dimensions are in mils.
Chip geometries are subject to change without notice as modifications are made.

Chip Geometries not scaled to size.

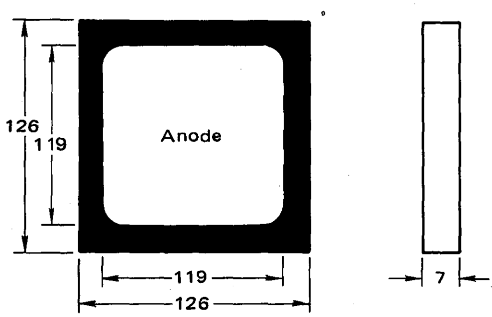
RL754



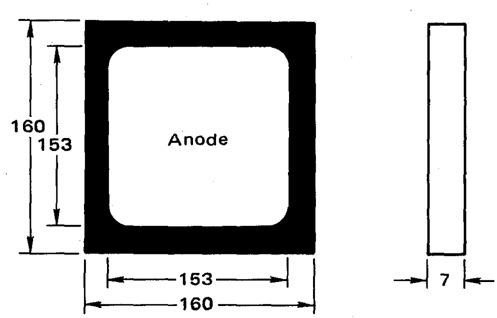
RL755



RL756



RL760



CHAPTER 4
Flip-Chip Devices

4

*To be introduced

GENERAL DESCRIPTION

A flip-chip is a complete, ready-to-mount, passivated active semiconductor device designed specifically for application in thick-film hybrid circuits. Active junctions are connected with metallization to 95% Pb/5% Sn solder bumps on the perimeter of the active face of the device. Die bonds and the flip-chip counterpart to wire bonds occur simultaneously when bumps on the face-down chip reflow together with mating bumps on the hybrid substrate (Figure 1) by employing control collapse reflow technology (Figure 2) (see *IBM Journal of Research and Development,* May 1969).

Control collapse technology and solder bump flip-chips were developed by IBM for internal use to provide a low-cost, high yield, high reliability assembly technique. Although the technique is entirely automatable, benefits of flip-chip technology will be realized with manual processing. An operator working with an illuminated magnifying lens and vacuum pencil should be capable of placing 800 flip chips each hour.

Flip-chips are manufactured with standard silicon planar technology exactly like metal can or plastic packaged chips except:

1. All contacts are made on the active surface through 95% Pb/5% Sn bumps connected to the aluminum metallization as described below;
2. All flip-chips are passivated with deposited glass.
3. All flip-chips are saw diced for precise size and square edges to facilitate automatic handling.

A SEM of a typical discrete flip-chip is shown in Figure 3, and an integrated circuit flip-chip is shown in Figure 4.

4

FIGURE 1

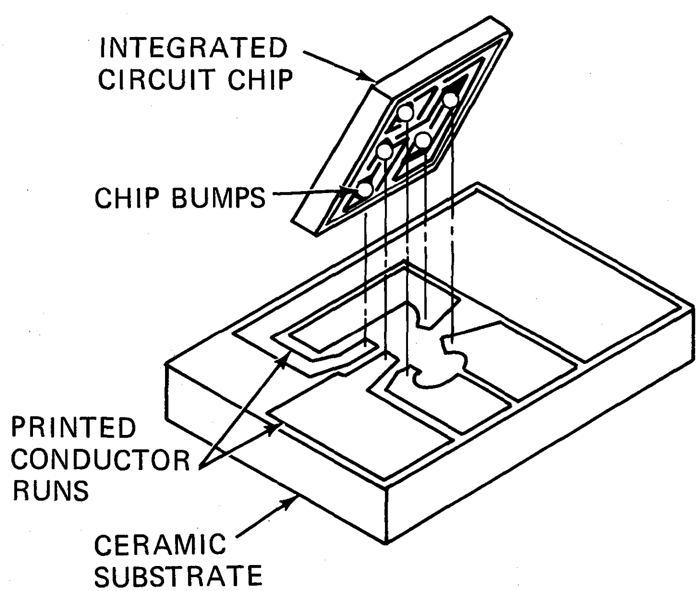


FIGURE 2 — CONTROL COLLAPSE TECHNOLOGY

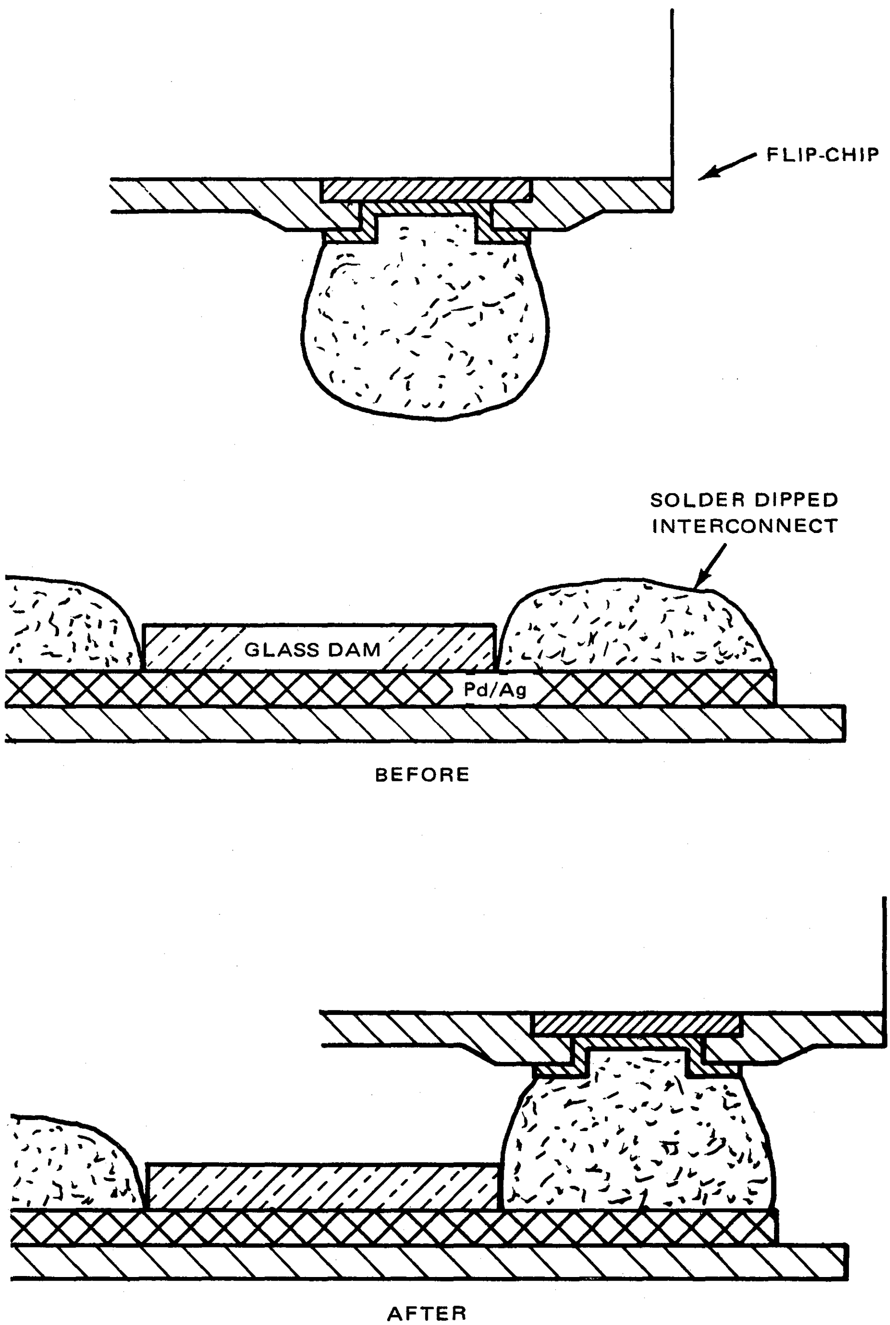
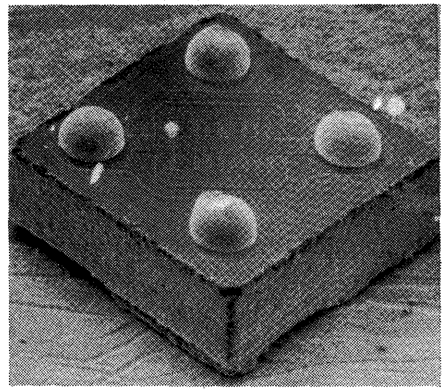


FIGURE 3 –
TYPICAL DISCRETE
FLIP-CHIP



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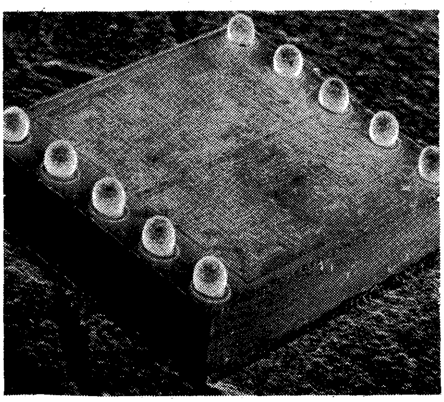

FIGURE 4 –
TYPICAL
INTEGRATED CIRCUIT
FLIP–CHIP

ADVANTAGES OF FLIP-CHIP TECHNOLOGY

- A high yield, inexpensive reflow process step replaces relatively low yield, costly die and wire bonding.
- More rugged and reliable reflow bonds replace relatively fragile wire bonds; the typical four-bump discrete flip-chip described below will withstand 100 grams push-off force and almost three watts power dissipation.
- Less expensive thick film technology can be used with flip-chips, and flip-chip thick film hybrids require no gold metal runs and permit greater co-firing potential.
- Flip-chips have established proven reliability after more than five years of field use.
- Flip-chip hybrid manufacturing requires less equipment resulting in less capital, depreciation, and maintenance cost.
- In most cases, flip-chip technology permits greater active device packing density on the hybrid.
- Low-tin content solder connections reduce leaching probability and enhance rework capability.

TABLE 1
Available Flip-Chip Devices

Polarity	Motorola Device Number	Similar to
GENERAL PURPOSE SWITCH AND AMPLIFIER		
NPN	MMCF2221/A	2N2221/A and 2N2218/A
NPN	MMCF2222/A	2N2222/A and 2N2219/A
PNP	MMCF2906/A	2N2906/A and 2N2904/A
PNP	MMCF2907/A	2N2907/A and 2N2905/A
SMALL-SIGNAL AMPLIFIER		
NPN	MMCF929	2N929
NPN	MMCF930	2N930
NPN	MMCF2484	2N2484
PNP	MMCF3798	2N3798
PNP	MMCF3799	2N3799
SWITCH		
NPN	MMCF708	2N708
NPN	MMCF2369	2N2369
NPN	MMCF3227	2N3227
PNP	MMCF3250/A	2N3250/A
PNP	MMCF3251/A	2N3251/A
HIGH VOLTAGE TRANSISTOR		
NPN	MMCFA43	MPSA43
PNP	MMCFA93	MPSA93
SMALL-SIGNAL RF TRANSISTOR		
NPN	MMCF5179	2N5179
NPN	MMCF2857	2N2857
N-CHANNEL JFET		
—	MMCF4223/4	2N4223/4
—	MMCF4338/9	2N4338/9
SWITCHING DIODE		
—	MMCFD914	1N914
LINEAR INTEGRATED CIRCUITS		
—	MCCF1709C	MC1709C UncompOp Amp
—	MCCF1458	Dual MC1741C
—	MCCF1741C	MC1741C Comp Op Amp
—	MCCF3403	MC3403 Quad Op Amp
†	MLMCF124 Series	MLM124 Quad Op Amp
†	MLMCF139 Series	MLM139 Quad Comparator
†	MCCF3346	MC3346 5-Transistor Array
†	MCCF3386	MC3386 5-Transistor Array

†To be introduced

DEVICE AVAILABILITY

Standard flip-chip devices currently available are listed in Table 1. Motorola's flip-chip offering, however, is considerably greater than indicated directly from the list. Virtually any small-signal discrete device may be supplied in flip-chip form by one of the following development schemes:

1. If a new device specification is similar to an existing specification, new devices may be specially selected and supplied within 2–4 weeks. Relaxed specifications result in lower prices.
2. Frequently, a new device specification is not sufficiently similar to an existing specification to permit special selection, but the device may be produced with minor processing changes. In this case, new devices will usually be available for qualification sample within 4–6 weeks.
3. Occasionally, a new device specification requires completely new processing. In this instance, development charges (if any) and delivery time will be based on the difficulty in producing the new device.

Similarly, almost all linear and most digital integrated circuits found in Motorola's general data library can be supplied in flip-chip form. Additionally, many hybrid applications require custom designed ICs. Motorola can design and produce flip-chip custom ICs to a broad range of custom requirements. The potentially detailed nature of flip-chip IC development dictates that each case be reviewed individually to determine development time and charges (if any). Contact the nearest Motorola Sales Office with your requirements.

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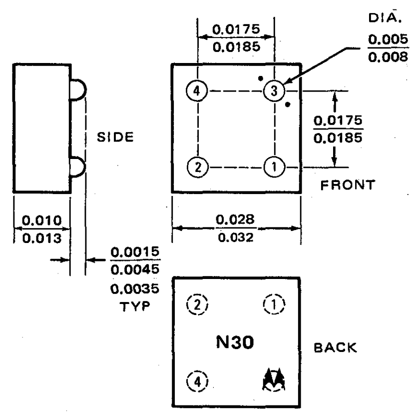
PHYSICAL CHARACTERISTICS

DISCRETE DEVICES

Motorola manufactures flip-chip discrete devices to a standard size and configuration as shown in Figure 5. This standard offers optimum characteristics for producing and automatically testing and placing virtually all small-signal devices in flip-chip form. A larger standard will be developed for devices requiring greater power dissipation.

FIGURE 5



ALL DIMENSIONS IN INCHES

TRANSISTORS

Bump 1. Collector
2. Base
3. Emitter
4. Collector

Emitter is identified on active face by 2 dots and on back by position of Ⓜ.

FETs

Bump 1. Gate
2. Drain
3. Source
4. Gate

Source is identified on active face by 2 dots and on back by position of M.

DIODES

Bump 1. Anode
2. Anode
3. Cathode
4. Cathode

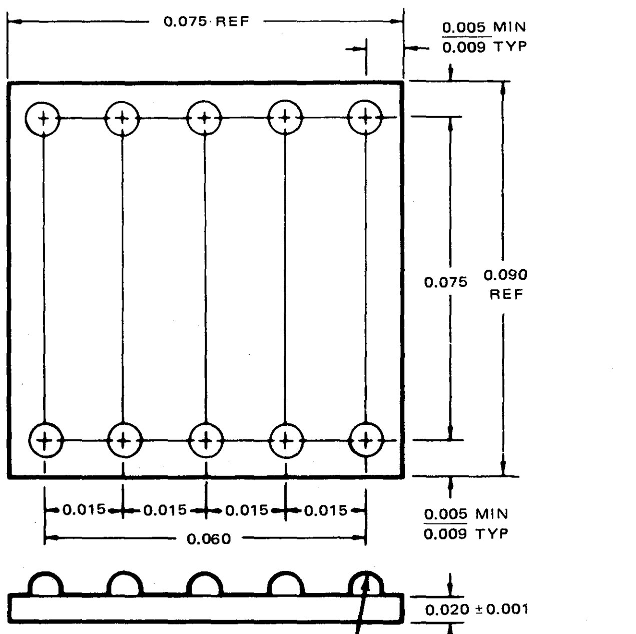
Cathode is identified on active face by 1 dot and on back by position of M.

Note the inclusion of dots on the front (active) face of each discrete device as well as the metallized back marking (visible with a low-power microscope). Because each discrete device must be oriented properly on the hybrid and because the device type must be identifiable from the backside for face-down mounted devices, the dots or Motorola emsignia designate the emitter or source or cathode, and the three-digit back marking designates device type (for transistors, an "N" designates NPN polarity and a "P" designates PNP polarity).

INTEGRATED CIRCUITS

The physical size and configuration of a typical integrated circuit flip-chip is depicted in Figure 6. Outline dimensions and bump center-to-center spacing will vary, of course, depending on the particular IC.

FIGURE 6



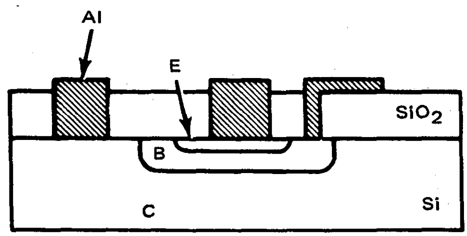
Bump Diameter at Base 0.006 ±0.001
Bump Height: 0.0040 ±0.0005
Each bump centerline to be located within 0.001 of its true position with respect to any other bump centerline.

Bump center-to-center spacing may be reduced to 0.008" and the number of bumps may be substantially increased to conform to device pinout requirements and hybrid construction capabilities.

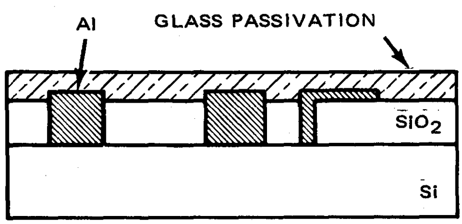
FLIP-CHIP PROCESSING

The Motorola flip-chip devices employ the IBM bump metallurgy system. The flip-chip processing starts with a wafer which has completed the standard wafer processing, that is, through final aluminum metallization. Subsequent processing is shown with the following sketches:

STANDARD TRANSISTOR DIE WITH SiO_2 PASSIVATION AND ALUMINUM METALLIZATION

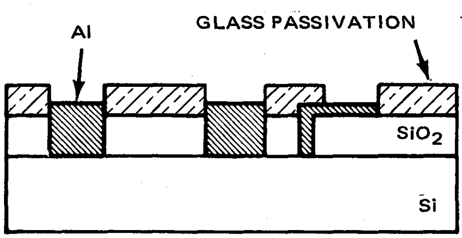


GLASS PASSIVATION



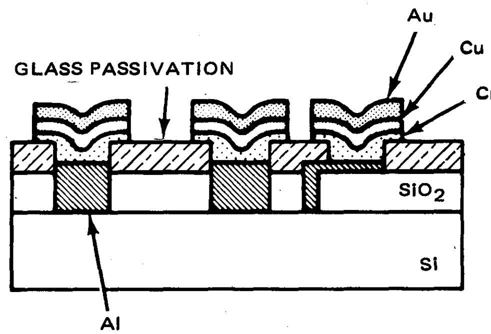
A layer of phosphorus-doped silene glass is deposited over the entire semiconductor wafer at low temperatures to avoid any shifts in the electrical characteristics that may occur at high temperatures.

CONTACT OPENING WITH STANDARD PHOTORESIST TECHNIQUES



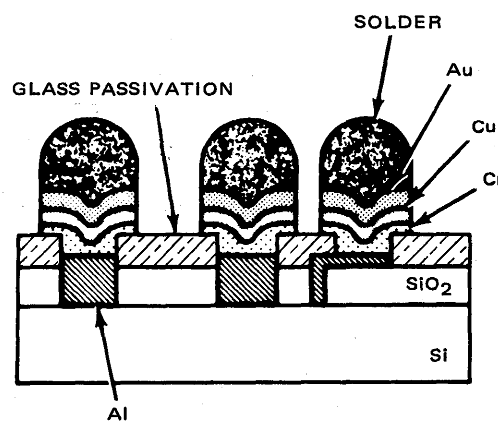
Standard photoresist techniques are used to delineate and etch contact holes in the passivation that will then become the actual bump areas.

METALLIZATION – 3 LAYERS – CHROMIUM-COPPER-GOLD



Metallization of the bump areas consists of three layers sequentially evaporated through a metal mask. The first metal is chromium which is needed to form a good bond to the aluminum metallization. The second metal is copper which forms a good bond to the chromium, but more importantly, is readily soldered. The gold is required to protect the copper from oxidation; it is a very thin layer and completely disolves into the solder during bonding. Although gold solders readily, it is not possible to use only gold as the metallization since gold and aluminum form undesirable intermetallics. Since gold also reacts unfavorably with the base silicon, it is not possible to use gold throughout the entire flip-chip system.

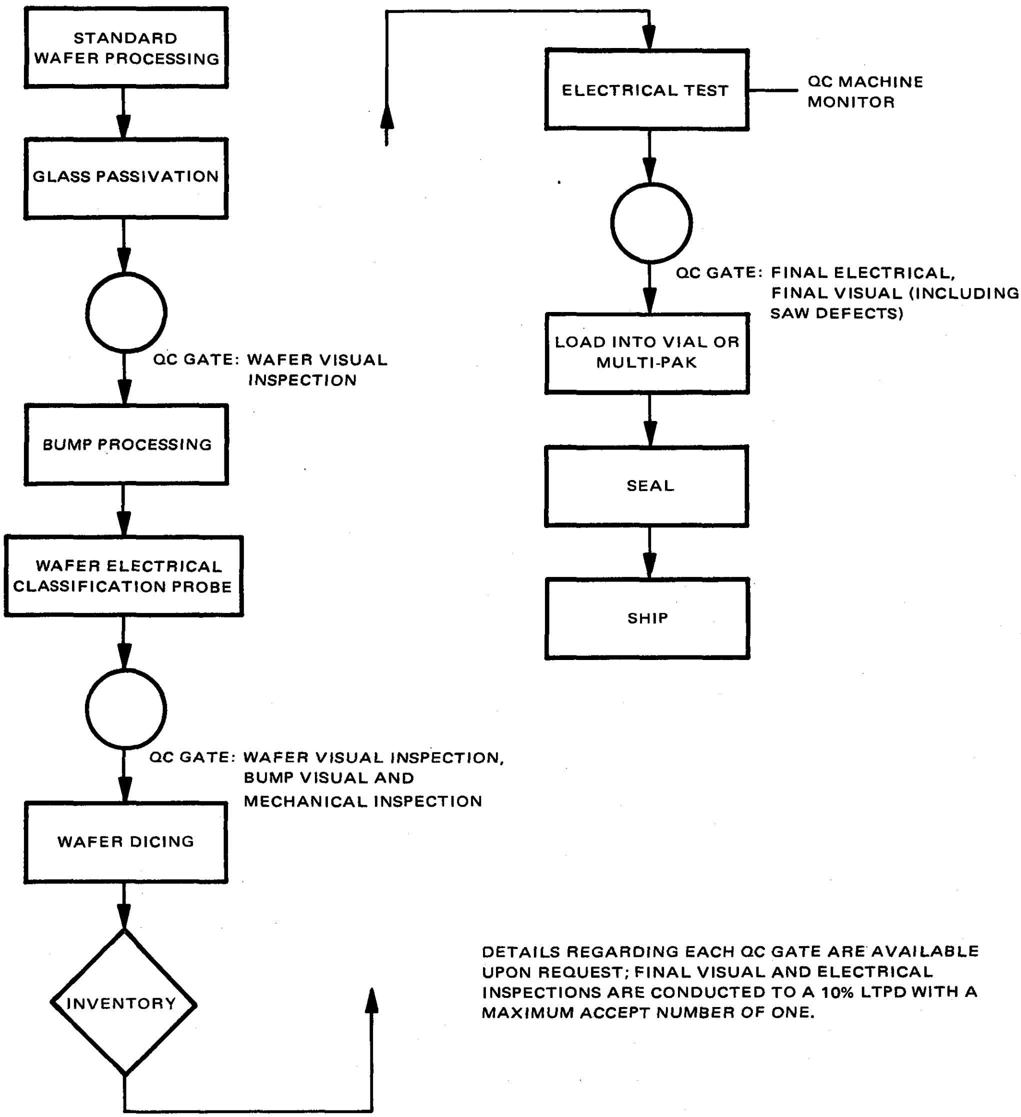
SOLDER APPLICATION BUMP FORMATION



The 95/5 lead tin solder is evaporated onto the Cr-Cu-Au pads through a metal mask. The amount of solder is carefully controlled. The wafer is heated to solder reflow temperature (approximately 326°C), where the combination of solder surface tension and unwettable glass surrounding the solder force the molten solder into the uniform and spherical bumps.

The completed wafers are then diced with a saw, tested and categorized (automatically for discrete devices), and checked for visual and electrical quality. Discrete flip-chips are loaded into a vial and ICs into a multi-pak for shipping. Figure 7 outlines this process flow and flip-chip quality control procedures.

FIGURE 7 – QUALITY CONTROL FLOW CHART



DETAILS REGARDING EACH QC GATE ARE AVAILABLE UPON REQUEST; FINAL VISUAL AND ELECTRICAL INSPECTIONS ARE CONDUCTED TO A 10% LTPD WITH A MAXIMUM ACCEPT NUMBER OF ONE.

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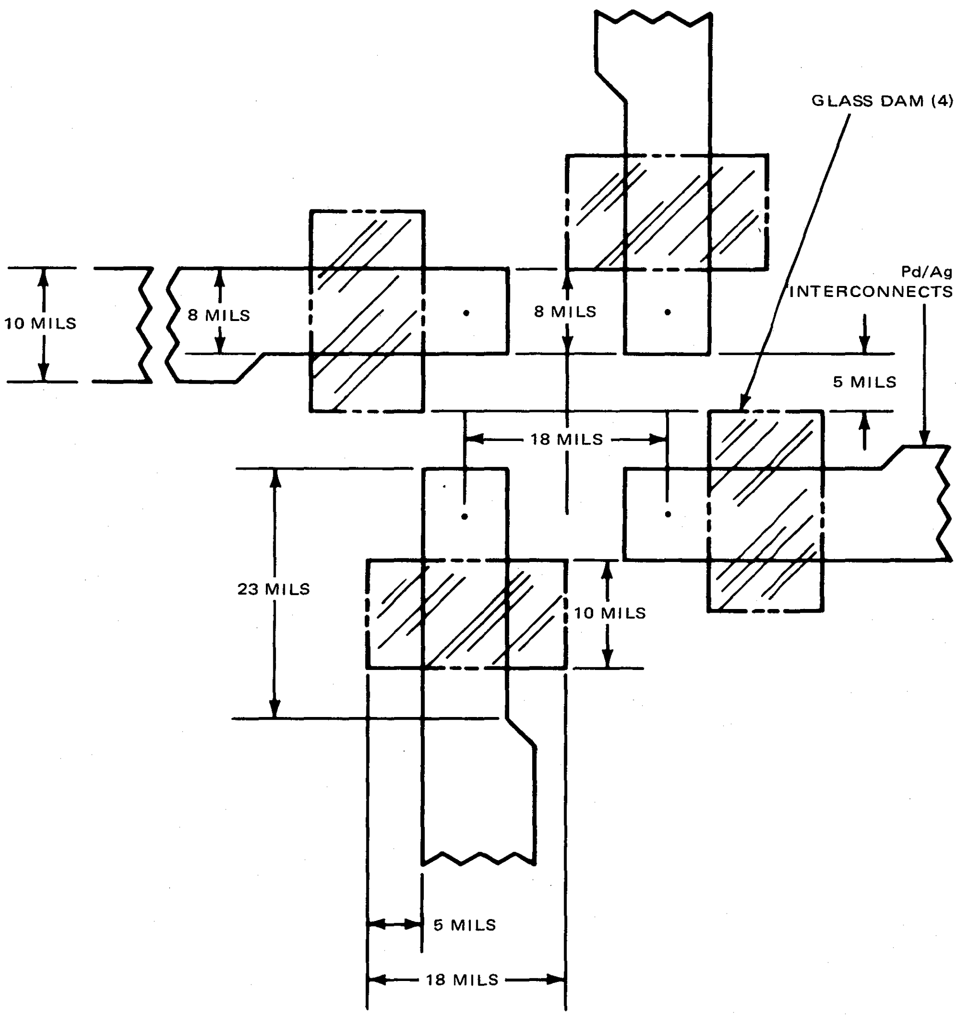
RECOMMENDATIONS FOR FLIP-CHIP HYBRID FABRICATION

Flip-chips are designed primarily for use on thick-film hybrids with high temperature (90% Pb/10% Sn) solder dip coated over palladium-silver metal runs. A typical hybrid layout to accept a discrete flip-chip is shown in Figure 8.

FIGURE 8



Note that solder is restricted to the pad area by glass dams (refer to Figure 2) which are fabricated by screening and firing any of a variety of non-tinnable pastes to the geometry shown. For integrated circuits, pad area size must be changed to 5 mils x 10 mils, but no other changes in geometry or processing are required.

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After application of tiny amounts of non-activated flux to substrate pad areas (only), flip-chips may be placed onto hybrid manually (using a vacuum probe) or automatically. Flip-chips need not be placed with extreme accuracy because the forgiving self-alignment feature of reflow technology dictates that chip and appropriate substrate bump need only be in mechanical contact. The sticky flux holds each flip-chip in place until all active devices and chip capacitors are in place on the hybrid and ready for reflow in a multi-zone, nitrogen purged belt oven with an ideal temperature profile as indicated in Figure 9.

Note that this curve is approximate and that adjustment must be made in the profile to account for process particulars. This curve may be approximated by adjusting a reflow furnace so that the temperature to melt pure lead is reached in a similar time profile. Time above 300°C must be minimized without causing poor reflow yield, and temperature rise time results from a tradeoff between thermal stress effects (if too rapid) and flux carbonizing (if too slow). Cooling time is not critical except for thermal shock considerations. Excellent reflow yields have been realized using this scheme, but flip-chips will reflow well on a hot plate in open air.

After reflow, flux residue must be removed by a solvent and the hybrid should be cleaned by standard procedures. The resulting reflow bond is ductile, strong, reliable, and stable. use of 60% Pb/40% Sn solder on the substrate, however, severely reduces bump ductility and chip self-alignment during reflow and causes tin leaching and bond embrittlement.

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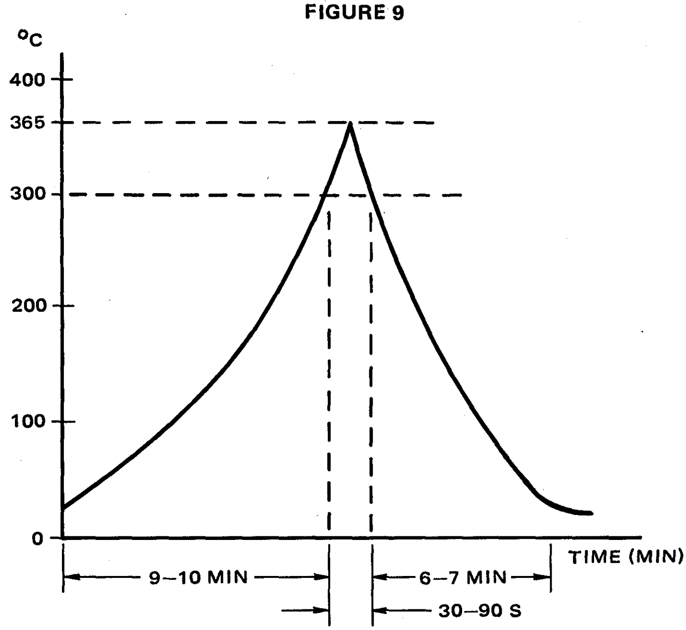
FIGURE 9

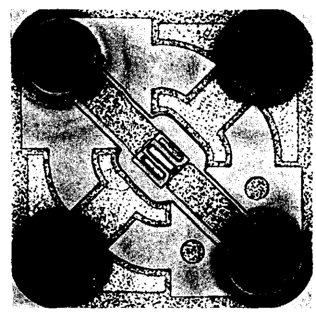


MMCF708 (SILICON)
MMCF2369
MMCF3227

FLIP-CHIP
NPN SWITCH AND
AMPLIFIER TRANSISTORS

Flip-Chip — NPN silicon Annular transistor family for low-current, high-speed switching applications similar to the 2N708, 2N2369 and 2N3227.

Primary Electrical Features:
- High speed switching characteristics similar to 2N2369.



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MAXIMUM RATINGS

Rating	Symbol	MMCF708	MMCF2369	MMCF3227	Unit
Collector-Emitter Voltage	V_{CEO}	15	15	20	Vdc
Collector-Emitter Voltage	V_{CES}	—	40	40	Vdc
Collector-Base Voltage	V_{CB}	←	40	→	Vdc
Emitter-Base Voltage	V_{EB}	5.0	4.5	6.0	Vdc
Collector Current — Peak (10 μs pulse)	I_C	←	500	→	mAdc

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	BV_{CEO}			Vdc
MMCF708, MMCF2369		15	–	
MMCF3227		20	–	
Collector-Emitter Breakdown Voltage (I_C = 10 μAdc, V_{BE} = 0)	BV_{CES}			Vdc
MMCF2369, MMCF3227		40	–	
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	BV_{CBO}	40	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	BV_{EBO}			Vdc
MMCF708		5.0	–	
MMCF2369		4.5	–	
MMCF3227		6.0	–	
Collector Cutoff Current (V_{CB} = 20 Vdc, I_E = 0)	I_{CBO}			μAdc
MMCF708		–	0.025	
MMCF2369		–	0.4	
MMCF3227		–	0.2	
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
(I_C = 0.5 mAdc, V_{CE} = 1.0 Vdc) MMCF708		15	–	
(I_C = 10 mAdc, V_{CE} = 1.0 Vdc) MMCF708		30	150	
MMCF2369		40	150	
MMCF3227		100	300	
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc) MMCF2369		15	–	
MMCF3227		30	–	
Collector-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)	$V_{CE(sat)}$			Vdc
MMCF708		–	0.4	
MMCF2369, MMCF3227		–	0.25	
Base-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)	$V_{BE(sat)}$			Vdc
MMCF708		–	0.8	
MMCF2369, MMCF3227		–	0.85	
DYNAMIC CHARACTERISTICS				
Current-Gain-Bandwidth Product (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	f_T			MHz
MMCF708		300	–	
MMCF2369, MMCF3227		500	–	
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}			pF
MMCF708		–	6.0	
MMCF2369, MMCF3227		–	4.0	

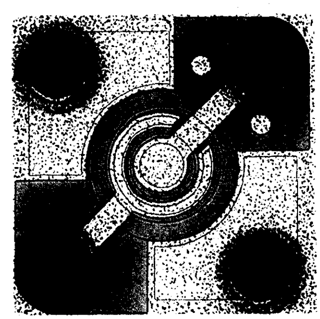
MMCF929, MMCF930 (SILICON)
MMCF2484

Flip-Chip — NPN silicon Annular transistor family for low-level amplifier applications similar to the 2N929, 2N930 and 2N2484.

Primary Electrical Features:

- High DC Current Gain @ I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc —
  h_{FE} = 200 (Min) — MMCF2484
  = 60 (Min) — MMCF929
- Low Collector-Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.25 Vdc (Max) @ I_C = 1.0 mAdc

FLIP-CHIP NPN SMALL-SIGNAL AMPLIFIER TRANSISTORS



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MAXIMUM RATINGS

Rating	Symbol	MMCF929 MMCF930	MMCF2484	Unit
Collector-Emitter Voltage	V_{CEO}	45	60	Vdc
Collector-Base Voltage	V_{CB}	45	60	Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current — Continuous	I_C	50		mAdc

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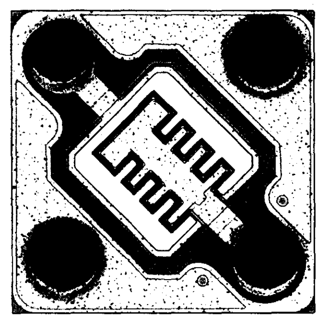
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	BV_{CEO}			Vdc
MMCF929, MMCF930		45	–	
MMCF2484		60	–	
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	BV_{CBO}			Vdc
MMCF929, MMCF930		45	–	
MMCF2484		60	–	
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	BV_{EBO}	5.0	–	Vdc
Collector Cutoff Current (V_{CB} = 45 Vdc, I_E = 0)	I_{CBO}	–	10	nAdc
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0)	I_{EBO}	–	10	nAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
(I_C = 0.1 mAdc, V_{CE} = 5.0 Vdc)				
MMCF929		50	–	
MMCF930		100	–	
MMCF2484		175	–	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)				
MMCF929		60	–	
MMCF930		150	–	
MMCF2484		200	–	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc)				
MMCF929		–	400	
MMCF930		–	700	
MMCF2484		–	900	
Collector-Emitter Saturation Voltage (I_C = 1.0 mAdc, I_B = 0.1 mAdc)	$V_{CE(sat)}$	–	0.25	Vdc
Base-Emitter On Voltage (I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	$V_{BE(on)}$	–	0.75	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain—Bandwidth Product (I_C = 500 mAdc, V_{CE} = 5.0 Vdc, f = 30 MHz)	f_T	30	–	MHz
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}			pF
MMCF929, MMCF930		–	8.0	
MMCF2484		–	6.0	

MMCF2221, MMCF2221A (SILICON)
MMCF2222, MMCF2222A

FLIP-CHIP
NPN SWITCH AND
AMPLIFIER TRANSISTORS



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Flip-Chip — General purpose NPN switching and amplifier transistor family similar to the 2N2221,A and 2N2222,A devices.

Primary Electrical Features:

- DC Current Gain specified for 0.1 to 300 mAdc
- Low Collector-Emitter Saturation Voltage —
- DC to VHF Amplifier Applications
- Complements to MMCF2906,A and MMCF2907, A

MAXIMUM RATINGS

Rating	Symbol	MMCF2221 MMCF2222	MMCF2221A MMCF2222A	Unit
Collector-Emitter Voltage	V_{CEO}	30	40	Vdc
Collector-Base Voltage	V_{CB}	60	75	Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current — Continuous	I_C	500		mAdc

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	BV_{CEO}			Vdc
MMCF2221, MMCF2222		30	–	
MMCF2221A, MMCF2222A		40	–	
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	BV_{CBO}			Vdc
MMCF2221, MMCF2222		60	–	
MMCF2221A, MMCF2222A		75	–	
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	BV_{EBO}	5.0	–	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	–	10	nAdc
Emitter Cutoff Current (V_{EB} = 3.0 Vdc, I_C = 0)	I_{EBO}	–	10	nAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)				
MMCF2221,A		20	–	
MMCF2222,A		35	–	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)				
MMCF2221,A		25	–	
MMCF2222,A		50	–	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)				
MMCF2221,A		35	–	
MMCF2222,A		75	–	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)(1)				
MMCF2221,A		40	150	
MMCF2222,A		100	300	
(I_C = 300 mAdc, V_{CE} = 10 Vdc)(1)				
MMCF2221		25	–	
MMCF2221A		30	–	
MMCF2222		35	–	
MMCF2222A		45	–	
Collector-Emitter Saturation Voltage(1) (I_C = 150 mAdc, I_B = 15 mAdc)	$V_{CE(sat)}$			Vdc
MMCF2221, MMCF2222		–	0.5	
MMCF2221A, MMCF2222A		–	0.4	
Base-Emitter Saturation Voltage(1) (I_C = 150 mAdc, I_B = 15 mAdc)	$V_{BE(sat)}$			Vdc
MMCF2221, MMCF2222		–	2.0	
MMCF2221A, MMCF2222A		–	1.5	
DYNAMIC CHARACTERISTICS				
Current-Gain-Bandwidth Product (I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	250	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)	C_{ob}	–	12	pF

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

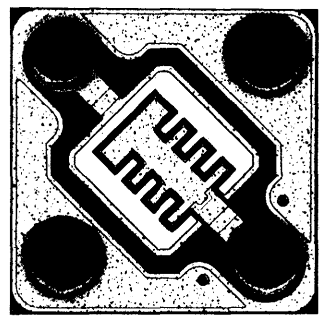
4

MMCF2906, MMCF2906A (SILICON)
MMCF2907, MMCF2907A

FLIP-CHIP PNP SWITCH AND AMPLIFIER TRANSISTORS

Flip-Chip — General purpose PNP switching and amplifier transistor family similar to the 2N2906,A and 2N2907,A devices.

Primary Electrical Features:
- DC Current Gain specified for 0.1 to 300 mAdc
- Low Collector-Emitter Saturation Voltage
- DC to VHF Amplifier Applications
- Complements to MMCF2221,A and MMCF2222,A



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MAXIMUM RATINGS

Rating	Symbol	MMCF2906 MMCF2907	MMCF2906A MMCF2907A	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	Vdc
Collector-Base Voltage	V_{CB}	60		Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current — Continuous	I_C	500		mAdc

4

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage(1) (I_C = 10 mAdc, I_B = 0)	BV_{CEO}			Vdc
MMCF2906, MMCF2907		40		
MMCF2906A, MMCF2907A		60		
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	BV_{CBO}	60		Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	BV_{EBO}	5.0		Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}			nAdc
MMCF2906, MMCF2907			20	
MMCF2906A, MMCF2907A			10	
Emitter Cutoff Current (V_{EB} = 3.0 Vdc, I_C = 0)	I_{EBO}		10	nAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)				
MMCF2906		20		
MMCF2906A		40		
MMCF2907		35		
MMCF2907A		75		
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)				
MMCF2906		25		
MMCF2906A		40		
MMCF2907		50		
MMCF2907A		100		
(I_C = 10 mAdc, V_{CE} = 10 Vdc)				
MMCF2906		35		
MMCF2906A		40		
MMCF2907		75		
MMCF2907A		100		
(I_C = 150 mAdc, V_{CE} = 10 Vdc)(1)				
MMCF2906,A		40	150	
MMCF2907,A		100	300	
(I_C = 300 mAdc, V_{CE} = 10 Vdc)(1)				
MMCF2906		30		
MMCF2906A		40		
MMCF2907		50		
MMCF2907A		75		
Collector-Emitter Saturation Voltage(1) (I_C = 150 mAdc, I_B = 15 mAdc)	$V_{CE(sat)}$		0.5	Vdc
Base-Emitter Saturation Voltage(1) (I_C = 150 mAdc, I_B = 15 mAdc)	$V_{BE(sat)}$		1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain—Bandwidth Product (I_C = 50 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	200		MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)	C_{ob}		12	pF

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0 %

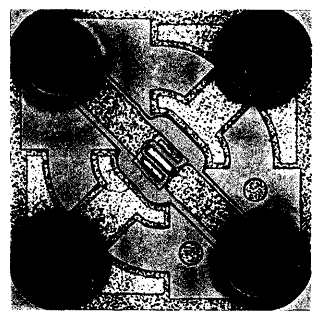
MMCF3250, MMCF3250A (SILICON)
MMCF3251, MMCF3251A

FLIP-CHIP
PNP SWITCH AND
AMPLIFIER TRANSISTORS

Flip-Chip — PNP silicon Annular transistor family for high-speed switching and amplifier applications similar to the 2N3250,A and 2N3251,A.

Primary Electrical Features:

- High speed switching characteristics similar to 2N3251.



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MAXIMUM RATINGS

Rating	Symbol	MMCF3250 MMCF3251	MMCF3250A MMCF3251A	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	Vdc
Collector-Base Voltage	V_{CB}	50	60	Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current — Continuous	I_C	200		mAdc

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ C$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage ($I_C = 10$ mAdc, $I_B = 0$)	BV_{CEO}			Vdc
MMCF3250, MMCF3251		40	–	
MMCF3250A, MMCF3251A		60	–	
Collector-Base Breakdown Voltage ($I_C = 10\ \mu$Adc, $I_E = 0$)	BV_{CBO}			Vdc
MMCF3250, MMCF3251		50	–	
MMCF3250A, MMCF3251A		60	–	
Emitter-Base Breakdown Voltage ($I_E = 10\ \mu$Adc, $I_C = 0$)	BV_{EBO}	5.0	–	Vdc
Collector Cutoff Current ($V_{CB} = 40$ Vdc, $I_E = 0$)	I_{CBO}	–	20	nAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
($I_C = 0.1$ mAdc, $V_{CE} = 1.0$ Vdc)				
MMCF3250,A		40	–	
MMCF3251,A		80	–	
($I_C = 1.0$ mAdc, $V_{CE} = 1.0$ Vdc)				
MMCF3250,A		45	–	
MMCF3251,A		90	–	
($I_C = 10$ mAdc, $V_{CE} = 1.0$ Vdc)				
MMCF3250,A		50	150	
MMCF3251,A		100	300	
($I_C = 50$ mAdc, $V_{CE} = 1.0$ Vdc)				
MMCF3250,A		15	–	
MMCF3251,A		30	–	
Collector-Emitter Saturation Voltage ($I_C = 10$ mAdc, $I_B = 1.0$ mAdc)	$V_{CE(sat)}$	–	0.25	Vdc
Base-Emitter Saturation Voltage ($I_C = 10$ mAdc, $I_B = 1.0$ mAdc)	$V_{BE(sat)}$	–	0.9	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain-Bandwidth Product ($I_C = 10$ mAdc, $V_{CE} = 20$ Vdc, f = 100 MHz)	f_T			MHz
MMCF3250,A		250	–	
MMCF3251,A		300	–	
Output Capacitance ($V_{CB} = 10$ Vdc, $I_E = 0$, f = 100 kHz)	C_{ob}	–	6.0	pF

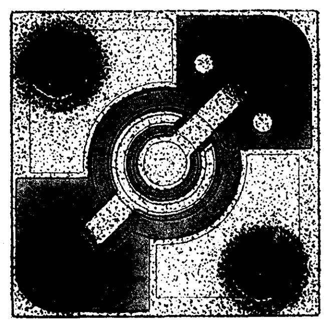
MMCF3798 (SILICON)
MMCF3799

FLIP-CHIP
PNP SMALL-SIGNAL
AMPLIFIER TRANSISTORS

Flip-Chip — PNP silicon Annular transistor family for low-level low-noise amplifier applications similar to the 2N3798 and 2N3799.

Primary Electrical Features:

- High DC Current Gain @ I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc –
  h_{FE} = 150-450 – MMCF3798
  = 300-900 – MMCF3799
- Low Collector-Emitter Saturation Voltage –
  $V_{CE(sat)}$ = 0.25 Vdc (Max) @ I_C = 1.0 mAdc
- Current-Gain Bandwidth Product – f_T = 100 MHz (Min)



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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	60	Vdc
Collector-Base Voltage	V_{CB}	60	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current – Continuous	I_C	50	mAdc

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	BV_{CEO}	60	–	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	BV_{CBO}	60	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	BV_{EBO}	5.0	–	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	–	10	nAdc
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0)	I_{EBO}	–	20	nAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
(I_C = 0.1 mAdc, V_{CE} = 5.0 Vdc) MMCF3798		150	–	
MMCF3799		250	–	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc) MMCF3798		150	450	
MMCF3799		300	900	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc) MMCF3798		125	–	
MMCF3799		250	–	
Collector-Emitter Saturation Voltage (1) (I_C = 1.0 mAdc, I_B = 0.1 mAdc)	$V_{CE(sat)}$	–	0.25	Vdc
Base-Emitter On Voltage (I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	$V_{BE(on)}$	–	0.7	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain–Bandwidth Product (I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc, f = 100 MHz)	f_T	100	–	MHz
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 100 kHz)	C_{ob}	–	6.0	pF

(1) Pulse Test: Pulse Width ≤300 μs, Duty Cycle ≤2.0%

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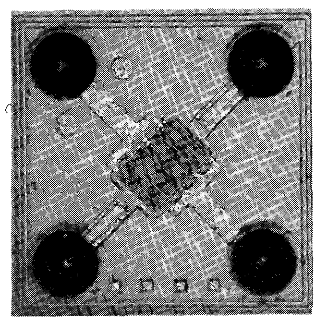
MMCF4223 (SILICON)
MMCF4224

FLIP-CHIP
N-CHANNEL JUNCTION
FIELD EFFECT
TRANSISTORS

Flip-Chip — N-channel junction field effect transistors designed for VHF amplifier and mixer applications.

- Drain and Source Interchangeable



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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	30	Vdc
Drain-Gate Voltage	V_{DG}	30	Vdc
Gate-Source Voltage	V_{GS}	30	Vdc
Drain Current	I_D	20	mAdc
Operating Junction Temperature	T_J	+175	^oC

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ELECTRICAL CHARACTERISTICS

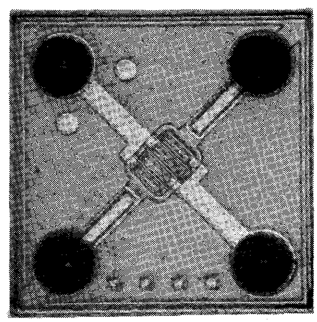
Characteristic		Symbol	Min	Max	Unit
Gate-Source Breakdown Voltage (I_G = 10 μAdc, V_{DS} = 0)		$V_{(BR)GSS}$	30	—	Vdc
Gate Reverse Current (V_{GS} = 20 Vdc, V_{DS} = 0)	MMCF4223	I_{GSS}	—	0.5	nAdc
	MMCF4224		—	1.0	
Gate-Source Cutoff Voltage (V_{DS} = 15 Vdc, I_D = 0.5 nAdc)	MMCF4223	$V_{GS(off)}$	—	8.0	Vdc
(V_{DS} = 15 Vdc, I_D = 1.0 nAdc)	MMCF4224		—	8.0	
Gate-Source Voltage (V_{DS} = 15 Vdc, I_D = 0.3 mAdc)	MMCF4223	V_{GS}	1.0	7.0	Vdc
(V_{DS} = 15 Vdc, I_D = 0.2 mAdc)	MMCF4224		1.0	7.5	
Zero-Gate Voltage Drain Current (V_{DS} = 15 Vdc, V_{GS} = 0)	MMCF4223	I_{DSS}	3.0	18	mAdc
	MMCF4224		2.0	20	
Forward Transmittance (V_{DS} = 15 Vdc, V_{GS} = 0, f = 1.0 kHz)	MMCF4223	$\|y_{fs}\|$	3000	7000	μmhos
	MMCF4224		2000	7500	
Input Capacitance (V_{DS} = 15 Vdc, V_{GS} = 0, f = 1.0 MHz)		C_{iss}	—	8.0	pF
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{GS} = 0, f = 1.0 MHz		C_{rss}	—	3.0	pF

MMCF4338 (SILICON)
MMCF4339

FLIP-CHIP
N-CHANNEL JUNCTION
FIELD EFFECT
TRANSISTORS

Flip-Chip — N-channel junction field effect transistor designed for low-level transistor designed for low-level audio and general purpose applications.

- Drain and Source Interchangeable
- Excellent Performance as High-Impedance Input
- Low Pinch-Off Voltage Permits Use in Battery Driven Applications.



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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	50	Vdc
Drain-Gate Voltage	V_{DG}	50	Vdc
Gate-Source Voltage	V_{GS}	50	Vdc
Drain Current	I_D	50	mAdc
Operating Junction Temperature	T_J	+175	^oC

ELECTRICAL CHARACTERISTICS

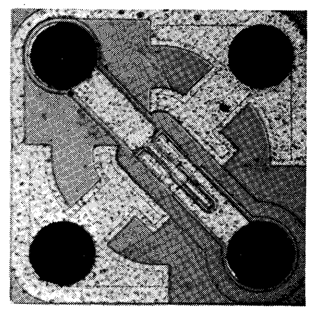
Characteristic		Symbol	Min	Max	Unit
Gate-Source Breakdown Voltage (I_G = 10 μAdc, V_{DS} = 0)		$V_{(BR)GSS}$	50	—	Vdc
Gate Reverse Current (V_{GS} = 30 Vdc, V_{DS} = 0)		I_{GSS}	—	1.0	nAdc
Gate-Source Pinch-Off Voltage (V_{DS} = 20 Vdc, I_D = 1.0 nAdc)	MMCF4338	$V_{GS(off)}$	0.3	1.0	Vdc
	MMCF4339		0.6	1.8	
Zero-Gate Voltage Drain Current (V_{DS} = 15 Vdc, V_{GS} = 0)	MMCF4338	I_{DSS}	0.2	0.6	mAdc
	MMCF4339		0.5	1.5	
Forward Transmittance (V_{DS} = 15 Vdc, V_{GS} = 0, f = 1.0 kHz)	MMCF4338	$\|y_{fs}\|$	600	1800	μmhos
	MMCF4339		800	2400	
Input Capacitance (V_{DS} = 15 Vdc, V_{GS} = 0, f = 1.0 MHz)		C_{iss}	—	7.0	pF
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{GS} = 0, f = 1.0 MHz		C_{rss}	—	3.0	pF

MMCF5179 (SILICON)
MMCF2857

FLIP-CHIP NPN
RF SMALL-SIGNAL
TRANSISTORS

Flip-Chip — NPN RF small-signal transistors designed for use in amplifier, oscillator and mixer applications.

- High Current-Gain Bandwidth Product
- Low Input Capacitance



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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	15	Vdc
Collector-Base Voltage	V_{CB}	30	Vdc
Emitter-Base Voltage	V_{EB}	25	Vdc
Collector Current — Continuous	I_C	50	mAdc

ELECTRICAL CHARACTERISTICS

Characteristic		Symbol	Min	Max	Unit
Collector-Emitter Breakdown Voltage (I_C = 3.0 mAdc, I_B = 0)	MMCF5179	BV_{CEO}	12	—	Vdc
	MMCF2857		15	—	
Collector-Base Breakdown Voltage (I_C = 1.0 μAdc, I_E = 0)	MMCF5179	BV_{CBO}	20	—	Vdc
	MMCF2857		30	—	
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)		BV_{EBO}	2.5	—	Vdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)		I_{CBO}	—	10	nAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 3.0 mAdc, V_{CE} = 1.0 Vdc)	MMCF5179	h_{FE}	25	250	—
	MMCF2857		30	150	
DYNAMIC CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 5.0 mAdc, V_{CE} = 6.0 Vdc, f = 100 MHz)	MMCF5179	f_T	900	2000	MHz
	MMCF2857		1000	1900	
Input Capacitance (V_{BE} = 10 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)		C_{cb}	—	1.0	pF

MMCFA43 (SILICON)

FLIP-CHIP
NPN HIGH-VOLTAGE
TRANSISTOR

Flip-Chip — NPN silicon annular transistor designed for applications requiring high breakdown voltages with low saturation voltages.

- Complement to PNP Type MMCFA93

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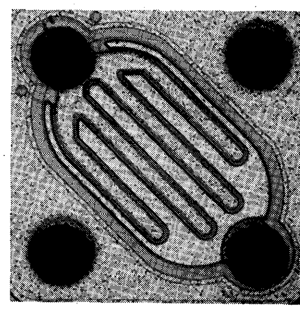


MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	200	Vdc
Collector-Base Voltage	V_{CB}	200	Vdc
Emitter-Base Voltage	V_{EB}	6.0	Vdc
Collector Current — Continuous	I_C	500	mAdc

ELECTRICAL CHARACTERISTICS

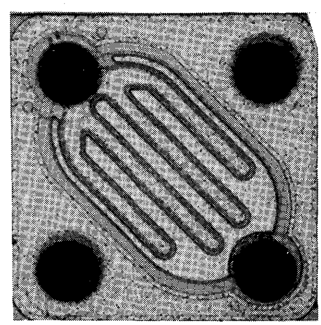
Characteristic	Symbol	Min	Max	Unit
Collector-Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	BV_{CEO}	200	—	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	BV_{CBO}	200	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	BV_{EBO}	6.0	—	Vdc
Collector Cutoff Current (V_{CB} = 160 Vdc, I_E = 0)	I_{CBO}	—	100	nAdc
Emitter Cutoff Current (V_{BE} = 4.0 Vdc, I_C = 0)	I_{EBO}	—	100	nAdc
DC Current Gain	h_{FE}			—
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)		25	—	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)		35	—	
(I_C = 30 mAdc, V_{CE} = 10 Vdc)		25	200	
Collector-Emitter Saturation Voltage (I_C = 20 mAdc, I_B = 2.0 mAdc)	$V_{CE(sat)}$	—	0.5	Vdc
Base-Emitter Saturation Voltage (I_C = 20 mAdc, I_B = 2.0 mAdc)	$V_{BE(sat)}$	—	0.9	Vdc

MMCFA93 (SILICON)

FLIP-CHIP PNP HIGH-VOLTAGE TRANSISTOR

Flip-Chip — PNP silicon annular transistor designed for applications requiring high breakdown voltages with low saturation voltages.

- Complement to NPN Type MMCFA43



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MAXIMUM RATINGS

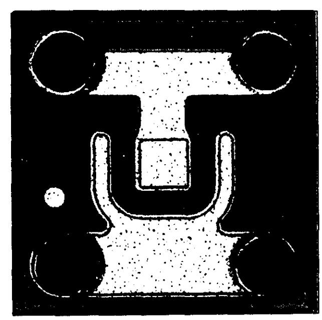
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	200	Vdc
Collector-Base Voltage	V_{CB}	200	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current — Continuous	I_C	500	mAdc

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Collector-Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	BV_{CEO}	200	—	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	BV_{CBO}	200	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	BV_{EBO}	5.0	—	Vdc
Collector Cutoff Current (V_{CB} = 160 Vdc, I_E = 0)	I_{CBO}	—	250	nAdc
Emitter Cutoff Current (V_{BE} = 3.0 Vdc, I_C = 0)	I_{EBO}	—	100	nAdc
DC Current Gain	h_{FE}			—
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)		25	—	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)		40	—	
(I_C = 30 mAdc, V_{CE} = 10 Vdc)		25	150	
Collector-Emitter Saturation Voltage (I_C = 20 mAdc, I_B = 2.0 mAdc)	$V_{CE(sat)}$	—	0.5	Vdc
Base-Emitter Saturation Voltage (I_C = 20 mAdc, I_B = 2.0 mAdc)	$V_{BE(sat)}$	—	0.9	Vdc

MMCFD914

FLIP-CHIP SWITCHING DIODE



Flip-Chip diode for high-speed switching applications with performance similar to the 1N914.

Primary Electrical Features:

- Breakdown Voltage — $V_{(BR)}$ = 100V (Min)
- Forward Current – to 225 mAdc
- Reverse Recovery time – $t_{rr} \leqslant 5.0$ ns

4

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Reverse Voltage	V_R	100	Vdc
Forward Current	I_F	225	mAdc
Forward Surge Current	$I_{F(surge)}$	500	mAdc

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Breakdown Voltage ($I_{(BR)}$ = 10 μAdc)	$V_{(BR)}$	100	—	Vdc
Reverse Current (V_R = 20 Vdc)	I_R	—	50	nAdc
Forward Voltage (I_F = 10 mAdc)	V_F	—	1.0	Vdc
Capacitance (V_R = 0)	C	—	5.0	pF
Reverse Recovery Time (I_F = 10 mAdc, V_R = 6.0 Vdc, i_{rr} = 1.0 mAdc)	t_{rr}	—	5.0	ns

MCCF1558
MCCF1458

OPERATIONAL AMPLIFIERS

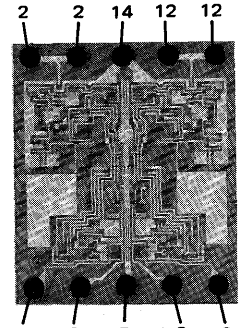
DUAL MC1741
INTERNALLY COMPENSATED, HIGH PERFORMANCE MONOLITHIC OPERATIONAL AMPLIFIER FLIP-CHIP

. . . designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

The MCCF1558 and MCCF1458 employ phosphorsilicate passivation that protects the entire die surface area, including metalization interconnects. The bumps are 95-5 solder on a chrome-copper-gold base. The interconnecting metalization is evaporated aluminum.

- No Frequency Compensation Required
- Short-Circuit Protection
- Wide Common-Mode and Differential Voltage Ranges
- Low-Power Consumption
- No Latch Up

FLIP-CHIP
(DUAL MC1741)
DUAL OPERATIONAL AMPLIFIER
MONOLITHIC SILICON INTEGRATED CIRCUIT



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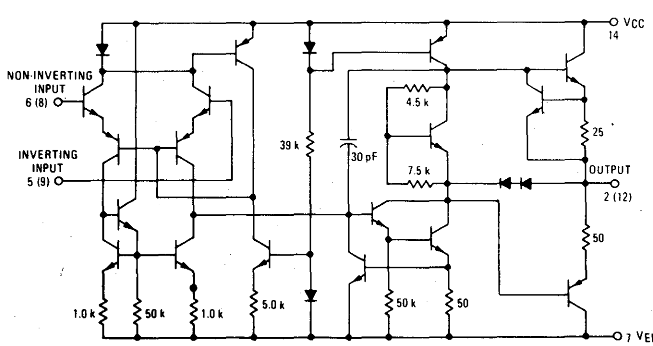
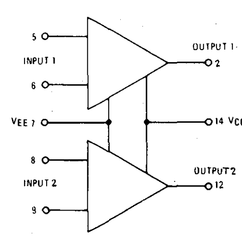
MAXIMUM RATINGS (T_A = +25°C unless otherwise noted.)

Rating		Symbol	MCCF1558	MCCF1458	Unit
Power Supply Voltage		V_{CC} V_{EE}	+22 -22	+18 -18	Vdc
Differential Input Signal		V_{ID}	±30		Volts
Common-Mode Input Swing		V_{IC}	±15		Volts
Output Short Circuit Duration		t_S	Continuous		
Operating Temperature Range	MCCF1558	T_A	-55 to +125		°C
	MCCF1458		0 to +75		
Junction Temperature Range		T_J	-65 to +150		°C



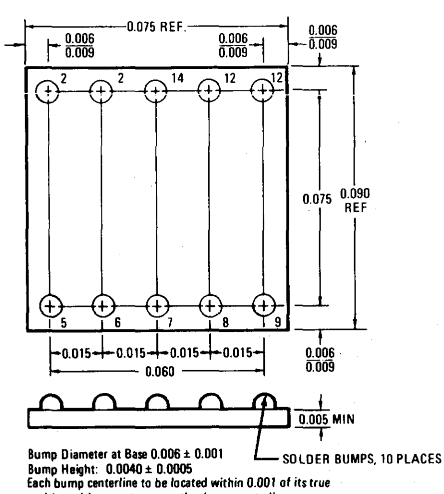
The letters without parenthesis represent the pin numbers for 1/2 of the dual circuit, letters in parenthesis represent the pin numbers for the other half.



ELECTRICAL CHARACTERISTICS (V_{CC} = +15 Vdc, V_{EE} = −15 Vdc, T_A = +25°C unless otherwise noted.)

Characteristic	Symbol	MCCF1558			MCCF1458			Unit
		Min	Typ	Max	Min	Typ	Max	
Input Bias Current	I_{IB}	–	0.2	0.5	–	0.2	0.5	μAdc
Input Offset Current	$\|I_{IO}\|$	–	0.03	0.2	–	0.03	0.2	μAdc
Input Offset Voltage ($R_S \leq$ 10 k ohms)	$\|V_{IO}\|$	–	1.0	5.0	–	2.0	6.0	mVdc
Differential Input Impedance (Open-Loop, f = 20 Hz)								
Parallel Input Resistance	R_p	–	1.0	–	–	1.0	–	Megohm
Parallel Input Capacitance	C_p	–	6.0	–	–	6.0	–	pF
Common-Mode Input Impedance (f = 20 Hz)	z_{in}	–	200	–	–	200	–	Megohms
Common-Mode Input Voltage Swing	V_{IC}	–	±13	–	–	±13	–	Vpk
Common-Mode Rejection Ratio (f = 100 Hz)	CMRR	–	90	–	–	90	–	dB
Open-Loop Voltage Gain (V_O = ±10 V, R_L = 2.0 k ohms)	A_{vol}	50,000	200,000	–	20,000	100,000	–	V/V
Power Bandwidth (A_v = 1, R_L = 2.0 k ohms, THD ≤ 5%, v_O = 20 Vp-p)	P_{BW}	–	14	–	–	14	–	kHz
Unity Gain Crossover Frequency (open-loop)		–	1.1	–	–	1.1	–	MHz
Phase Margin (open-loop, unity gain)		–	65	–	–	65	–	degrees
Gain Margin		–	11	–	–	11	–	dB
Slew Rate (Unity Gain)	dV_O/dt	–	0.8	–	–	0.8	–	V/μs
Output Impedance (f = 20 Hz)	z_O	–	75	–	–	75	–	ohms
Short-Circuit Output Current	I_S	–	20	–	–	20	–	mAdc
Output Voltage Swing (R_L = 10 k ohms)	V_O	±12	±14	–	±12	±14	–	Vpk
Power Supply Sensitivity								μV/V
V_{EE} = constant, $R_s \leq$ 10 k ohms	S^+	–	30	150	–	30	150	
V_{CC} = constant, $R_s \leq$ 10 k ohms	S^-	–	30	150	–	30	150	
Power Supply Current	I_{DCC}	–	2.3	5.0	–	2.3	5.6	mAdc
	I_{DEE}	–	2.3	5.0	–	2.3	5.6	
DC Quiescent Power Dissipation (V_O = 0)	P_D	–	70	150	–	70	170	mW

See current MC1558/MC1458 data sheet for additional information.



The popular 1558 type dual operational amplifier is now available in three chip forms: 1) conventional chips, 2) beam-lead chips and 3) flip-chips, as well as in a variety of plastic and hermetic packages. *The flip-chip consists of a silicon chip* with solder bumps on the geometry surface to provide easy mechanical mounting and electrical connection. These devices are protected by a thin layer of phosphorsilicate passivation which covers the interconnect metalization and active areas of the die.

Care must be exercised when removing the dice from the shipping carrier to avoid scratching the solder bumps. A vacuum pickup is useful for the handling of dice. Tweezers are not recommended for this purpose.

The non-spill type shipping carrier consists of a compartmentalized tray and fitted cover. Die are placed in the carrier with geometry side up.

MCCF1709
MCCF1709C

OPERATIONAL AMPLIFIERS

MONOLITHIC OPERATIONAL AMPLIFIER FLIP-CHIP

. . . designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

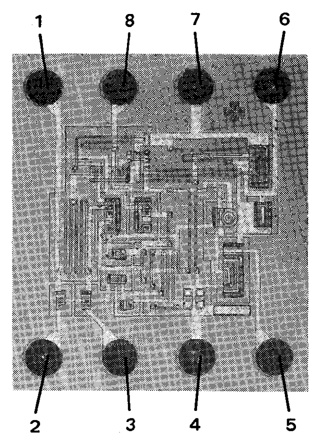
The MCCF1709 and MCCF1709C employ phosphorsilicate passivation that protects the entire die surface area, including metalization interconnects. The bumps are 95-5 solder on a chrome-copper-gold base. The interconnecting metalization is evaporated aluminum.

- High-Performance Open Loop Gain Characteristics
  A_{vol} = 45,000 typical
- Low Temperature Drift – ±3.0 μV/^{o}C
- Large Output Voltage Swing – ±14 V typical @ ±15 V Supply
- Low Output Impedance – z_o = 150 ohms typical

FLIP-CHIP

OPERATIONAL AMPLIFIER

MONOLITHIC SILICON INTEGRATED CIRCUIT



MAXIMUM RATINGS (T_A = +25^{o}C unless otherwise noted.)

Rating		Symbol	Value	Unit
Power Supply Voltage		V_{CC} V_{EE}	+18 -18	Vdc
Differential Input Signal		V_{ID}	±5.0	Volts
Common Mode Input Swing		V_{IC}	±V_S	Volts
Load Current		I_L	10	mA
Output Short Circuit Duration		t_S	5.0	s
Operating Temperature Range	MCCF1709 MCCF1709C	T_A	-55 to +125 0 to +75	^{o}C
Junction Temperature Range		T_J	-55 to +150	^{o}C

FIGURE 1 – CIRCUIT SCHEMATIC

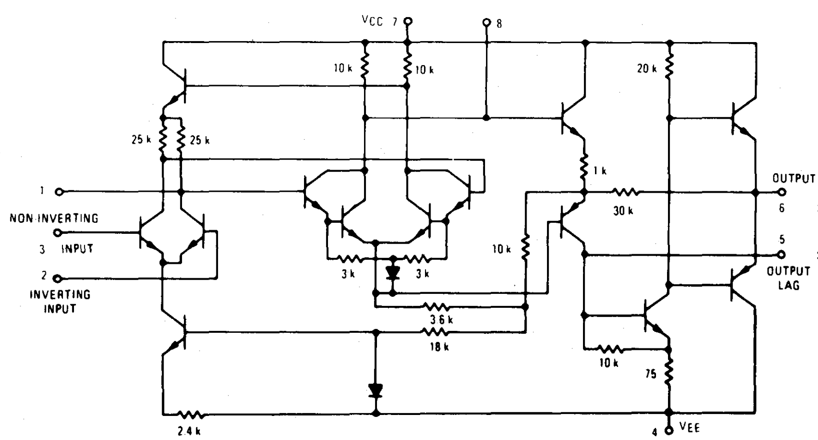
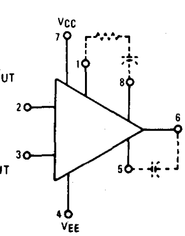


FIGURE 2 – EQUIVALENT CIRCUIT



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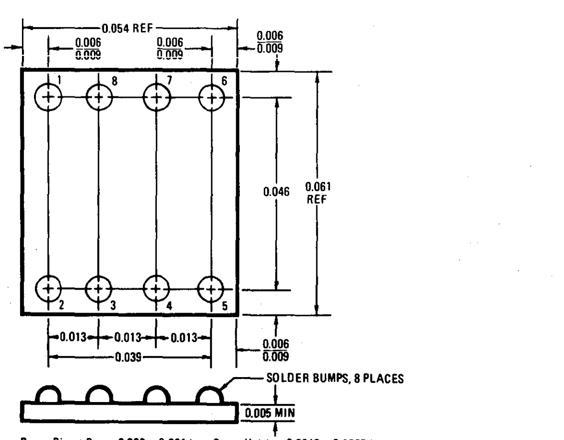
ELECTRICAL CHARACTERISTICS (V_{CC} = +15 Vdc, V_{EE} = -15 Vdc, T_A = +25°C unless otherwise noted.)

Characteristic	Symbol	MCCF1709 Min	MCCF1709 Typ	MCCF1709 Max	MCCF1709C Min	MCCF1709C Typ	MCCF1709C Max	Unit
Open Loop Voltage Gain (V_O = ±10V)	A_{vol}	25,000	45,000	70,000	15,000	45,000	–	–
Output Impedance (f = 20 Hz)	z_o	–	150	–	–	150	–	Ω
Input Impedance (f = 20 Hz)	z_{in}	–	400	–	–	250	–	kΩ
Output Voltage Swing (R_L = 10 kΩ) (R_L = 2.0 kΩ)	V_O	 ±12 ±10	 ±14 ±13	 – –	 ±12 ±10	 ±14 ±13	 – –	V_{peak}
Input Common-Mode Voltage Swing	V_{IC}	–	±10	–	–	±10	–	V_{peak}
Common-Mode Rejection Ratio (f = 20 Hz)	CMRR	–	90	–	–	90	–	dB
Input Bias Current	I_{IB}	–	0.2	0.5	–	0.3	1.5	μA
Input Offset Current	$\lvert I_{IO} \rvert$	–	0.05	0.2	–	0.1	0.5	μA
Input Offset Voltage	$\lvert V_{IO} \rvert$	–	1.0	5.0	–	2.0	7.5	mV
Step Response Gain = 100, 5.0% overshoot	t_{THL} t_d dV_O/dt	– – –	0.8 0.38 12	– – –	– – –	0.8 0.38 12	– – –	μs μs V/μs
Gain = 10, 10% overshoot	t_{THL} t_d dV_O/dt	– – –	0.6 0.34 1.7	– – –	– – –	0.6 0.34 1.7	– – –	μs μs V/μs
Gain = 1, 5.0% overshoot	t_{THL} t_d dV_O/dt	– – –	2.2 1.3 0.25	– – –	– – –	2.2 1.3 0.25	– – –	μs μs V/μs
Power Supply Current	I_{DCC} I_{DEE}	– –	2.7 2.7	5.5 5.5	– –	2.7 2.7	6.7 6.7	mAdc
DC Quiescent Power Dissipation (Power Supply = ±15 V, V_O = 0)	P_D	–	80	165	–	80	200	mW
Positive Supply Sensitivity (V_{EE} constant)	S^+	–	25	150	–	25	200	μV/V
Negative Supply Sensitivity (V_{CC} constant)	S^-	–	25	150	–	25	200	μV/V

See current MC1709/1709C data sheet for additional information.



Bump Dia. at Base: 0.006 ± 0.001 in. Bump Height: 0.0040 ± 0.0005 in.
Each bump centerline to be located within 0.001 in. of its true position with respect to any other bump centerline.

PACKAGING AND HANDLING

The popular 1709 type operational amplifier is now available in three chip forms: 1) conventional chips, 2) beam-lead chips and 3) flip-chips, as well as in a variety of plastic and hermetic packages. The flip-chip consists of a silicon chip with solder bumps on the geometry surface to provide easy mechanical mounting and electrical connection. These devices are protected by a thin layer of phosphorsilicate passivation which covers the interconnect metalization and active areas of the die.

Care must be exercised when removing the dice from the shipping carrier to avoid scratching the solder bumps. A vacuum pickup is useful for the handling of dice. Tweezers are not recommended for this purpose.

The non-spill type shipping carrier consists of a compartmentalized tray and fitted cover. Die are placed in the carrier with geometry side up.

MCCF1741
MCCF1741C

INTERNALLY COMPENSATED, HIGH PERFORMANCE MONOLITHIC FLIP-CHIP OPERATIONAL AMPLIFIER

. . . designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

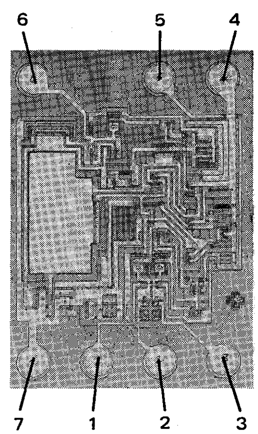
The MCCF1741 and MCCF1741C employ phosphorsilicate passivation that protects the entire die surface area, including metalization interconnects. The bumps are 95-5 solder on a chrome-copper-gold base. The interconnecting metalization is evaporated aluminum.

- No Frequency Compensation Required
- Short-Circuit Protection
- Offset Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low-Power Consumption
- No Latch Up

FLIP-CHIP

OPERATIONAL AMPLIFIER

MONOLITHIC SILICON INTEGRATED CIRCUIT



MAXIMUM RATINGS (T_A = +25°C unless otherwise noted.)

Rating	Symbol	Value		Unit
		MCCF1741C	MCCF1741	
Power Supply Voltage	V_{CC} V_{EE}	+18 -18	+22 -22	Vdc
Differential Input Signal	V_{ID}	±30		Volts
Common Mode Input Swing (Note 1)	V_{IC}	+15		Volts
Output Short Circuit Duration (Note 2)	t_S	Continuous		
Operating Temperature Range	T_A	0 to +75	-55 to +125	°C
Junction Temperature Range	T_J	-65 to +150		°C

Note 1. For supply voltages less than ± 15 V, the absolute maximum input voltage is equal to the supply voltage.

Note 2. Supply voltage equal to or less than 15 V.

FIGURE 1 – CIRCUIT SCHEMATIC

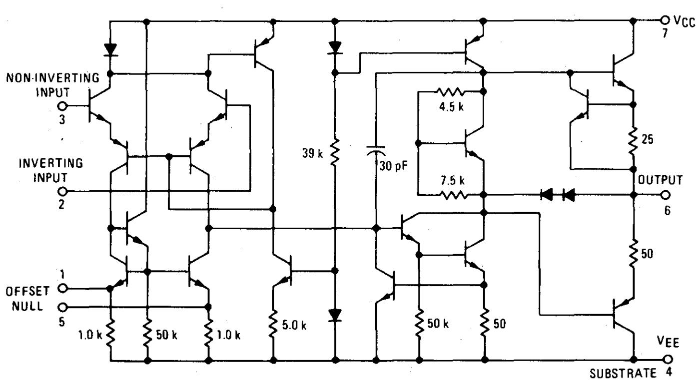
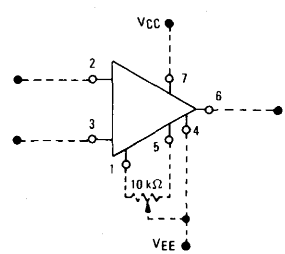


FIGURE 2 – OFFSET ADJUST CIRCUIT

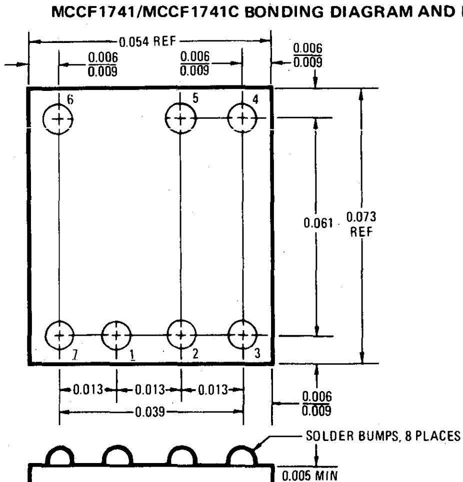


ELECTRICAL CHARACTERISTICS (V_{CC} = +15 Vdc, V_{EE} = 15 Vdc, T_A = +25°C unless otherwise noted.)

Characteristic	Symbol	MCCF1741			MCCF1741C			Unit
		Min	Typ	Max	Min	Typ	Max	
Open Loop Voltage Gain (R_L = 2.0 kΩ) (V_O = ±10 V)	A_{vol}	50,000	200,000	—	20,000	100,000	—	—
Output Impedance (f = 20 Hz)	z_o	—	75	—	—	75	—	Ω
Input Impedance (f = 20 Hz)	z_{in}	—	1.0	—	—	1.0	—	Meg Ω
Output Voltage Swing (R_L = 10 kΩ)	V_O	±12	±14	—	±12	±14	—	V_{peak}
(R_L = 2.0 kΩ)		±10	±13	—	±10	±13	—	
Input Common-Mode Voltage Swing	V_{IC}	—	±13	—	—	±13	—	V_{peak}
Common-Mode Rejection Ratio (f = 20 Hz)	CMRR	—	90	—	—	90	—	dB
Input Bias Current	I_{IB}	—	0.2	0.5	—	0.2	0.5	µA
Input Offset Current	$\|I_{IO}\|$	—	0.03	0.2	—	0.03	0.2	µA
Input Offset Voltage (R_S = ≦ 10 kΩ)	$\|V_{IO}\|$	—	1.0	5.0	—	2.0	6.0	mV
Step Response Gain = 100	t_{THL}	—	29	—	—	29	—	µs
	t_d	—	8.5	—	—	8.5	—	µs
	dV_O/dt (1)	—	1.0	—	—	1.0	—	V/µs
Gain = 10	t_{THL}	—	3.0	—	—	3.0	—	µs
	t_d	—	1.0	—	—	1.0	—	µs
	dV_O/dt (1)	—	1.0	—	—	1.0	—	V/µs
Gain = 1	t_{THL}	—	0.6	—	—	0.6	—	µs
	t_d	—	0.38	—	—	0.38	—	µs
	dV_O/dt (1)	—	0.8	—	—	0.8	—	V/µs
Power Supply Current	I_{DCC}	—	1.67	2.83	—	1.67	2.83	mA
	I_{DEE}	—	1.67	2.83	—	1.67	2.83	
DC Quiescent Power Dissipation (Power Supply = ± 15 V, V_o = 0)	P_D	—	50	85	—	50	85	mW
Positive Supply Sensitivity (V_{EE} constant)	S^+	—	30	150	—	30	150	µV/V
Negative Supply Sensitivity (V_{CC} constant)	S^-	—	30	150	—	30	150	µV/V

(1) dV_O/dt = Slew Rate   See current MC1741/1741C data sheet for additional information.

MCCF1741/MCCF1741C BONDING DIAGRAM AND DEVICE DIMENSIONS



Bump Dia. at Base: 0.006 ± 0.001 in. Bump Height: 0.0040 ± 0.0005 in.
Each bump centerline to be located within 0.001 in. of its true position with respect to any other bump centerline.

PACKAGING AND HANDLING

The popular 1741 type operational amplifier is now available in three chip forms: 1) conventional chips, 2) beam-lead chips and 3) flip-chips, as well as in a variety of plastic hermetic packages. The flip-chip consists of a silicon chip with solder bumps on the geometry surface to provide easy mechanical mounting and electrical connection. These devices are protected by a thin layer of phosphorsilicate passivation which covers the interconnect metalization and active areas of the die.

Care must be exercised when removing the dice from the shipping carrier to avoid scratching the solder bumps. A vacuum pickup is useful for the handling of dice. Tweezers are not recommended for this purpose.

The non-spill type shipping carrier consists of a compartmentalized tray and fitted cover. Die are placed in the carrier with geometry side up.

MCCF3503
MCCF3403
MCCF3303

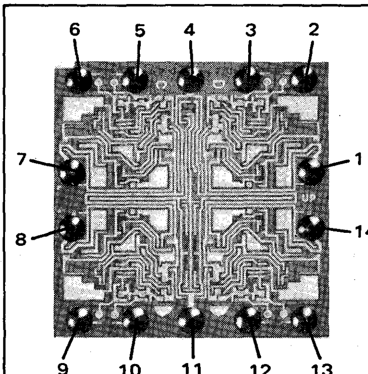
QUAD LOW POWER OPERATIONAL AMPLIFIER FLIP-CHIPS

. . . low-cost, quad operational amplifiers, with true differential inputs. This amplifier can operate at supply voltages as low as 3.0 Volts or as high as 36 Volts with quiescent currents about one-third of those associated with the MCCF1741 (on a per amplifier basis). The common mode input range includes the negative supply, thereby eliminating the necessity for external biasing components in many applications. The output voltage range also includes the negative power supply voltage.

- Short Circuit Protected Outputs
- Class AB Output Stage for Minimal Crossover Distortion
- Split Supply Operation: ± 1.5 to ± 18 Volts
- Low Input Bias Currents: 500 nA Max
- Internally Compensated

QUAD DIFFERENTIAL INPUT OPERATIONAL AMPLIFIERS

SILICON MONOLITHIC INTEGRATED CIRCUIT

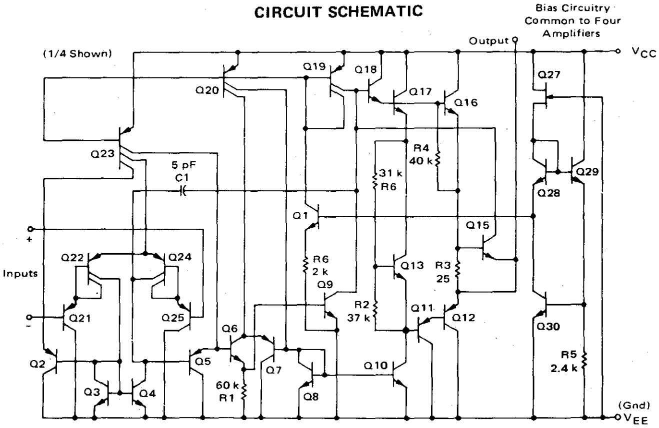


MAXIMUM RATINGS

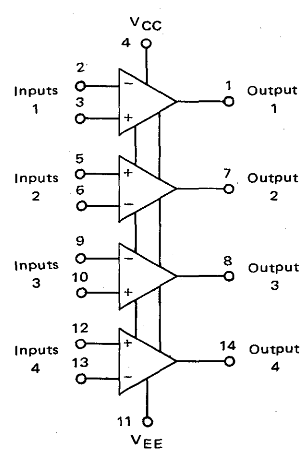
Rating	Symbol	Value	Unit
Power Supply Voltages			Vdc
Single Supply	V_{CC}	36	
Split Supplies	V_{CC}	+18	
	V_{EE}	-18	
Input Differential Voltage Range (1)	V_{IDR}	±30	Vdc
Input Common Mode Voltage Range (1) (2)	V_{ICR}	±15	Vdc
Storage Temperature Range	T_{stg}		°C
Ceramic Package		-65 to +150	
Plastic Package		-55 to +125	
Operating Ambient Temperature Range	T_A		°C
MCCF3503		-55 to +125	
MCCF3403		0 to +70	
MCCF3303		-40 to +85	

(1) Split Power Supplies.
(2) For Supply Voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.

CIRCUIT SCHEMATIC



EQUIVALENT CIRCUIT



ELECTRICAL CHARACTERISTICS (V_{CC} = +15 V, V_{EE} = -15 V, T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	MCCF3503 Min	MCCF3503 Typ	MCCF3503 Max	MCCF3403 Min	MCCF3403 Typ	MCCF3403 Max	MCCF3303 Min	MCCF3303 Typ	MCCF3303 Max	Unit
Input Offset Voltage	V_{IO}	–	2.0	5.0	–	2.0	10	–	2.0	8.0	mV
Input Offset Current	I_{IO}	–	30	50	–	30	50	–	30	75	nA
Large Signal Open-Loop Voltage Gain V_O = ±10 V, R_L = 2.0 kΩ, T_A = T_{high} to T_{low}	A_{VOL}	 50 25	 200 300	 – –	 20 15	 200 –	 – –	 20 15	 200 –	 – –	V/mV
Input Bias Current	I_{IB}	–	-200	-500	–	-200	-500	–	-200	-500	nA
Output Voltage Range R_L = 10 kΩ R_L = 2.0 kΩ	V_{OR}	 ±12 ±10	 ±13.5 ±13	 – –	 ±12 ±10	 ±13.5 ±13	 – –	 ±12 ±10	 ±12.5 ±12	 – –	V
Common-Mode Rejection Ratio $R_S \leq$ 10 kΩ	CMRR	70	90	–	70	90	–	70	90	–	dB
Power Supply Current (V_O = 0) R_L = ∞	I_{CC},I_{EE}	–	2.8	4.0	–	2.8	7.0	–	2.8	7.0	mA
Individual Output Short-Circuit Current (2)	$I_{OS\pm}$	±10	±30	±45	±10	±20	±45	±10	±30	±45	mA
Positive Power Supply Rejection Ratio	PSRR+	–	30	150	–	30	150	–	30	150	μV/V
Negative Power Supply Rejection Ratio	PSRR-	–	30	150	–	30	150	–	30	150	μV/V
Average Temperature Coefficient of Input	$\Delta I_{IO}/\Delta T$	–	50	–	–	50	–	–	50	–	pA/°C

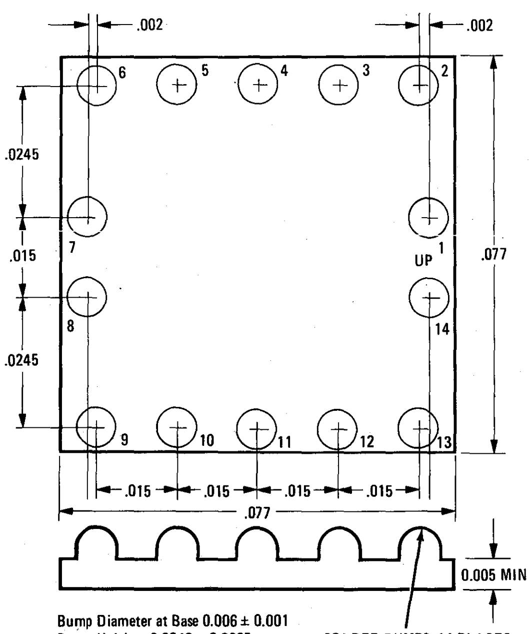
ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0 V, V_{EE} = Gnd, T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	MCCF3503 Min	MCCF3503 Typ	MCCF3503 Max	MCCF3403 Min	MCCF3403 Typ	MCCF3403 Max	MCCF3303 Min	MCCF3303 Typ	MCCF3303 Max	Unit
Input Offset Voltage	V_{IO}	–	2.0	5.0	–	2.0	10	–	–	10	mV
Input Offset Current	I_{IO}	–	30	50	–	30	50	–	–	75	nA
Input Bias Current	I_{IB}	–	-200	-500	–	-200	-500	–	–	-500	nA
Large-Signal Open-Loop Voltage Gain R_L = 2.0 kΩ	A_{VOL}	20	200	–	20	200	–	20	200	–	V/mV
Power Supply Rejection Ratio	PSRR	–	–	150	–	–	150	–	–	150	μV/V
Output Voltage Range (3) R_L = 10 kΩ, V_{CC} = 5.0 V R_L = 10 kΩ, 5.0 V ≤ V_{CC} ≤ 30 V	V_{OR}	 3.3 V_{CC}-1.7	 3.5 V_{CC}-1.5	 – –	 3.3 V_{CC}-1.7	 3.5 V_{CC}-1.5	 – –	 3.3 V_{CC}-1.7	 3.5 V_{CC}-1.5	 – –	Vp-p
Power Supply Current	I_{CC}	–	2.5	4.0	–	2.5	7.0	–	2.5	7.0	mA
Channel Separation f = 1.0 kHz to 20 kHz (Input Referenced)	–	–	-120	–	–	-120	–	–	-120	–	dB

(1) Output will swing to ground

4

MCCF3503/MCCF3403/MCCF3303 BONDING DIAGRAM AND DEVICE DIMENSIONS



PACKAGING AND HANDLING

The popular 3503 type quad operational amplifier is now available in two chip forms: 1) conventional chips, and 2) flip-chips, as well as in a variety of plastic and hermetic packages. The flip-chip consists of a silicon chip with solder bumps (90-10 solder on a chrome-copper-gold base) on the geometry surface to provide easy mechanical mounting and electrical connection. These devices are protected by a thin layer of phosphorsilicate passivation which covers the interconnect metallization and active areas of the die.

Care must be exercised when removing the dice from the shipping carrier to avoid scratching the solder bumps. A vacuum pickup is useful for the handling of dice. Tweezers are not recommended for this purpose.

The non-spill type shipping carrier consists of a compartmentalized tray and fitted cover. Die are placed in the carrier with geometry side up.

CHAPTER 5
Linear Integrated Circuits

5

LINEAR INTEGRATED CIRCUIT CHIPS

GENERAL DESCRIPTION

Motorola now offers a very broad selection of linear integrated circuit chips. Among the types of circuits which compose the linear family there are:

A. Operational Amplifiers
B. Voltage Regulators
C. Comparators
D. Drivers and Receivers
E. Sense Amplifiers
F. D/A and A/D Converters

As a general rule of thumb, all linear chips from Motorola are 100% unit probed to the D.C. parameters given in Volume 6 of the Semiconductor Data Library. For specific information on electrical parameters which are probed contact the nearest Motorola Sales Office.

STANDARD FEATURES FOR LINEAR INTEGRATED CIRCUIT CHIPS

All linear integrated circuit chips . . .

- are 100% electrically tested to sufficient parameter limits (min/max) to permit distinct identification as either premium or industrial versions
- employ phosphorsilicate passivation which protects the entire active surface area including metallization interconnects during shipping and handling
- are 100% visually inspected to a modified criteria per MIL-STD-883, Method 2010, Condition B
- incorporate a minimum of 4000 Å gold backing to ensure positive adherence bonding

GENERAL PHYSICAL CHARACTERISTICS OF LINEAR CHIPS

The following characteristics represent the vast majority of all Motorola linear chips. Since an individual chip type may vary slightly, contact your local sales office for information regarding physical characteristics critical to a specific application. The overall size and final metallization patterns are shown in the following pages; however the geometries shown and MIC numbers listed are current at the date of printing. Since we are constantly striving to improve the quality, performance, and yield of our linear devices we cannot be responsible for changes at future dates. Please contact your local Motorola Sales representative for the most current information.

A. Chips thickness: 8 ± 1 mil
B. Passivation: Phosphorsilicate
C. Passivation thickness: 5kÅ ± 1kÅ
D. Metallization: Aluminum
E. Metallization thickness: 12kÅ ± 2kÅ
F. Back metallization: Gold, alloyed
G. Bonding pad dimensions:
   Typical 4.0 mil x 5.0 mil
H. *Overall chip dimensions:*
   See pages that follow for individual device type. Tolerance of ±5 mils should be allowed.

HANDLING PRECAUTIONS

Although passivation on all chips provides protection in shipping and handling, care should be exercised to prevent damaging the face of the chip. A vacuum pickup is most useful for this purpose; tweezers are not recommended.

There are four basic requirements for handling devices in a prudent manner:

1. Store the chips in a covered or sealed container
2. Store devices in an environment of no more than 30% relative humidity
3. Process the chips in a non-inert atmosphere not exceeding 100°C, or in an inert atmosphere not exceeding 400°C.
4. Processing equipment should conform to the minimum standards that are normally employed by semiconductor manufacturers.

Motorola's engineering staff is available for consultation in the event of correlation or processing problems encountered in the use of Motorola linear chips. For assistance, please contact your nearest Motorola sales representative.

CHIP AND WAFER PACKAGING

Chips

Motorola's linear integrated circuit chips come Packaged to the customer in the Multi-Pak carrier. Refer to page 1-11, Figure 7.

Wafers

Motorola's linear integrated circuit wafers come packaged to the customer in the Wafer-Pak plastic bow. The wafer has been probed and rejects are designated by a red color dot on the die surface. Refer to page 1-8, Figure 2.

HOW TO ORDER LINEAR CHIPS OR WAFERS FROM MOTOROLA

1. Remove all suffix package designators from the desired device type. (EXAMPLE: MC1741CP1 now becomes MC1741C)
2. Add a C to the prefix designator if individual chips are desired. (EXAMPLE: MC1741C now is MCC1741C)

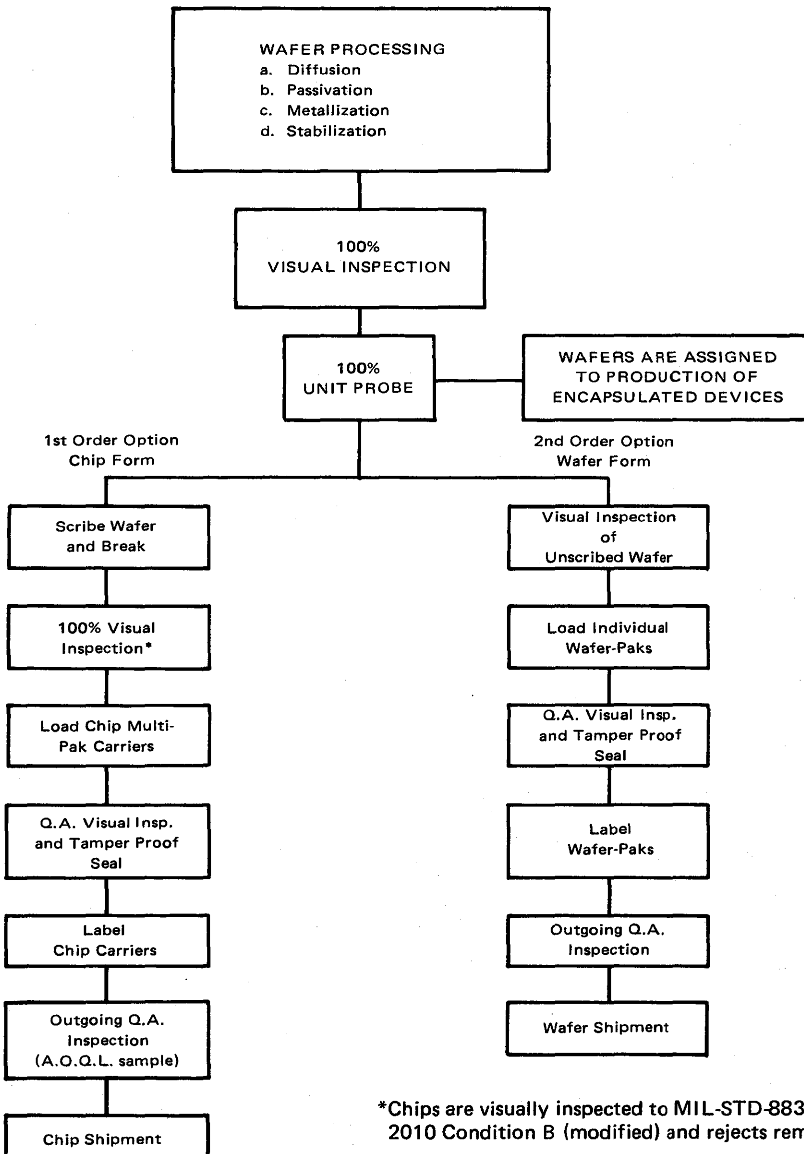
   Add a W to the prefix designator if a wafer is desired. (EXAMPLE: MC1741C now is MCW1741C)
3. When ordering chips, two options are available:
   a. The -1 suffix designator will deliver to you 10 chips per Multi-Pak, up to 1000 chips. (EXAMPLE: MCC1741C-1)

b. The -2 suffix designator will deliver to you 100 chips per Multi-Pak, minimum of 100 chips per order. (EXAMPLE: MC1741C-2)

4. Contact you local Motorola Sales Office or franchised distributor to place your order.

LINEAR CHIP PROCESSING FLOW CHART

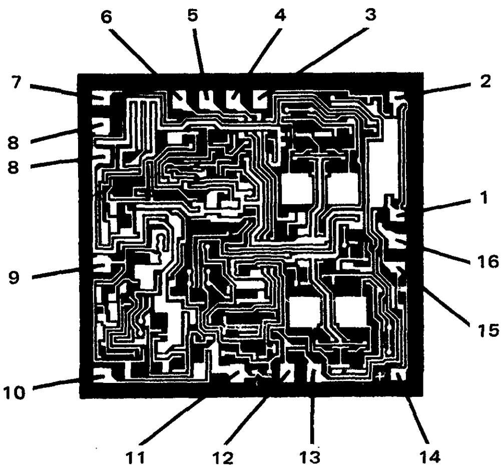
The linear integrated circuits offered in Motorola's Linear Chip line are subjected to the same in-process controls as Motorola's standard linear encapsulated devices. The chip processing and quality control requirements are designed to insure reliability and performance of the finished product.



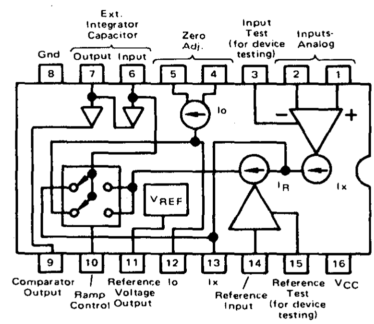
*Chips are visually inspected to MIL-STD-883 Method 2010 Condition B (modified) and rejects removed.

MCC1505/MCC1405 Analog-to-Digital Converter Subsystem

82 x 88

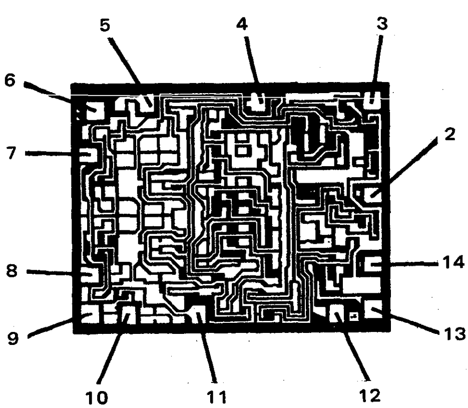


PIN CONNECTIONS



MCC1506/MCC1406 Six Bit, Multiplying Digital-to-Analog Converter

66 x 85



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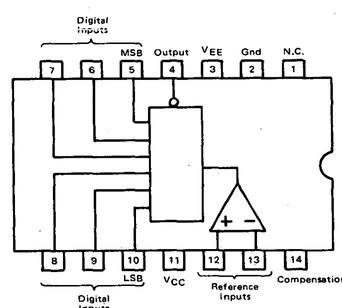
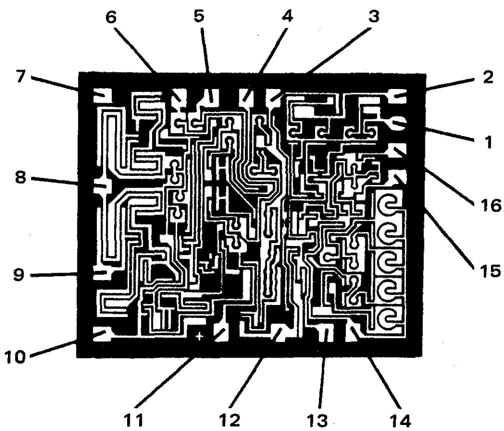


All dimensions are in mils.

MCC1507/MCC1407 Analog-to-Digital Control Circuit

72 x 88



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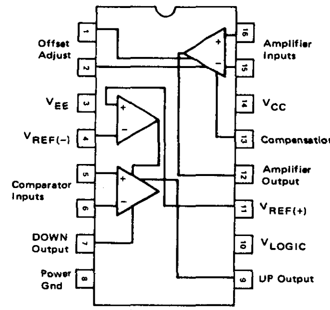
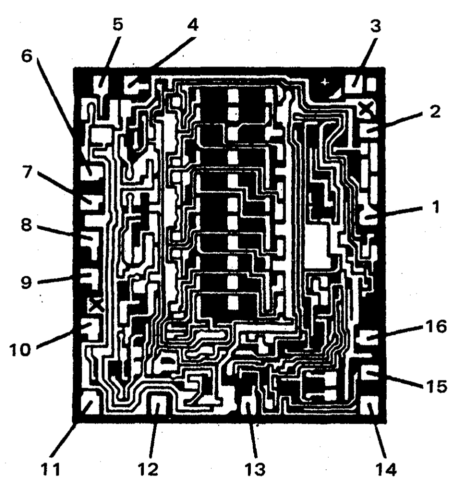


MCC1508/MCC1408 Eight-Bit Multiplying Digital-to-Analog Converter

84 x 94



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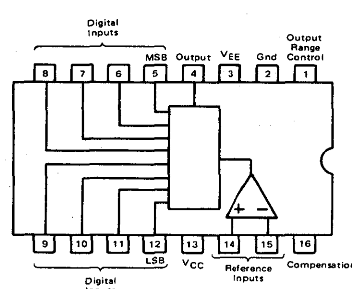

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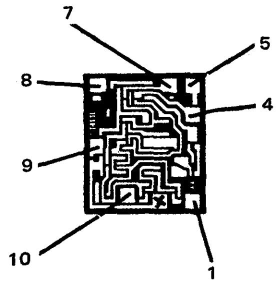
MCC1510/MCC1410 Video Amplifier

35 x 40



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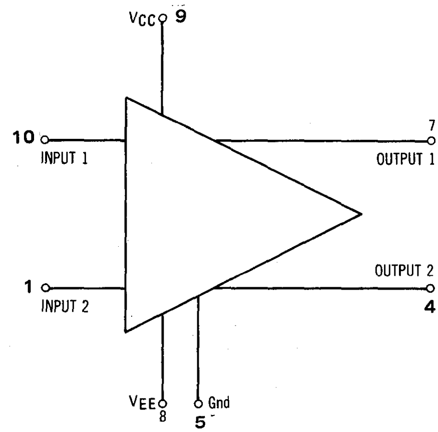
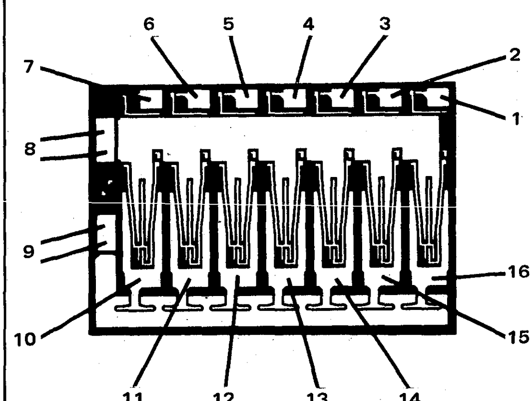


MCC1411/MCC1412/MCC1413
High Voltage, High Current Darlington Transistor Arrays

99 x 68



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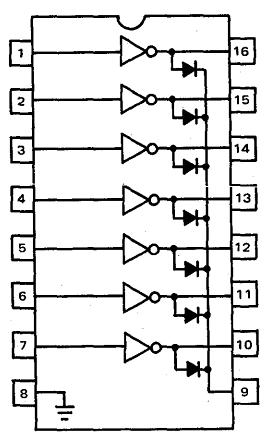
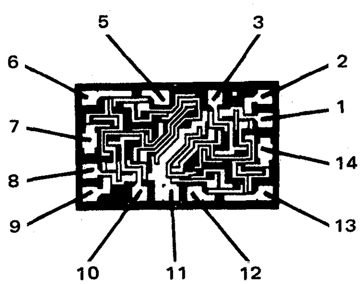


The MCC1411 features direct access to the transistor base for use in TTL or DTL systems. The MCC1412 provides a series zener diode and a 10.5KΩ resistor for PMOS systems while the MCC1413 provides only a 2.7KΩ resistor for CMOS systems.

MCC1514/MCC1414 Dual Differential Voltage Comparator

35 x 56



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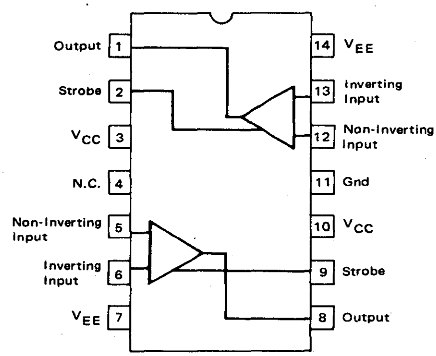
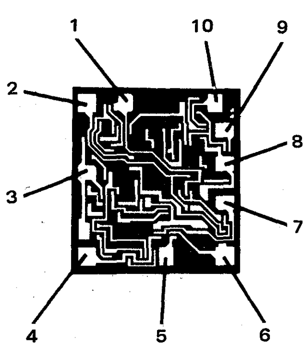


MCC1520/MCC1420 Differential Output Operational Amplifier

51 x 47



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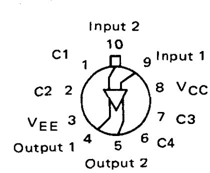
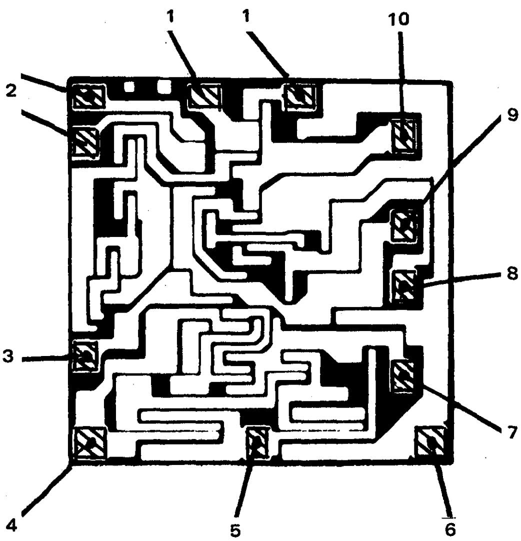


MCC1530/MCC1430 Operational Amplifier

60 x 60



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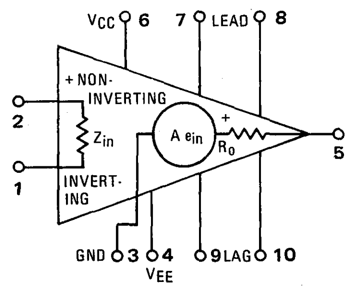
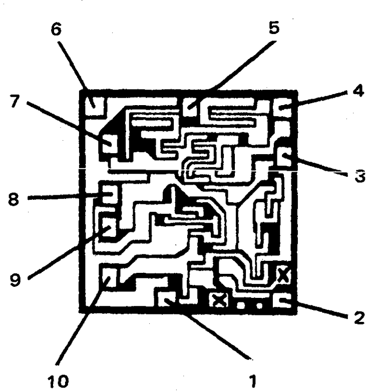


MCC1531/MCC1431 Operational Amplifier (Darlington Input)

60 x 60



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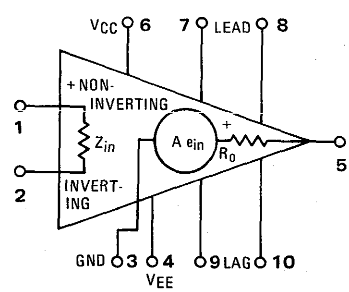
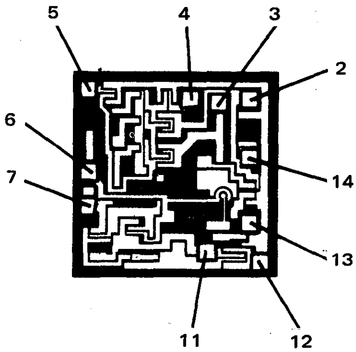


MCC1533/MCC1433 Operational Amplifier

55 x 55



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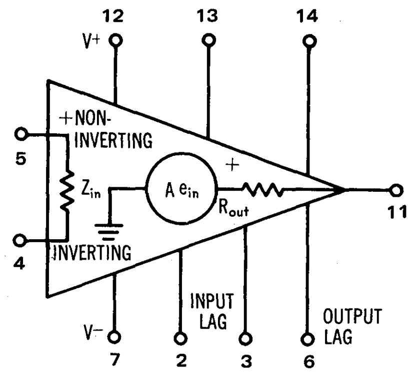
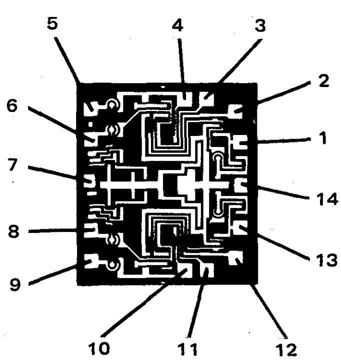


MCC1535/MCC1435 Dual Operational Amplifier

49 x 55



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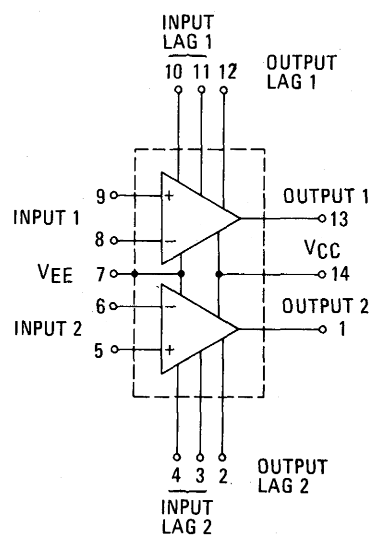
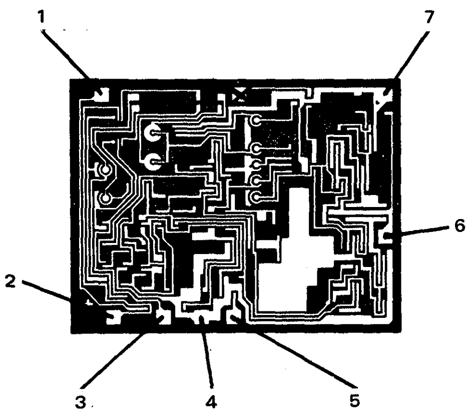


MCC1536/MCC1436
High Voltage, Internally Compensated Operational Amplifier

68 x 88



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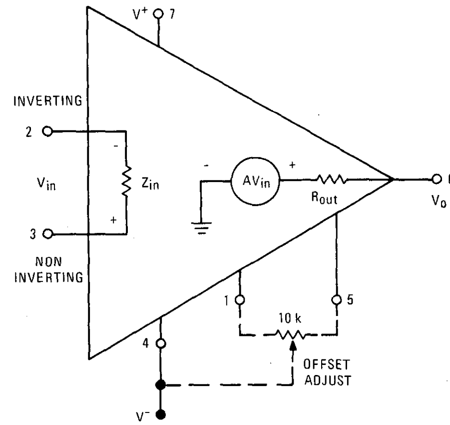
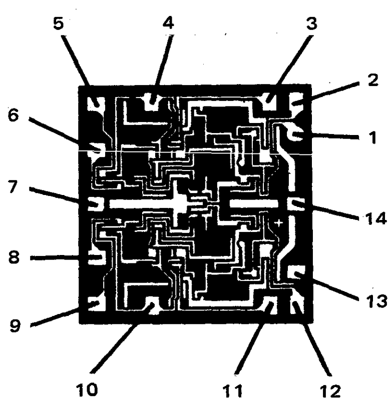


MCC1537/MCC1437 Highly Matched Dual Operational Amplifier

63 x 64



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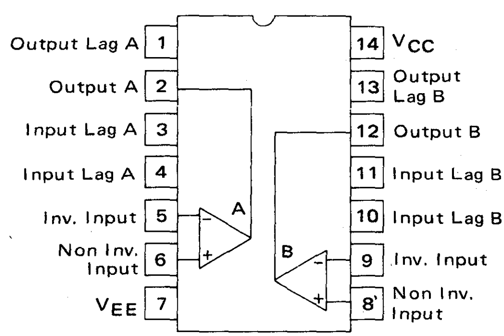
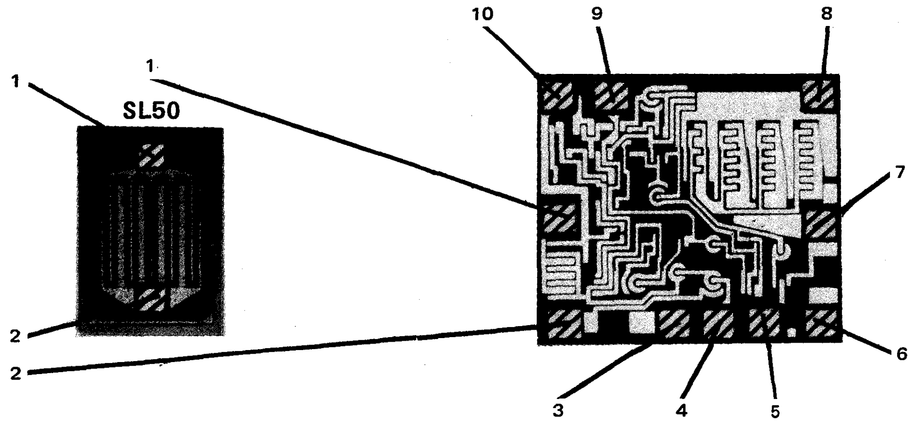


MCC1538/MCC1438 Operational Amplifier/Power Booster



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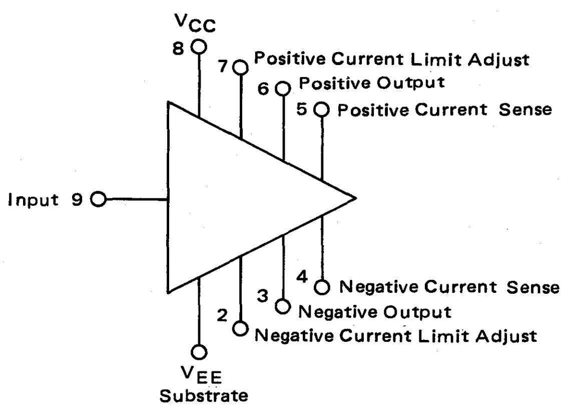
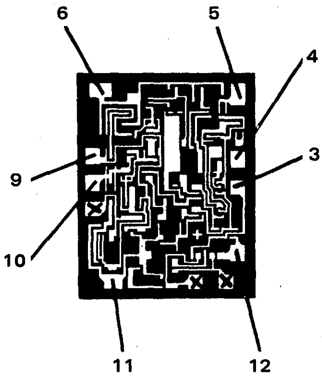


The MCC1538/MCC1438 requires a second chip (SL50 or SL56) to complete its function. Please consult factory or your nearest sales office or distributor.

MCC1539/MCC1439 Uncompensated Operational Amplifier

48 x 60



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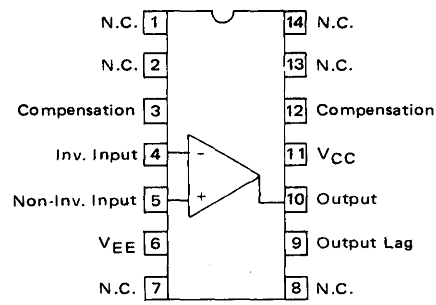
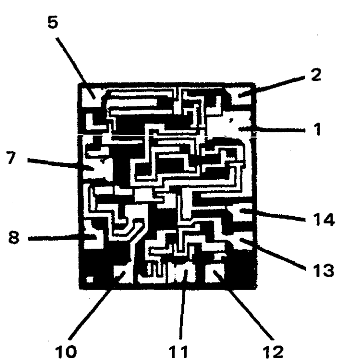


MCC1540/MCC1440 Core Memory Sense Amplifier

41 x 47



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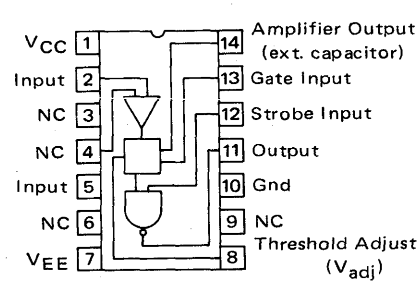
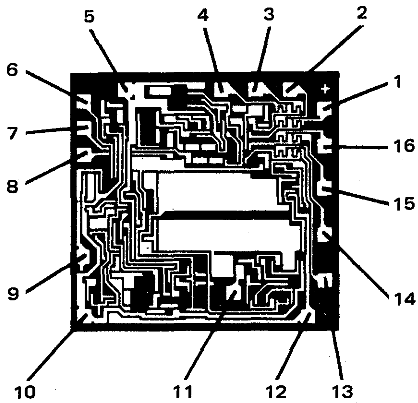


MCC1544/MCC1444 AC-Coupled Four-Channel Sense Amplifier

69 x 73



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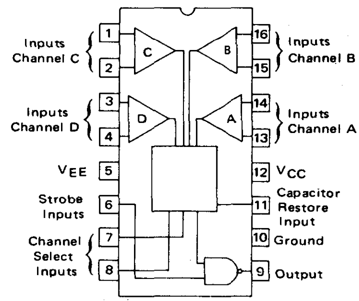
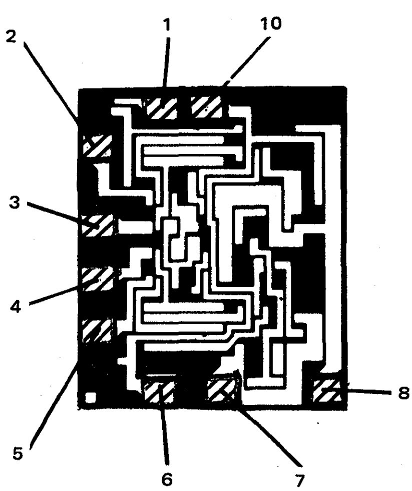


MCC1545/MCC1445
Gate Controlled Two-Channel-Input-Wideband Amplifier

39 x 46



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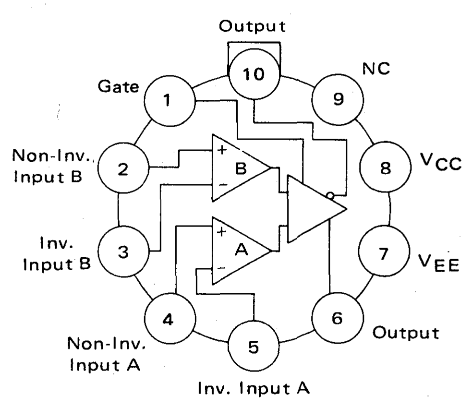
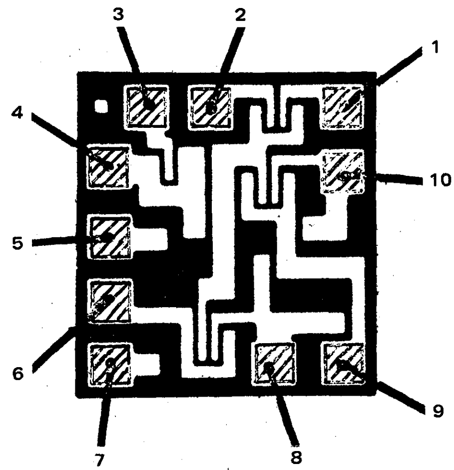


MCC1550 RF-IF Amplifier

30 x 32



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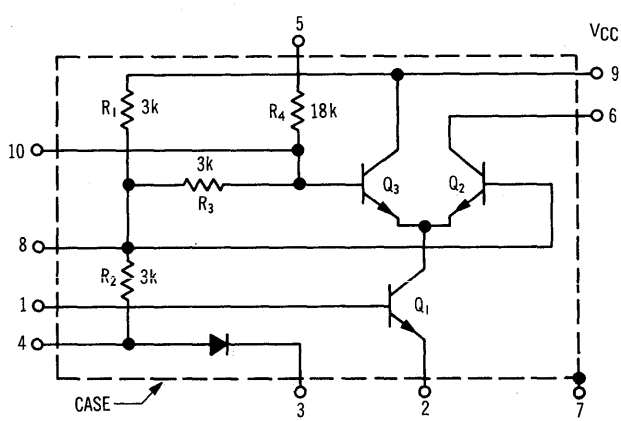
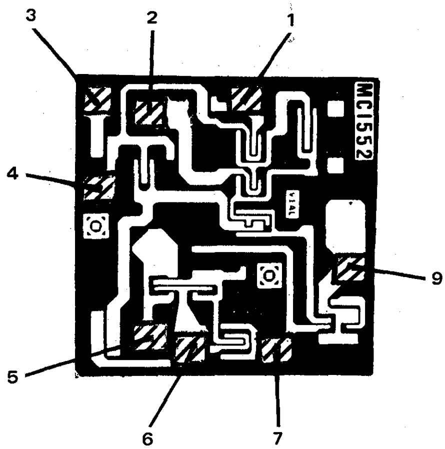


MCC1552 High Frequency Video Amplifier (Low Gain)

42 x 42



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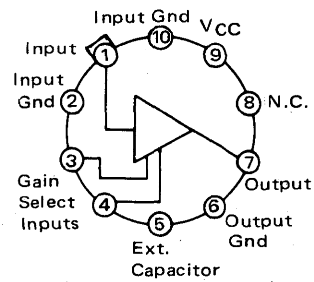
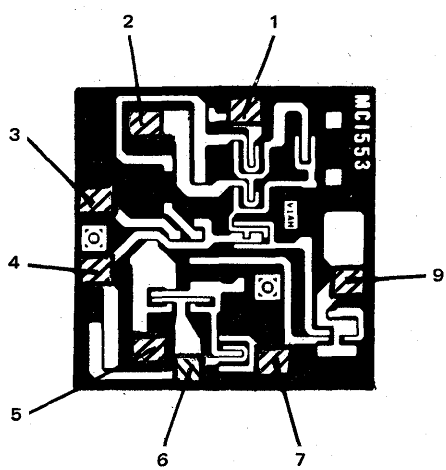


MCC1553 High Frequency Video Amplifier (High Gain)

42 x 42



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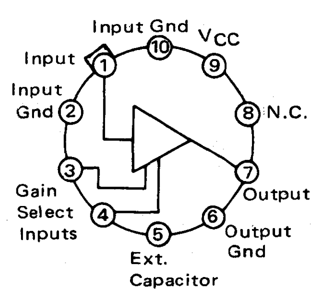
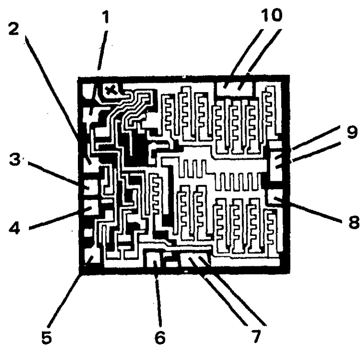


MCC1554/MCC1454 1-Watt Power Amplifier

54 x 58



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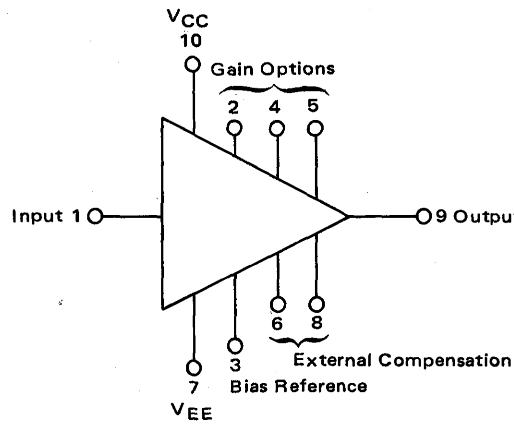

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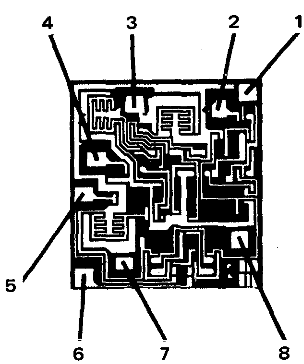
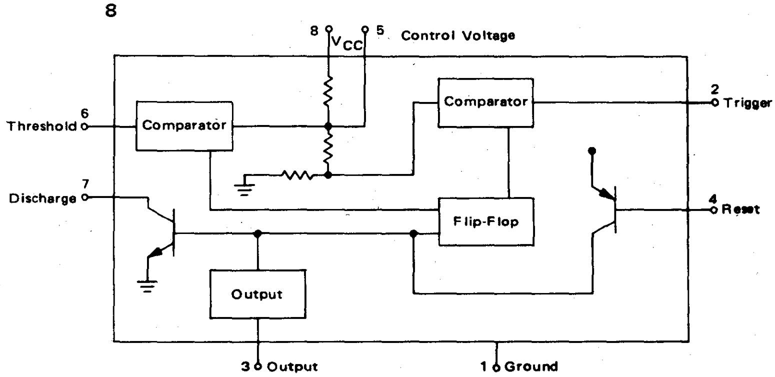
MCC1555/MCC1455 Timing Circuit



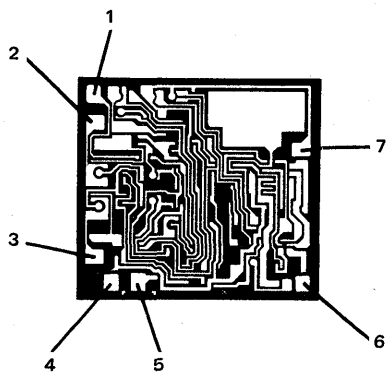
54 x 59

PIN CONNECTIONS



MCC1556/MCC1456
Internally Compensated, High Performance Operational Amplifier

60 x 65



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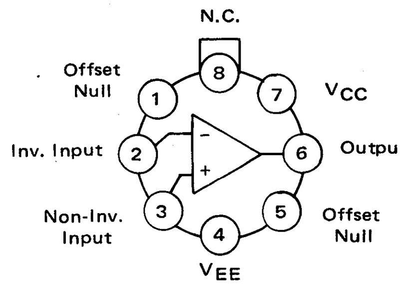
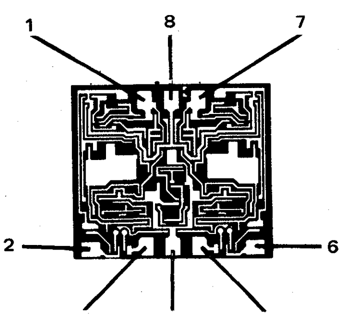


MCC1558/MCC1458
Dual MC1741 Internally Compensated, High Performance Operational Amplifier

54 x 49



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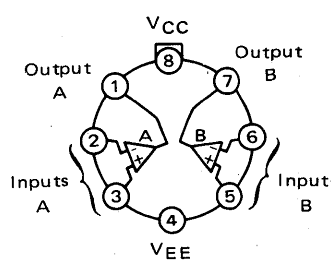
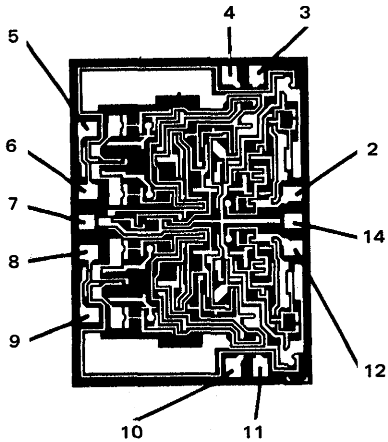


MCC1558S/MCC1458S Dual High Slew Rate Operational Amplifier

64 x 87



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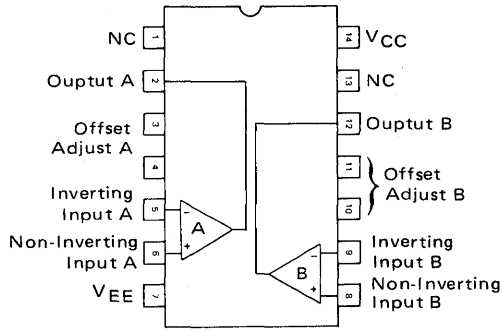
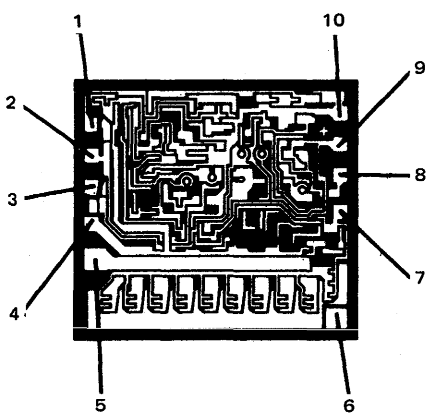
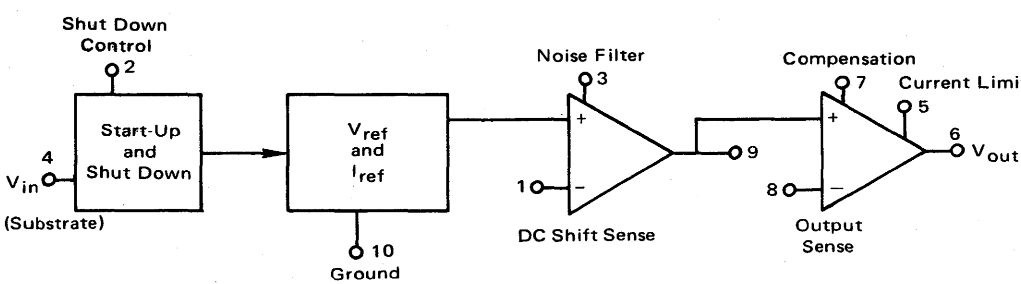


MCC1563/MCC1463 Negative Power Supply Voltage Regulator

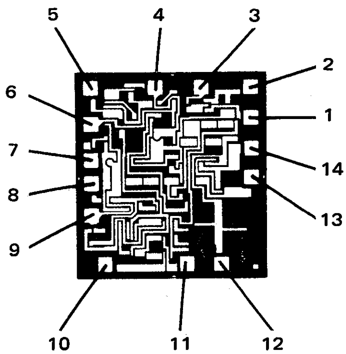


68 x 75

PIN CONNECTIONS

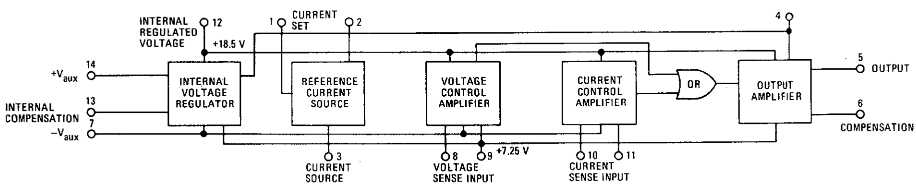


MCC1566/MCC1466 Precision Wide-Range Voltage and Current Regulator



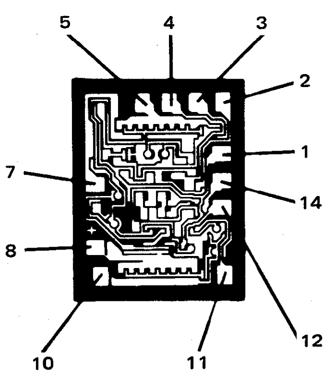
56 x 52

PIN CONNECTIONS

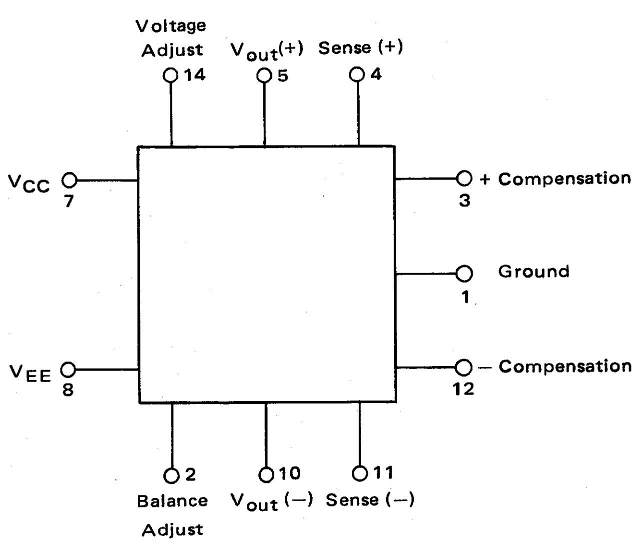


MCC1568/MCC1468 Dual ±15 Volt Tracking Regulator

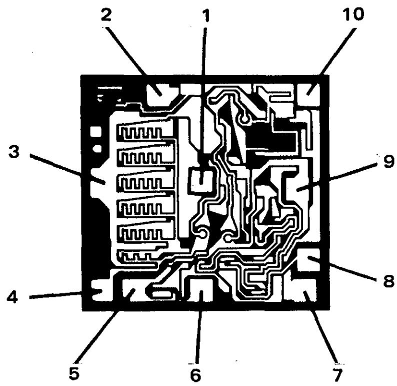
44 x 56



PIN CONNECTIONS

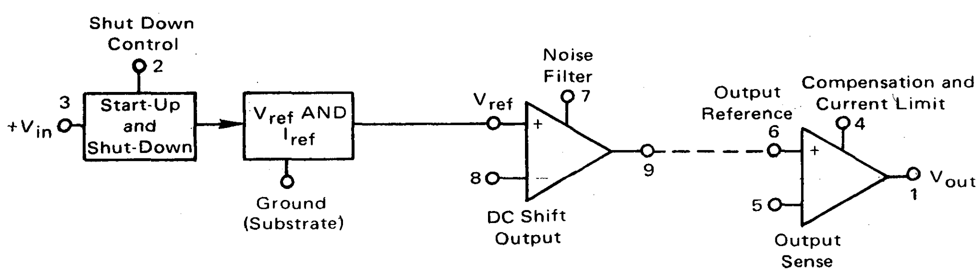


MCC1569/MCC1469 Positive Voltage Regulator



63 x 66

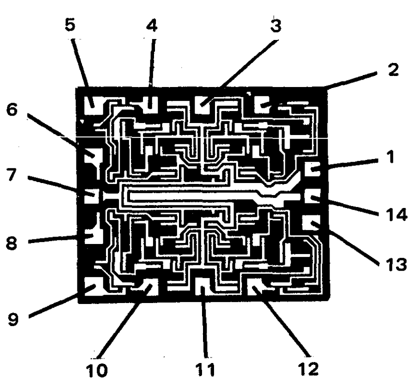
PIN CONNECTIONS



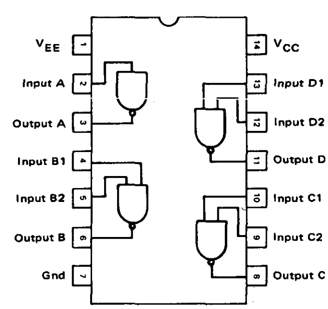
5

MCC1488 Quad MDTL Line Driver

68 x 58

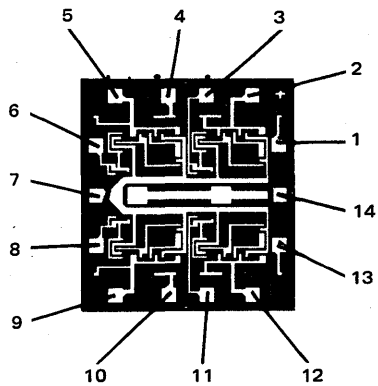


PIN CONNECTIONS

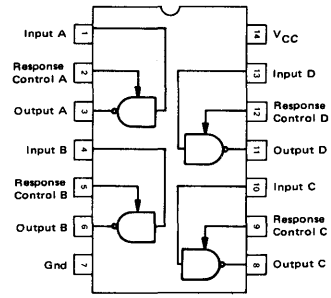


MCC1489/MCC1489A Quad MDTL Line Receiver

58 x 62



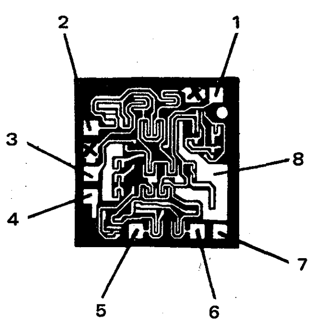
PIN CONNECTIONS



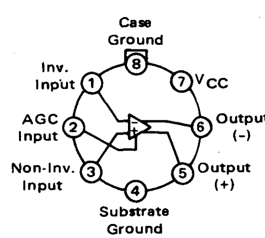
The MCC1489A provides increased hysteresis over the MCC1489

MCC1590 Wideband Amplifier With AGC

44 x 46

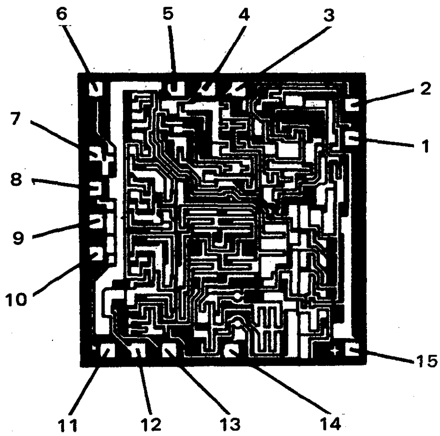


PIN CONNECTIONS

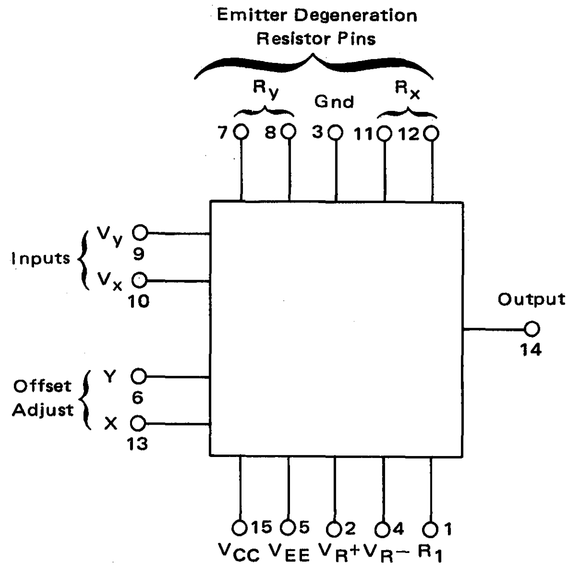


MCC1594/MCC1494 Linear Four-Quadrant Multiplier

78 x 77

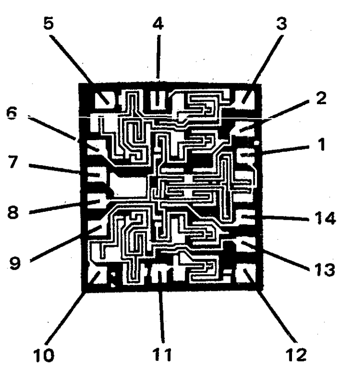


PIN CONNECTIONS

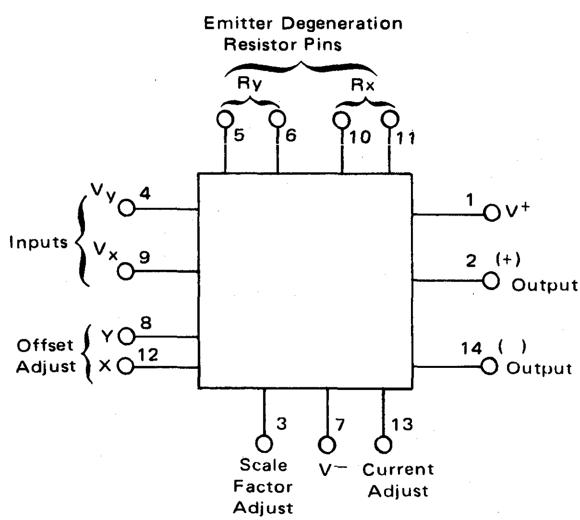


MCC1595/MCC1495 Linear Four-Quadrant Multiplier

50 x 56

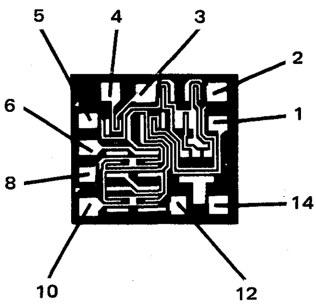


PIN CONNECTIONS

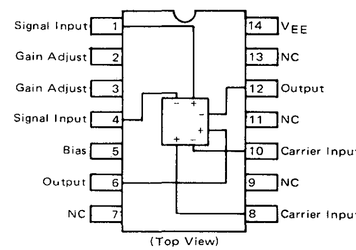


MCC1596/MCC1496 Balanced Modulator-Demodulator

41 x 45

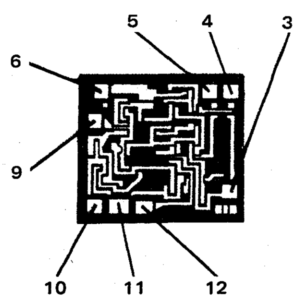


PIN CONNECTIONS

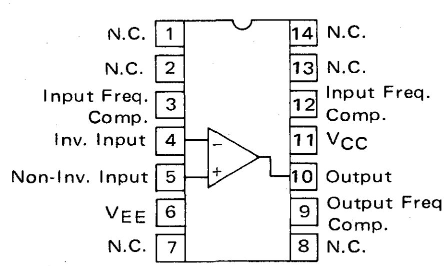


MCC1709/MCC1709A/MCC1709C Operational Amplifier

40 x 45



PIN CONNECTIONS



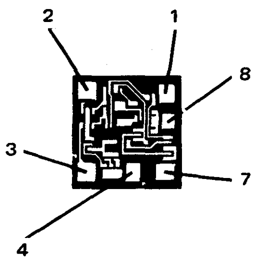
The MCC1709A is an improved performance version of the MCC1709/MCC1709C.

5

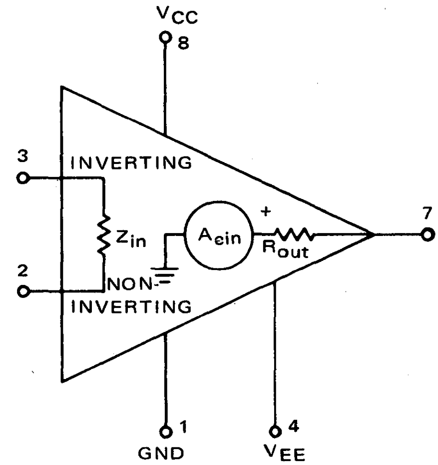
5

MCC1710/MCC1710C Differential Voltage Comparator

32 x 32

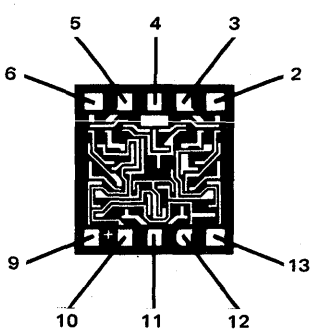


PIN CONNECTIONS

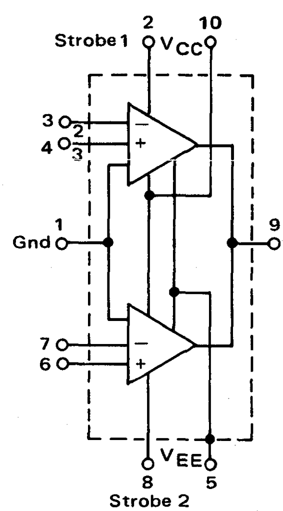


MCC1711/MCC1711C Dual Differential Voltage Comparator

46 x 43

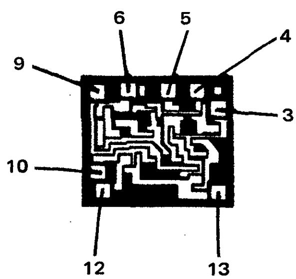


PIN CONNECTIONS

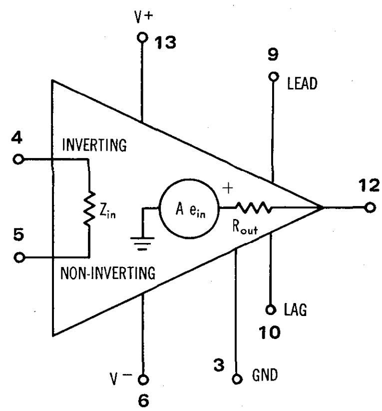


MCC1712/MCC1712C Wideband DC Amplifier

36 x 42

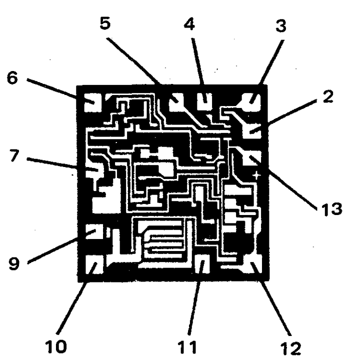


PIN CONNECTIONS

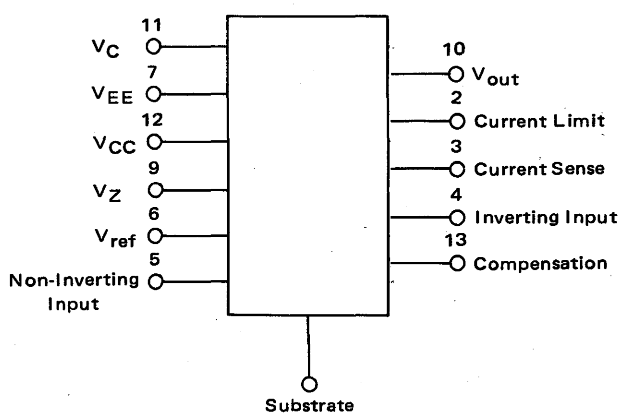


MCC1723/MCC1723C Voltage Regulator

52 x 53



PIN CONNECTIONS



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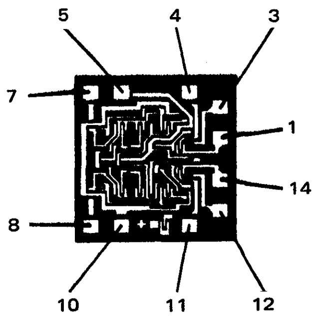
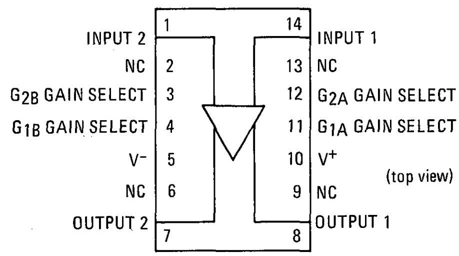
MCC1733/MCC1733C Differential Video Wideband Amplifier

45 x 46

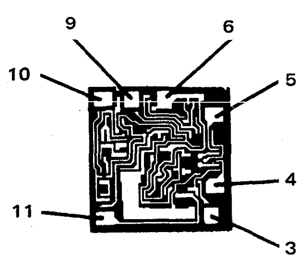


PIN CONNECTIONS

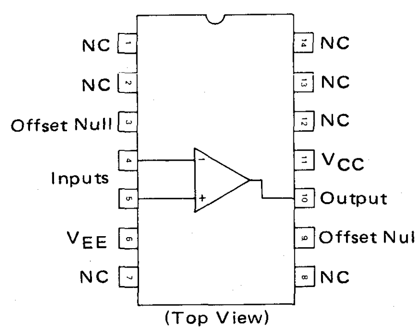


MCC1741/MCC1741C
Internally Compensated High Performance Operational Amplifier

41 x 40

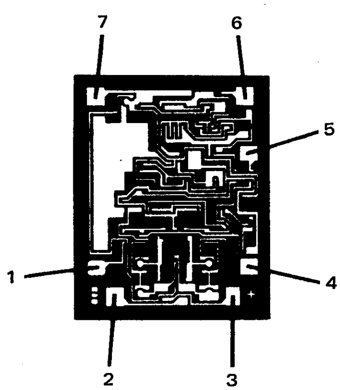


PIN CONNECTIONS

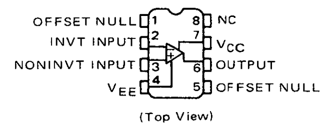


MCC1741S/MCC1741SC
High Slew-Rate Internally Compensated Operational Amplifier

51 x 63

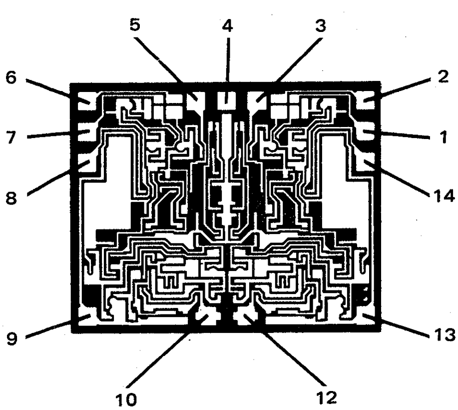


PIN CONNECTIONS

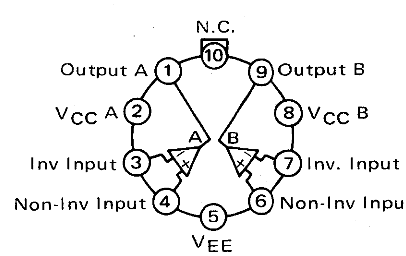


MCC1747/MCC1747C
Dual MC1741, Internally Compensated Operational Amplifier

67 x 84

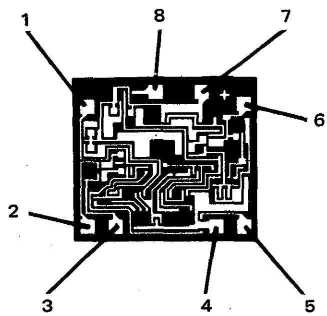


PIN CONNECTIONS



MCC1748/MCC1748C High Performance Operational Amplifier

51 x 45



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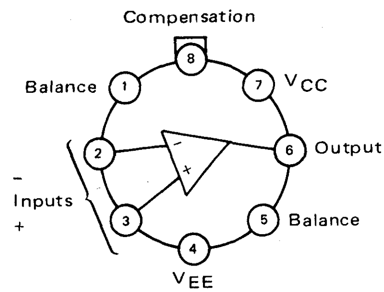
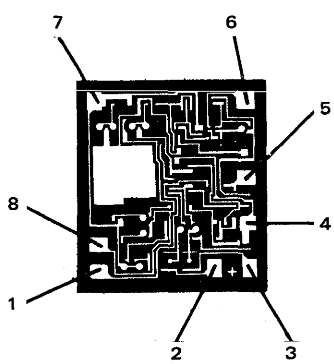


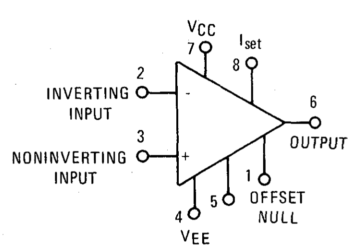
5

MCC1776/MCC1776C/MCC3476
Micropower Programmable Operational Amplifier

50 x 55

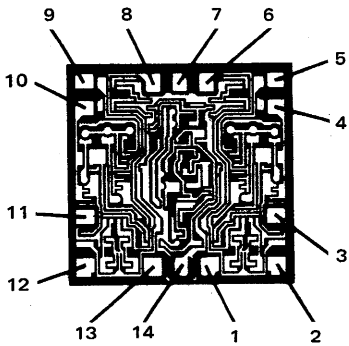


PIN CONNECTIONS

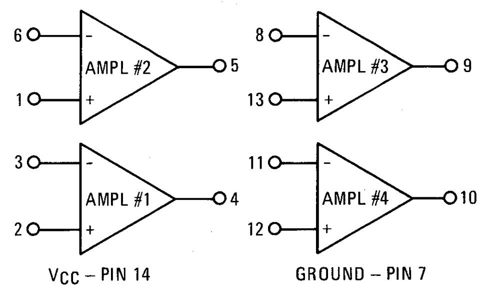


MCC3301 Quad Single Supply Operational Amplifier

59 x 61

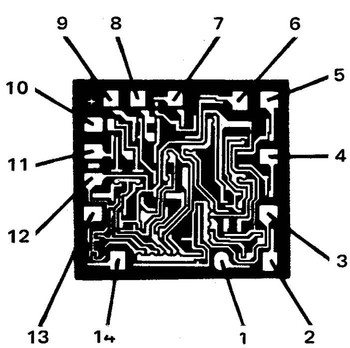


PIN CONNECTIONS

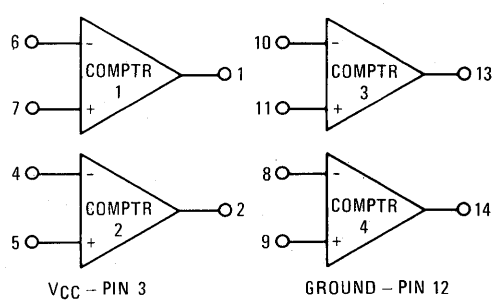


MCC3302 Quad Single-Supply Comparator

53 x 57

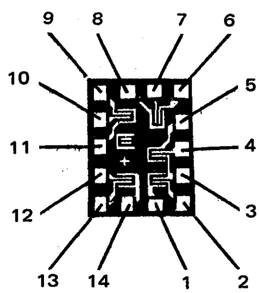


PIN CONNECTIONS

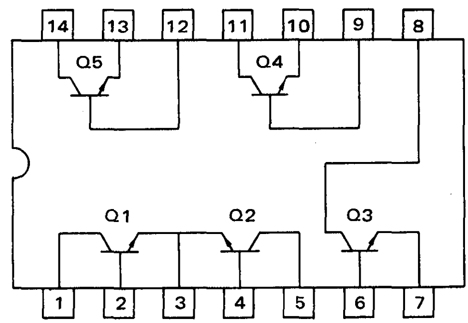


MCC3346 Five Transistor General Purpose Array

31 x 39



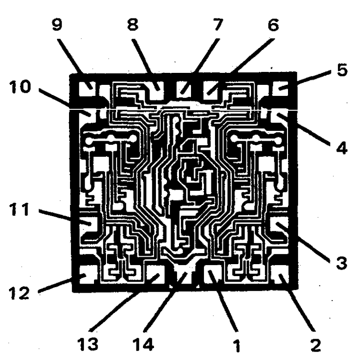
PIN CONNECTIONS



5

MCC3401 Quad Single-Supply Operational Amplifier

59 x 61



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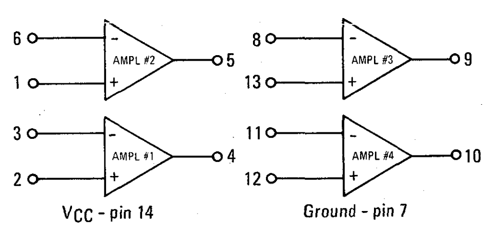
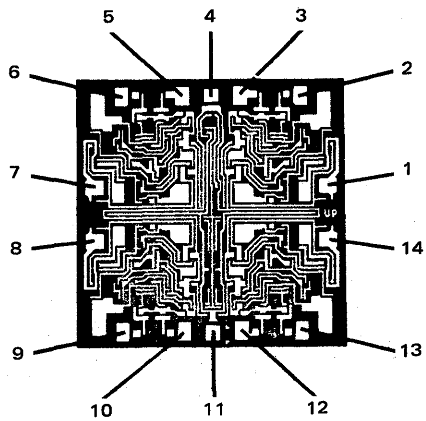
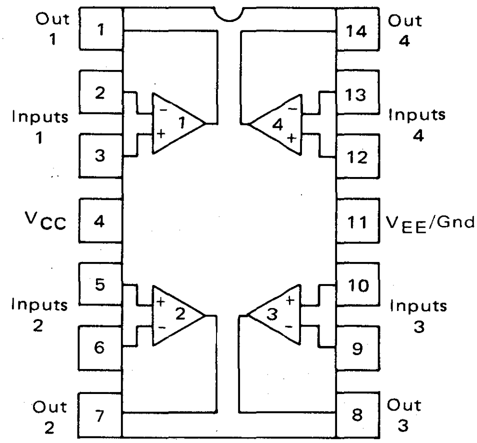


MCC3503/MCC3403/MCC3303 Quad Differential Input Operational Amplifier

72 x 72

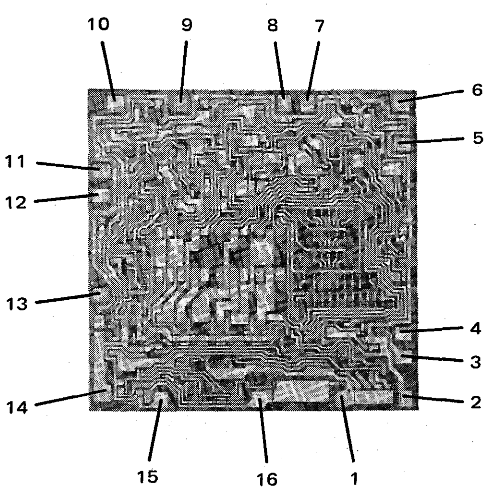


PIN CONNECTIONS



MCC3510/MCC3410 10 Bit Digital-to-Analog Converter

100 x 102



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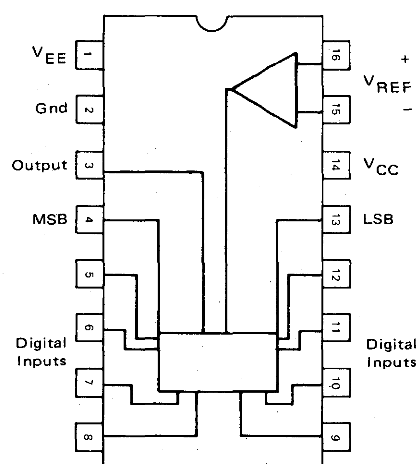
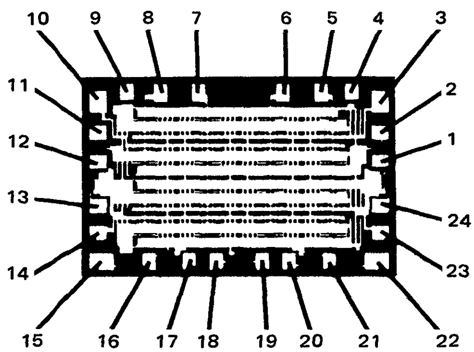
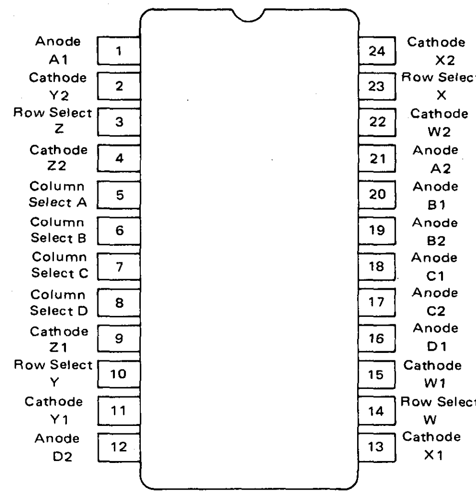


MCC3416 4x4x2 Crosspoint Switch

87 x 57

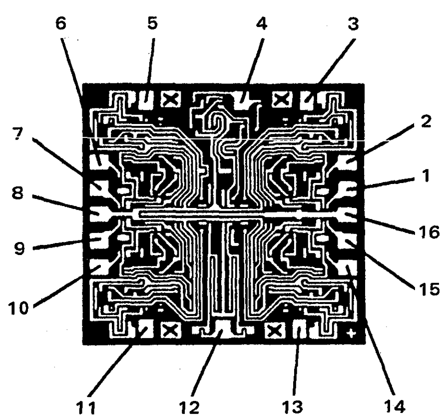


PIN CONNECTIONS

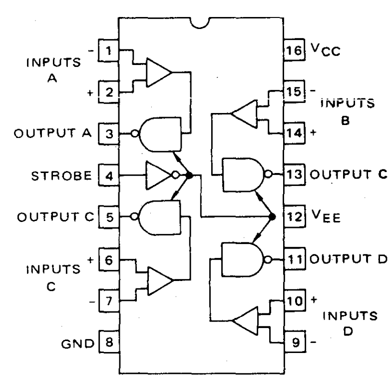


MCC3430/MCC3431/MCC3432/MCC3433 Quad High-Speed Voltage Comparators

76 x 70

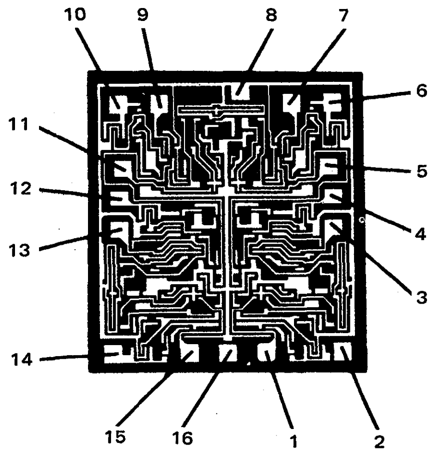


PIN CONNECTIONS

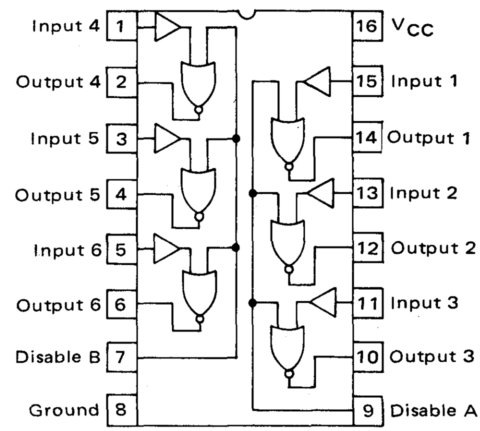


MCC3437 Hex Unified Bus Receiver

73 x 79

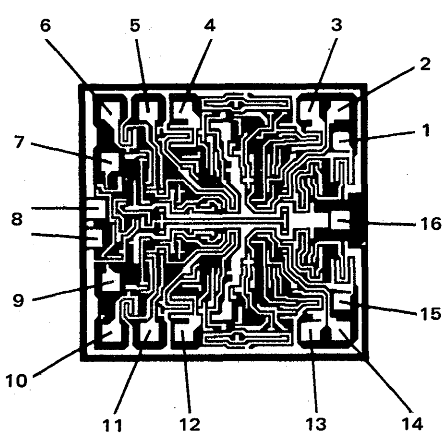


PIN CONNECTIONS

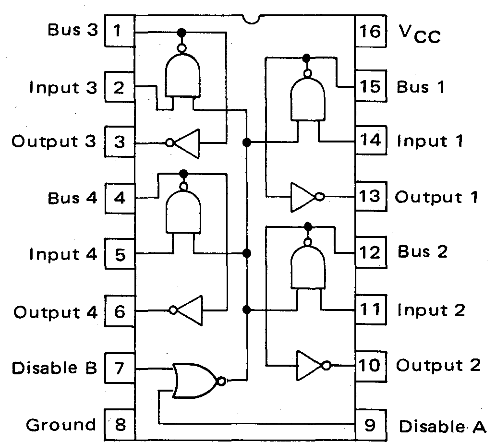


MCC3438 Quad Bus Transceiver

75 x 78



PIN CONNECTIONS

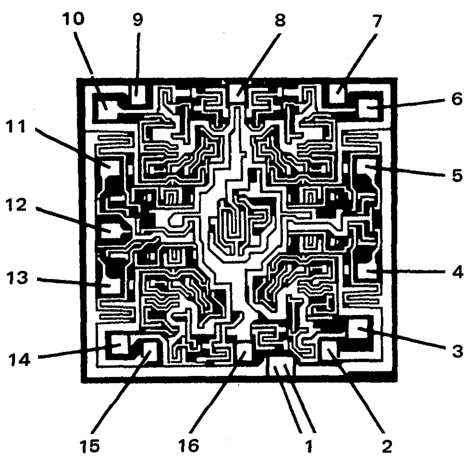


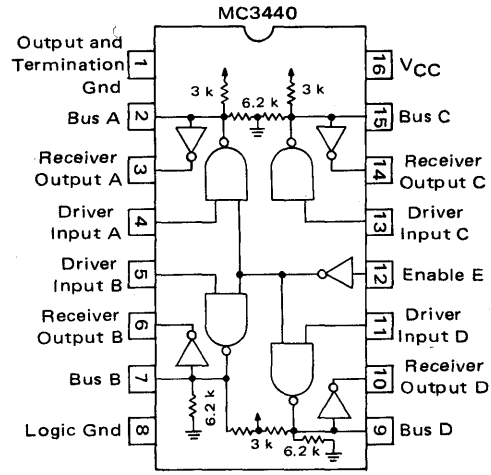
5

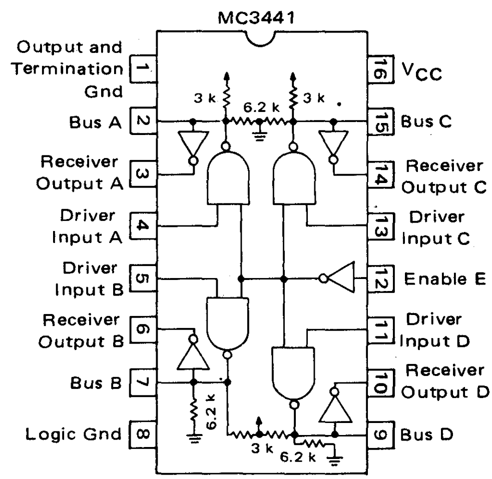
MCC3440/MCC3441/MCC3443
Quad General Purpose Interface Bus Transceivers

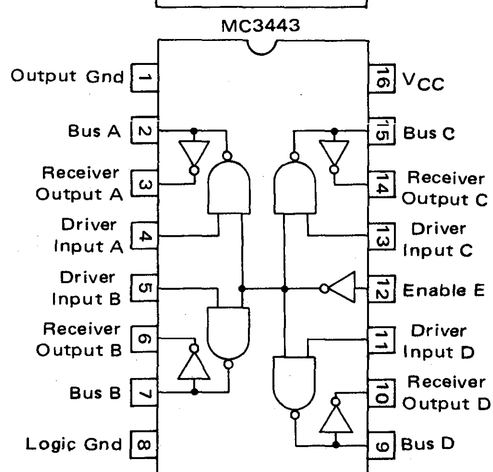
PIN CONNECTIONS

86 x 82



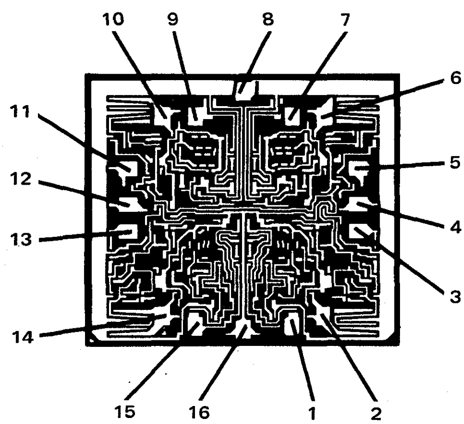




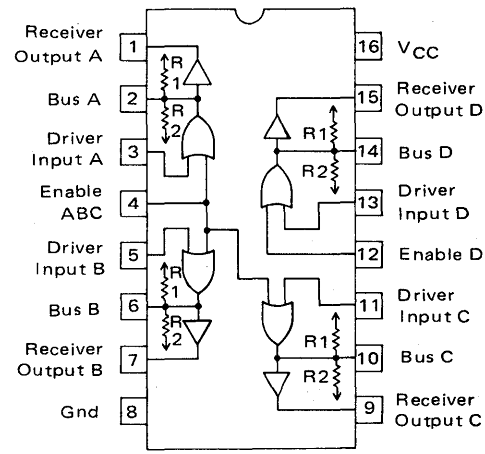


MCC3446 Quad General Purpose Interface Bus Transceiver

84 x 73



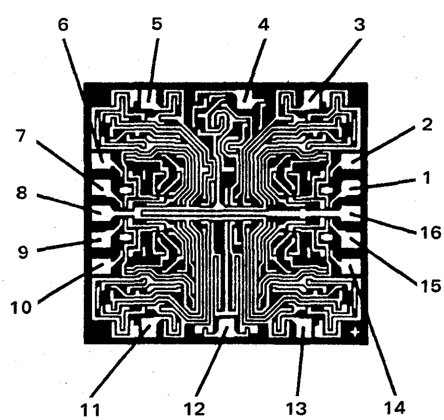
PIN CONNECTIONS



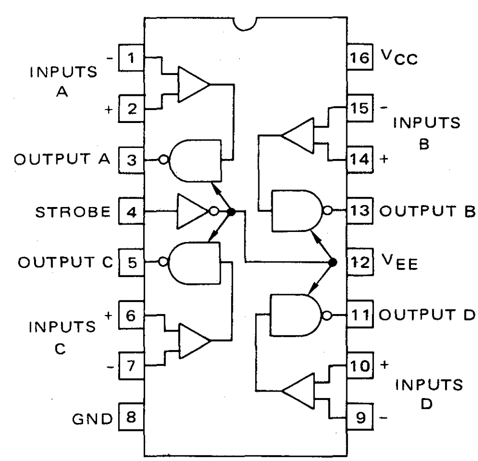
R1 = 2.4 k
R2 = 5.0 k

MCC3450/MCC3452
Quad Line Receivers with Common Three-State Strobe Input

76 x 70

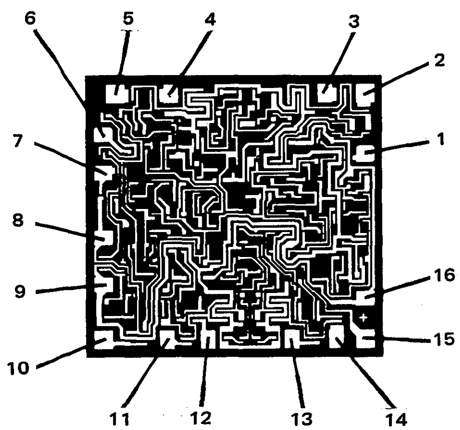


PIN CONNECTIONS

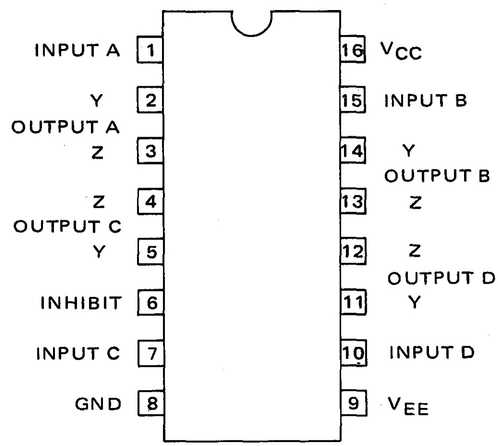


MCC3453 Quad Line Driver with Common Inhibit Input

75 x 79

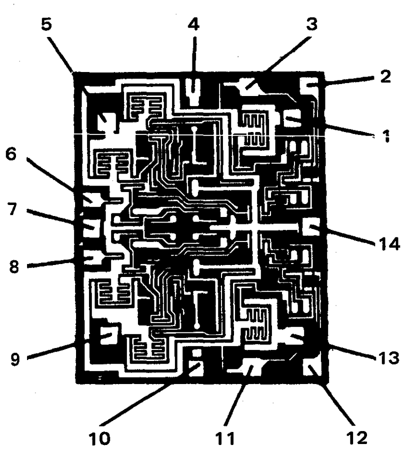


PIN CONNECTIONS

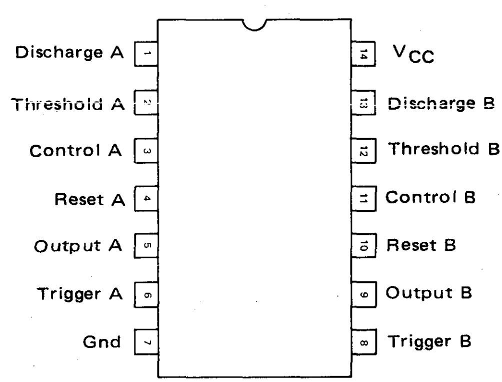


MCC3556/MCC3456 Dual Timing Circuit

84 x 68

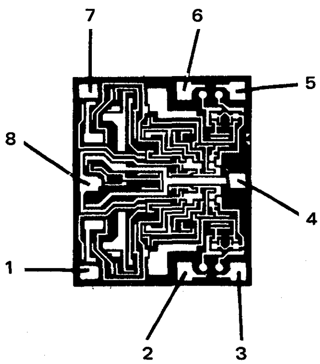


PIN CONNECTIONS

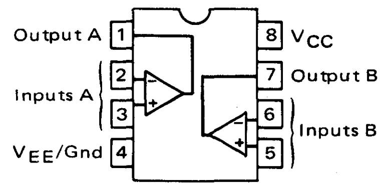


MCC3558/MCC3458/MCC3358
Dual Differential Input Operational Amplifier

50 x 58

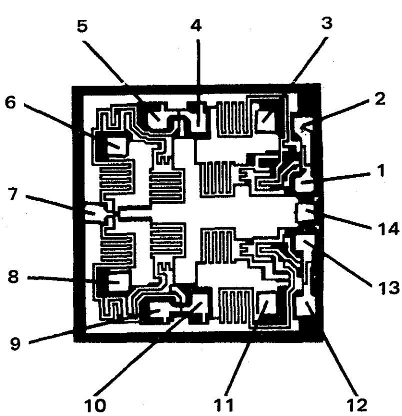


PIN CONNECTIONS

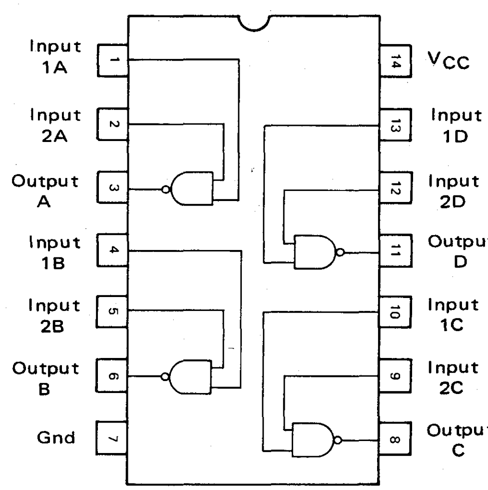


MCC3459 Quad NMOS Address Line Driver

66 x 68

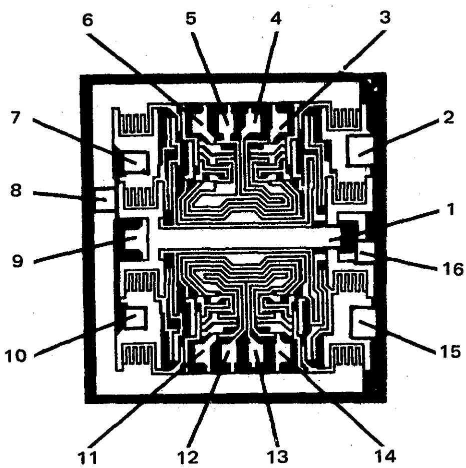


PIN CONNECTIONS

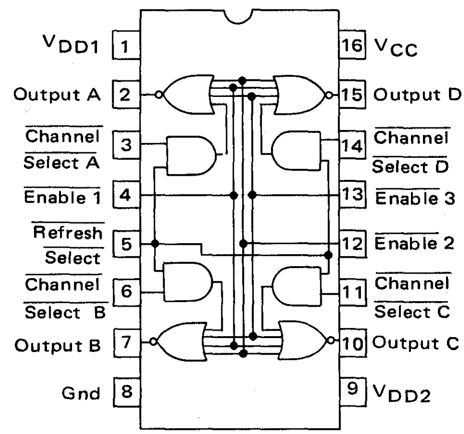


MCC3460/MCC3466
Gate Controlled Four Channel MOS Clock Drivers

86 x 79

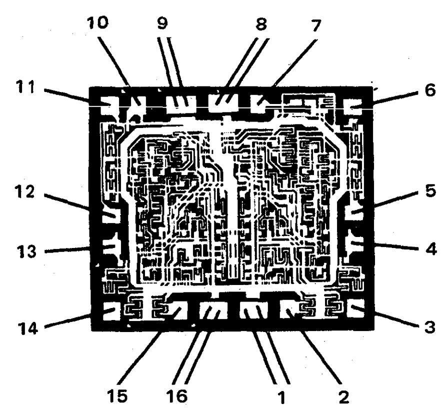


PIN CONNECTIONS

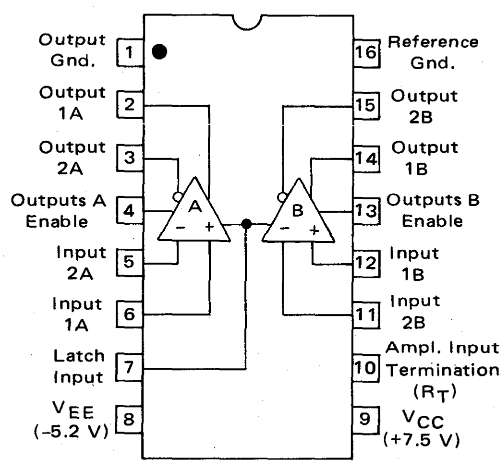


MCC3461 Dual NMOS Memory Sense Amplifier

76 x 66



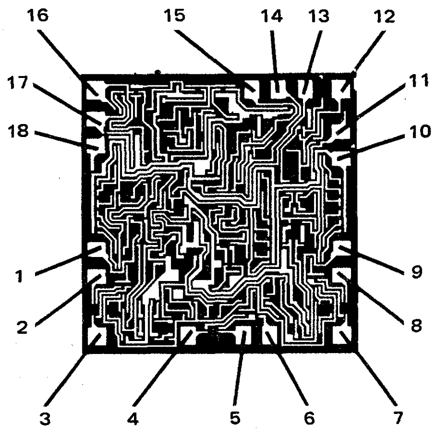
PIN CONNECTIONS



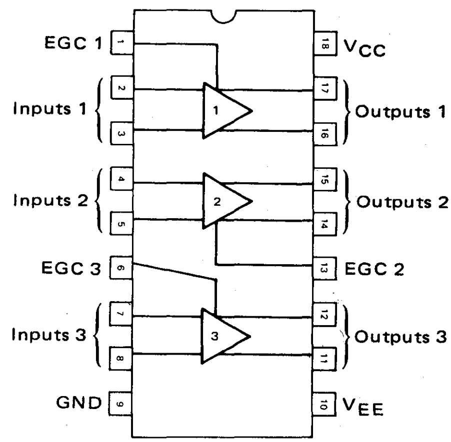
5

MCC3467 Triple Preamplifer

75 x 75

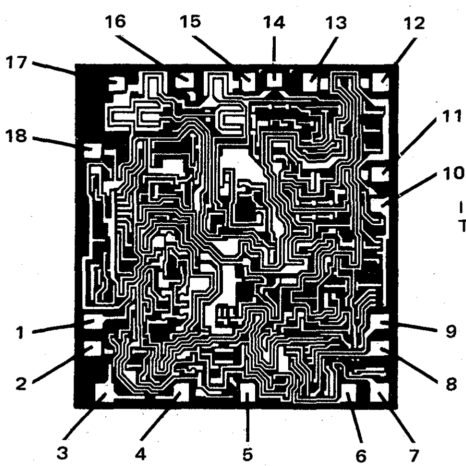


PIN CONNECTIONS

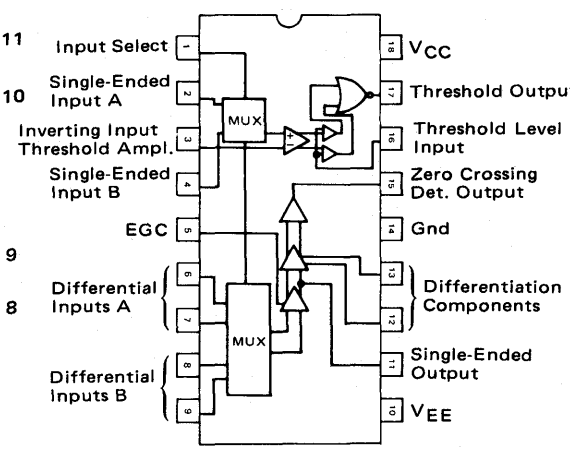


MCC3468 Magnetic Tape Read Amplifier

86 x 92

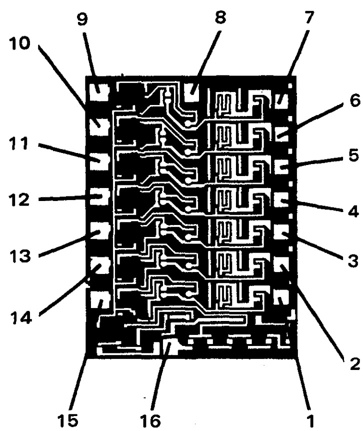


PIN CONNECTIONS

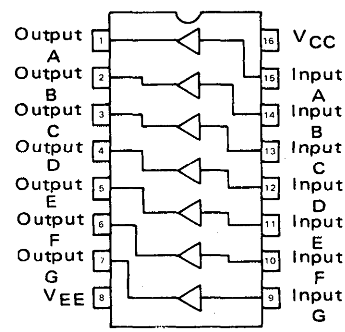


MCC3490/MCC3494 Seven-Digit Gas-Discharge Display Drivers

60 x 77



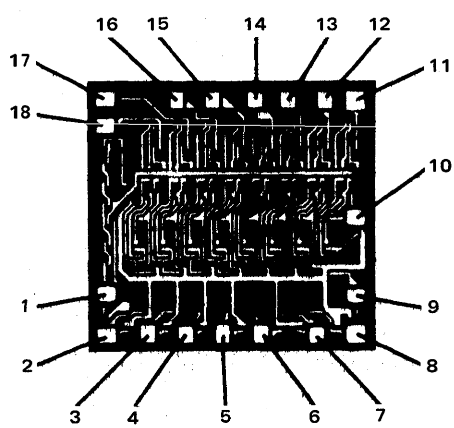
PIN CONNECTIONS



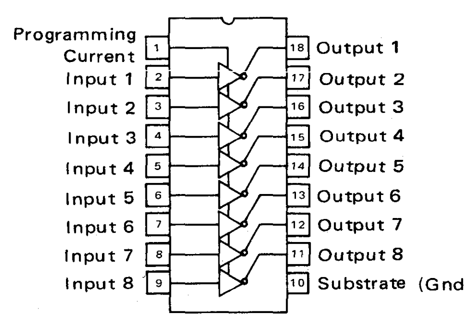
The MCC3490 requires a high logic level to turn drivers on while the MCC 3494 requires a low logic level.

MCC3491 Segment Driver for Gas-Discharge Displays

76 x 72

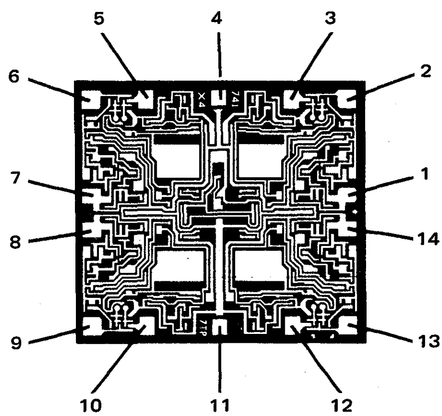


PIN CONNECTIONS

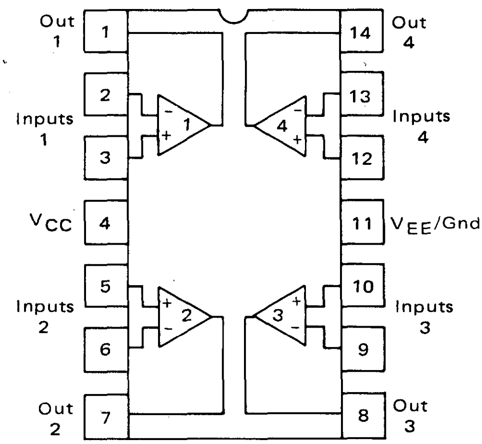


MCC4741/MCC4741C Quad MC1741 Operational Amplifier

78 x 70

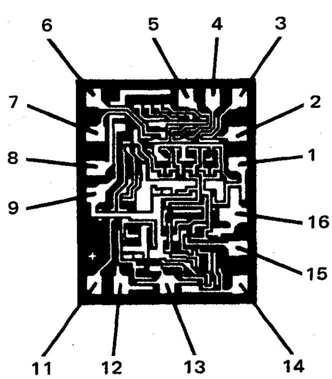


PIN CONNECTIONS

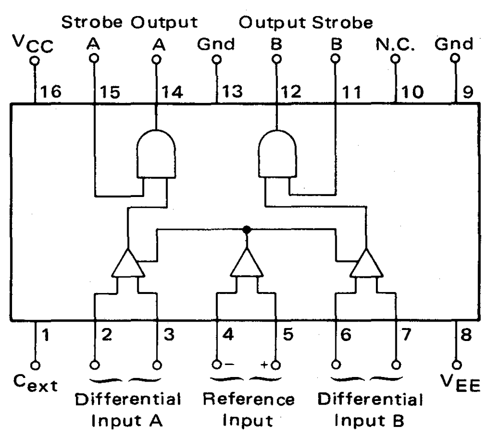


MCC5524/MCC5525/MCC7524/MCC7525
Dual High-Speed Sense Amplifier

48 x 60



PIN CONNECTIONS

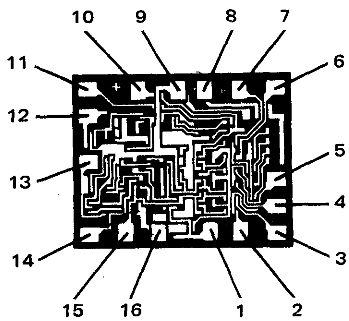


The MCC5524/MCC7524 feature improved threshold over the MCC5525/MCC7525.

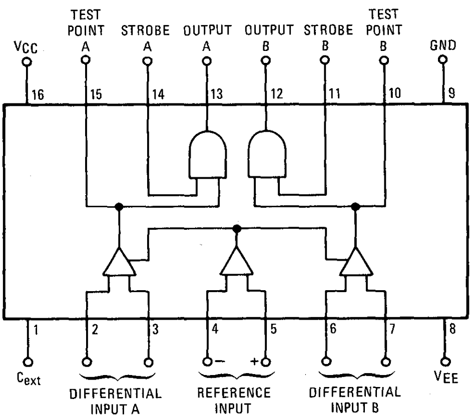
5

MCC5528/MCC5529/MCC7528/MCC7529
Dual High-Speed Sense Amplifier with Preamplifier Test Points

48 x 60



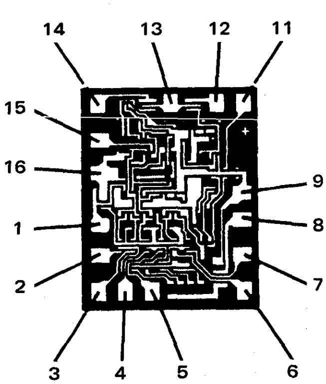
PIN CONNECTIONS



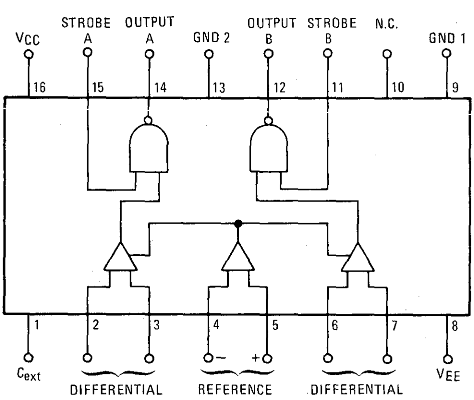
The MCC5528/MCC7528 feature improved threshold over the MCC5529/MC7529.

MCC5534/MCC5535/MCC7534/MCC7535
Dual High-Speed Sense Amplifier with Inverted Outputs

48 x 60



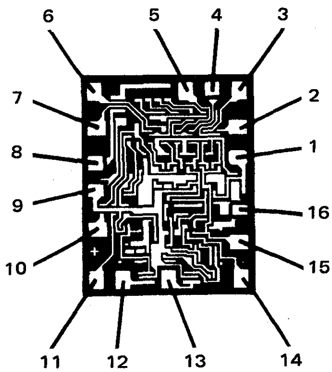
PIN CONNECTIONS



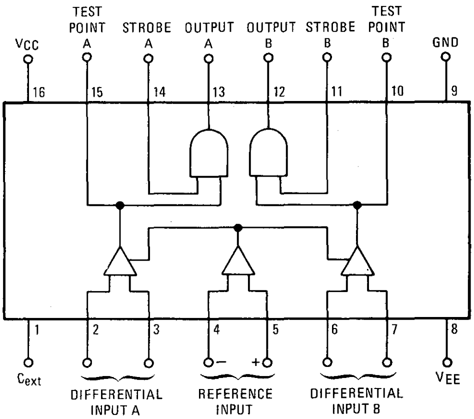
The MCC5534/MCC7534 feature improved threshold over the MCC5535/MCC7535.

MCC5538/MCC5539/MCC7538/MCC7539
Dual Sense Amplifiers with Preamplifier Test Points and Inverted outputs

48 x 60



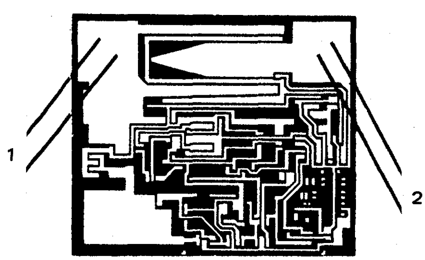
PIN CONNECTIONS



The MCC5538/MCC7538 feature improved threshold over the MCC5539/MCC7539.

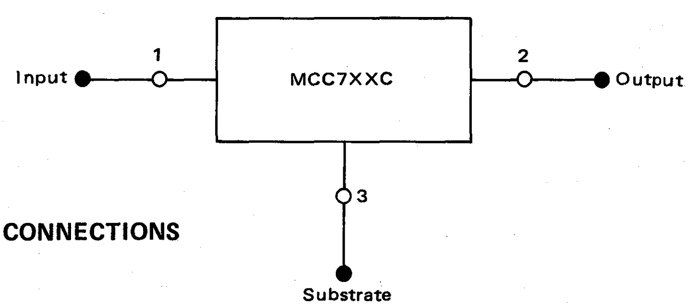
MCC7700 C Series Three Terminal Positive Fixed Voltage Regulators

66 x 77



Chips available in the following voltages:

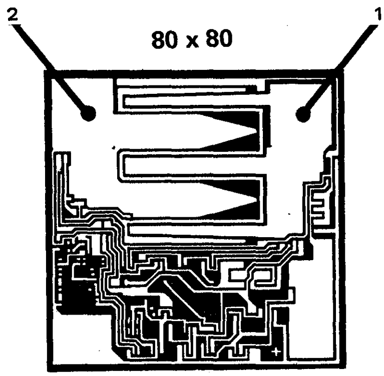
TYPE NO./VOLTAGE	
MCC7705C	5.0 Volts
MCC7706C	6.0 Volts
MCC7708C	8.0 Volts
MCC7712C	12 Volts
MCC7715C	15 Volts
MCC7718C	18 Volts
MCC7720C	20 Volts
MCC7724C	24 Volts



PIN CONNECTIONS

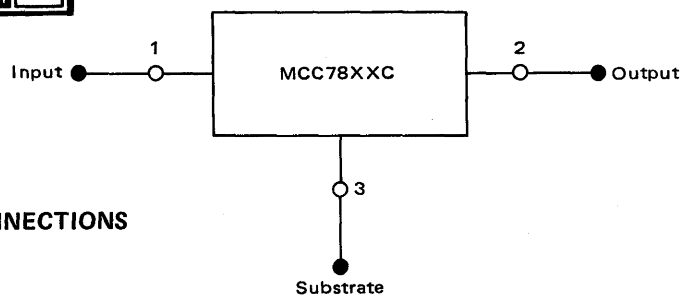
MCC7800C Series
Three-Terminal Positive Fixed Voltage Regulator

80 x 80



Chips available in the following voltages:

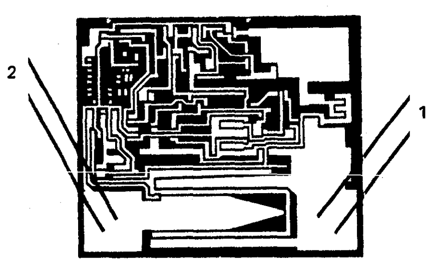
TYPE NO./VOLTAGE	
MCC7805C	5.0 Volts
MCC7806C	6.0 Volts
MCC7808C	8.0 Volts
MCC7812C	12.0 Volts
MCC7815C	15.0 Volts
MCC7818C	18.0 Volts
MCC7824C	24.0 Volts



PIN CONNECTIONS

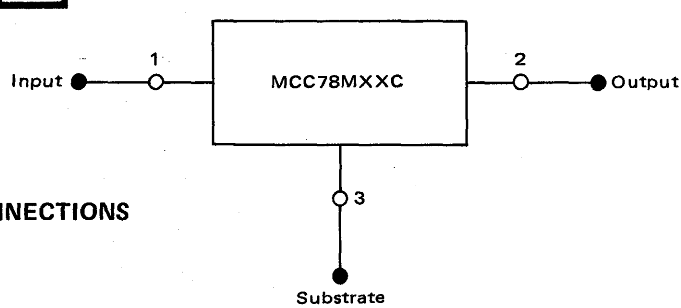
MCC78M00C Series
Three-Terminal Positive Fixed Voltage Regulator

66 x 77



Chips available in the following Voltages:

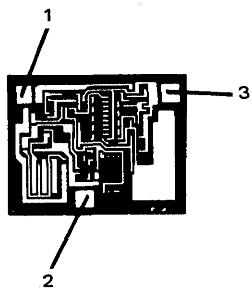
TYPE NO./VOLTAGE	
MCC78M05C	5.0 Volts
MCC78M06C	6.0 Volts
MCC73M08C	8.0 Volts
MCC78M12C	12 Volts
MCC78M15C	15 Volts
MCC78M18C	18 Volts
MCC78M20C	20 Volts
MCC78M24C	24 Volts



PIN CONNECTIONS

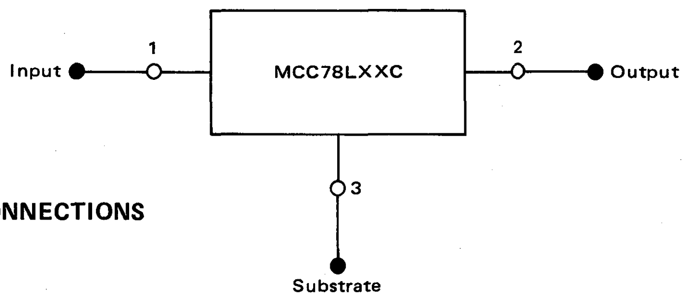
MCC78L00C/MCC78L00AC Series
Three-Terminal Positive Fixed Voltage Regulators

38 x 49



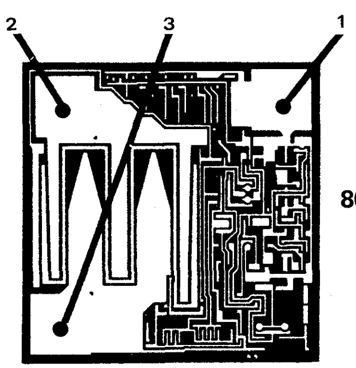
Chips available in the following voltages:

Device No. ±10%	Device No. ±5%	Nominal Voltage
MCC78L05C	MCC78L05AC	5.0
MCC78L08C	MCC78L08AC	8.0
MCC78L12C	MCC78L12AC	12
MCC78L15C	MCC78L15AC	15
MCC78L18C	MCC78L18AC	18
MCC78L24C	MCC78L24AC	24



PIN CONNECTIONS

MCC7900C Series
Three-Terminal Negative Fixed Voltage Regulator

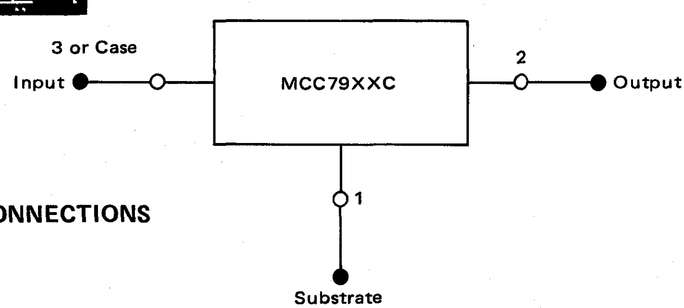


80 x 80

Chips available in the following voltages:

TYPE NO./VOLTAGE

MCC7902C	2.0 volts
MCC7905C	5.0 volts
MCC7905.2C	5.2 volts
MCC7906C	6.0 volts
MCC7908C	8.0 volts
MCC7912C	12.0 volts
MCC7915C	15.0 volts
MCC7918C	18.0 volts
MCC7924C	24.0 volts

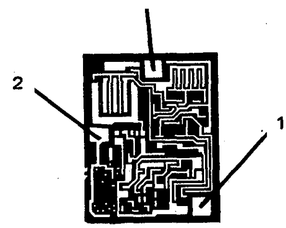


PIN CONNECTIONS

5

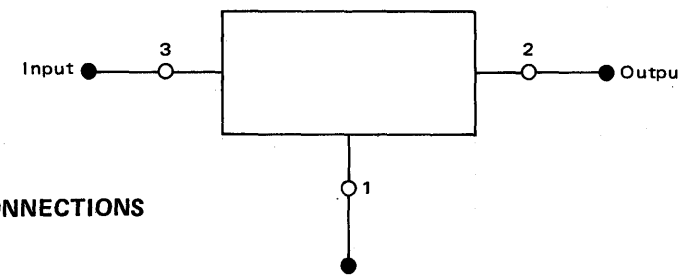
MCC79L00C/MCC79L00AC Series
Three-Terminal Negative Fixed Voltage Regulator

38 x 47



Chips available in the following voltages;

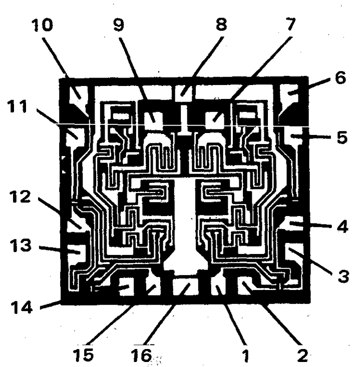
Device No. ±10%	Device No. ±5%	Nominal Voltage
MCC79L03C	MCC79L03AC	−3.0
MCC79L05C	MCC79L05AC	−5.0
MCC79L12C	MCC79L12AC	−12
MCC79L15C	MCC79L15AC	−15
MCC79L18C	MCC79L18AC	−18
MCC79L24C	MCC79L24AC	−24



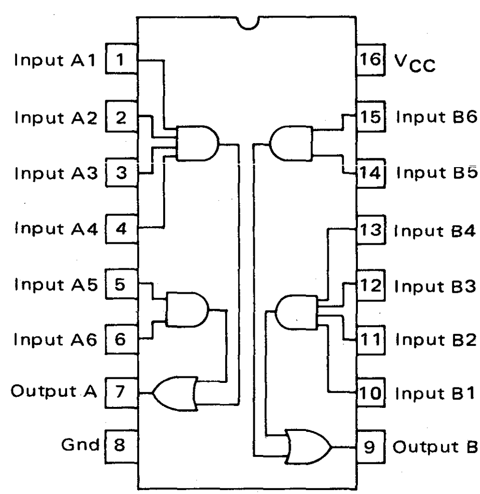
PIN CONNECTIONS

MCC8T13/MCC8T23 Dual Line Drivers

61 x 68



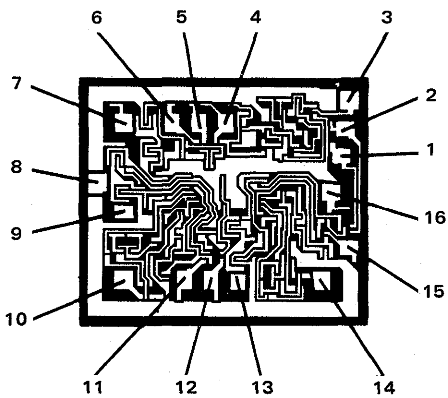
PIN CONNECTIONS



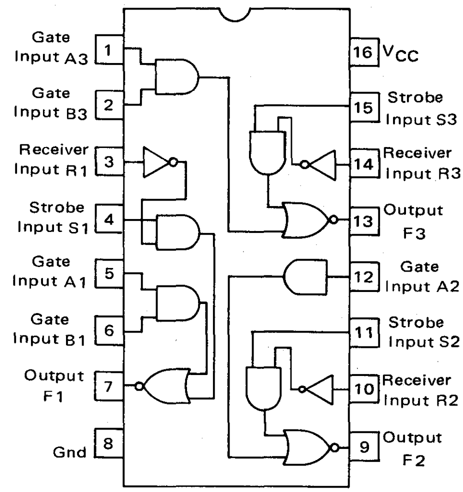
The MCC8T23 meets all of the input/output requirements of the IBM system 360/370 specifications.

MCC8T14/MCC8T24 Triple Line Receivers with Hysteresis

77 x 66

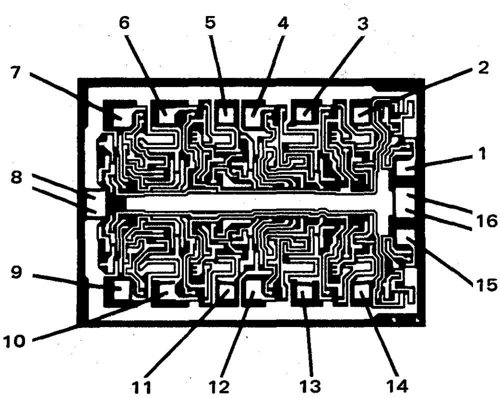


PIN CONNECTIONS

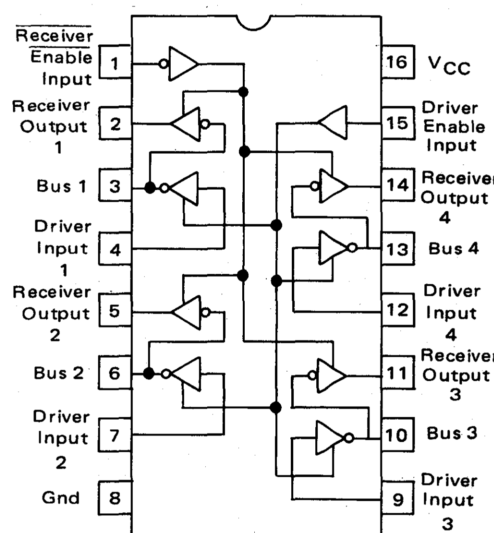


MCC8T26/MCC6880
Quad Three-State Bus Tranceiver with High Impedance PNP Inputs

92 x 66

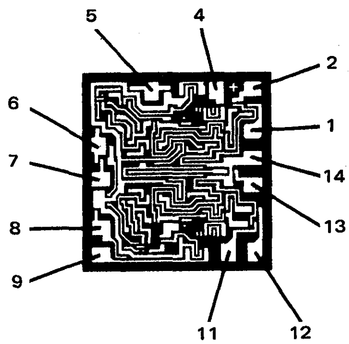


PIN CONNECTIONS

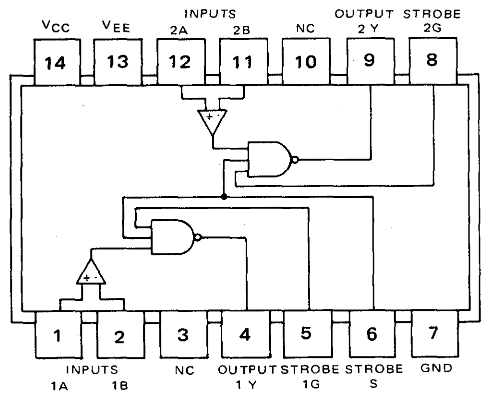


MCC55107/MCC55108/MCC75107/MCC75108
Dual Line Receivers

51 x 53



PIN CONNECTIONS

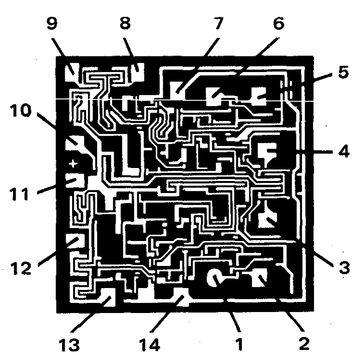


The MCC55107/MCC75107 feaure active pullup outputs, while the MCC55108/MCC75108 features an open collector output.

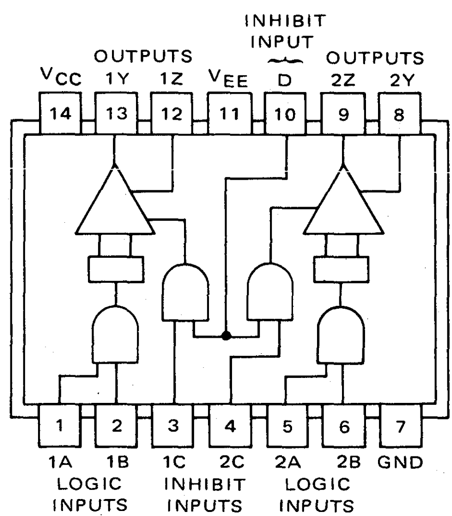
5

MCC75110 Dual Line Driver

70 x 70

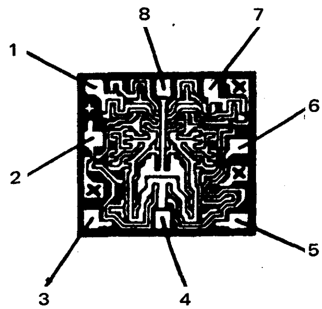


PIN CONNECTIONS

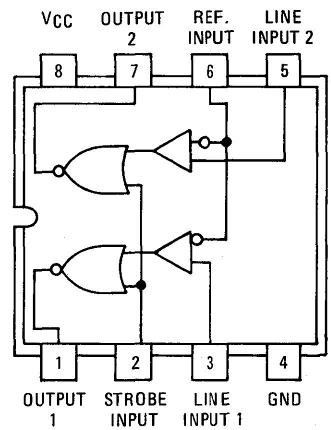


MCC75140 Dual Line Receiver

49 x 45

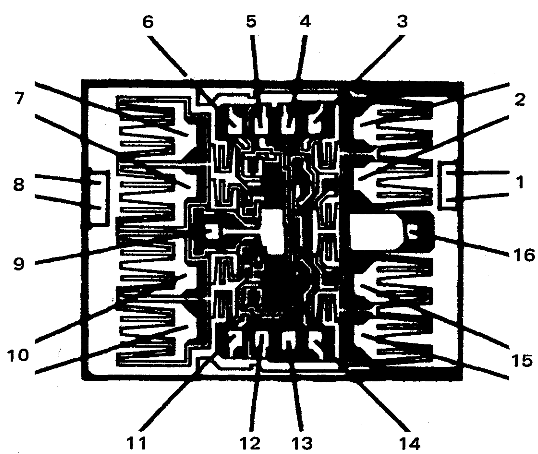


PIN CONNECTIONS

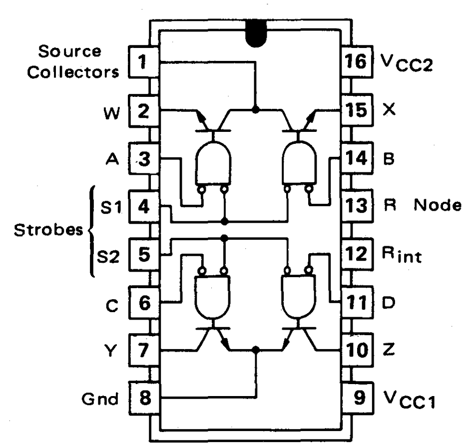


MCC55325/MCC75325 Dual Memory Driver

80 x 102

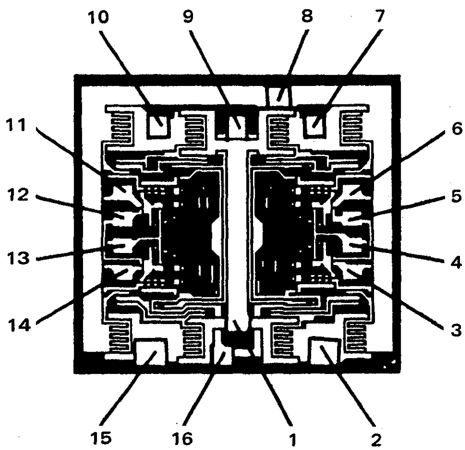


PIN CONNECTIONS

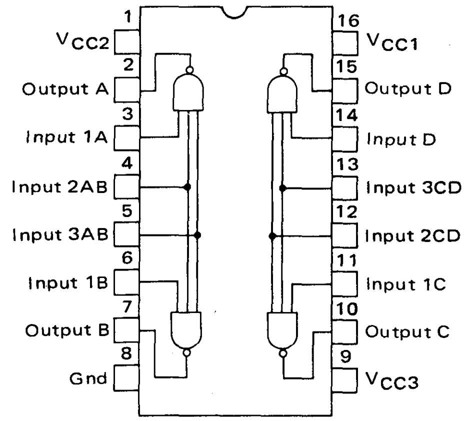


MCC75365 Quad MOS Clock Driver

86 x 79

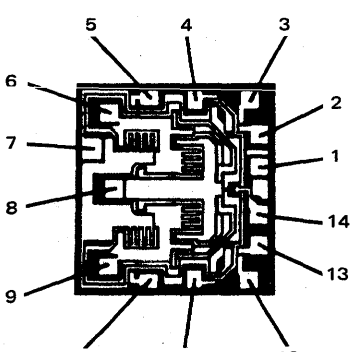


PIN CONNECTIONS

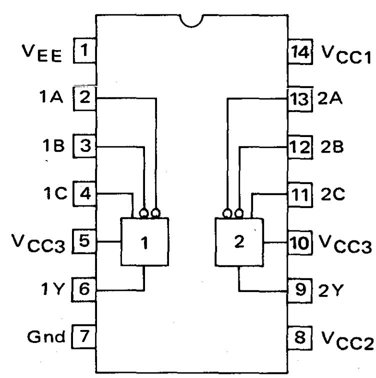


MCC75368/MCC75358 Dual MECL-to-MOS Drivers

55 x 58



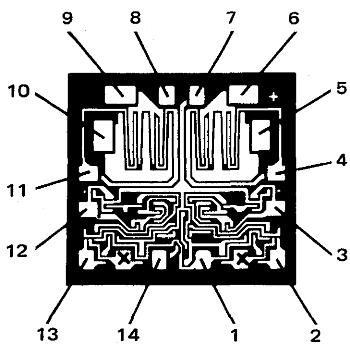
PIN CONNECTIONS



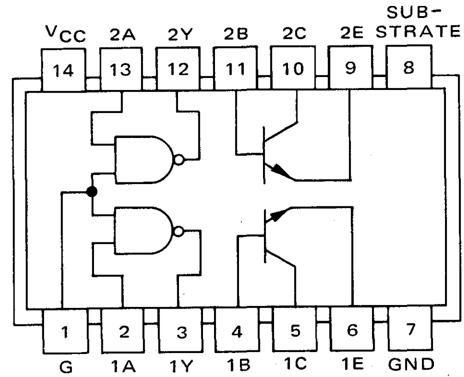
The MCC75368 is optimized for higher voltage operation while the MCC75358 is optimized for higher speed at a sacrifice of operating voltage.

MCC75450 Dual Peripheral Positive "AND" Driver

54 x 60

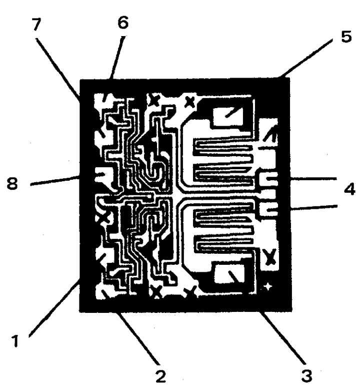


PIN CONNECTIONS

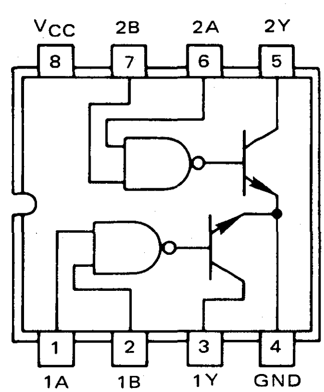


MCC75451/MCC75461 Dual Peripheral Drivers

54 x 60



PIN CONNECTIONS



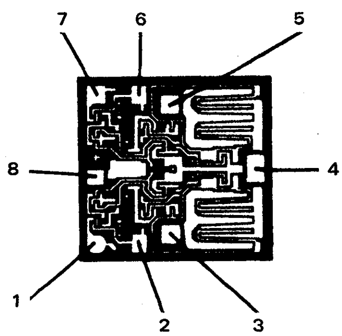
Positive Logic: Y = AB

The MCC75461 exhibits a higher breakdown voltage than the MCC75451.

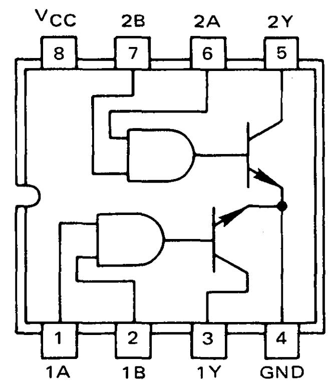
5

MCC75452/MCC75462 Dual Peripheral Drivers

50 x 52



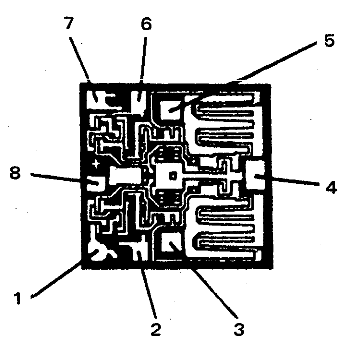
PIN CONNECTIONS



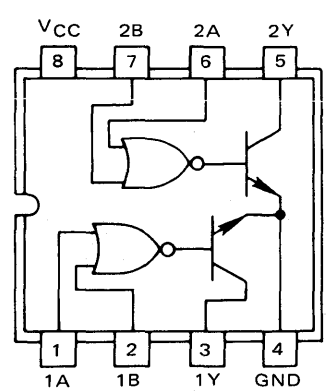
The MCC75462 exhibits a higher breakdown voltage than the MCC75452.

MCC75453/MCC75463 Dual Peripheral Drivers

50 x 52



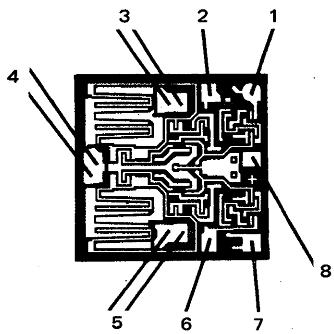
PIN CONNECTIONS



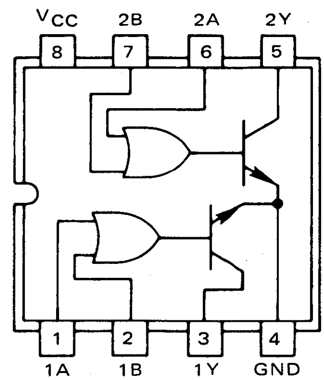
The MCC75463 exhibits higher breakdown voltage than the MCC75453.

MCC75454/MCC75464 Dual Peripheral Drivers

50 x 52



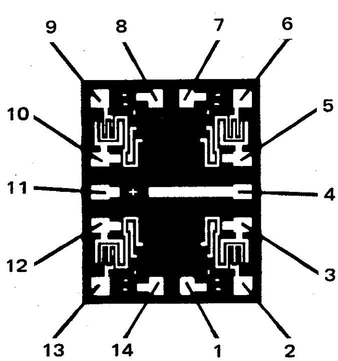
PIN CONNECTIONS



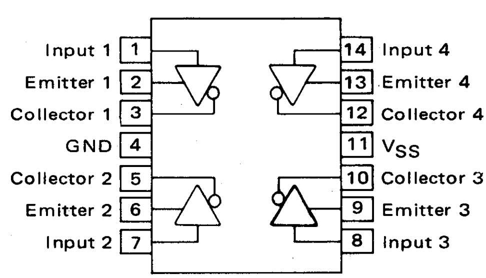
The MCC75464 exhibits higher breakdown voltage than the MCC75454.

MCC75491 Quad LED Segment Driver

48 x 60



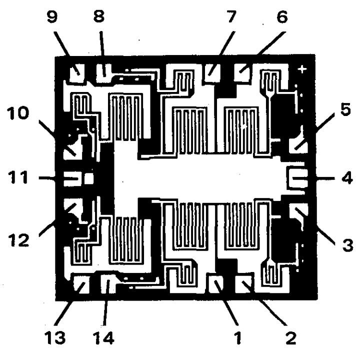
PIN CONNECTIONS



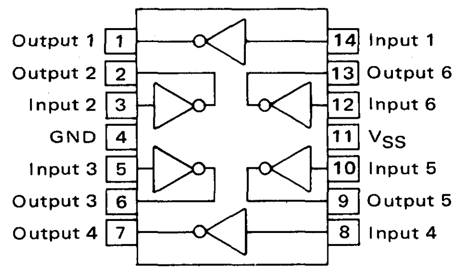
5

MCC75492 Hex LED Digit Driver

66 x 70



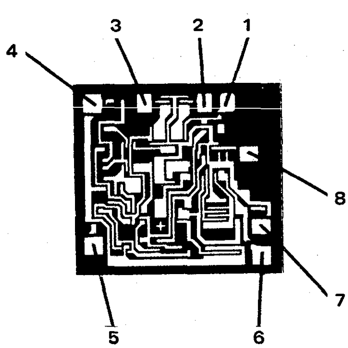
PIN CONNECTIONS



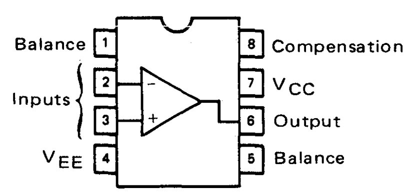
5

MLMC101A/MLMC201A/MLMC301A Operational Amplifier

51 x 55

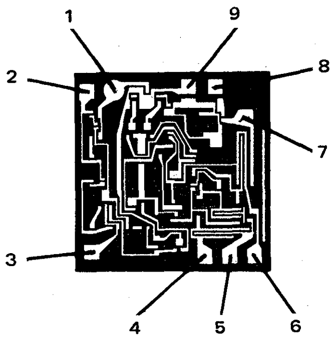


PIN CONNECTIONS

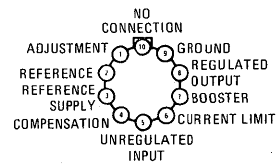


MLMC104/MLMC204/MLMC304 Negative Voltage Regulator

55 x 55

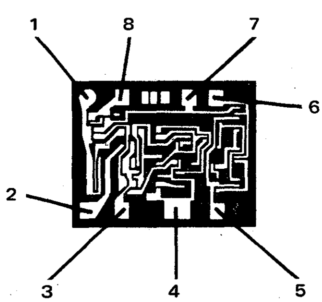


PIN CONNECTIONS

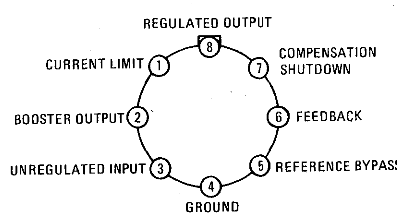


MLMC105/MLMC205/MLMC305 Positive Voltage Regulator

49 x 39



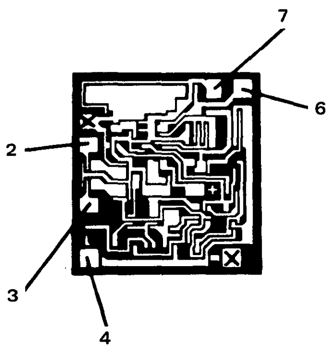
PIN CONNECTIONS



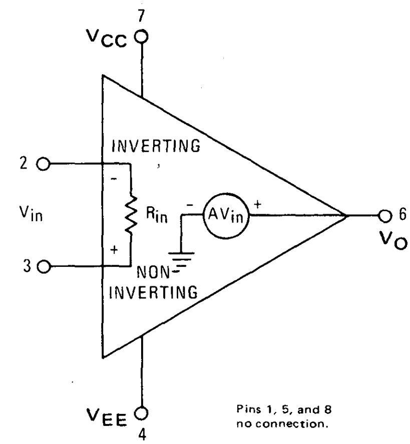
Note: Pin 4 connected to case
(TOP VIEW)

MLMC107/MLMC207/MLMC307
Internally Compensated Operational Amplifier

51 x 55

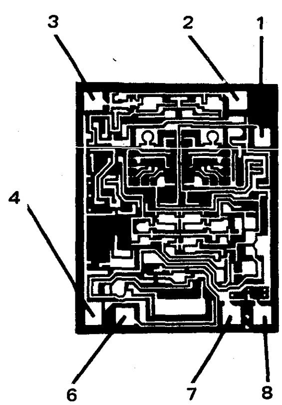


PIN CONNECTIONS

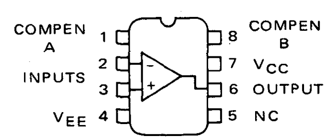


MLMC108/MLMC208/MLMC308/MLMC108A/MLMC208A/MLMC308A
Precision Operational Amplifier

67 x 55

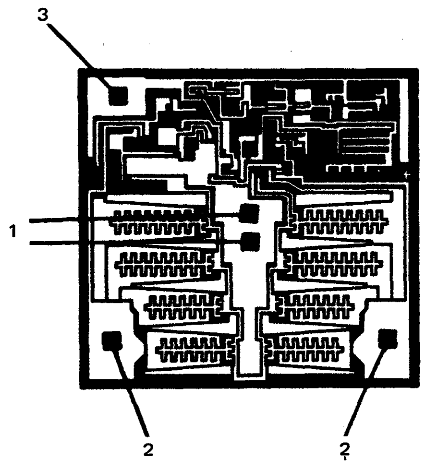


PIN CONNECTIONS



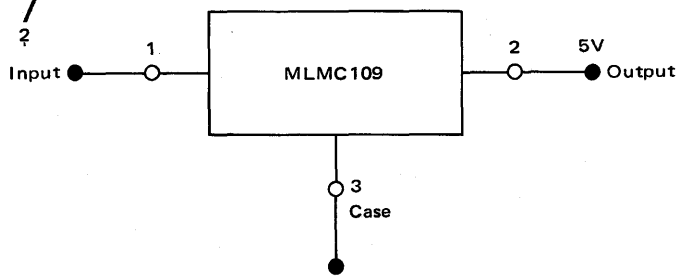
The MLMC108A features improved input offset voltage over the MLMC108.

MLMC109/MLMC209/MLMC309 Positive Voltage Regulator



86 x 90

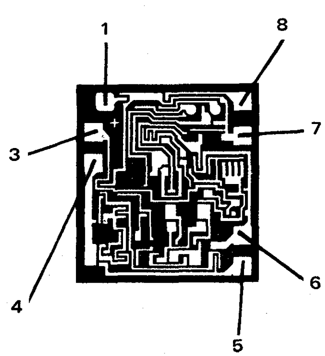
PIN CONNECTIONS

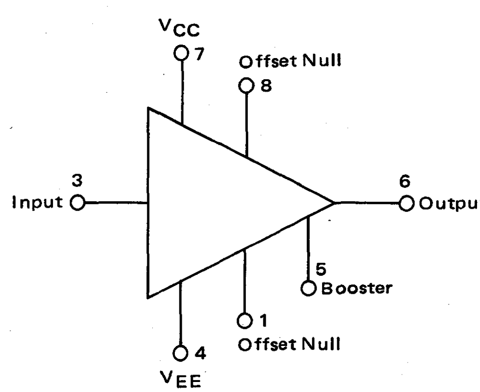


MLMC110/MLMC210/MLMC310 Operational Amplifier Voltage Follower

50 x 54

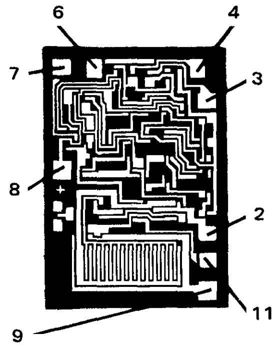
PIN CONNECTIONS



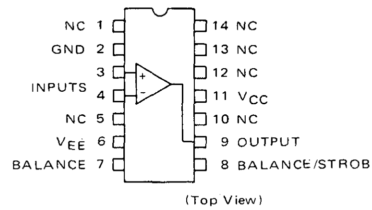


MLMC111/MLMC211/MLMC311 High Performance Voltage Comparator

49 x 69



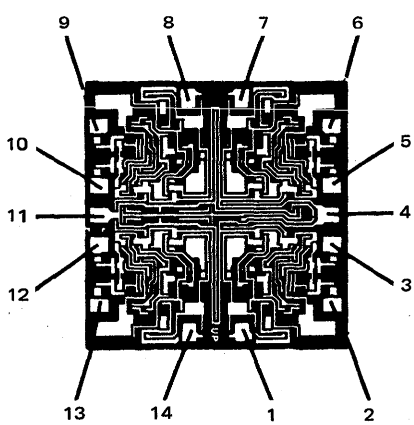
PIN CONNECTIONS



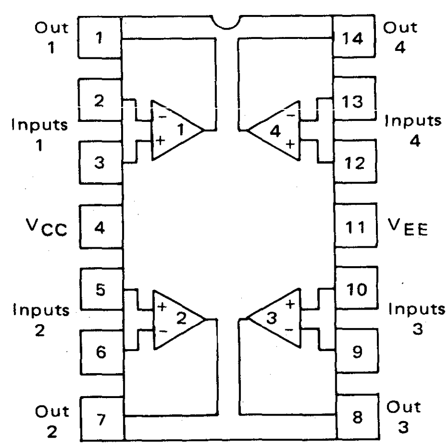
5

MLMC124/MLMC224/MLMC324 Quad Differential Input Operational Amplifier

72 x 72

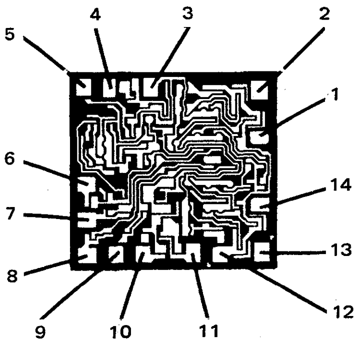


PIN CONNECTIONS

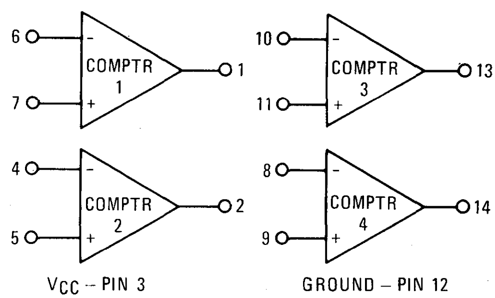


MLMC139/MLMC239/MLMC329/MLMC139A/MLMC239A/MLMC329A
Quad Comparator

54 x 56



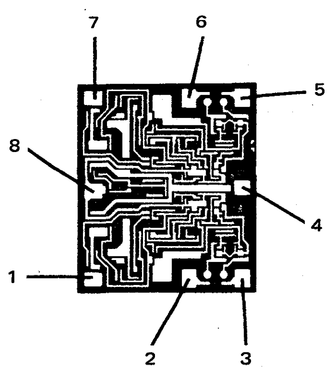
PIN CONNECTIONS



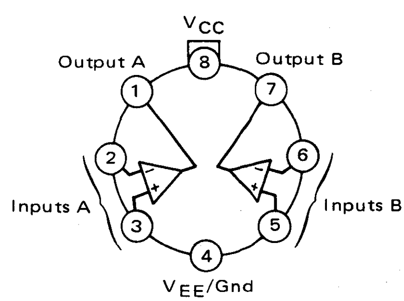
The MLMC139A/MLMC239A/MLMC339A feature improved input offset voltage over the MLMC139/MLMC239/MLMC339.

MLMC158/MLMC258/MLMC358
Quad Differential Input Operational Amplifier

50 x 58

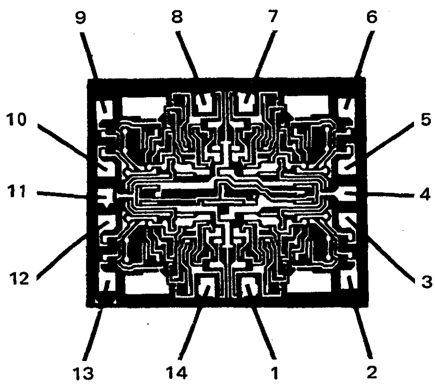


PIN CONNECTIONS

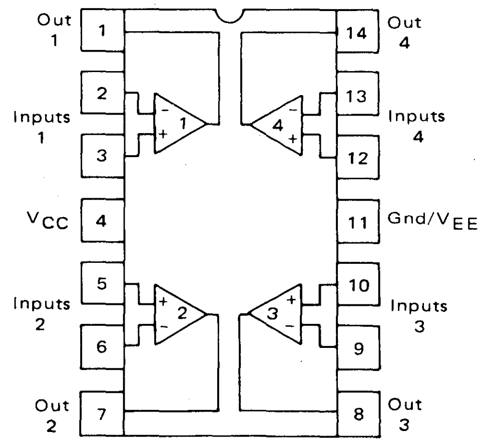


MLMC2902 Quad Differential Input Operational Amplifier

60 x 74

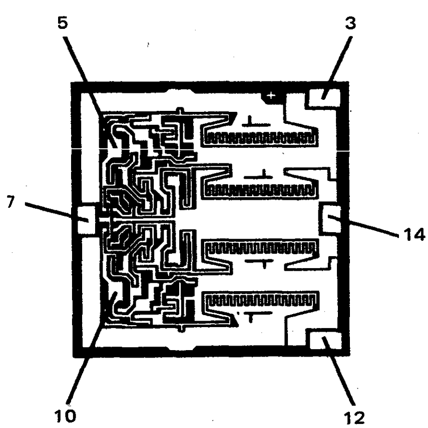


PIN CONNECTIONS

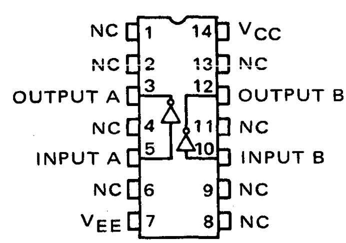


MMHC0026/MMHC0026C Dual MOS Clock Driver

74 x 75



PIN CONNECTIONS



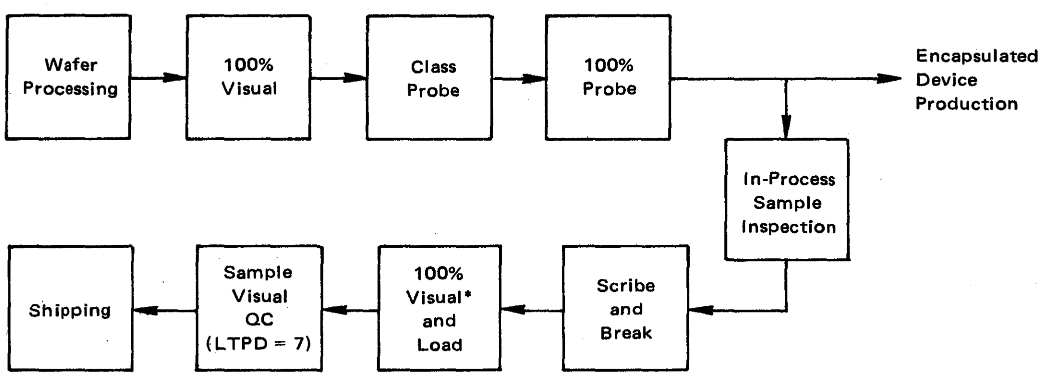
5

CHAPTER 6
MECL, Memories, Phase-Locked Loop, & LSI Integrated Circuits

MECL, MEMORIES, PHASE-LOCKED LOOP, AND LSI INTEGRATED CIRCUITS

STANDARD CHIP PROCESSING

The circuits offered are subjected to the same in-process controls as Motorola's standard encapsulated devices. The chip processing and quality control requirements are designed to ensure the same reliability and performance of the finished product. The following flow chart represents the processing after the wafer has been completely diffused, passivated, metallized, and stabilized.



*MIL-STD-883, Method 2010.2, Condition B (12M55367J)

DEVICE DATA

Detailed information on these chips is presented in the Motorola MECL Data Book or on detailed data sheets. Information contained herein includes the device description or function, logic diagram, chip geometry, and "pinouts".

PROBE CAPABILITIES

All chips in this chapter are 100% probed to ensure that they meet the dc electrical specifications and functionality presented on the Motorola standard data sheets. For some device types certain tests can be guaranteed only by testing packaged samples.

GENERAL PHYSICAL CHARACTERISTICS

The following characteristics represent the majority of all MECL, Memory, PLL, and LSI chips. Since an individual chip type may vary slightly, contact Product Marketing for information regarding physical characteristics critical to a particular application. The overall size and final metallization pattern are shown for each chip. The metallization pattern shows the position and identification for each bonding pad.

	MECL III, MECL 10,000, Memories, PLL, LSI	MECL II
Chip Thickness	10 ± 1 mil	9 ± 1 mil
Passivation	9-11 kÅ	9-11 kÅ
Metallization Type	Silicon Aluminum	Silicon Aluminum
Metallization Thickness:* Single Layer Metal Double Layer Metal, First Layer Double Layer Metal, Second Layer	 12.5-14.5 kÅ 6-8 kÅ 15-18 kÅ	 11-14 kÅ 7-8.5 kÅ 20-22 kÅ
Back Metallization	Gold, Alloyed	Gold, Alloyed
Pad Dimensions	4.5 x 4.5 mil typ 4.0 x 4.0 mil min	4.5 x 4.5 mil typ 4.0 x 4.0 mil min
Overall Chip Dimensions	Given for individual device type; allow ±5 mils for scribe tolerance.	

*Some LSI devices have three layers of metallization; consult Product Marketing for details.

QUALITY ASSURANCE PROVISIONS

All chips in these families are subjected to the same in-process controls as Motorola's standard encapsulated devices. The chip processing and quality control requirements are designed to ensure reliability and performance of the finished product.

PACKAGING

These devices are available in two package options: Multi-Pak for chips and Wafer-Pak for wafers.

MULTI-PAK

The Multi-Pak is a non-spill type waffle carrier consisting of a two inch square with 100 compartments arranged in a 10 by 10 matrix tray with a transparent cover. The chips are covered within the carrier that is designed to provide maximum device protection, permit partial removal of chips and resealing of carrier, and supply a convenient container for unused device storage.

WAFER-PAK

Wafers are placed in a plastic box, between two layers of mylar or inert filter paper sandwiched between two layers of polyfoam. The plastic box is securely taped shut and allows no movement of the wafer.

6

MECL 10,000 INTEGRATED CIRCUITS

The MECL 10,000 family is a high speed (2 ns propagation delay), economical logic family designed to fill the gap between the MECL II (4 ns) and MECL III (1 ns) families and to meet the requirements for future performance systems.

The features of MECL II and MECL III have been optimized and combined to give MECL 10,000 an excellent speed-power product, relatively slow rise and fall times, and transmission-line drive capability.

MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Ratings above which device life may be impaired:			
Power Supply Voltage (V_{CC} = 0 Vdc)	V_{EE}	-8 to 0	Vdc
Base Input Voltage (V_{CC} = 0 Vdc)	V_{in}	0 to V_{EE}	Vdc
Output Source Current — Continuous — Surge	I_O	< 50 < 100	mAdc
Storage Temperature Range MCC10100 thru MCC10287 MCC10500 thru MCC10631	T_{stg}	 -55 to +150 -55 to +150	°C
Recommended maximum ratings above which performance may be degraded:			
Operating Temperature Range MCC10100 thru MCC10287 MCC10500 thru MCC10631	T_A	 -30 to +85 -55 to +125	°C

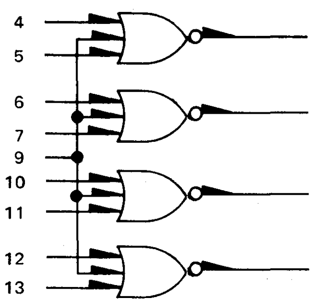
6

LOGIC DIAGRAMS AND CHIP GEOMETRIES

Logic diagram, geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

Chip Geometries not scaled to size.

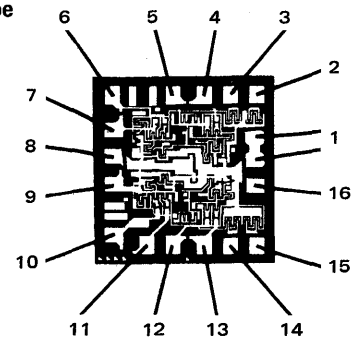
MCC10100/MCC10500
Quad NOR Gate W/Strobe



2 = $\overline{4 + 5 + 9}$

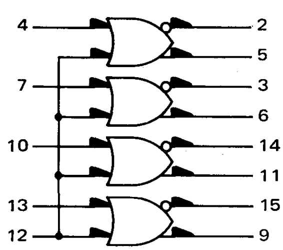
49 x 51
(3MR)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

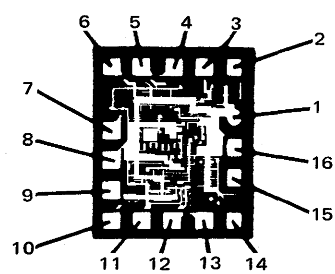


MCC10101/MCC10501
Quad OR/NOR Gate

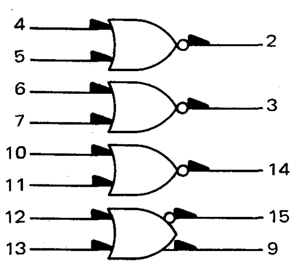
51 x 43
(3MR)



V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

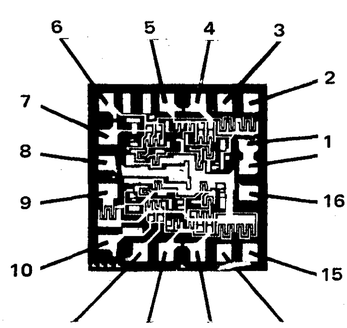


MCC10102/MCC10502
Quad NOR Gate



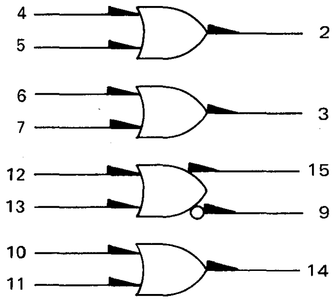
49 x 51
(3MR)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



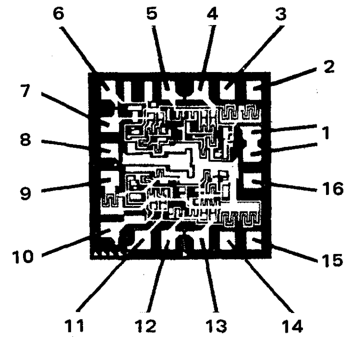
6

MCC10103/MCC10503
Quad 2-Input OR Gate

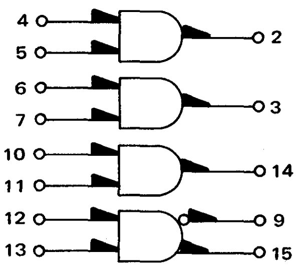


49 x 51
(3MR)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

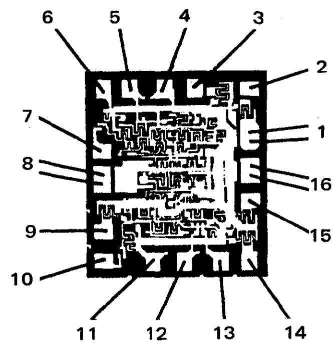


MCC10104/MCC10504
Quad AND Gate



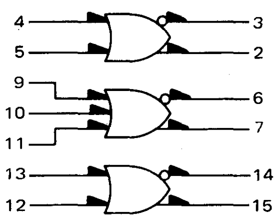
51 x 58
(1KN)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

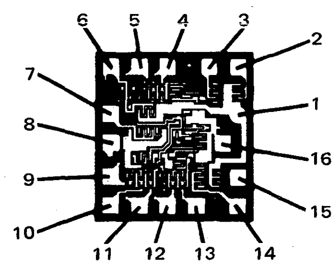


MCC10105/MCC10505
Triple 2-3-2 OR/Nor Gate

44 x 47
(6MT)

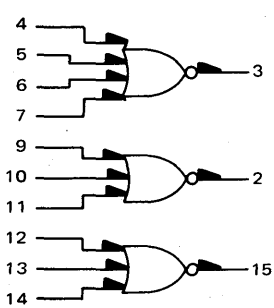


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

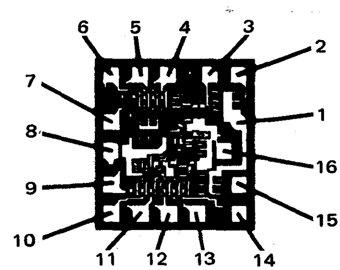


MCC10106/MCC10506
Triple 4-3-3 NOR Gate

44 x 47
(6MT)

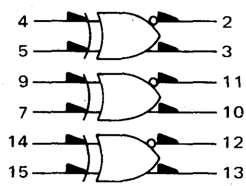


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



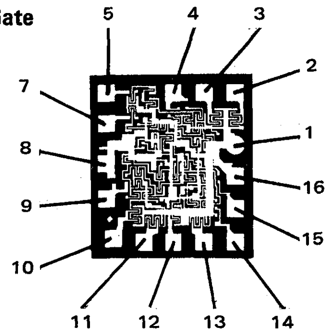
6

MCC10107/MCC10507
Triple Exclusive OR/NOR Gate

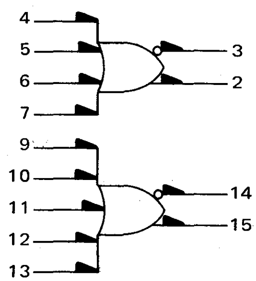


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

50 x 49
(1TD)

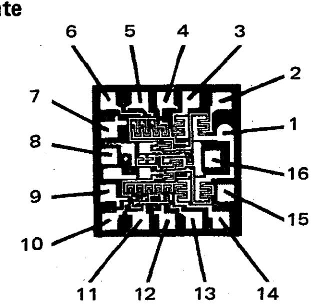


MCC10109/MCC10509
Dual 4-5-Input OR/NOR Gate



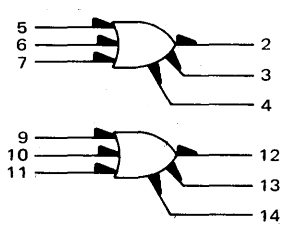
V_{CC1} = 1
V_{CC2} = 16
V_{EE} = 8

41 x 42
(9KN)

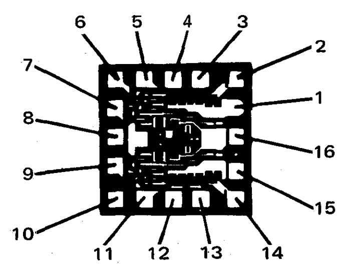


MCC10110
Dual 3-Input/3-Output OR Gate

42 x 42
(9KK)

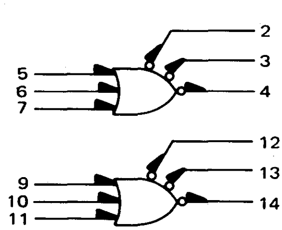


V_{CC1} = Pin 1, 15
V_{CC2} = Pin 16
V_{EE} = Pin 8

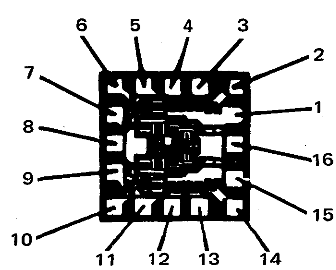


MCC10111
Dual 3-Input/3-Output NOR Gate

42 x 42
(9KK)

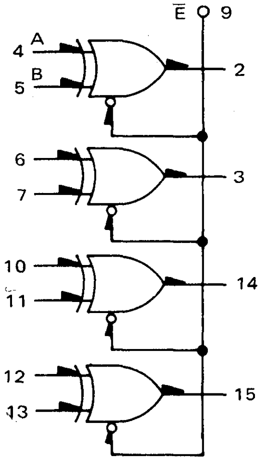


V_{CC1} = Pin 1, 15
V_{CC2} = Pin 16
V_{EE} = Pin 8

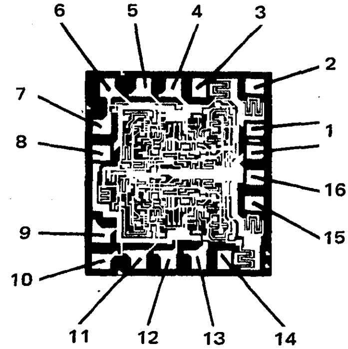


6

MCC10113/MCC10513
Quad Exclusive OR Gate

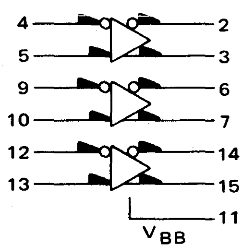


52 x 57
(9NA)



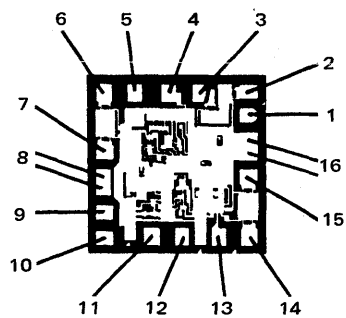
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10114/MCC10514
Triple Line Receiver

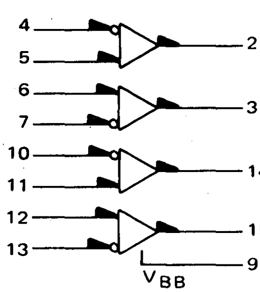


50 x 50
(3TR)

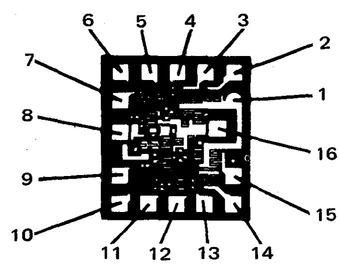
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



MCC10115/MCC10515
Quad Line Receiver



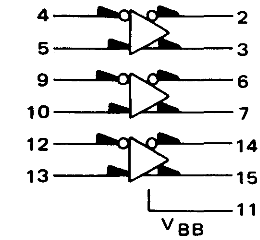
40 x 45
(1KP)



V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

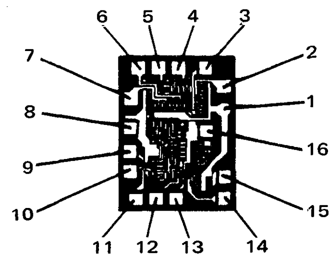
6

MCC10116/MCC10516
Triple LIne Receiver

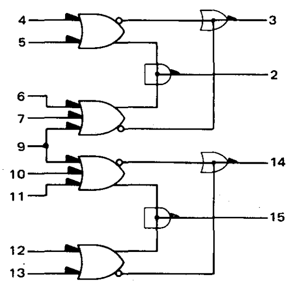


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

41 x 53
(4MJ)

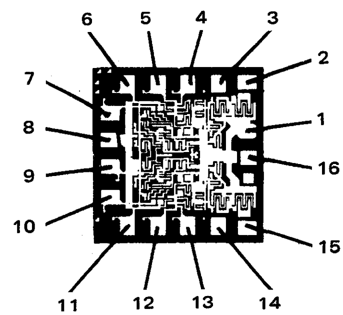


MCC10117/MCC10517
Dual 2-Wide OR-AND/OR-AND-INVERT Gate

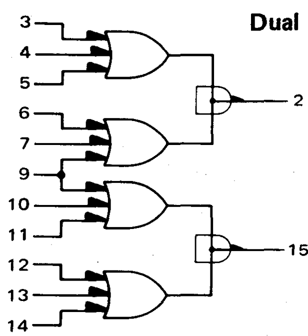


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

48 x 49
(7NE)

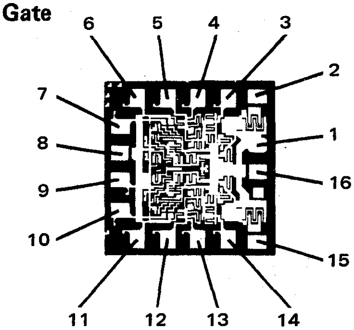


MCC10118/MCC10518
Dual 2-Wide 3-Input OR-AND Gate

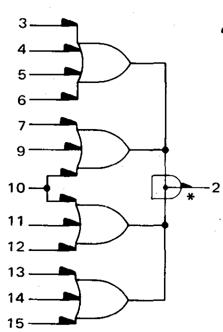


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

48 x 49
(7NE)



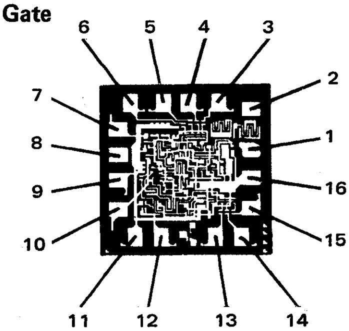
MCC10119/MCC10519
4-Wide 4-3-3-3-Input OR-AND Gate



*Collector Dot

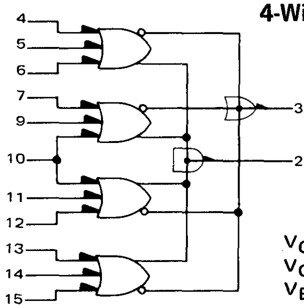
V_{CC1} = Pin 1
V_{CC2} = Pin 2
V_{EE} = Pin 8

47 x 47
(1NF)



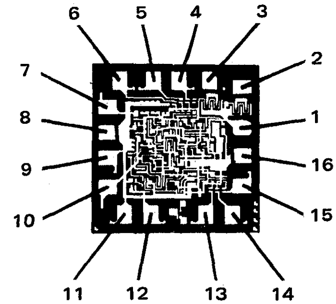
6

MCC10121/MCC10521
4-Wide OR-AND/OR-AND-INVERT Gate

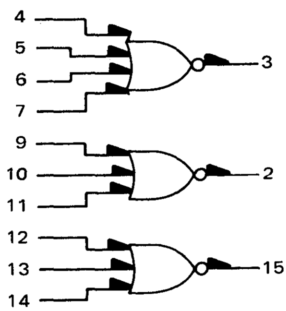


47 x 47
(1NF)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

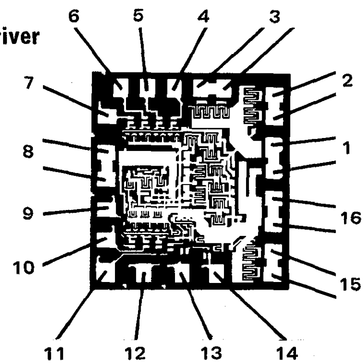


MCC10123
Triple 4-3-3-Input Bus Driver

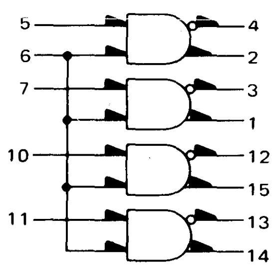


61 x 56
(1ND)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

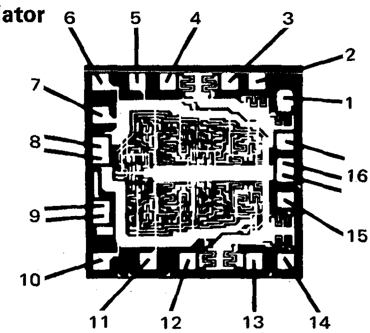


MCC10124/MCC10524
Quad TTL-To-MECL Translator

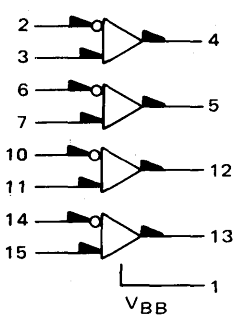


60 x 59
(7KS)

Gnd = Pin 16
V_{CC} (+5.0 Vdc) = Pin 9
V_{EE} (-5.2 Vdc) = Pin 8

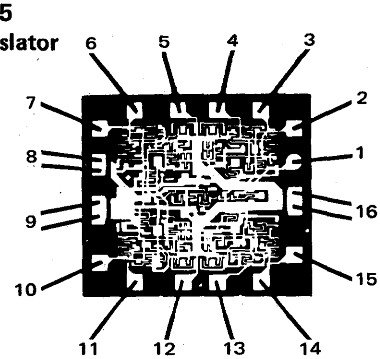


MCC10125/MCC10525
Quad MECL-To-TTL Translator

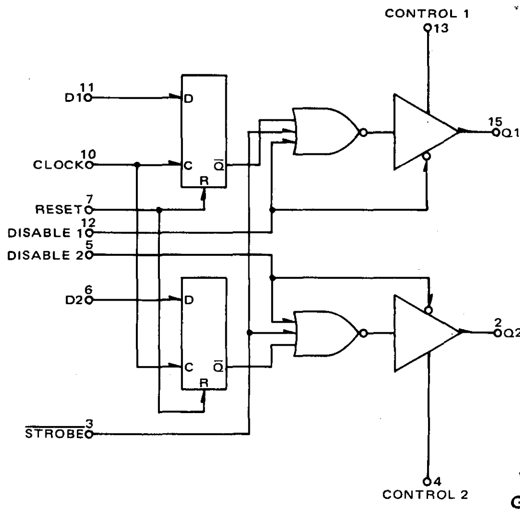


57 x 62
(3KV)

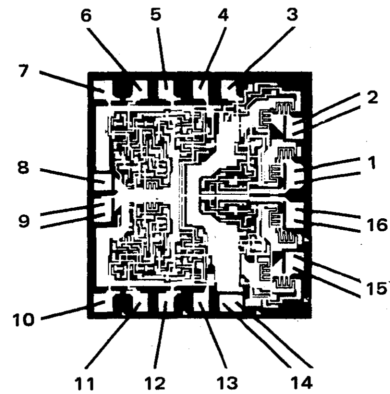
Gnd = Pin 16
V_{CC} (+5.0 Vdc) = Pin 9
V_{EE} (-5.2 Vdc) = Pin 8



MCC10128
Dual Bus Driver

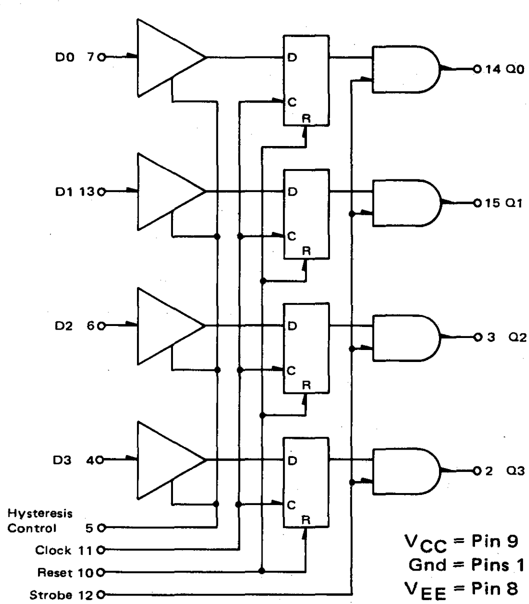


68 x 63
(7NC)

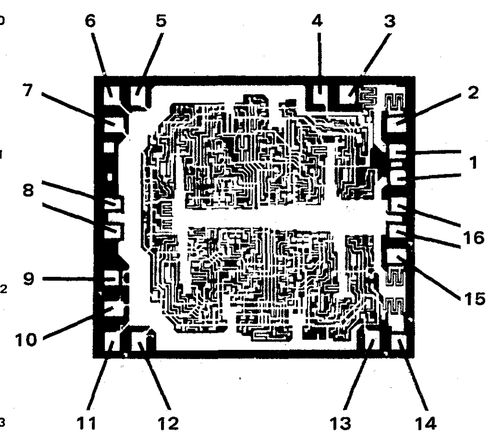


V_{CC} = Pin 14
Gnd1 = Pin 16
Gnd2 = Pin 1
Gnd3 = Pin 9
V_{EE} = Pin 8

MCC10129
Quad Bus Receiver



76 x 86
(6LS)

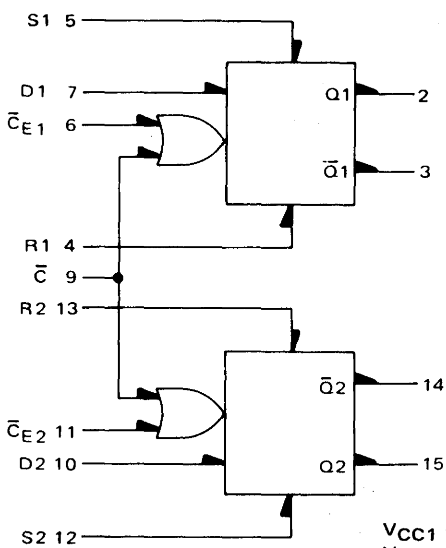


V_{CC} = Pin 9
Gnd = Pins 1 and 16
V_{EE} = Pin 8

6

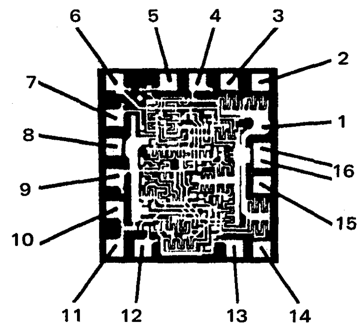
6

MCC10130/MCC10530
Dual D Latch

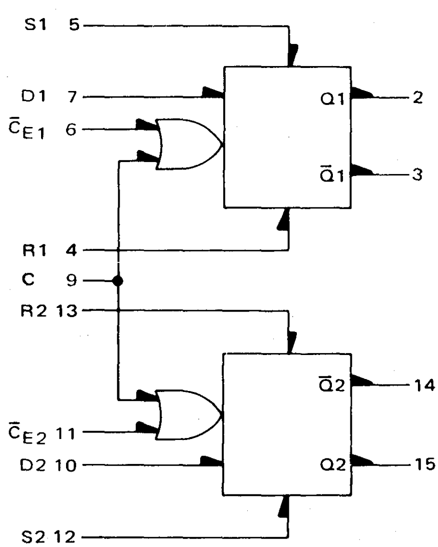


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

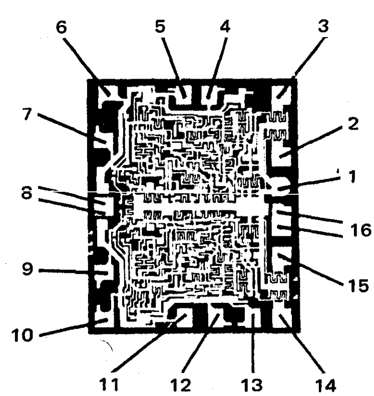
55 x 50
(3NF)



MCC10131/MCC10531
Dual D Flip-Flop

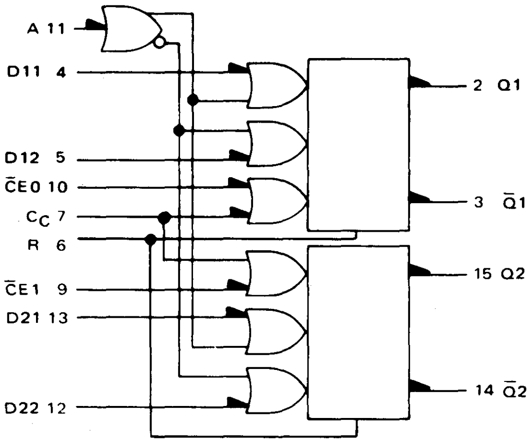


58 x 70
(9NB)

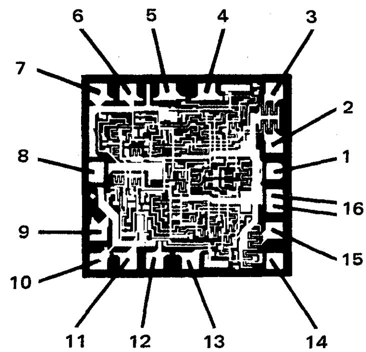


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10132/MCC10532
Dual MUX W/Latch (Common Reset)

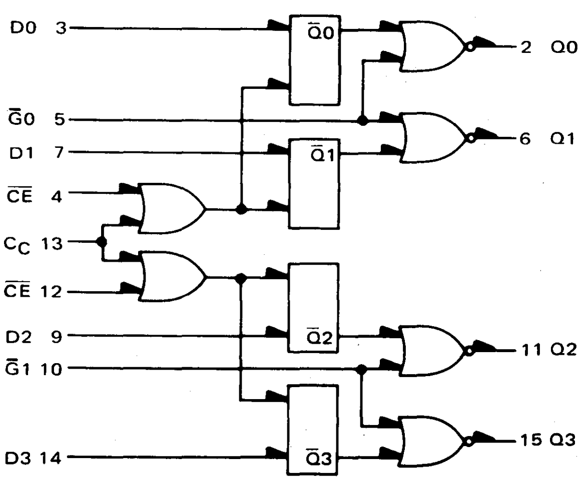


58 x 56
(2TG)

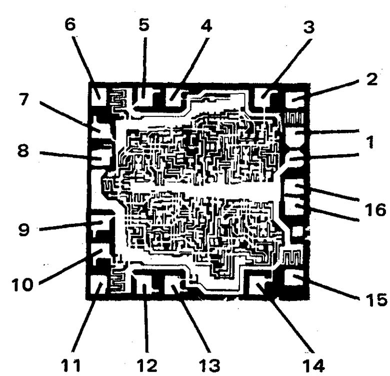


V_{CC1} = Pin 1
V_{CC2} = Pin 15
V_{EE} = Pin 8

MCC10133/MCC10533
Quad Latch

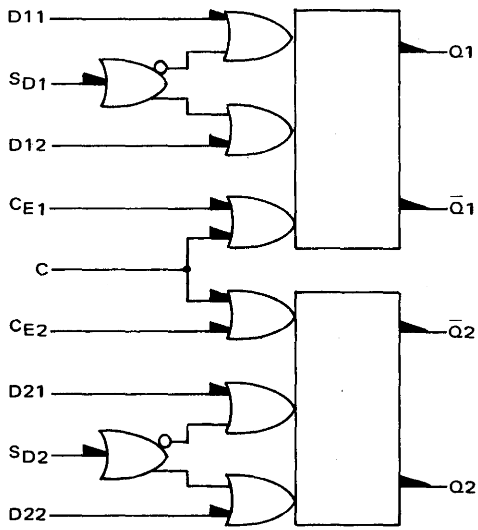


61 x 63
(1MV)

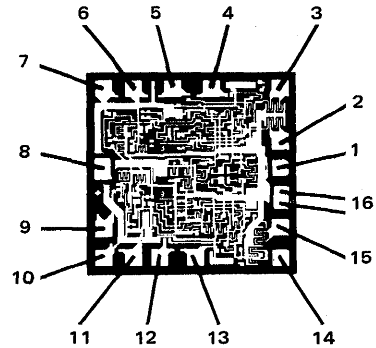


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10134/MCC10534
Dual MUX W/Latch (Separate Select)

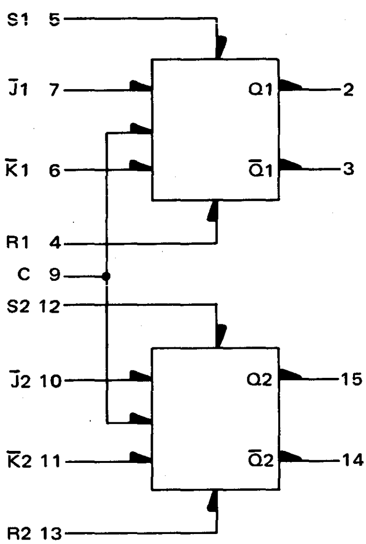


58 x 56
(2TG)

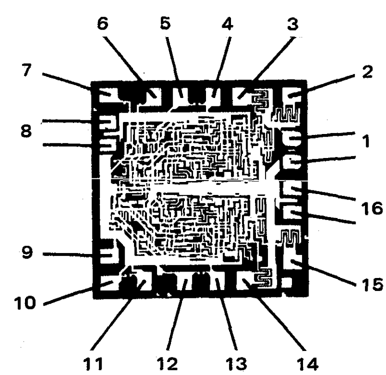


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10135/MCC10535
Dual J-K Master-Slave Flip-Flop

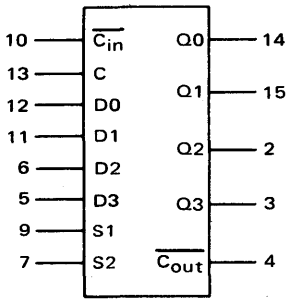


60 x 60
(5LD)

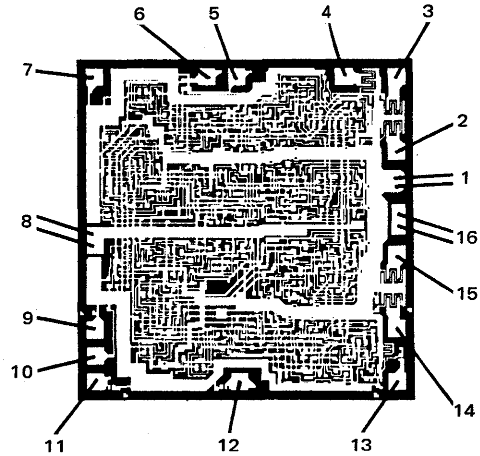


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10136/MCC10536
Universal Binary Counter

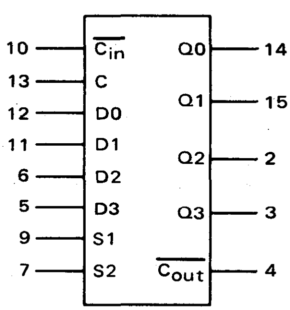


90 x 91
(5KR)

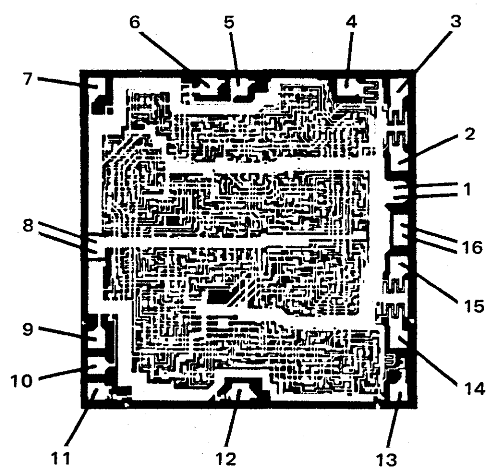


V_{CC} = Gnd
V_{EE} = −5.2 Vdc

MCC10137/MCC10537
Universal Decade Counter

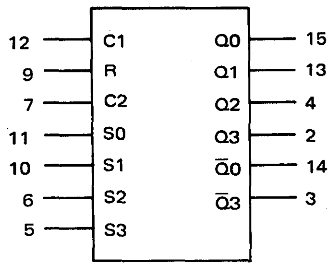


90 x 91
(5KR)

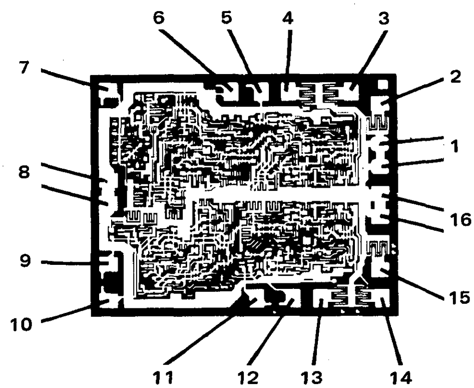


V_{CC} = Gnd
V_{EE} = −5.2 Vdc

MCC10138/MCC10538
Bi-Quinary Counter

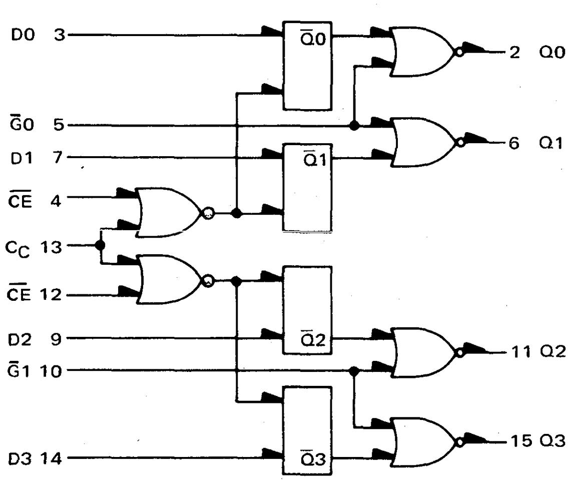


66 x 83
(3NA)

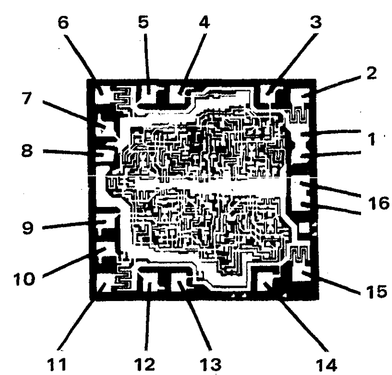


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10153/MCC10553
Quad Latch (Negative Clock)



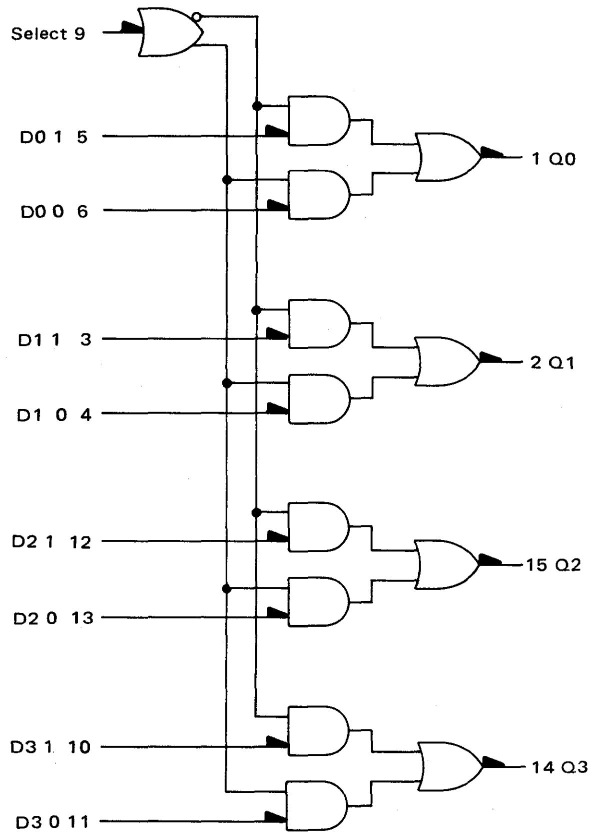
61 x 63
(1MV)



V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

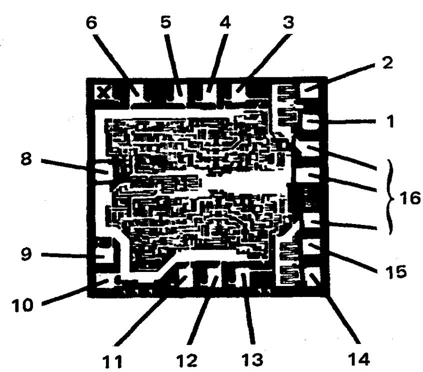
6

MCC10158/MCC10558
Quad 2-Input Multiplexer (Non-Inverting Output)



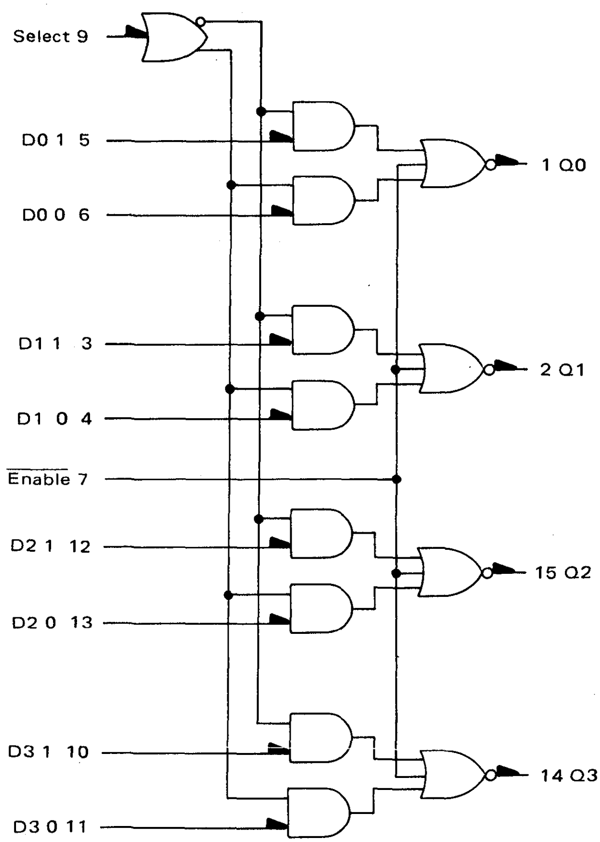
V_{CC} = Pin 16
V_{EE} = Pin 8

60 x 66
(6LB)

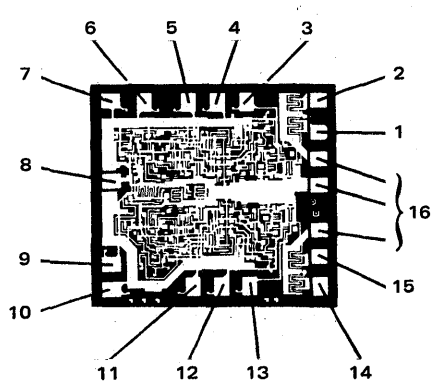


6

MCC10159/MCC10559
Quad 2-Input Multiplexer (Inverting Output)



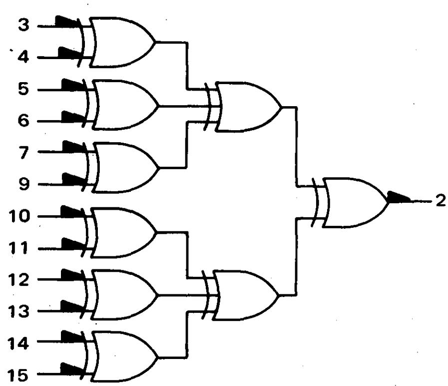
V_{CC} = Pin 16
V_{EE} = Pin 8



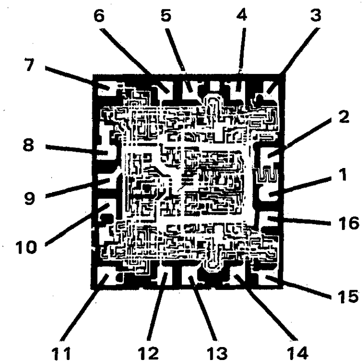
60 x 66
(6LB)

6

MCC10160/MCC10560
12-Bit Parity Generator/Checker

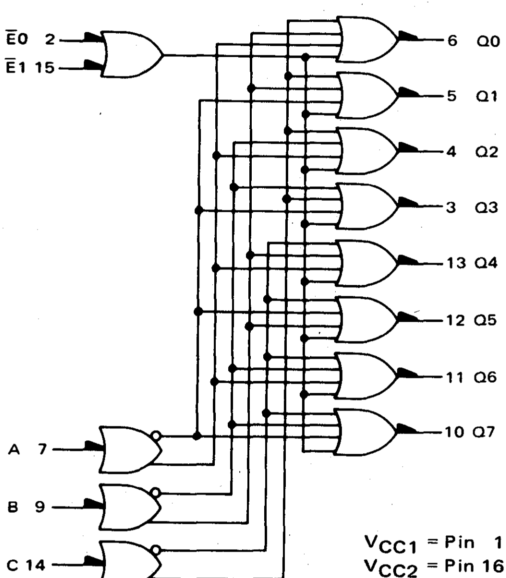


61 x 55
(1MS)

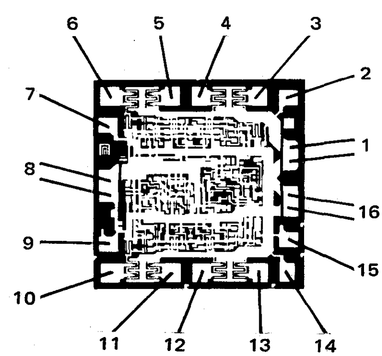


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10161/MCC10561
Binary to 1–8 Line Decoder (Low)



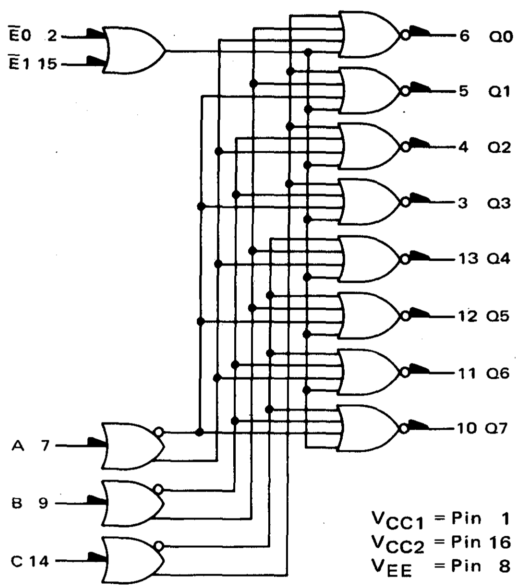
58 x 59
(9MT)



V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

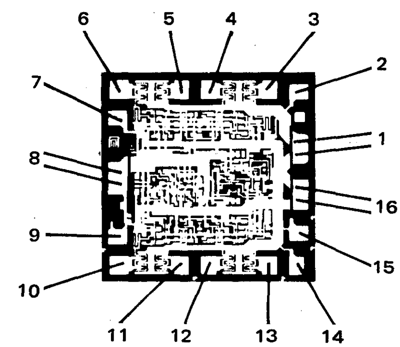
6

MCC10162/MCC10562
Binary to 1–8 Line Decoder (High)

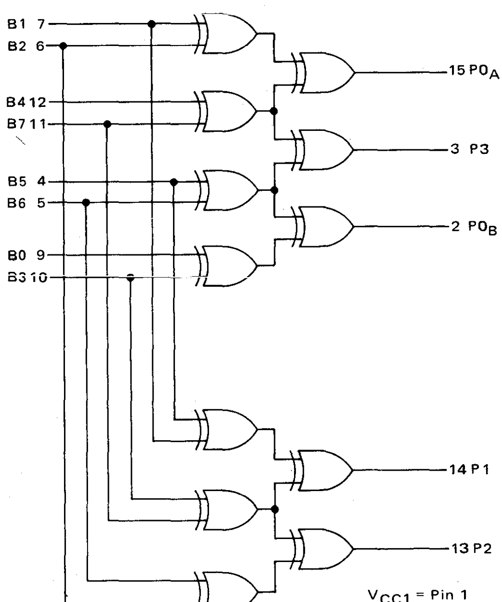


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

58 x 59
(9MT)

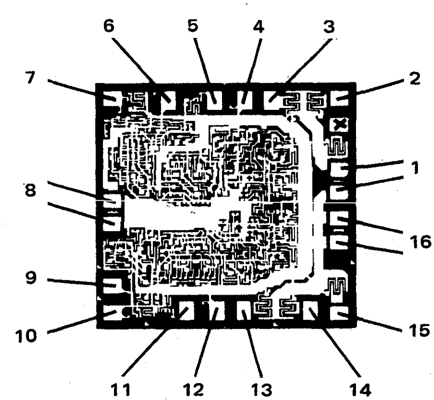


MCC10163
Error Detection/Correction Ckt. (IBM Pattern)

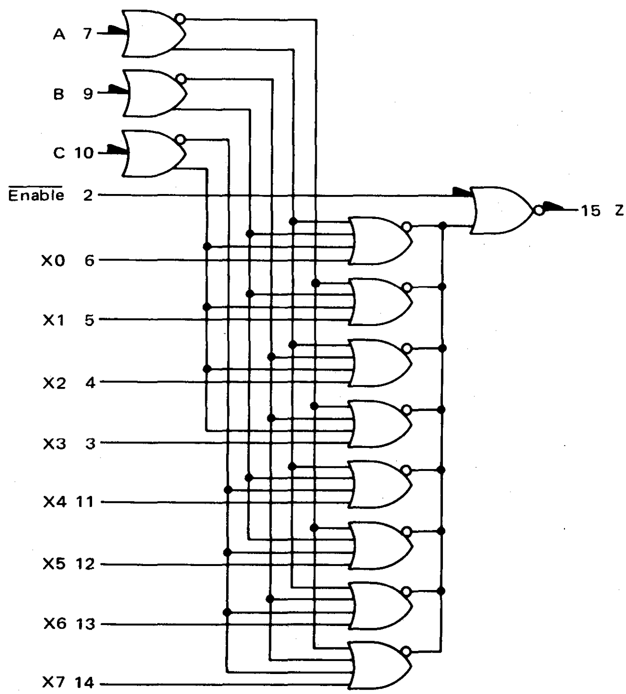


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

67 x 71
(5ND)

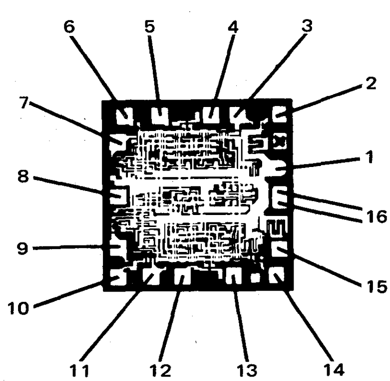


MCC10164/MCC10564
8-Line Multiplexer

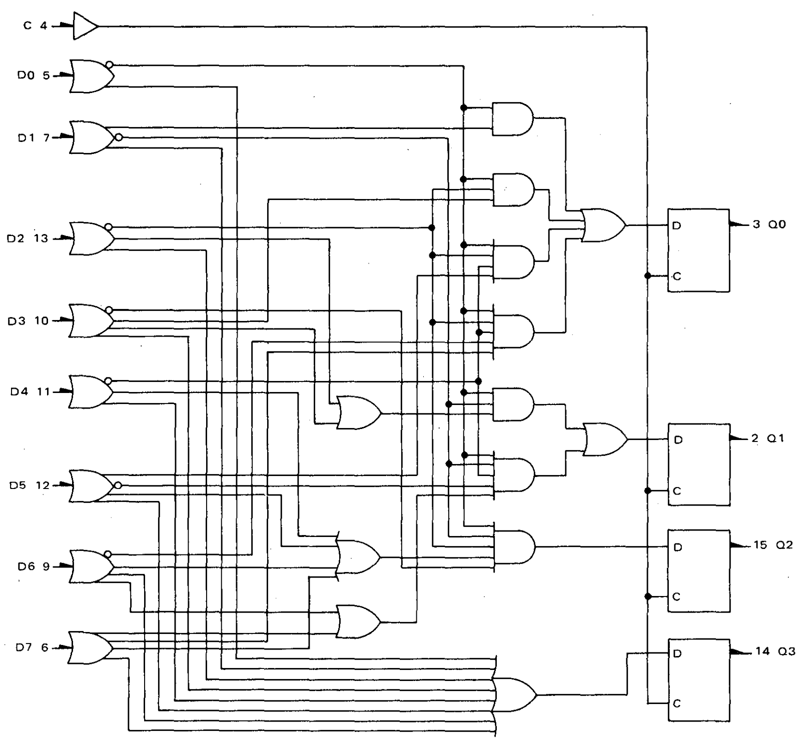


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

54 x 54
(8MA)

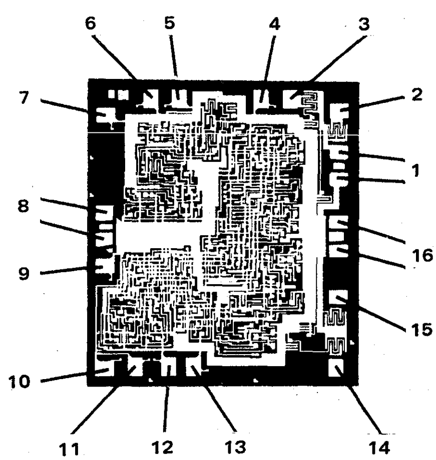


MCC10165/MCC10565
Priority Encoder

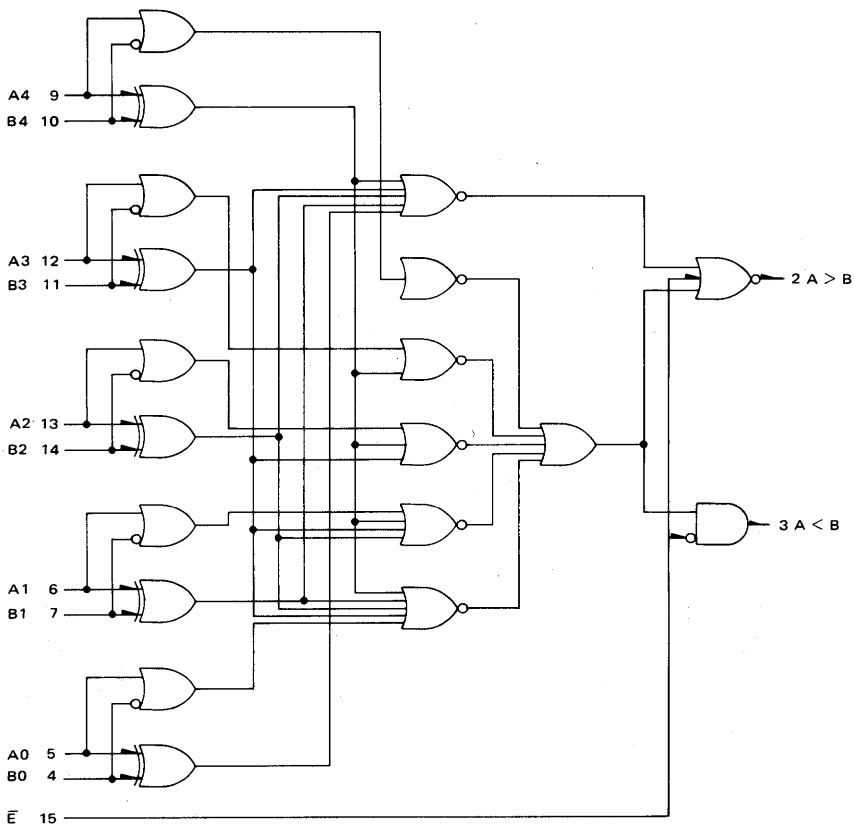


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

73 x 82
(6MG)

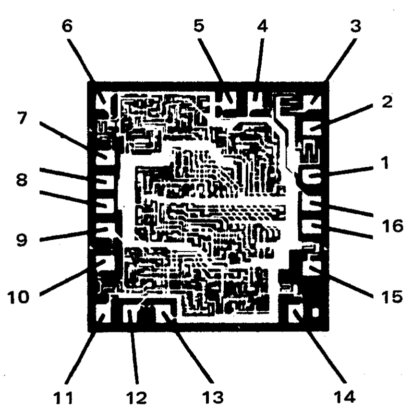


MCC10166/MCC10566
5-Bit Comparator

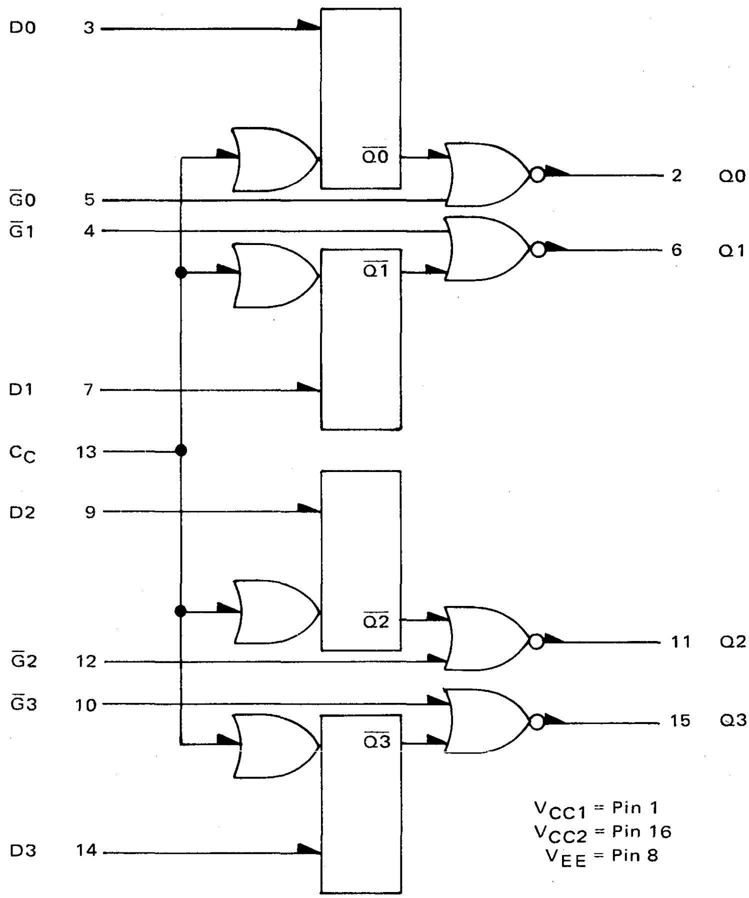


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

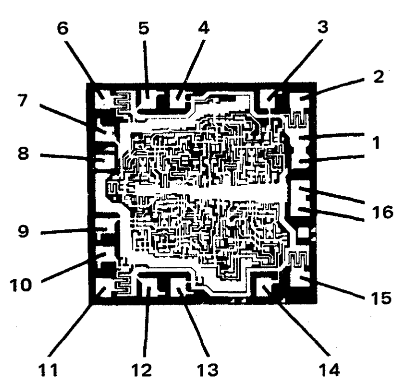
61 x 62
(1TH)



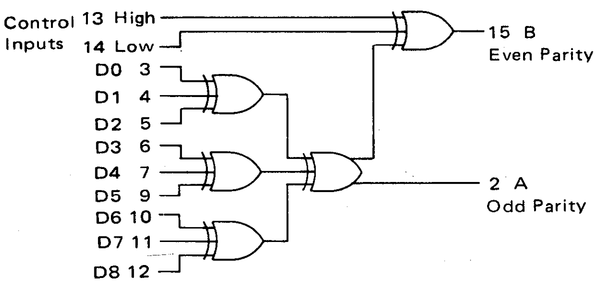
MCC10168/MCC10568
Quad Latch (Common Clock)



61 x 63
(1MV)

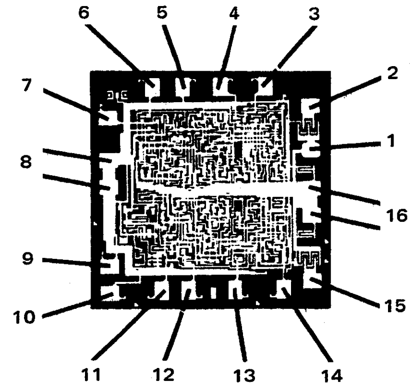


MCC10170/MCC10570
9 + 2 Bit Parity Checker

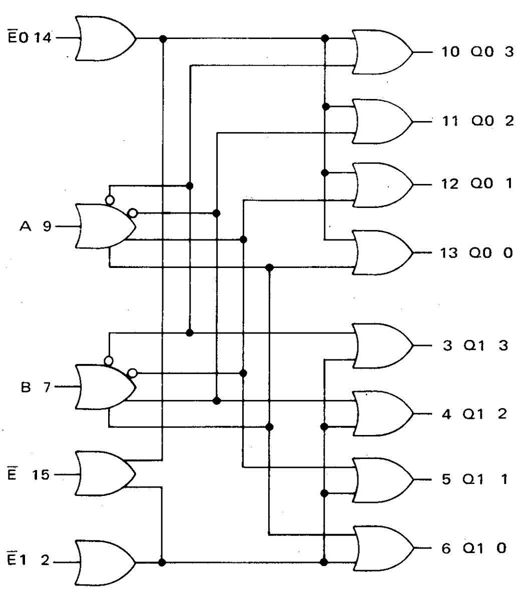


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

65 x 65
(3RF)

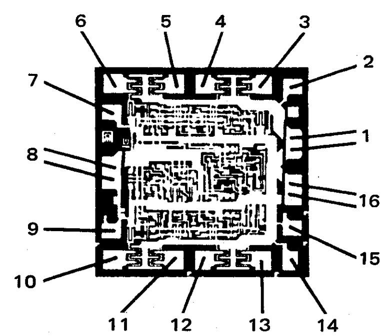


MCC10171/MCC10571
Dual 4-Line Decoder (Low)



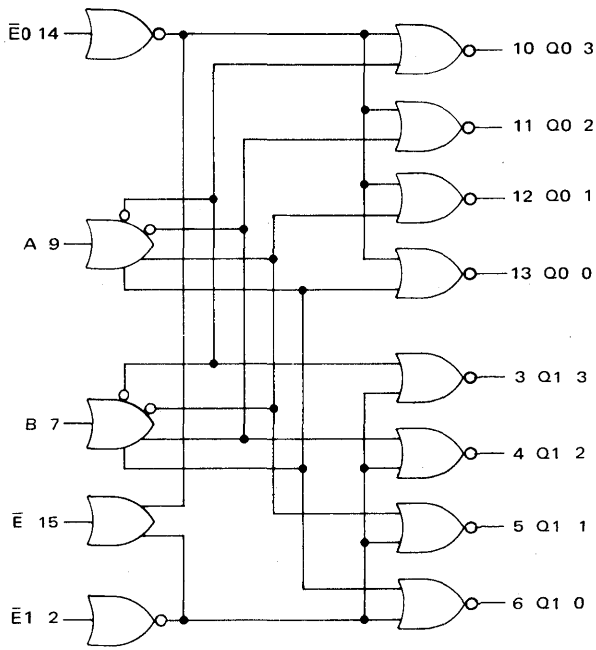
V_{CC} = Gnd
V_{EE} = −5.2 Vdc

58 x 59
(9MT)

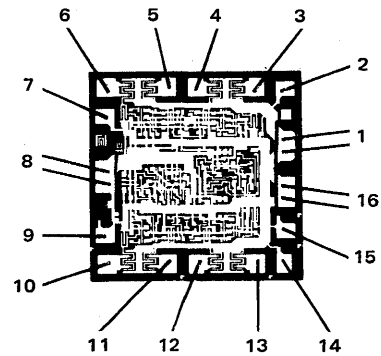


6

MCC10172/MCC10572
Dual 4-Line Decoder (High)

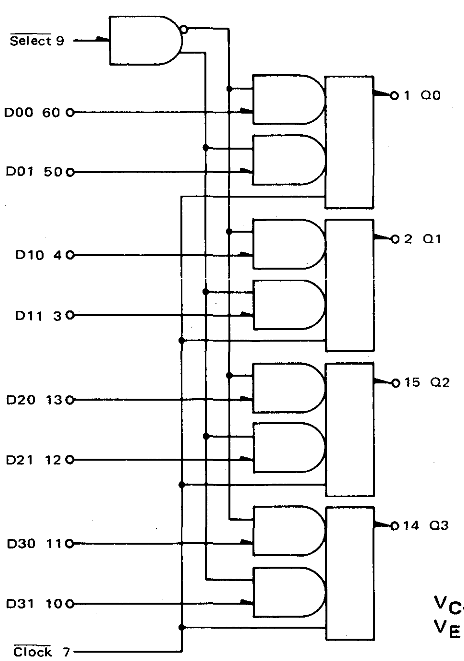


58 x 59
(9MT)

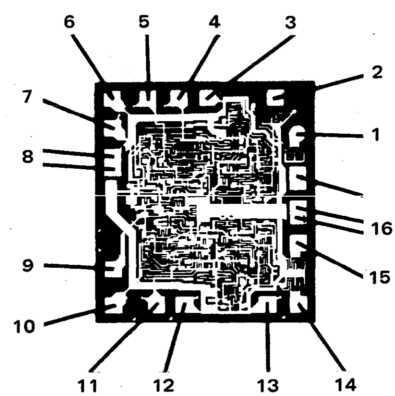


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10173/MCC10573
Quad 2-Input MUX W/Latch



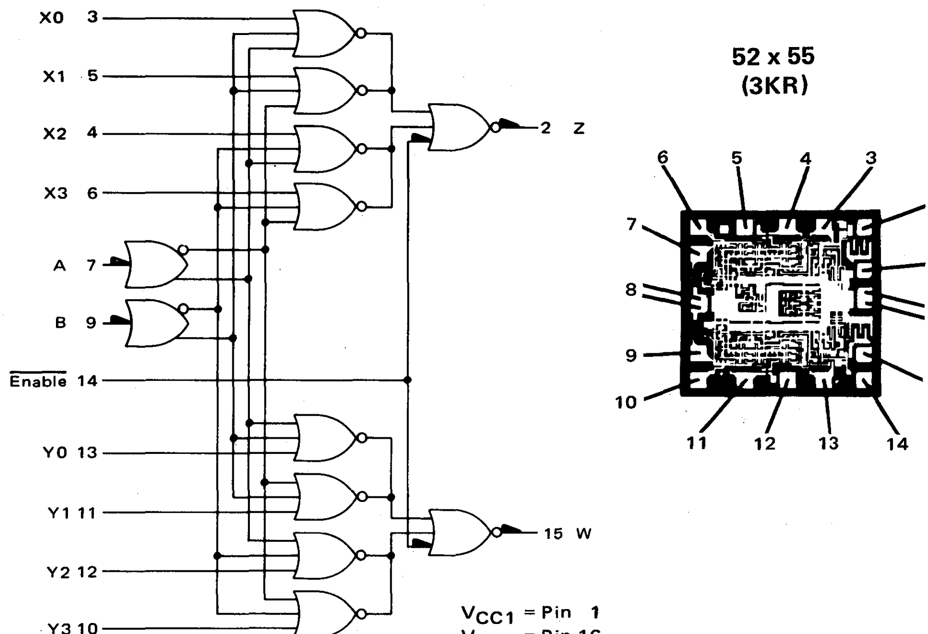
60 x 66
(6LB)



V_{CC} = Pin 16
V_{EE} = Pin 8

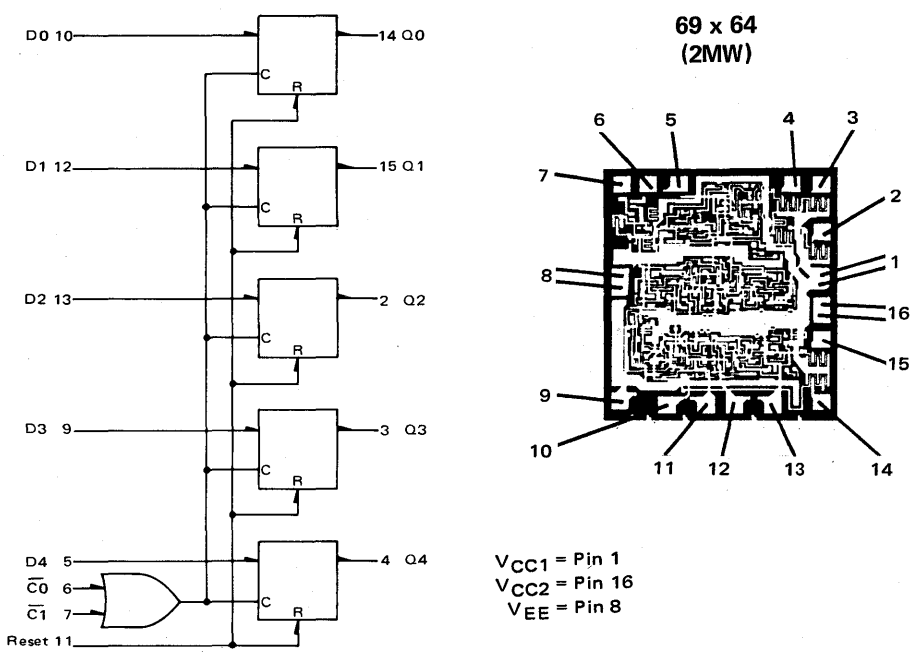
6

MCC10174/MCC10574
Dual 4-to-1 Multiplexer



V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

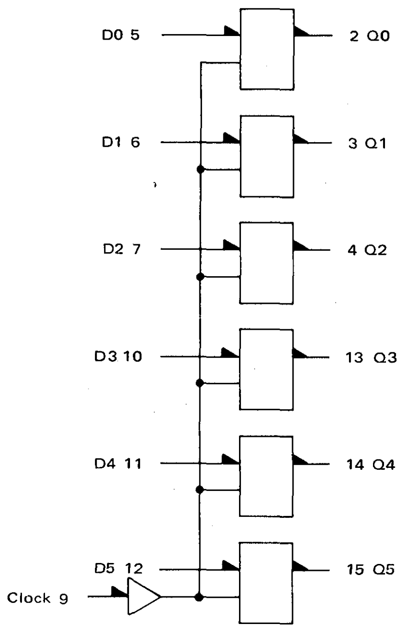
MCC10175/MCC10575
Quint Latch



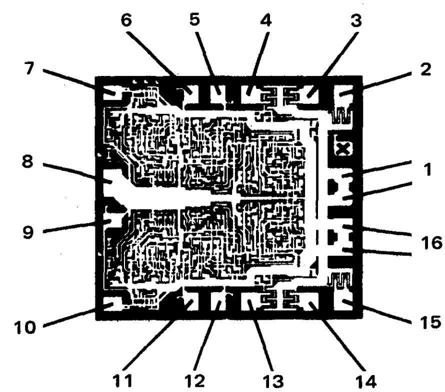
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

6

MCC10176/MCC10576
Hex D Flip-Flop

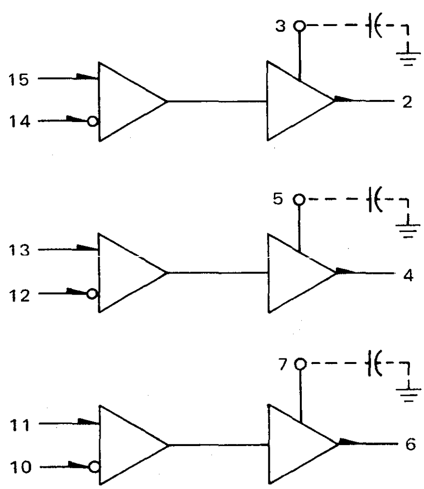


66 x 72
(4NC)

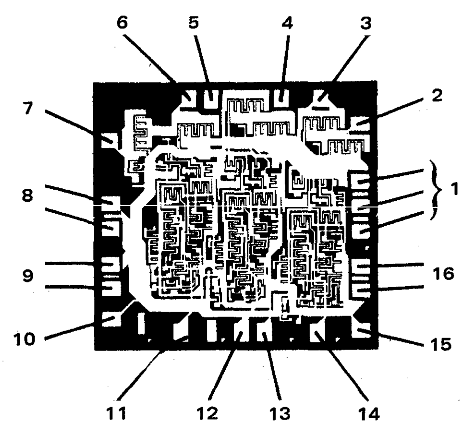


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10177
Triple MECL-to-MOS Translator (N-Channel)



73 x 77
(5TR)

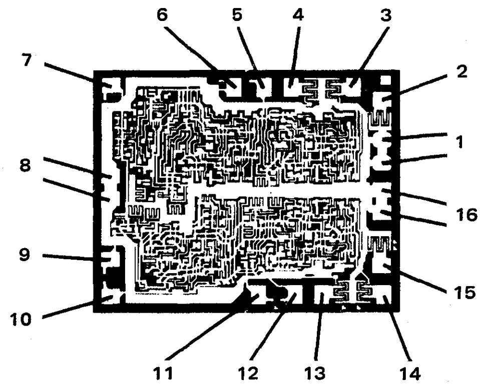


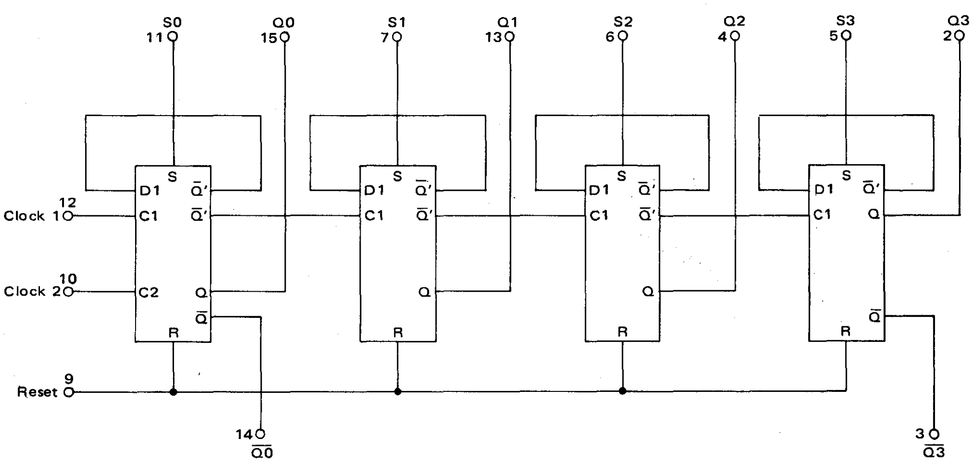
V_{CC} = Gnd = Pins 1, 16
V_{EE} = Pin 8 = –5.2 Vdc ± 5%
V_{SS} = Pin 9 (+5.0 Vdc or +6.0 Vdc ± 10%)

6

MCC10178/MCC10578
Binary Counter

66 x 83
(3NA)

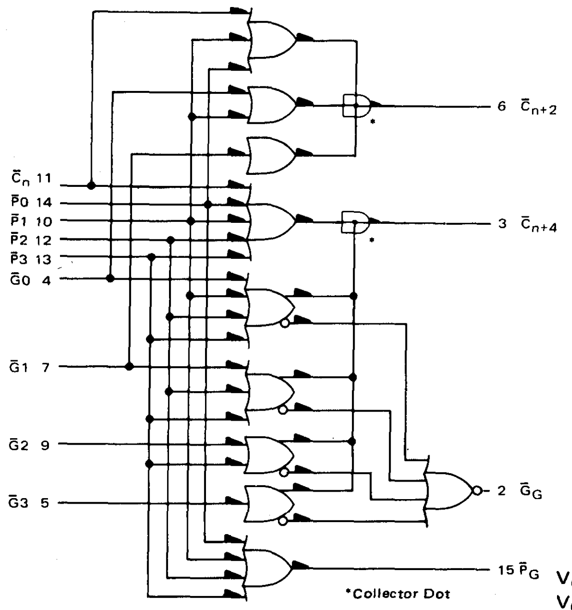




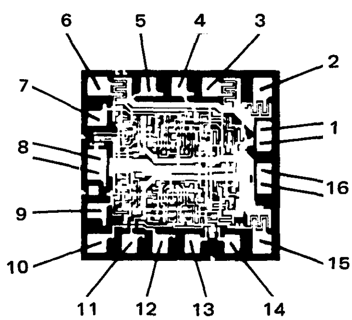
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

6

MCC10179/MCC10579
Look Ahead Carry Block

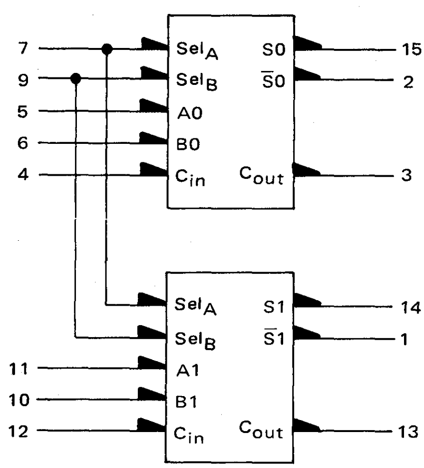


53 x 55
(8MV)

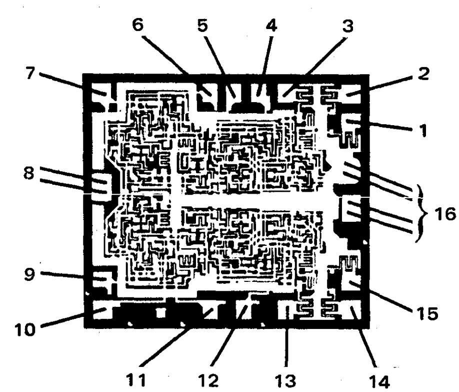


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10180/MCC10580
Dual High-Speed Adder/Subtractor



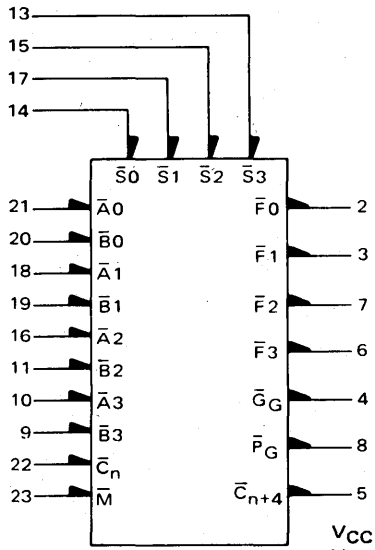
69 x 77
(1NE)



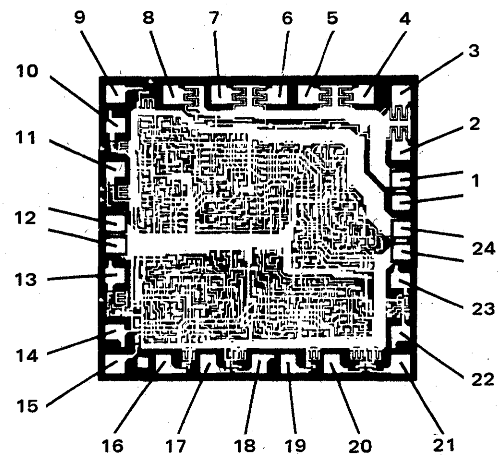
V_{CC} = Pin 16
V_{EE} = Pin 8

6

MC10181/MCC10581
4-Bit Arithmetic Logic Unit

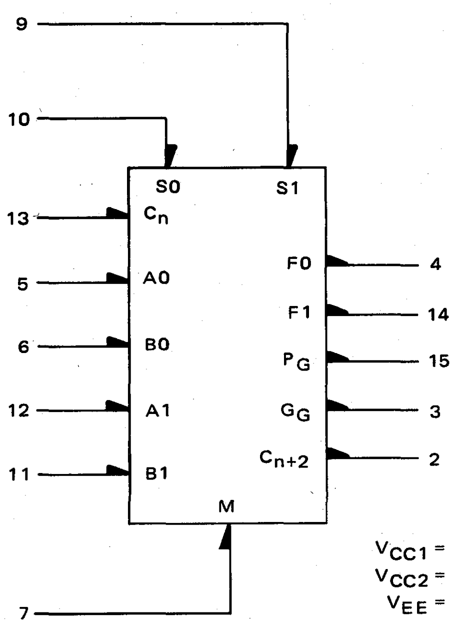


82 x 87
(4EF)

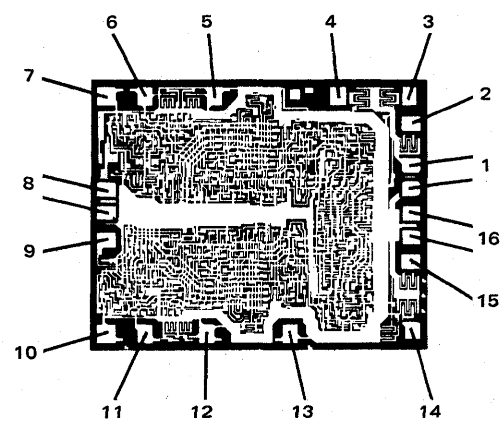


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10182/MCC10582
16-Pin 2-Bit ALU



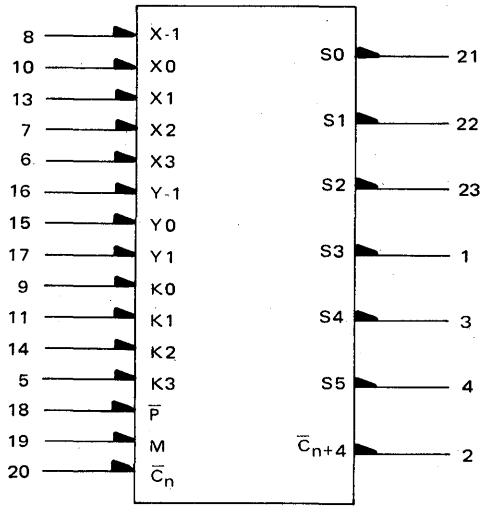
74 x 92
(2TT)



V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

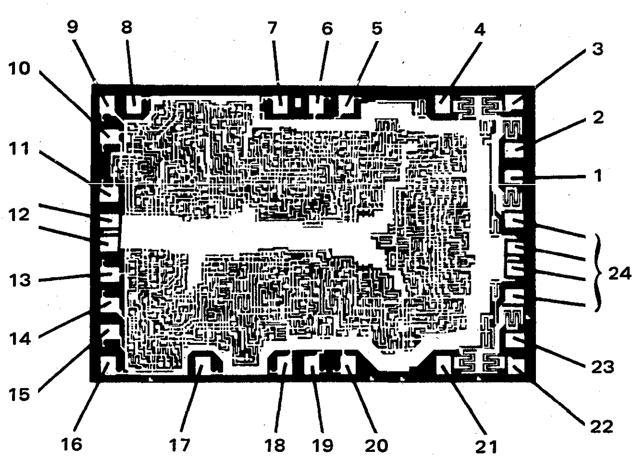
6

MCC10183/MCC10583
4 x 2 (2s complement) Multiplier

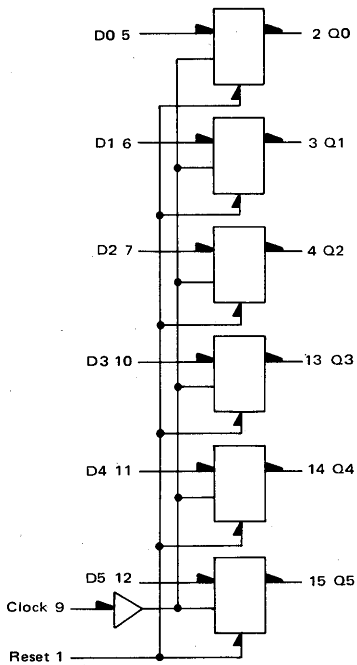


V_{CC} = Pin 24
V_{EE} = Pin 12

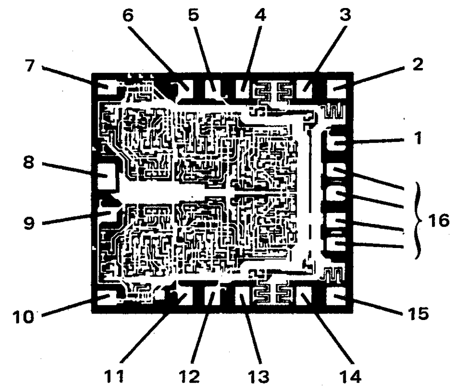
80 x 118
(1PB)



MCC10186/MCC10586
Hex D Flip-Flop W/Common Reset

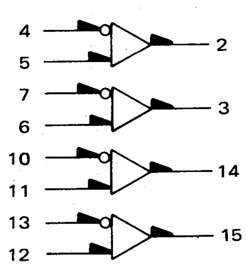


66 x 72
(4NC)

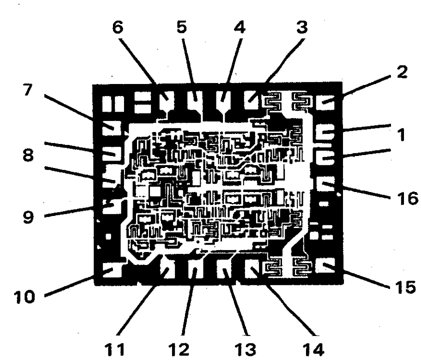


V_{CC} = Pin 16
V_{EE} = Pin 8

MCC10190/MCC10590
Quad IBM-to-MECL Translator



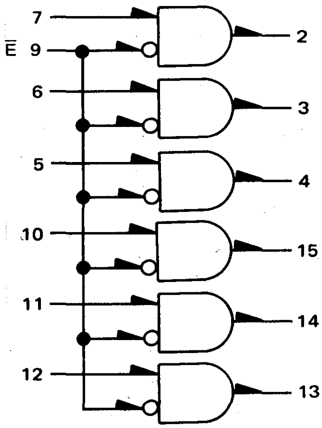
56 x 68
(5TG)



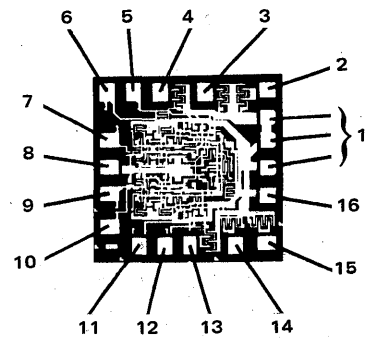
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8
V_{SS} = Pin 9 Translator
V_{CC} = Pin 9 Receiver

6

MCC10191/MCC10591
Hex MECL-to-IBM Translator

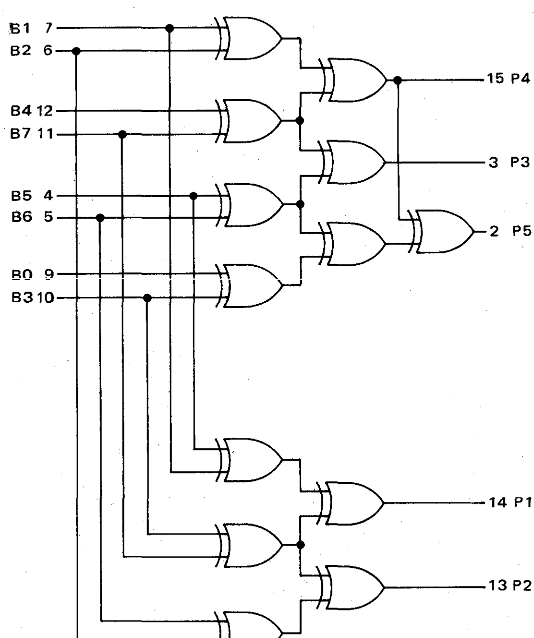


53 x 52
(3TG)

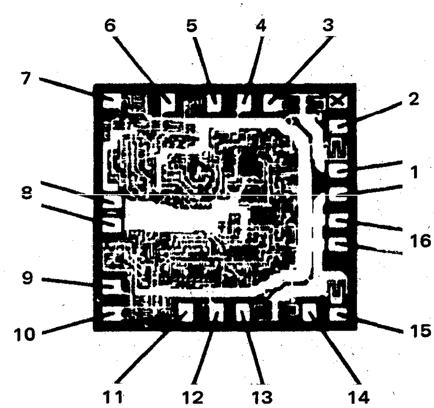


V_{CC1} = Pin 1 = +1.25 Vdc
V_{CC2} = Pin 16 = Gnd
V_{EE} = Pin 8 = –5.2 Vdc

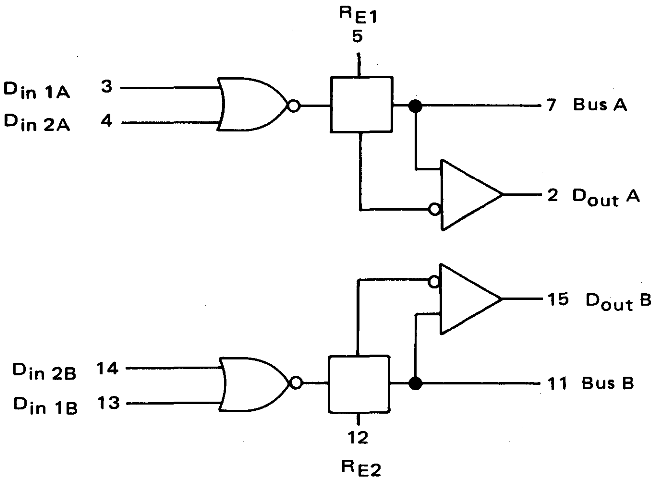
MCC10193
Error Detection/Correction Ckt. (Motorola Pattern)



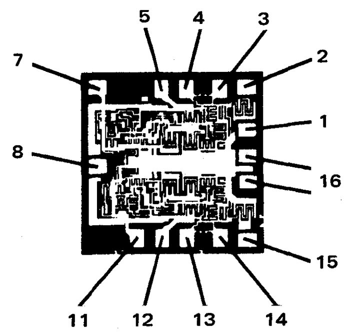
67 x 71
(5ND)



MCC10194/MCC10594
Dual Simultaneous Bus Transceiver

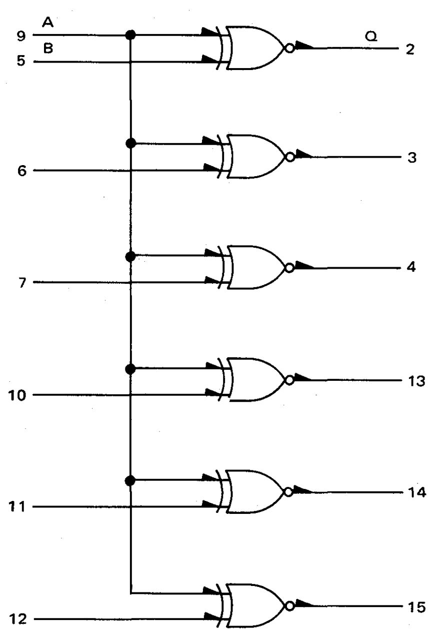


51 x 51
(5LP)

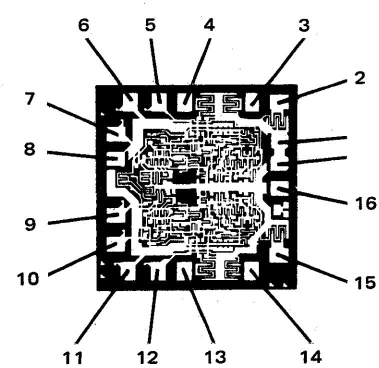


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10195/MCC10595
Hex Inverter/Buffer

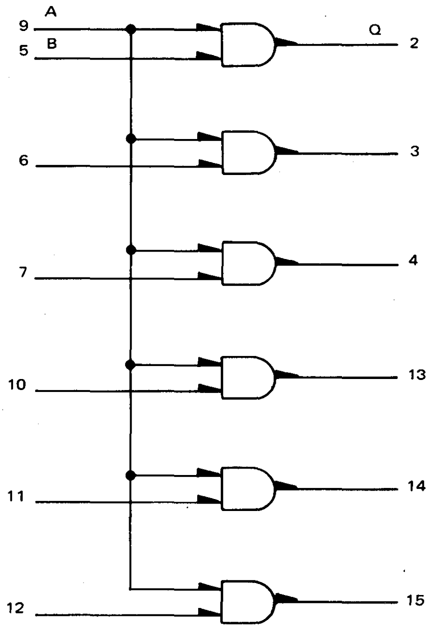


55 x 56
(7TR)

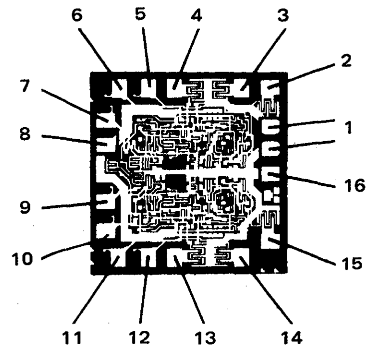


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10197/MCC10597
Hex AND Gate

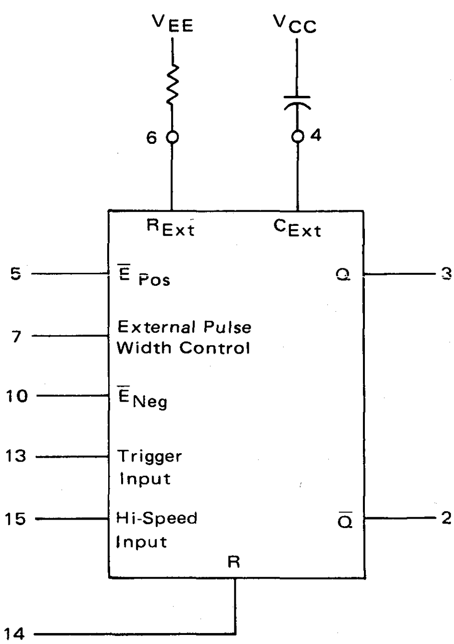


55 x 56
(7TR)

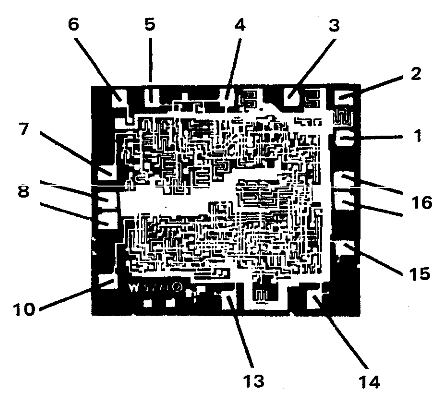


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10198
Retriggerable 1-shot Multivibrator

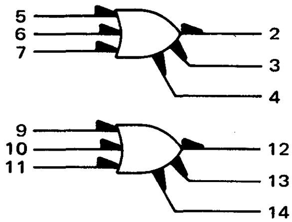


65 x 74
(3NG)

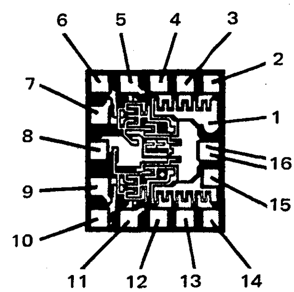


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10210/MCC10610
High-Speed Dual 3-Input/3-Output OR Gate

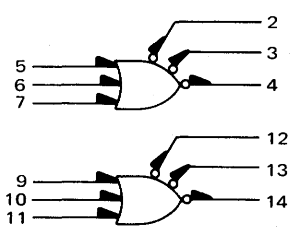


40 x 46
(B2F)

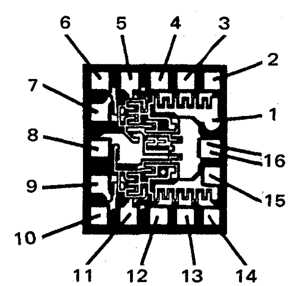


V_{CC1} = 1, 15
V_{CC2} = 16
V_{EE} = 8

MCC10211/MCC10611
High-Speed Dual 3-Input/3-Output NOR Gate



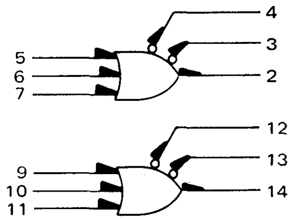
40 x 46
(B2F)



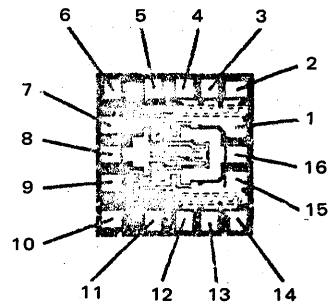
V_{CC1} = 1, 15
V_{CC2} = 16
V_{EE} = 8

6

MCC10212/MCC10612
High-Speed Dual 2-NOR/1-OR Gate

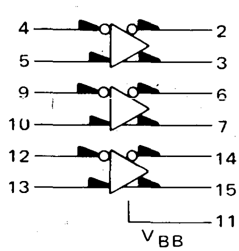


46 x 44
(9WJ)

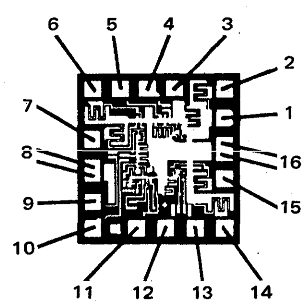


V_{CC1} = 1, 15
V_{CC2} = 16
V_{EE} = 8

MCC10216/MCC10616
High-Speed Triple Line Receiver

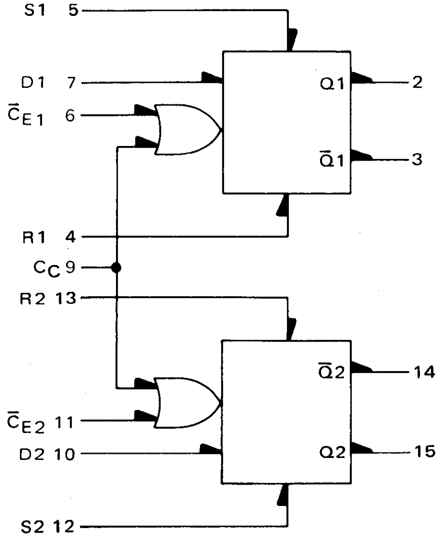


46 x 48
(4NE)

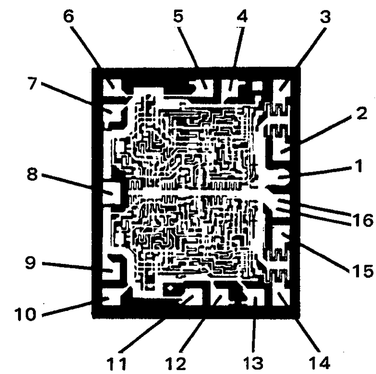


V_{CC} = Gnd
V_{EE} = –5.2 Vdc

MCC10231/MCC10631
High-Speed Dual D Flip-Flop



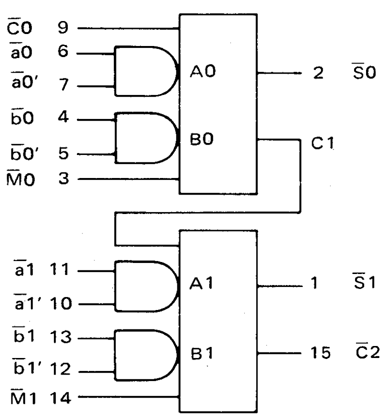
66 x 56
(3WE)

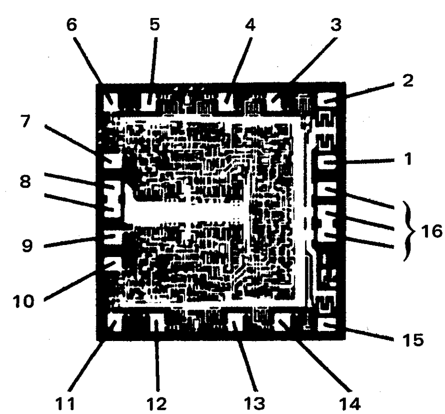


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC10287
High-Speed 2-Bit Multiplier

68 x 70
(3TT)





V_{CC} = Pin 16
V_{EE} = Pin 8

6

MECL III INTEGRATED CIRCUITS
MCC1600 Series

The MECL III Series of circuits presents the system design engineer with a family designed with even higher performance than MECL II.

- Compatible with MECL II and MECL 10,000
- Propagation Delays Typically 1.0 ns
- Clock Rates Greater than 300 MHz

MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Ratings above which devices life may be impaired:			
Power Supply Voltage (V_{CC} = 0)	V_{EE}	− 8 to 0	Vdc
Input Voltage (V_{CC} = 0)	V_{in}	0 to V_{EE} min	Vdc
Output Source Current	I_o	40	mAdc
Storage Temperature Range	T_{stg}	−55 to +150	°C
Recommended maximum ratings above which performance may be degraded:			
Operating Temperature Range	T_A	−30 to +185	°C
DC Fan-Out (Gates and Flip-Flops)	n	70	—

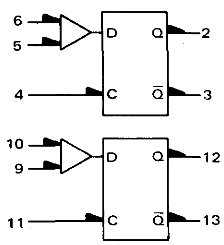
6

LOGIC DIAGRAMS and CHIP GEOMETRIES

Logic diagram, geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

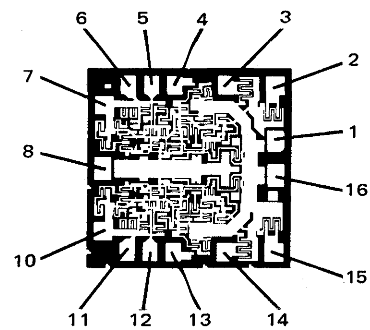
Chip Geometries not scaled to size.

MCC1650
Dual A-D Comparator

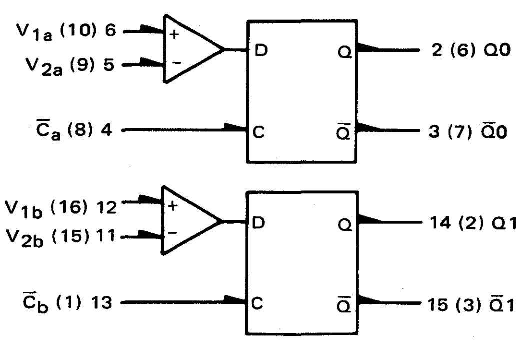


56 x 57
(4NG)

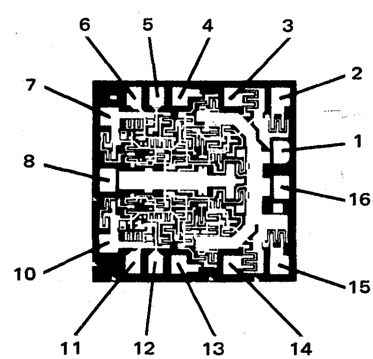
V_{EE} = 5.2 Volts
V_{CC} = +5.0 Volts



MCC1651
Dual A-D Comparator



56 x 57
(4NG)

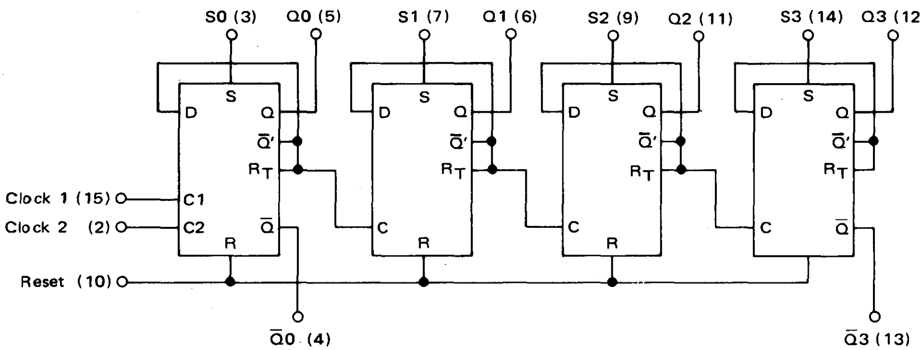


V_{CC} = +5.0 V = Pin 7,10 - (11), (14)
V_{EE} = −5.2 V = Pin 8 (12)
Gnd = Pin 1,16 (4) (5)

- P_D = 330 mW typ/pkg (No Load)
- t_{pd} = 3.5 ns typ (MC1650)
  = 3.0 ns typ (MC1651)
- Input Slew Rate = 350 V/µs (MC1650)
  = 500 V/µs (MC1651)
- Differential Input Voltage:
  −5.0 V to +5.0 V (−30°C to +85°C)
- Common Mode Range:
  −3.0 V to +2.5 V (−30°C to +85°C) (MC1651)
  −2.5 V to +3.0 V (−30°C to +85°C) (MC1650)
- Resolution: ⩽20 mV (−30°C to +85°C)
- Drives 50 Ω lines

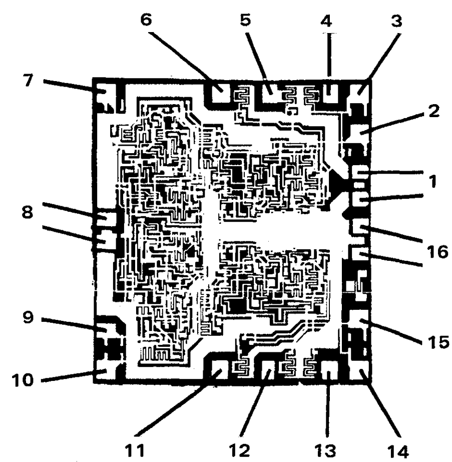
Number at end of terminal denotes pin number for L package (Case 620).
Number in parenthesis denotes pin number for F package (Case 650).

MCC1654
Binary Counter



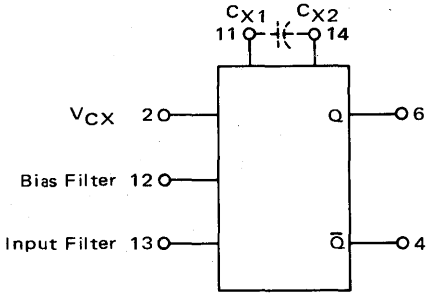
84 x 78
(4TG)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



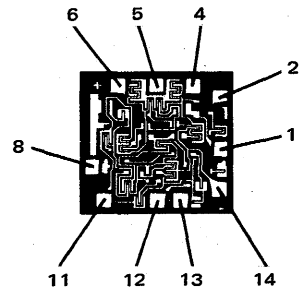
This chip requires careful and knowledgeable thermal management to handle the high current and assure the power dissipation necessary to achieve the high speed performance. This thermal management should be discussed with a Motorola device engineer prior to decision to use the chip.

MCC1658
Voltage Controlled Multivibrator

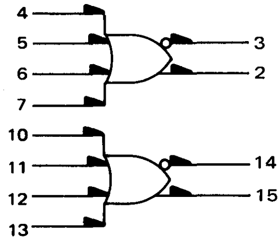


40 x 43
(5WJ)

V_{CC1} = Pin 1
V_{CC2} = Pin 5
V_{EE} = Pin 6



MCC1660 (High Z)
Dual 4-Input OR/NOR Gate

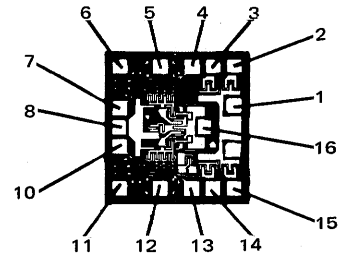


$3 = \overline{4 + 5 + 6 + 7}$

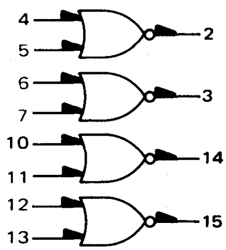
$2 = 4 + 5 + 6 + 7$

40 x 42
(3TW)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



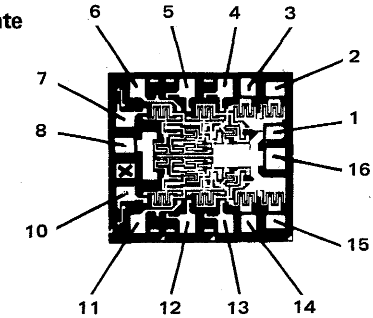
MCC1662 (High Z)
Quad 2-Input NOR Gate



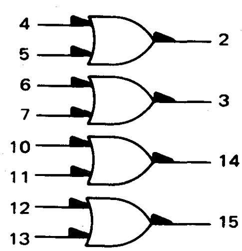
$2 = \overline{4 + 5}$

48 x 52
(1NJ)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



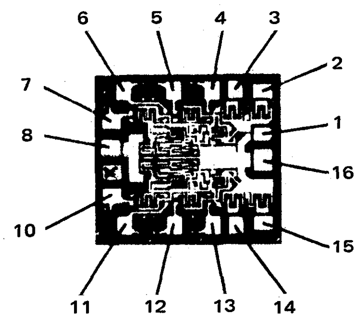
MCC1664 (High Z)
Quad 2-Input OR Gate



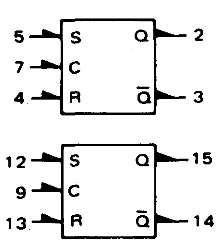
$2 = 4 + 5$

48 x 52
(1NJ)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

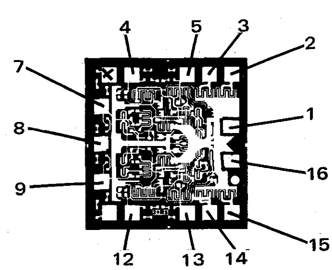


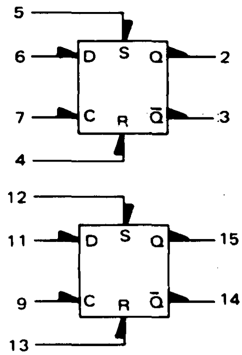
MCC1666 (High Z)
Dual Clocked R-S Flip-Flop



45 x 47
(8TT)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

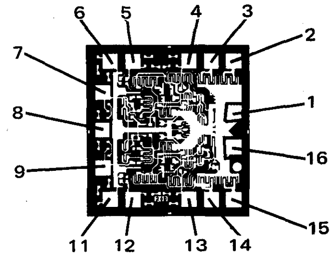




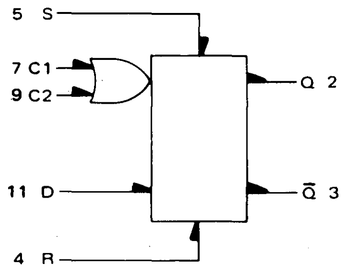
MCC1668 (High Z)
Dual Clocked Latch

45 x 47
(8TT)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

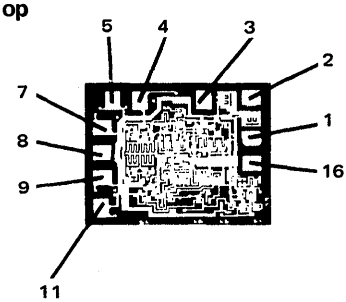


MCC1670 (High Z)
Master-Slave Type D Flip-Flop

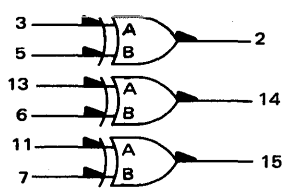


40 x 51
(A1L)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



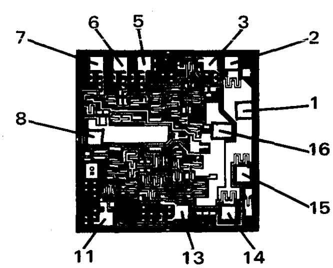
MCC1672 (High Z)
Triple 2-Input Exclusive OR Gate



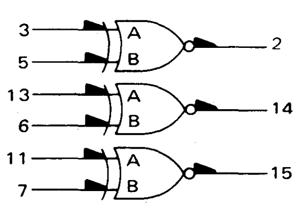
2 = (3 • $\bar{5}$) + ($\bar{3}$ • 5)

56 x 56
(68F)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



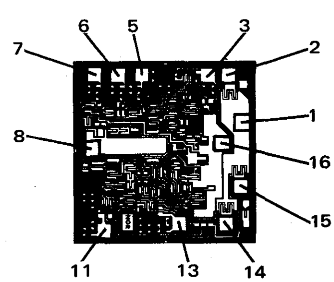
MCC1674 (High Z)
Triple 2-Input Exclusive NOR Gate



2 = (3 • $\bar{5}$) + ($\bar{3}$ • 5)

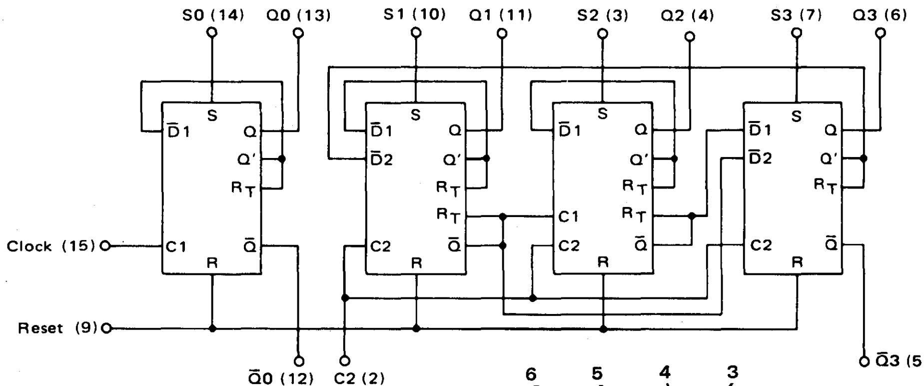
56 x 56
(68F)

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

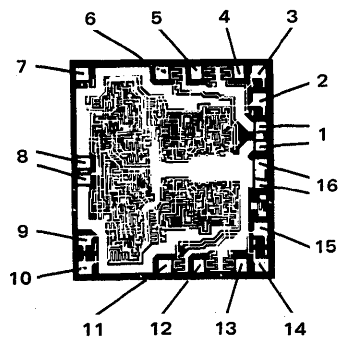


6

MCC1678 (High Z)
Bi-Quinary Counter



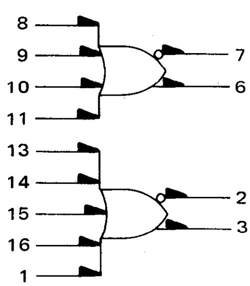
This chip requires careful and knowledgeable thermal management to handle the high current and assure the power dissipation necessary to achieve the high speed performance. This thermal management should be discussed with a Motorola device engineer prior to decision to use the chip.



84 x 78
(4TG)

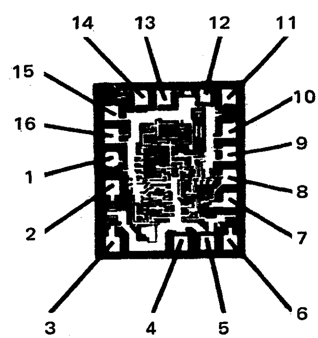
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC1688
Dual 4-5 Input OR/NOR Gate

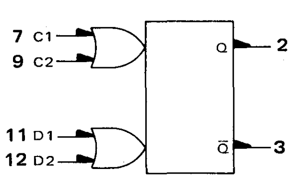


49 x 42
(9NF)

V_{CC1} = 4
V_{CC2} = 5
V_{EE} = 12

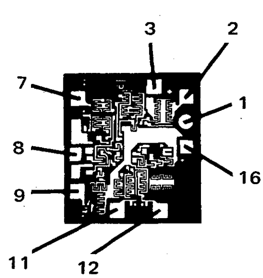


MCC1690
UHF Prescaler Type D Flip-Flop



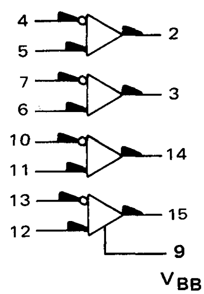
43 x 39
(6WK)

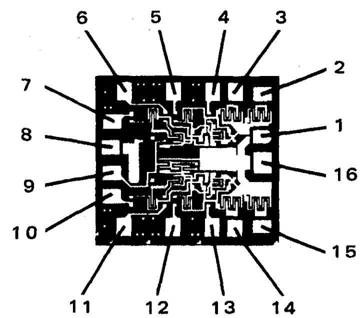
V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8



MCC1692
Quad Line Receiver

48 x 52
(1NJ)

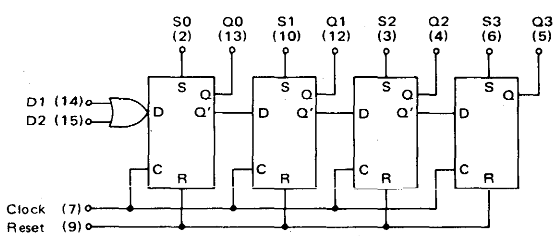


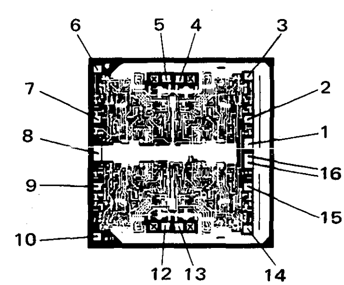


V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

MCC1694
4-Bit Shift Register

99 x 101
(8WJ)





This chip requires careful and knowledgeable thermal management to handle the high current and assure the power dissipation necessary to achieve the high speed performance. This thermal management should be discussed with a Motorola device engineer prior to decision to use the chip.

V_{CC1} = Pin 1
V_{CC2} = Pin 16
V_{EE} = Pin 8

6

MECL II INTEGRATED CIRCUITS
MCC1200 Series

The MECL II Series of circuits presents the system design engineer with a family designed to permit system implementation with the fewest number of devices.

- Propagation Delays Typically 4 ns
- Excellent Noise Immunity
- Simultaneous OR/NOR Outputs
- High Fan-In and Fan-Out

MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Ratings above which device life may be impaired:			
Power Supply Voltage (V_{CC} = 0)	V_{EE}	−10 to 0	Vdc
Input Voltage (V_{CC} = 0)	V_{in}	0 to V_{EE}	Vdc
Output Source Current	I_O	20	mAdc
Storage Temperature Range	T_{stg}	−55 to +150	^{o}C
Recommended maximum ratings above which performance may be degraded:			
Operating Temperature Range	T_A	−55 to +125	^{o}C
AC Fan-In (Expandable Gates)	m	20	—
AC Fan-Out* (Gates and Flip-Flops)	n	15	—

*Although a minimum dc fan-out of 25 is guaranteed in each electrical specification, it is recommended that the maximum ac fan-out of 15 be used for high-speed operation.

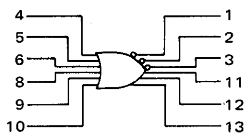
LOGIC DIAGRAMS AND CHIP GEOMETRIES

Logic diagram, geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

Chip Geometries not scaled to size.

MCC1201
6-Input Gate

40 x 55 (41E)

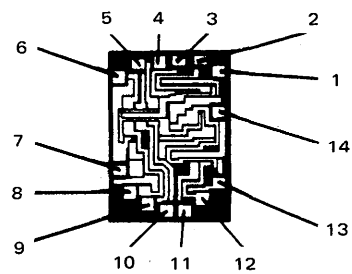


$1 = \overline{4+5+6+8+9+10}$

$11 = 4+5+6+8+9+10$

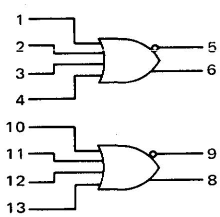
t_{pd} = 4.0 ns

V_{CC} = Pin 14
V_{EE} = Pin 7



MCC1204/MCC1206
Dual 4-Input Gate

45 x 50 (25D)

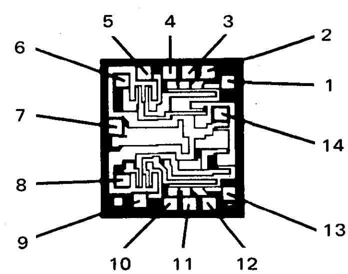


$5 = \overline{1+2+3+4}$

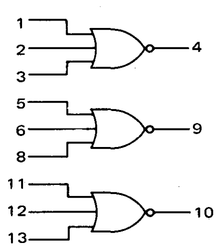
$6 = 1+2+3+4$

t_{pd} = 4.0 ns

V_{CC} = Pin 14
V_{EE} = Pin 7



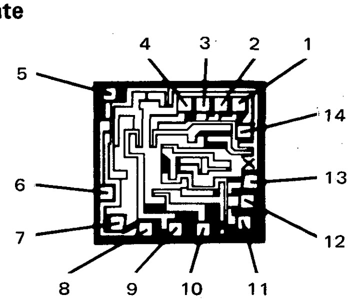
MCC1207
Triple 3-Input Gate



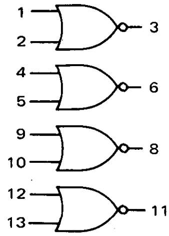
$4 = \overline{1+2+3}$

51 x 54 (24D)
OR
45 x 47 (9EG)

V_{CC} = Pin 14
V_{EE} = Pin 7



MCC1210/MCC1211/MCC1212
Quad 2-Input Gate

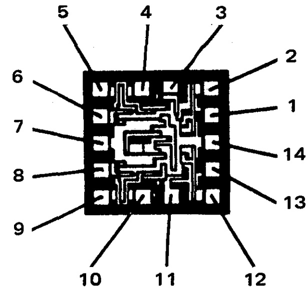


$3 = \overline{1 + 2}$

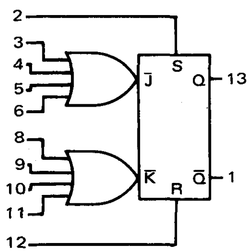
t_{pd} = 4.5 ns

39 x 40 (O5N)

V_{CC} = Pin 14
V_{EE} = Pin 7



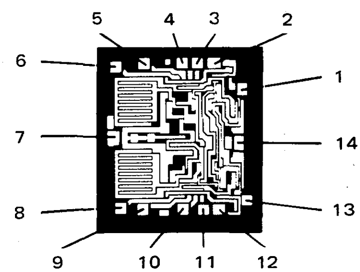
MCC1213
AC-Coupled J-K Flip-Flop

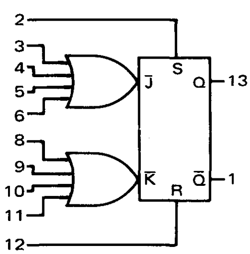


t_{pd} = 6.0 ns

V_{CC} = Pin 14
V_{EE} = Pin 7

58 x 65 (31D)



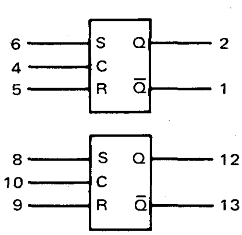


t_{pd} = 4.0 ns

MCC1227
AC-Coupled J-K Flip-Flop

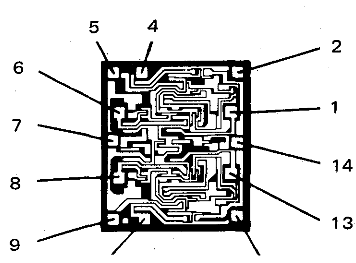
MCC1214/MCC1215
Dual-Clocked R-S Flip-Flop

54 x 62 (23D)



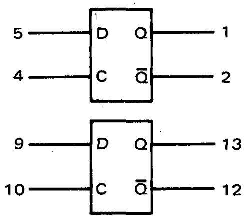
t_{pd} = 6.0 ns

V_{CC} = Pin 14
V_{EE} = Pin 7



6

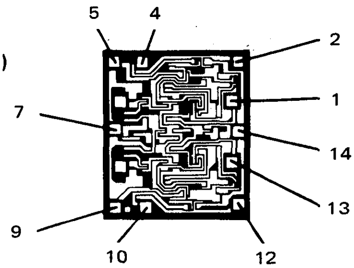
MCC1216/MCC1233
Dual Clocked Single Rail R-S Flip-Flop



t_{pd} = 6.0 ns

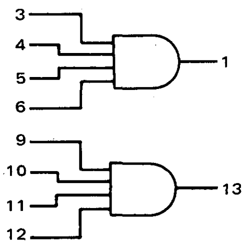
54 x 62 (23D)

V_{CC} = Pin 14
V_{EE} = Pin 7



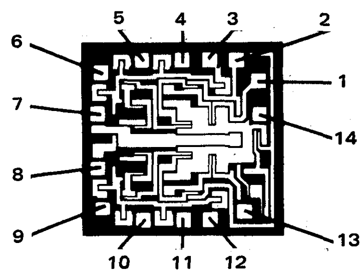
MCC1217
Level Translator

52 x 54 (83B)



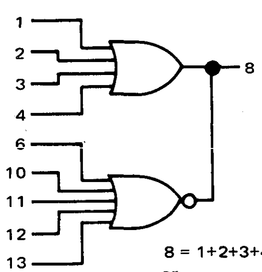
1 = 3•4•5•6
t_{pd} = 15 ns

V_{CC} = Pin 14
V_{EE} = Pin 7



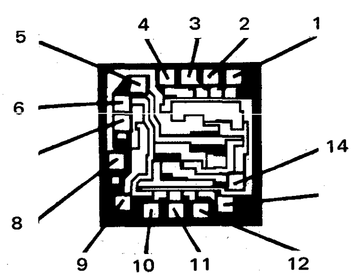
MCC1218
Level Translator

44 x 45 (22D)



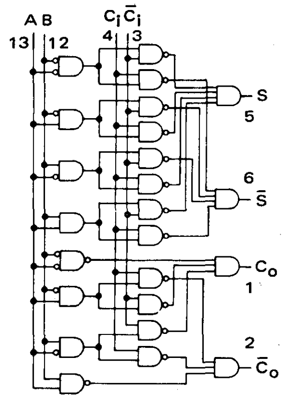
t_{pd} = 19 ns

$8 = 1+2+3+4$
or
$8 = \overline{6+10+11+12+13}$

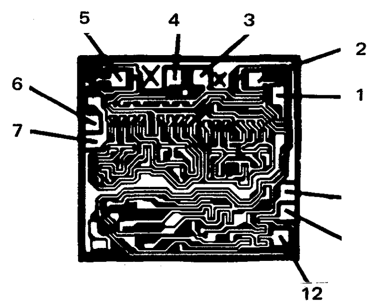


V_{CC} = Pin 14
V_{EE} = Pin 7

MCC1219
Full Adder



56 x 60 (80K)



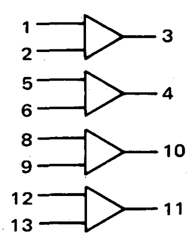
$$S = ABC_i + A\bar{B}\bar{C}_i + \bar{A}B\bar{C}_i + \bar{A}\bar{B}C_i$$
$$\bar{S} = \bar{A}\bar{B}\bar{C}_i + AB\bar{C}_i + A\bar{B}C_i + \bar{A}BC_i$$
$$C_o = ABC_i + AB\bar{C}_i + A\bar{B}C_i + \bar{A}BC_i$$
$$\bar{C}_o = \bar{A}\bar{B}\bar{C}_i + A\bar{B}\bar{C}_i + \bar{A}B\bar{C}_i + \bar{A}\bar{B}C_i$$

t_{pd} = 3.0 to 8.0 ns

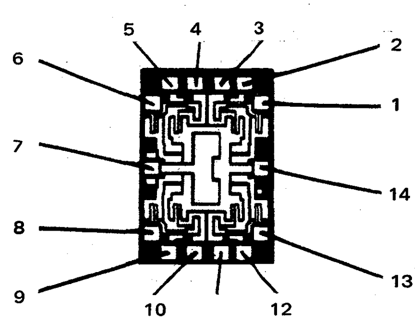
V_{CC} = Pin 14
V_{EE} = Pin 7

MCC1220
Quad Line Receiver

39 x 54 (28D)



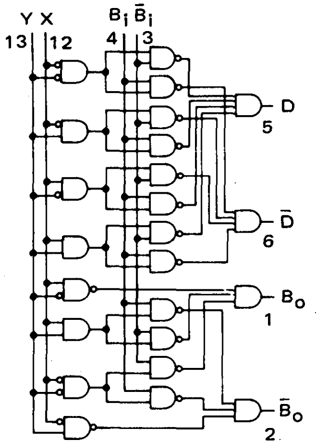
V_{CC} = Pin 14
V_{EE} = Pin 7



t_{pd} = 4.0 ns

6

MCC1221
Full Subtractor



$D = YXB_i + Y\bar{X}\bar{B}_i + \bar{Y}X\bar{B}_i + \bar{Y}\bar{X}B_i$

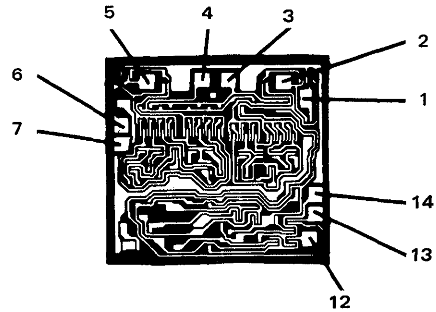
$\bar{D} = \bar{Y}\bar{X}\bar{B}_i + YX\bar{B}_i + Y\bar{X}B_i + \bar{Y}XB_i$

$B_o = \bar{Y}\bar{X}B_i + Y\bar{X}\bar{B}_i + Y\bar{X}B_i + YXB_i$

$\bar{B}_o = \bar{Y}\bar{X}\bar{B}_i + \bar{Y}X\bar{B}_i + \bar{Y}XB_i + YX\bar{B}_i$

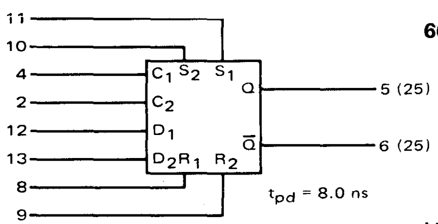
t_{pd} = **4.0 to 11 ns**

56 x 60 (80K)



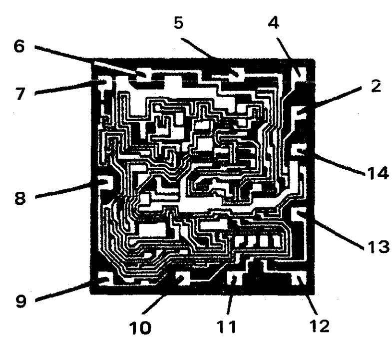
V_{CC} = Pin 14
V_{EE} = Pin 7

MCC1222
Type D Flip-Flop



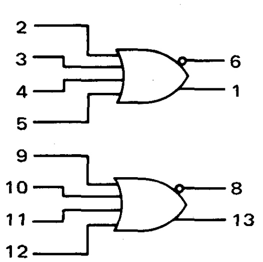
t_{pd} = 8.0 ns

60 x 63 (31B)



V_{CC} = Pin 14
V_{EE} = Pin 7

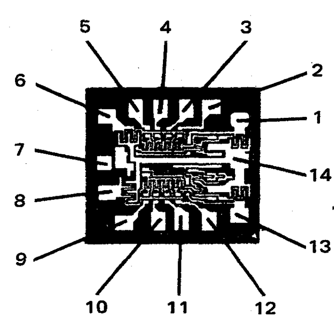
MCC1223
Dual 4-Input Clock Driver



$6 = \overline{2 + 2 + 4 + 5}$
$1 = 2 + 3 + 4 + 5$

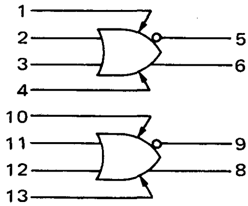
t_{pd} = 2.0 ns

47 x 42 (6DT)

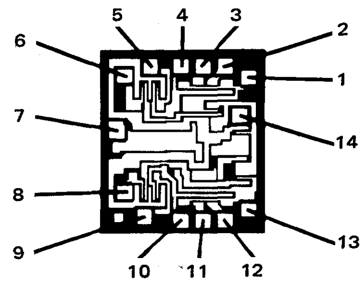


V_{CC} = Pin 14
V_{EE} = Pin 7

MCC1224
Dual 2-Input Expandable Gate



45 x 50 (25D)

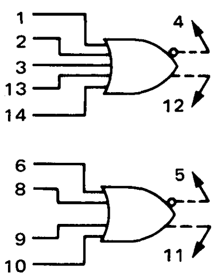


$5 = \overline{2 + 3}$
$6 = 2 + 3$

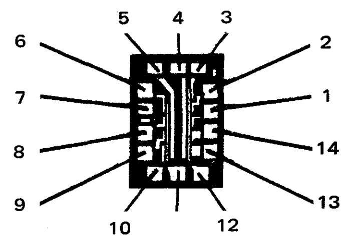
$t_{pd} = 4.0$ ns

V_{CC} = Pin 14
V_{EE} = Pin 7

MCC1225
Dual 4-5 Input Expander



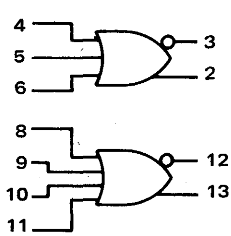
27 x 37 (36D)

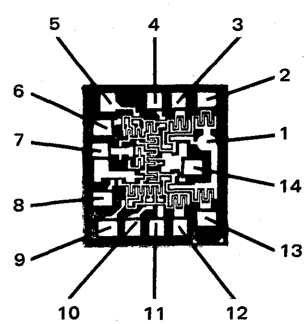


V_{CC} = Pin 14
V_{EE} = Pin 7

MCC1226
Dual 3-4 Input Transmission Line and Clock Driver

45 x 40 (6DM)





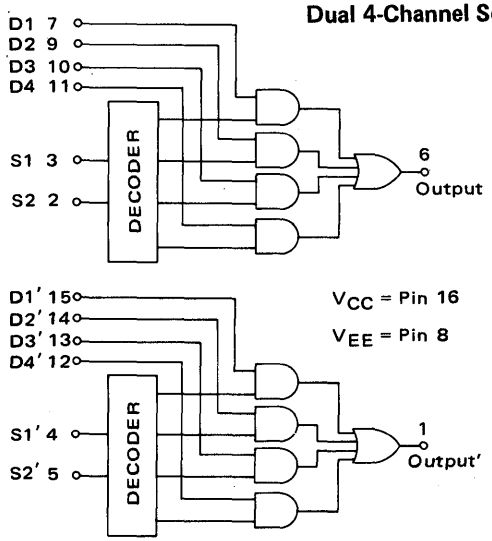
V_{CC} = Pin 14
V_{EE} = Pin 7

$3 = \overline{4 + 5 + 6}$
$2 = 4 + 5 + 6$

$t_{pd} = 2.0$ ns

6

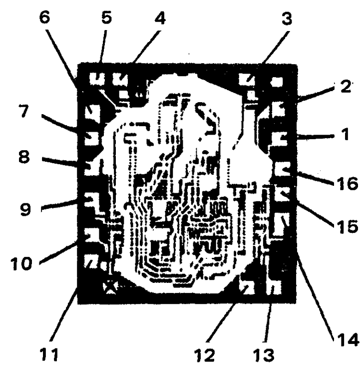
MCC1228
Dual 4-Channel Selector



V_{CC} = Pin 16

V_{EE} = Pin 8

60 x 64 (59E)

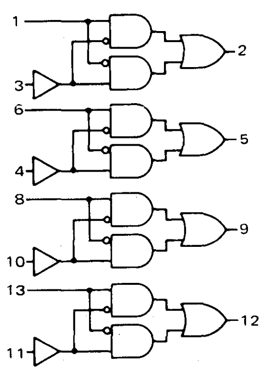


t_{pd} = 5.0 or 10 ns*

*Data Input = 5.0 ns
Select Input = 10 ns

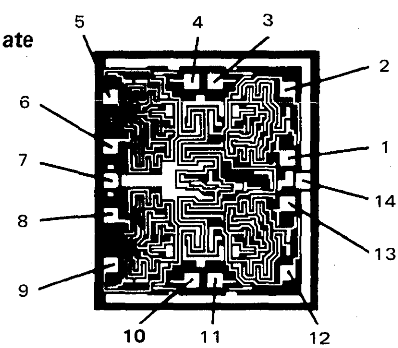
Output Function: $\overline{S1}\,\overline{S2}\,D1 + S1\,\overline{S2}\,D2 + \overline{S1}\,S2\,D3 + S1\,S2\,D4$

MCC1230
Quad Exclusive OR Gate



60 x 70 (73A)

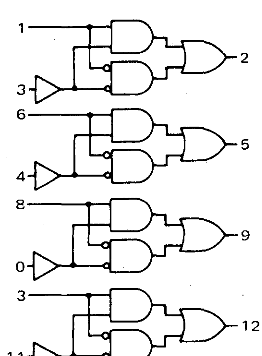
V_{CC} = Pin 14
V_{EE} = Pin 7



t_{pd} = 5.0 ns

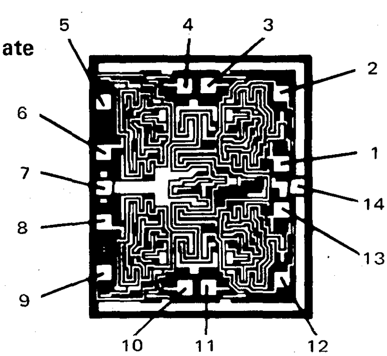
$2 = 1 \bullet \overline{3} + \overline{1} \bullet 3$

MCC1231
Quad Exclusive NOR Gate



60 x 70 (73A)

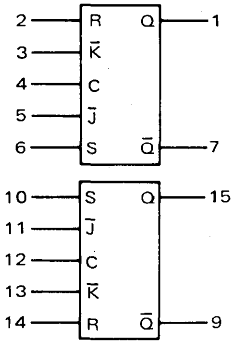
V_{CC} = Pin 14
V_{EE} = Pin 7



t_{pd} = 5.0 ns

$2 = 1 \bullet 3 + \overline{1} \bullet \overline{3}$

6

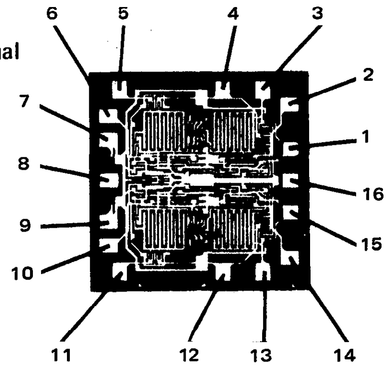


MCC1232
100 MHz AC-Coupled Dual J-K Flip-Flop

60 x 60 (6EH)

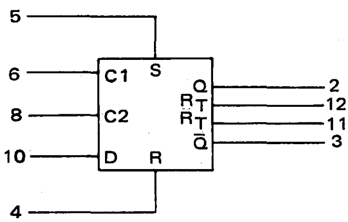
V_{CC} = Pin 16
V_{EE} = Pin 8

t_{pd} = 4.5 ns



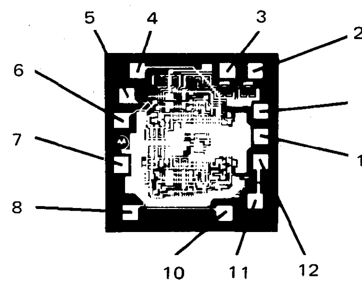
MCC1234
Type D Flip-Flop

47 x 48 (26K)



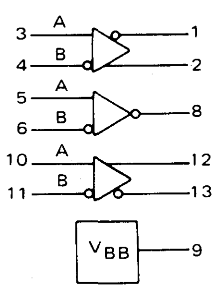
t_{pd} = 4.0 ns

V_{CC} = Pin 14
V_{EE} = Pin 7



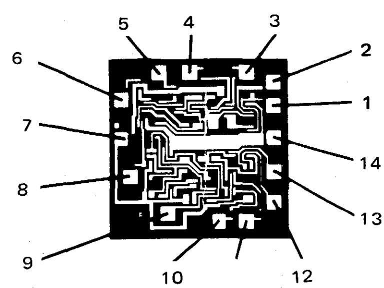
MCC1235
Triple Line Receiver

49 x 50 (48B)



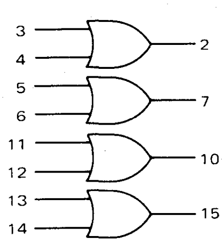
V_{CC} = Pin 14
V_{EE} = Pin 7

t_{pd} = 5.0 ns



***MCC1236**

MCC1239
Quad Level Translator

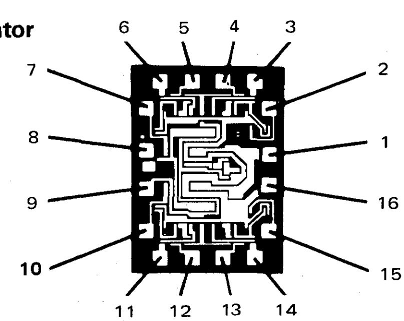


42 x 56 (41C)

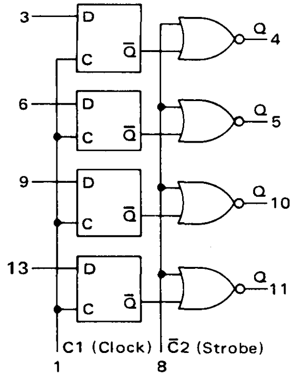
V_{CC} = Pin 16
V_{EE} = Pin 8

t_{pd} = 12 ns

2 – 3 + 4



*MCC1236—See Page 6-59.

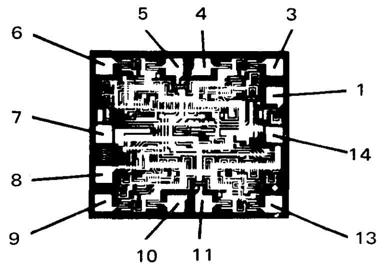


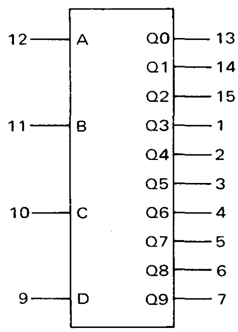
MCC1240/MCC1270
Quad Latch

42 x 46 (61T)

V_{CC} = Pin 14
V_{EE} = Pin 7

t_{pd} = 8.0 ns

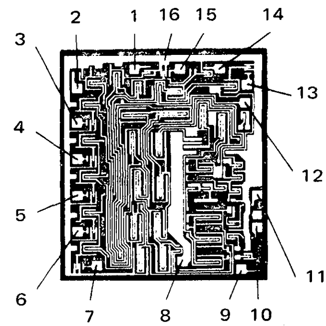


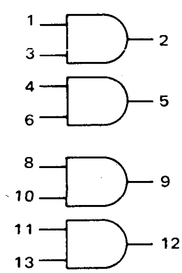


MCC1245
Decoder – Nixie® Driver

85 x 95 (99F)

V_{CC} = Pin 16
V_{EE} = Pin 8





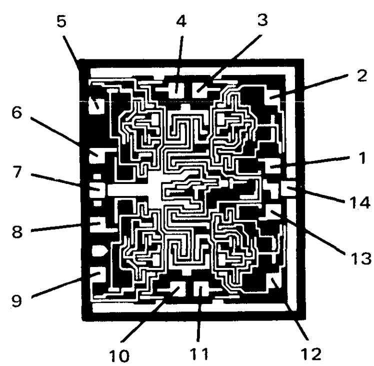
MCC1247
Quad 2-Input AND Gate

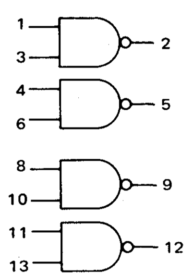
60 x 70 (73A)

V_{CC} = Pin 14
V_{EE} = Pin 7

$2 = 1 \bullet 3$

t_{pd} = 5.0 ns





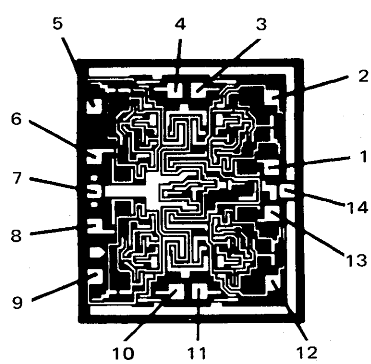
MCC1248
Quad 2-Input NAND Gate

60 x 70 (73A)

V_{CC} = Pin 14
V_{EE} = Pin 7

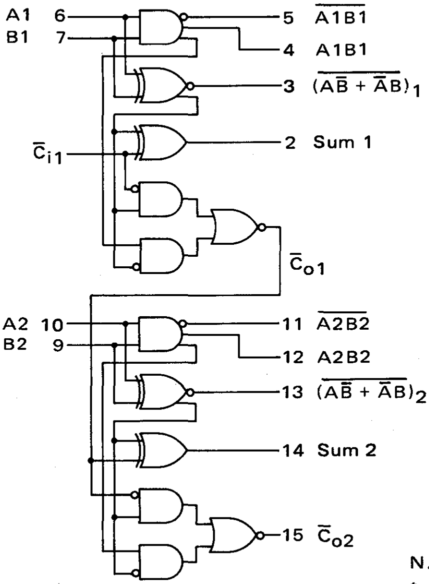
$2 = \overline{1 \bullet 3}$

t_{pd} = 5.0 ns

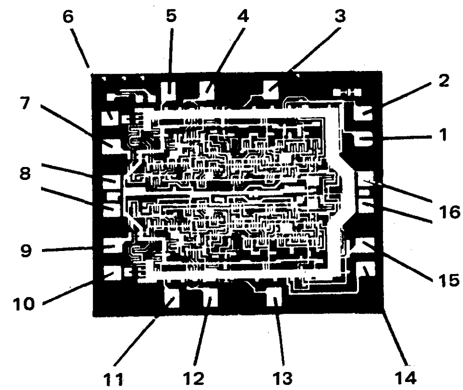


6

MCC1259
Dual Full Adder

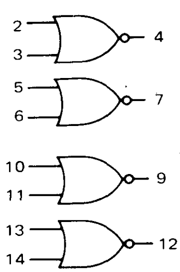


66 x 78 (9FC)



N.M. = 150 mV
t_{pd} (Add delay) = 9.0 ns typ
P_D = 375 mW typ

MCC1262
Quad 2-Input NOR Gate

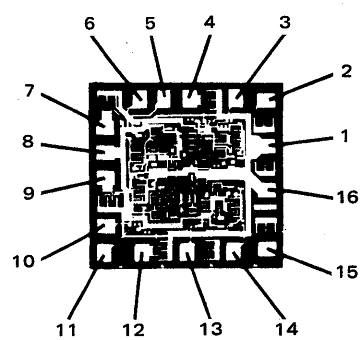


54 x 52 (2KB)

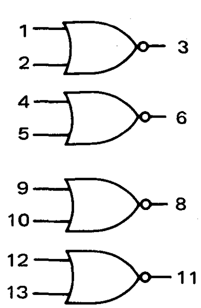
V_{CC} = Pin 16
V_{EE} = Pin 8

$4 = \overline{2 + 3}$

t_{pd} = 2.0 ns



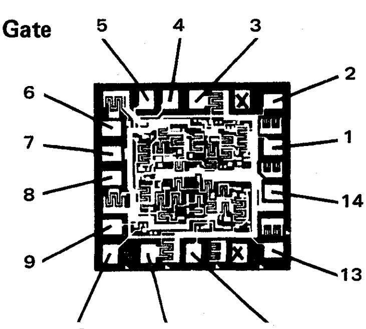
MCC1263
Hi-Speed Quad 2-Input OR/NOR Gate



$3 = \overline{1 + 2}$

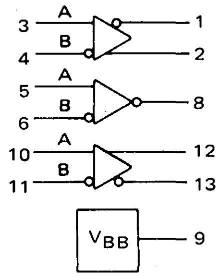
54 x 52 (2KB)

N.M. = 150 mV
t_{pd} = 2.0 ns
P_D = 320 mW



6

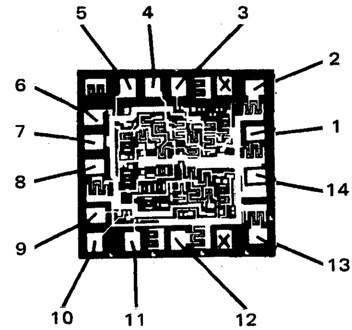
MCC1266
Triple Line Receiver



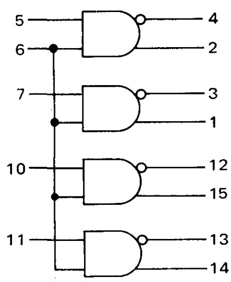
t_{pd} = 2.0 ns

54 x 52 (2KB)

V_{CC} = Pin 14
V_{EE} = Pin 7



MCC1267
Quad MTTL to MECL Translator With Strobe

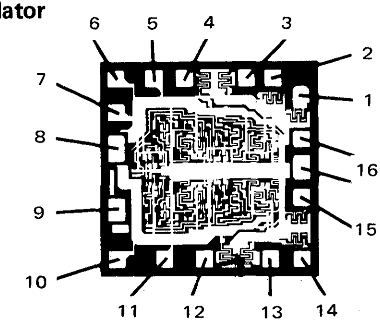


59 x 60 (2CR)

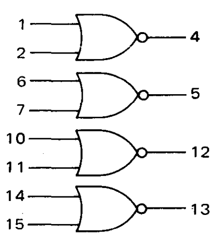
Gnd = 16
V_{CC} (+5.0 Vdc) = 9
V_{EE} (-5.2 Vdc) = 8

t_{pd} = 5.0 ns typ

$2 = 5 \bullet 6$
$4 = \overline{5 \bullet 6}$



MCC1268
Quad MECL to MTTL Translator With Totem-Pole Outputs

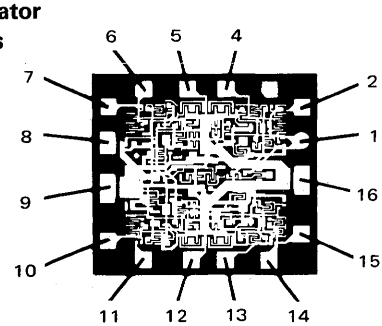


57 x 62 (7CF)

Gnd = 16
V_{CC} (+5.0 Vdc) = 9
V_{EE} (-5.2 Vdc) = 8

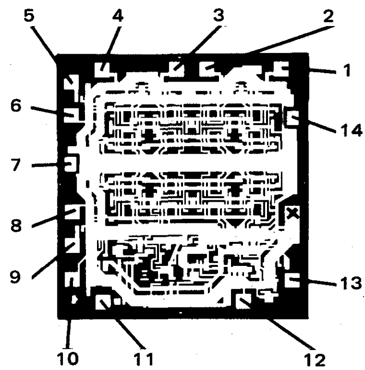
t_{pd} = 5.0 typ

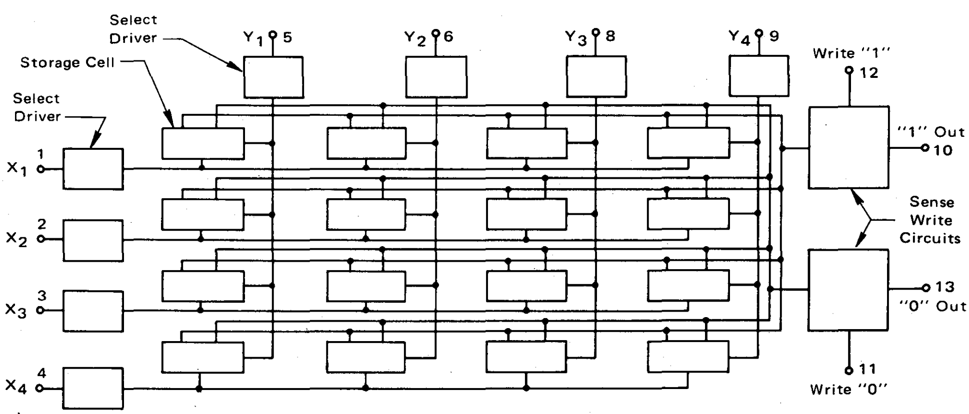
$4 = \overline{1 + 2}$



MCC1236
16-Bit Coincident Memory

67 x 70(32G)





DC Input Loading Factor: X, Y = 2
Write = 0.5
DC Output Loading Factor = 5
Cycle Time = 50 ns

t_{pd} = 17 ns typ
Power Dissipation = 250 mW typ
Maximum Power Supply Variation = ±10%
Noise Immunity = 150 mV

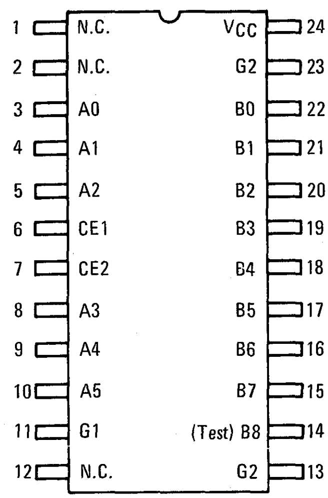
6

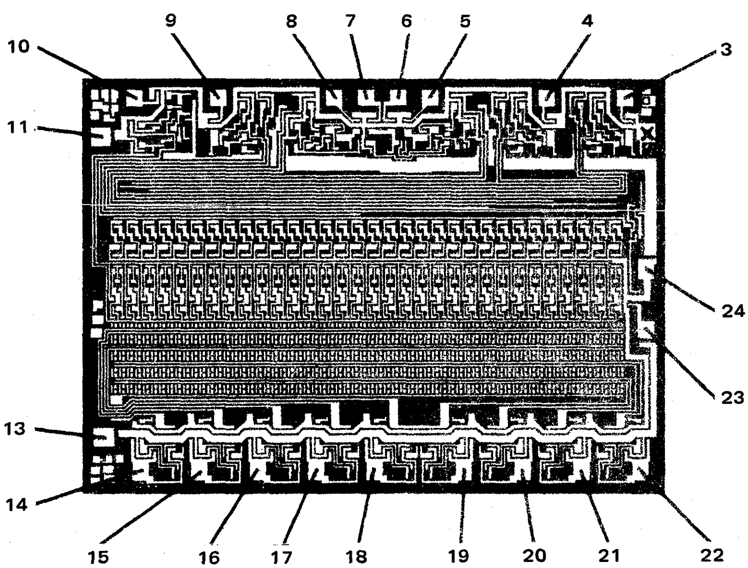
CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils.
Chip geometries are subject to change without notice as modifications are made.
Chip Geometries not scaled to size.

MCMC5003
512-Bit Programmable ROM

PIN CONNECTIONS



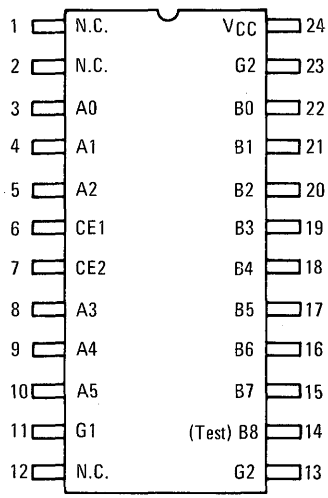


109 x 154
(5RP)

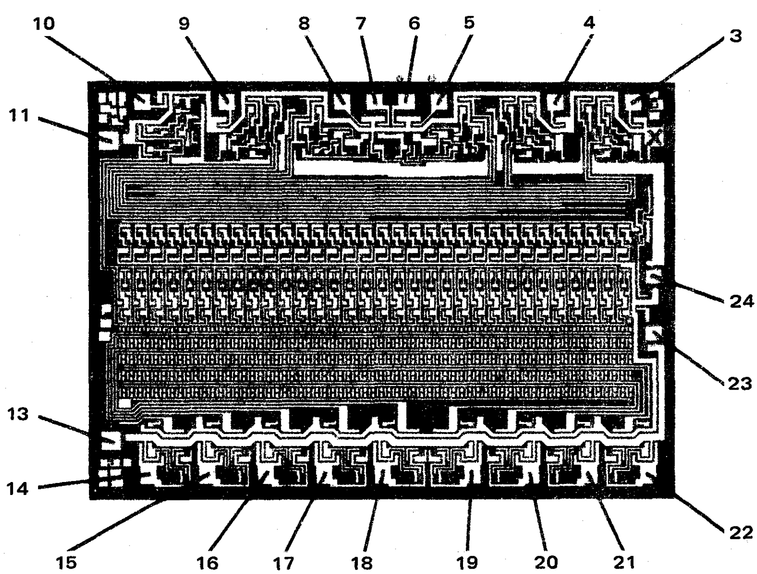
6

MCMC5004
512-Bit Programmable ROM

PIN CONNECTIONS



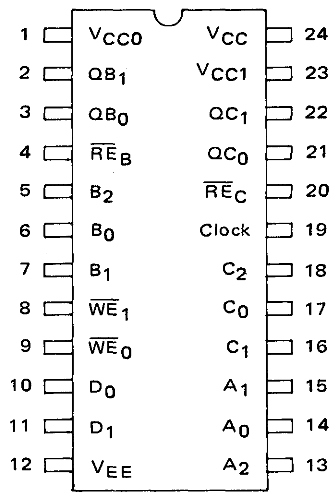
109 x 154
(5RP)



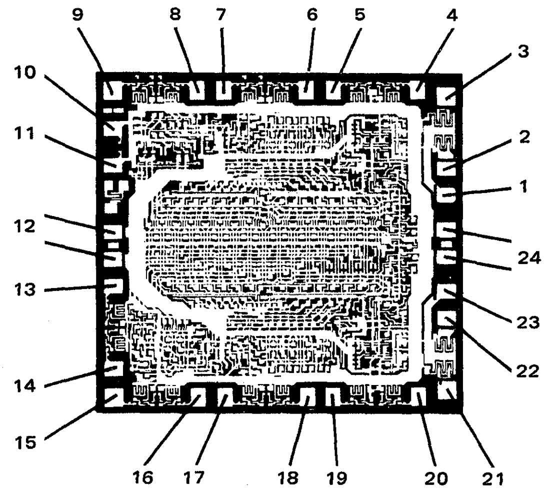
6

MCMC10143
8 x 12 Multiport Register File

PIN CONNECTIONS

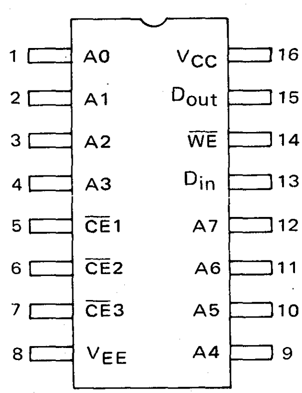


92 x 99
(6MW)

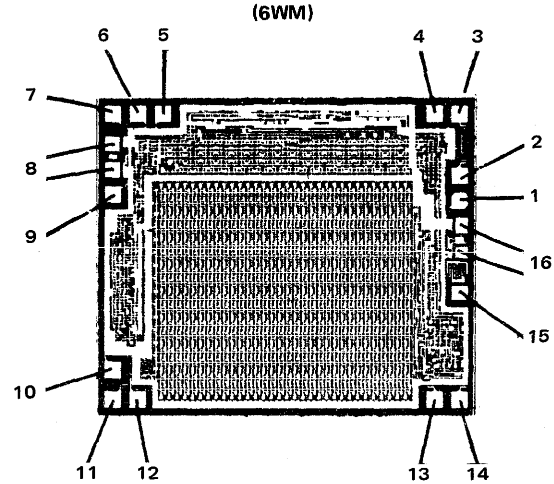


MCMC10144
256-Bit Random Access Memory

PIN CONNECTIONS

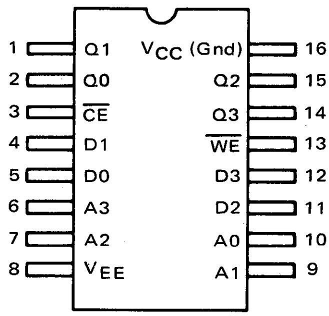


85 x 101
(6WM)

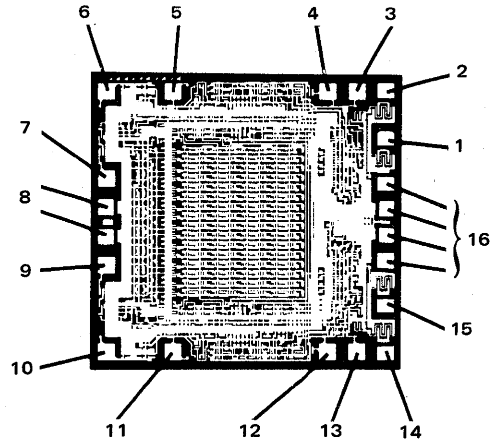


MCMC10145
64-Bit Register File (RAM)

PIN CONNECTIONS

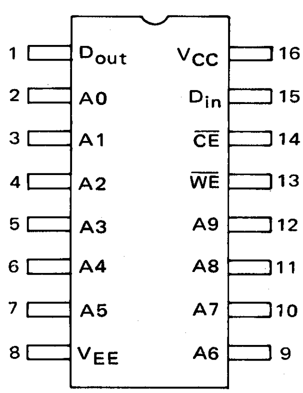


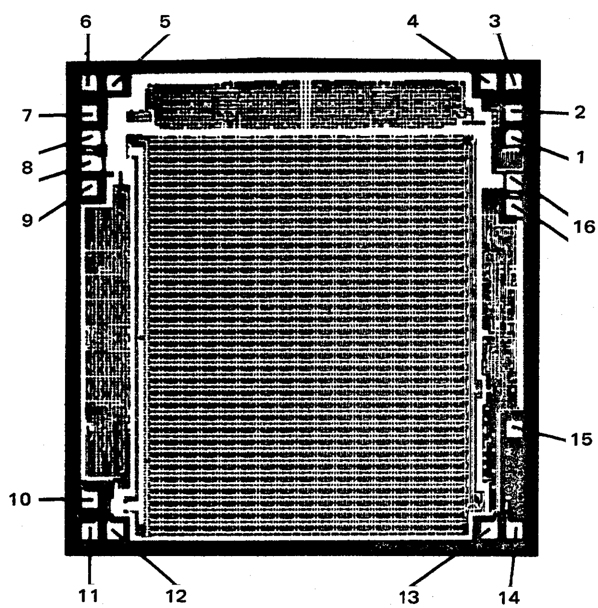
79 x 84
(A8A)



MCMC10146
1024-Bit Random Access Memory

PIN CONNECTONS

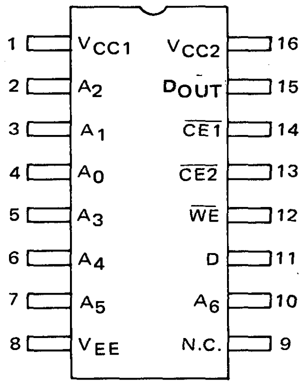




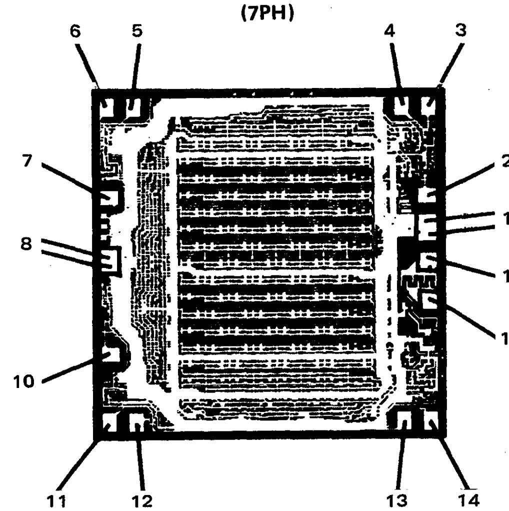
122 x 128
(9TR)

MCMC10147
128-Bit Random Access Memory

PIN CONNECTIONS

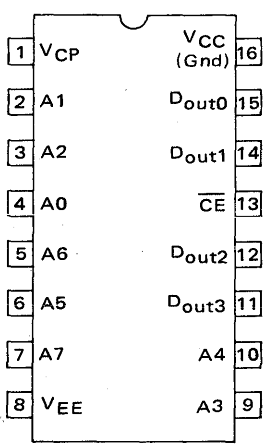


94 x 95
(7PH)

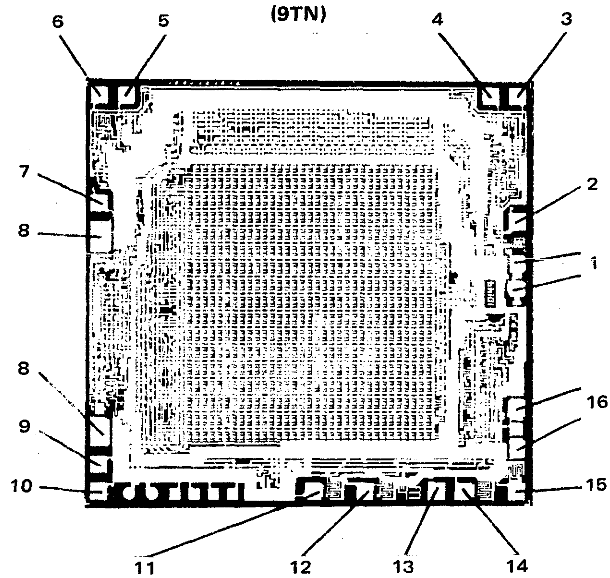


MCMC10149
1024-Bit Programmable ROM

PIN CONNECTIONS



114 x 120
(9TN)



6

PHASE-LOCKED LOOP INTEGRATED CIRCUITS

The MCC12000/12500 family offers a choice of specially-designed integrated circuits for performing phase-locked loop functions: phase detection, frequency division, filtering, and voltage-controlled signal generation. MECL III and MECL 10,000 processing are used throughout this family.

MAXIMUM RATINGS

(Applicable to all MCC12000/12500 Series devices except MC12014.)

Characteristic	Symbol	Rating	Unit
Ratings above which device life may be impaired:			
Power Supply Voltage (V_{CC} = 0 Vdc)	V_{EE}	-8 to 0	Vdc
Base Input Voltage (V_{CC} = 0 Vdc)	V_{in}	0 to V_{EE}	Vdc
Output Source Current — Continuous — Surge	I_O	< 50 < 100	mAdc
Storage Temperature Range MCC12000 Series MCC12500 Series	T_{stg}	 -55 to +150 -55 to +150	°C
Recommended maximum ratings above which performance may be degraded:			
Operating Temperature Range MCC12000 Series MCC12500 Series	T_A	 -0 to +75 -55 to +125	°C

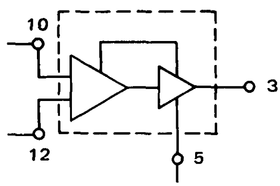
6

LOGIC DIAGRAMS AND CHIP GEOMETRIES

Logic diagram, geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

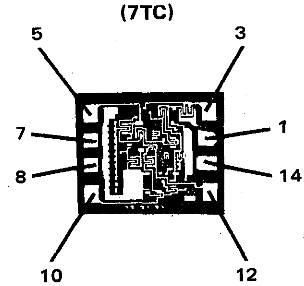
Chip Geometries not scaled to size.

MCC1648
Voltage Controlled Oscillator

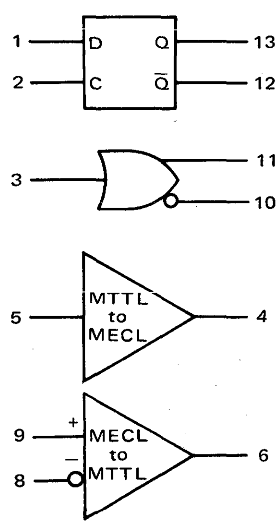


V_{CC} (+5.0 Vdc) = Pins 1, 14; Gnd = Pins 7, 8
V_{EE} (−5.2 Vdc) = Pins 7, 8; Gnd = Pins 1, 14

33 x 42
(7TC)

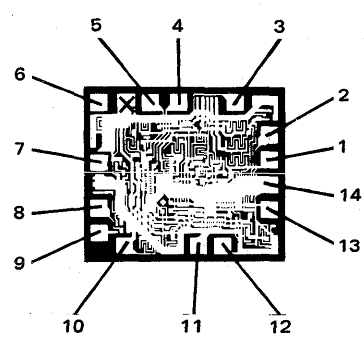


MCC12000
Digital Mixer/Translator



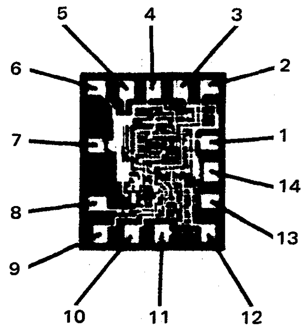
V_{CC} = Pin 14
V_{EE} = Pin 7

48 x 55
(6WJ)

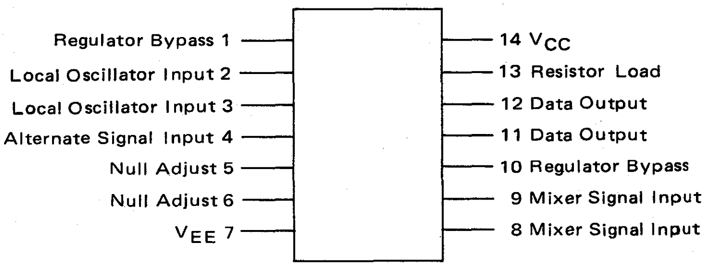


D	Q_n	Q_{n+1}
0	0	0
0	1	0
1	0	1
1	1	1

MCC12002/MCC12502
Analog Mixer

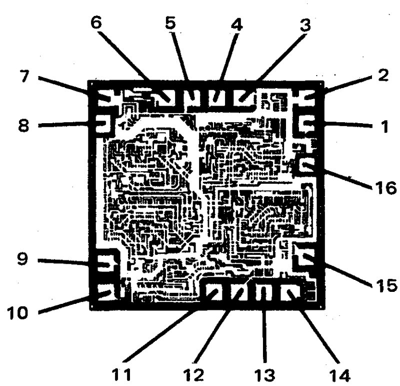


41 x 50
(8MT)

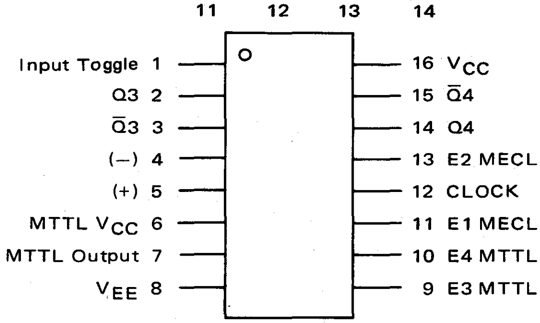


NC — No Connection

MCC12012
Two Modulus Prescaler

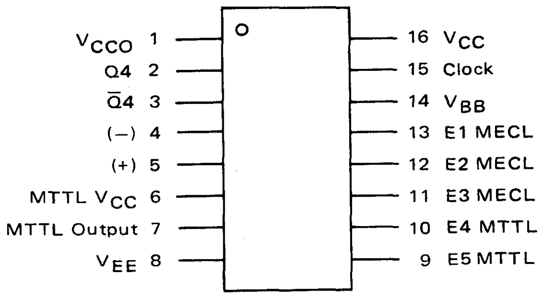


62 x 64
(9WJ)

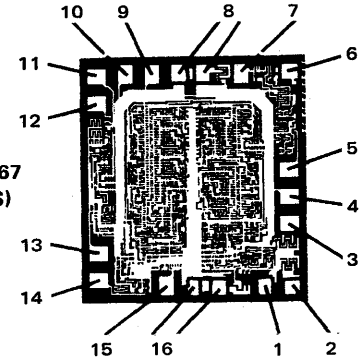


6

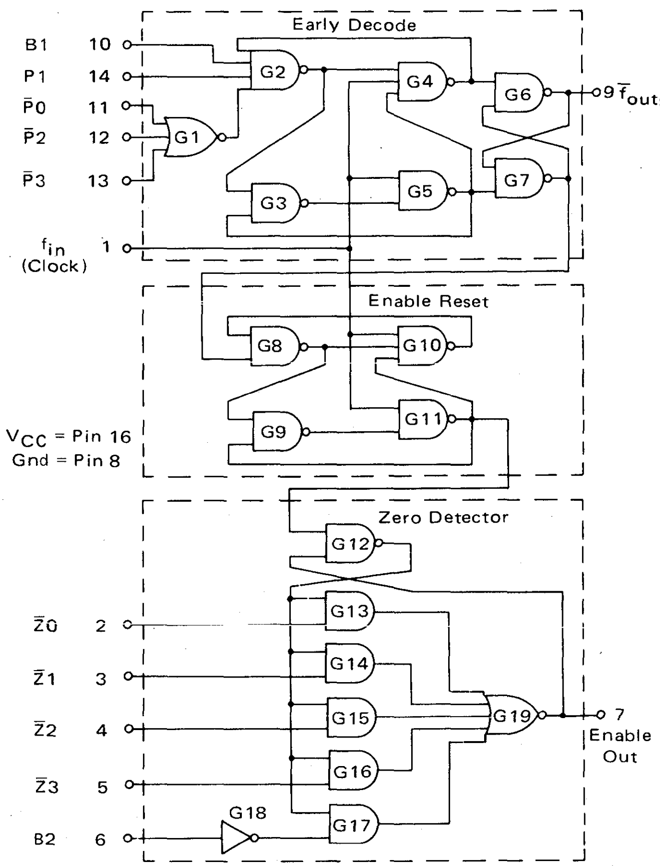
MCC12013/MCC12513
Two Modulus Prescaler



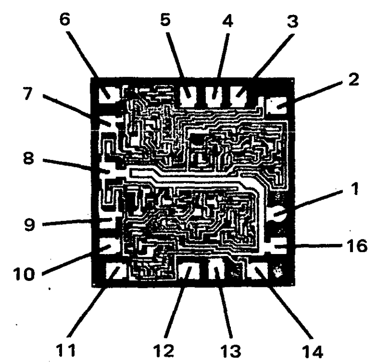
62 x 67
(3PS)



MCC12014
Counter Control Logic

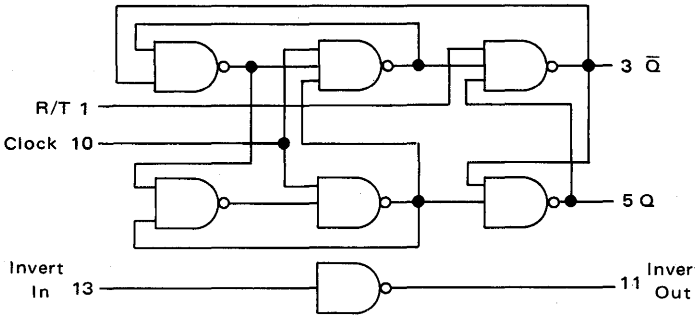


56 x 57
(3TP)



6

MCC12020/MCC12520
Offset Control

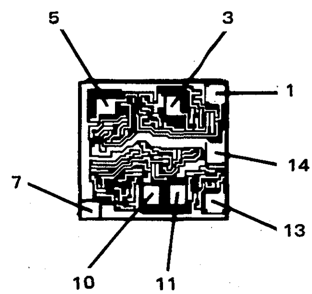


V_{CC} = Pin 14 = +5.0 Vdc
Gnd = Pin 7
0 @ Clock, R/T = +0.5 Vdc
1 @ Clock, R/T = +4.0 Vdc

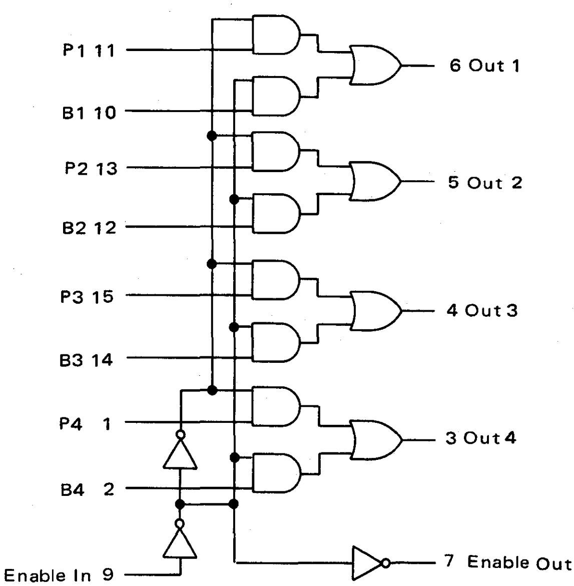
MC12020 • MC12520

Functional Truth Table			
Input		Output	
R/T	Clock	Q	Q̄
0	0	0	1
0	1	1	1
1	1	1	0
1	0	1	0
1	1	0	1

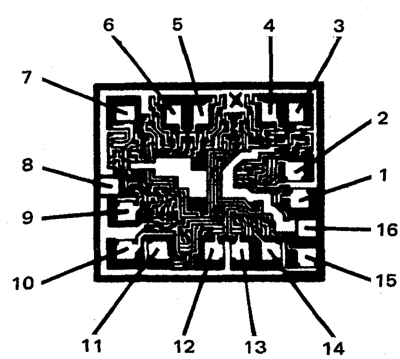
41 x 44
(1WB)



MCC12021/MCC12521
Offset Programmer



55 x 63
(5WE)

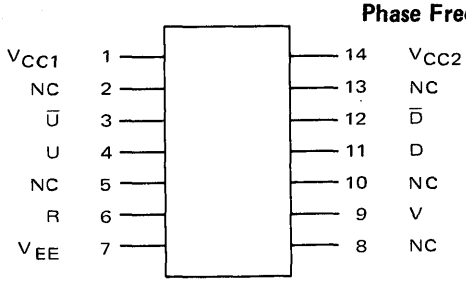


MCC12030

41 x 50
(7TW)

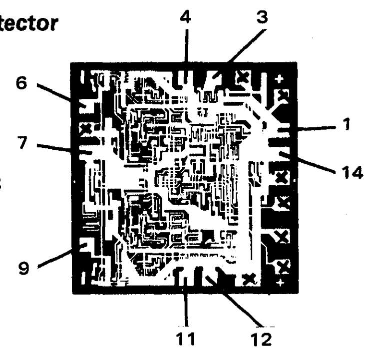
To Be Introduced

MCC12040
Phase Frequency Detector



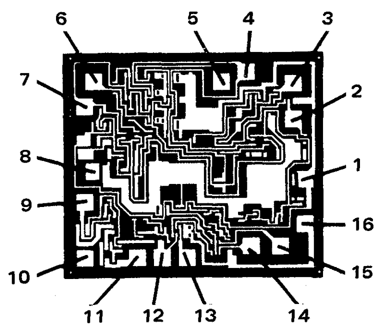
NC – No Connection

61 x 63
(37L)

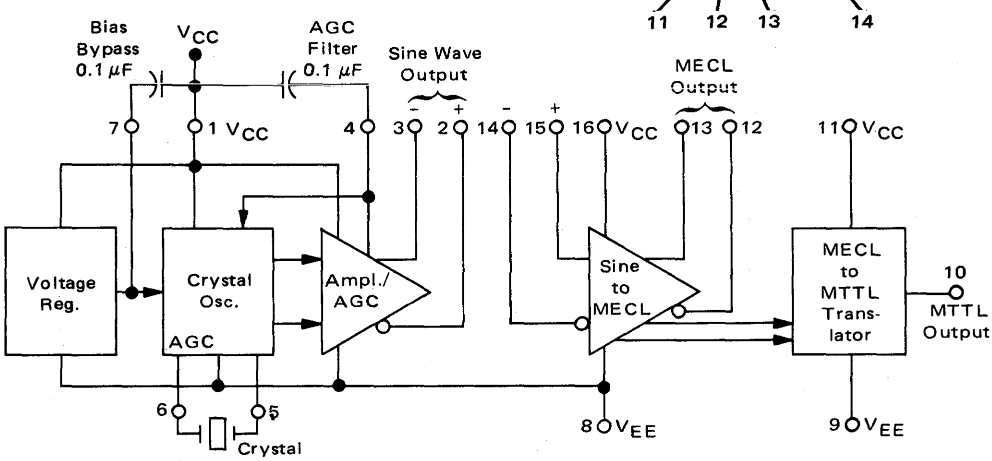


MCC12060/MCC12560
Crystal Oscillator

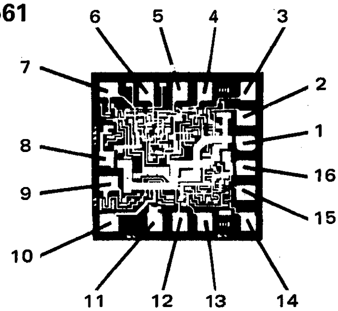
60 x 69
(7WJ)



Note: 0.1 µF power supply pin bypass capacitors not shown.

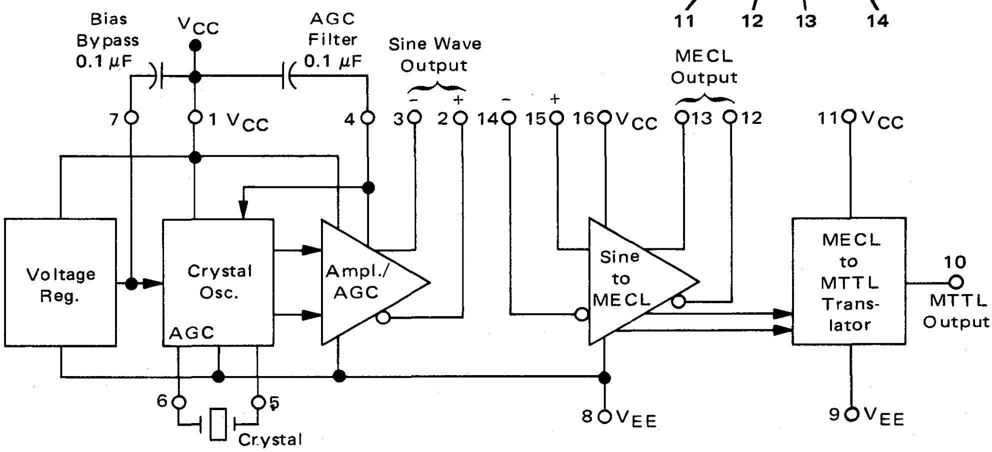


MCC12061/MCC12561
Crystal Oscillator



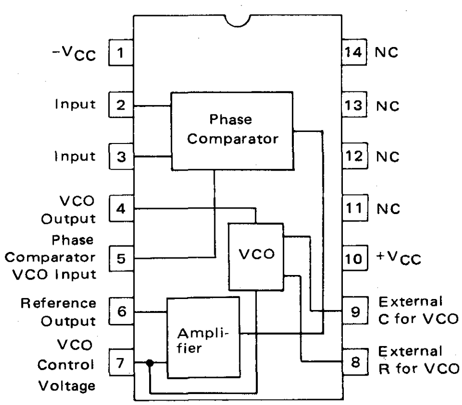
46 x 48
(8RH)

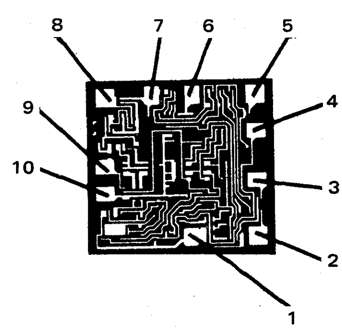
Note: 0.1 μF power supply pin bypass capacitors not shown.



MLMC565
Linear Phase-Locked Loop

48 x 51
(3PJ)

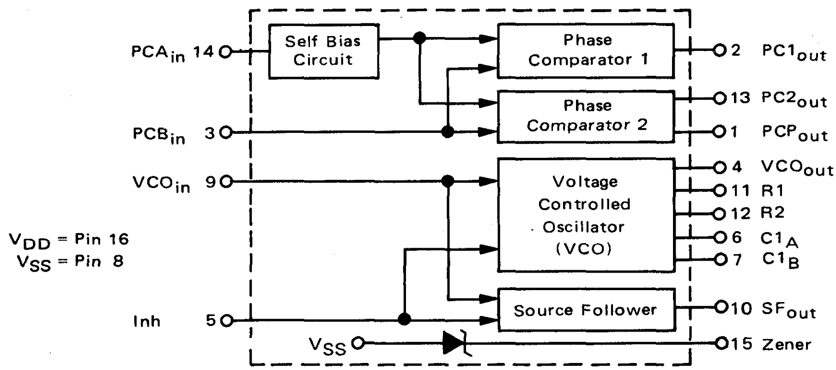




6

MCC14046
McMOS Phase-Locked Loop

Consult Factory



6

LSI INTEGRATED CIRCUITS

The MCC8500 Series is a bipolar LSI family of low-cost products directed to the computer, industrial, and consumer markets, for both MPU and non-MPU applications. The MCC8500 family offers production-proven, cost-effective, off-the-shelf availability of standard bipolar LSI functions.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.5 to +7.0	Vdc
Input Voltage	V_{in}	-1.0 to +5.5	Vdc
Operating Temperature Range	T_A	0 to +75	$^{\circ}C$
Storage Temperature Range	T_{stg}	-55 to +165	$^{\circ}C$

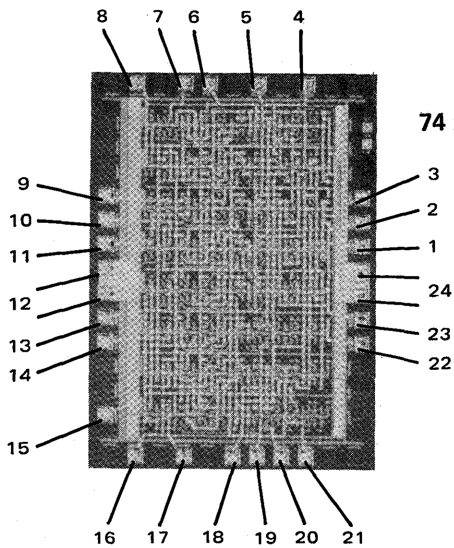
6

CHIP GEOMETRIES

Geometry and chip size are shown for each chip. All dimensions are in mils. Chip geometries are subject to change without notice as modifications are made.

Chip Geometries not scaled to size.

MCC8500 CRCC Generator



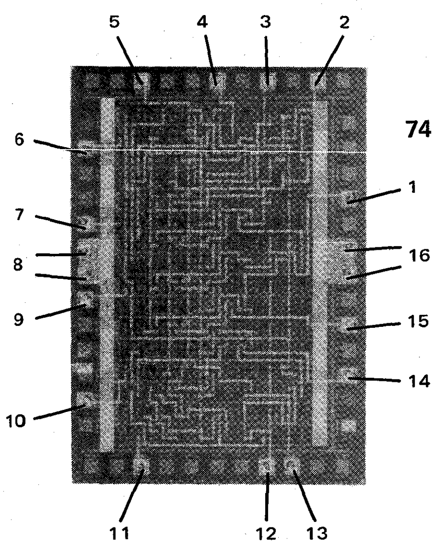
74 x 103

PIN CONNECTIONS

1	D3	V_{CC}	24
2	D7	D2	23
3	CD7	WE	22
4	D5	Reset	21
5	D4	DP	20
6	D6	D1	19
7	CD6	D0	18
8	CD5	CDP	17
9	CD4	$\overline{\text{Clock}}$	16
10	CD3	CD0	15
11	$\overline{\text{Match}}$	CD1	14
12	Gnd	CD2	13

6

MCC8501 Error Pattern Register



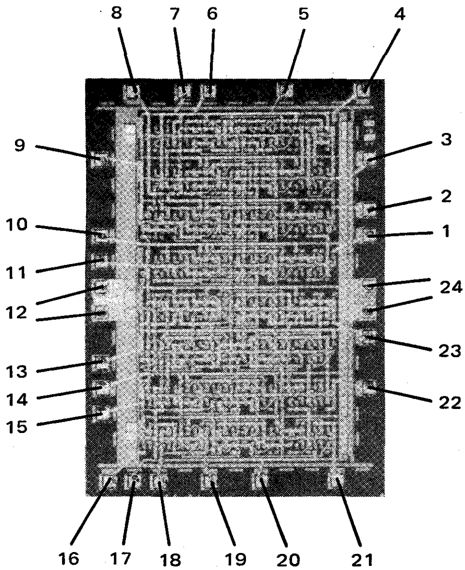
74 x 103

PIN CONNECTIONS

1	CD3	V_{CC}	16
2	CD1	CD4	15
3	CD2	CD5	14
4	CDP	CD6	13
5	CD0	CD7	12
6	Reset	$\overline{\text{Clock}}$	11
7	$\overline{\text{Read}}$	VRC	10
8	Gnd	$\overline{\text{Match}}$	9

MCC8502 Longitudinal Redundancy Check Character/Data Register

74 x 103

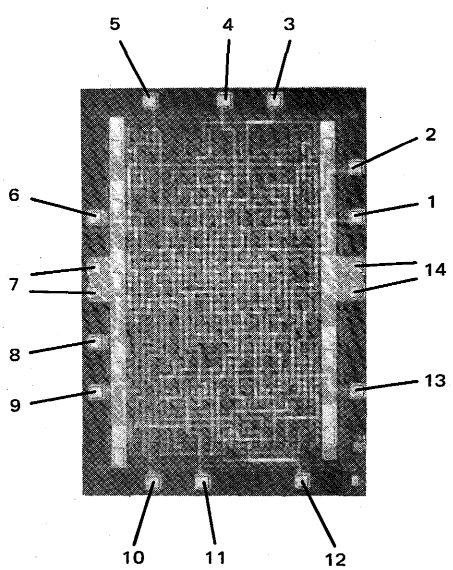


PIN CONNECTIONS

1	$\overline{\text{Clock}}$	V_{CC}	24
2	D6	Q1	23
3	D7	D1	22
4	MC	Reset	21
5	Q5	D3	20
6	Q7	DP	19
7	Q6	QP	18
8	D5	Q0	17
9	$\overline{\text{Match}}$	D0	16
10	D4	Q2	15
11	Q4	D2	14
12	Gnd	Q3	13

MCC8503 Universal Polynominal Generator (UPG)

74 x 103

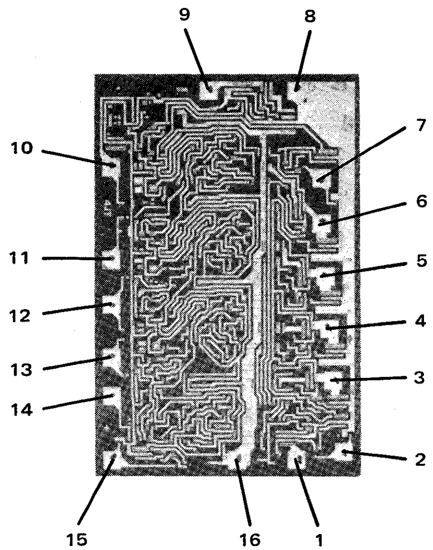


PIN CONNECTIONS

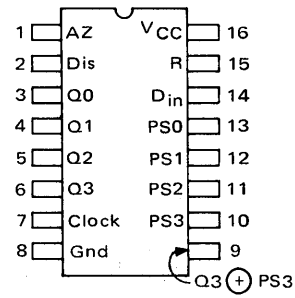
1	$\overline{\text{C}}$	V_{CC}	14
2	Q8	$\overline{\text{AZ}}$	13
3	Z	SDO	12
4	R	SDI	11
5	Y	$\overline{\text{SR}}$	10
6	D1	D9	9
7	Gnd	X	8

MCC8504 Universal Presettable Polynominal Generator (UPPG)

69 x 103

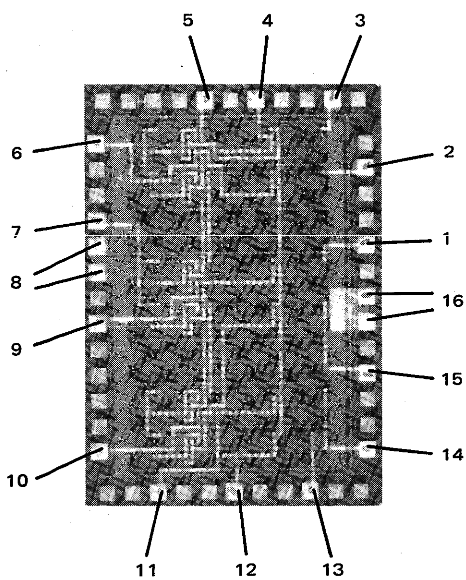


PIN CONNECTIONS

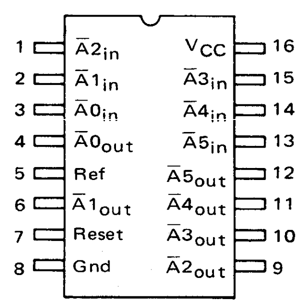


MCC8505 MOS Dynamic Memory Address Refresh Logic Circuit

74 x 103



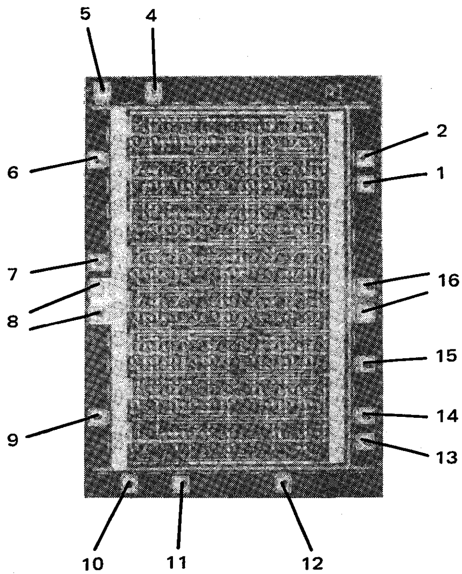
PIN CONNECTIONS



6

MCC8506 Polynominal Generator

74 x 103



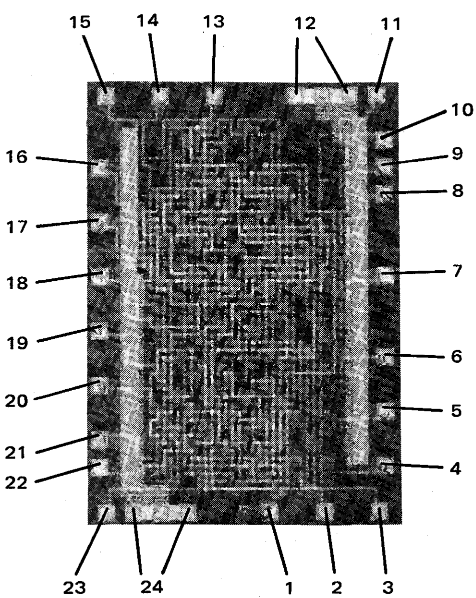
PIN CONNECTIONS

1	$\overline{PM}$	V_{CC}	16
2	$\overline{AZ}$	P	15
3	NC	WD	14
4	$\overline{WC}$	R/W	13
5	$\overline{RC}$	RD	12
6	$\overline{E}$	D_{out}	11
7	PS	Inv	10
8	Gnd	Shift	9

NC = No Connection

MCC8507 Priority Interrupt Controller

74x103

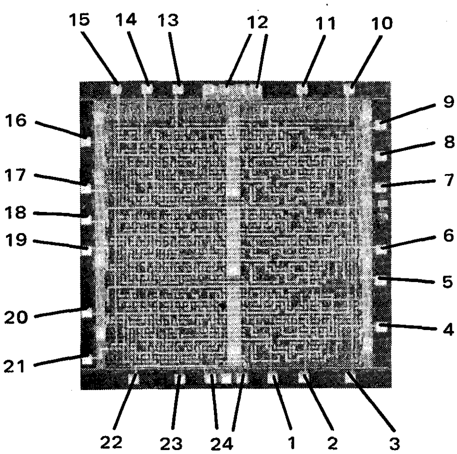


PIN CONNECTIONS

1	CS1	V_{CC}	24
2	$\overline{Stretch}$	$\overline{IRQ}$	23
3	$\overline{CSO}$	Z4	22
4	$\overline{IN0}$	Z3	21
5	$\overline{IN1}$	Z2	20
6	$\overline{IN2}$	Z1	19
7	$\overline{IN3}$	E	18
8	$\overline{IN4}$	R/W	17
9	$\overline{IN5}$	A1	16
10	$\overline{IN6}$	A2	15
11	$\overline{IN7}$	A3	14
12	Gnd	A4	13

MCC8520 DSKEW/QUEUE Register

125 x 123



PIN CONNECTIONS

1	OC_A	V_{CC}	24
2	IC_A	RF_A	23
3	D_A	RF_B	22
4	D_B	Out 2_A	21
5	OC_B	Out 1_A	20
6	IC_B	Out 2_B	19
7	R	Out 1_B	18
8	D_C	Out 2_C	17
9	IC_C	Out 1_C	16
10	Inv	B2	15
11	OC_C	B1	14
12	Gnd	RF_C	13

CHAPTER 7
Digital Saturated Logic
(MTTL, MDTL, MRTL, MHTL, SUHL)

DIGITAL SATURATED LOGIC INTEGRATED CIRCUIT CHIPS

MTTL
MDTL
MRTL
SUHL
MHTL
DIODE ARRAYS
CUSTOM CIRCUITS

Motorola is firmly committed to supply a complete line of TTL, DTL, SUHL, HTL, RTL, diode arrays and custom digital chips.

By combining a N.A.S.A. Class A approved wafer area with technology advantages (Silicon-Aluminum metallization) and state-of-the-art screening methods (Total Electrical Stress Test) overall chip reliability is maximized.

Si-Al METALLIZATION

Silicon-Aluminum metallization is utilized on all TTL and SUHL product lines. This process provides several important advantages over pure Aluminum metal systems. The result is increased quality and more reliable product:

1. Mean-times-before-failure due to electromigration are extended through the addition of Silicon.
2. Produces improved step coverage, as deposition temperatures can be increased without etch pit problems.
3. Etch pit formation at the metal-semiconductor surface interface in the preohmic contact areas is minimized.
4. Hillock formation (protrusions from the metal surface) is reduced due to addition of the silicon.
5. Provides more desirable interface conditions between metal and insulation glass in the manufacture of multilayer metal circuits.
6. Excellent edge definition in the metal patterning.

MOTOROLA STRESS T.E.S.T.

Motorola now has available an additional test procedure at wafer probe for all TTL and Saturated Logic product lines. This special testing is called Motorola Stress T.E.S.T. (Total Electrical Stress Test). These tests are designed to eliminate any electrically weak device, even though it may be completely within all other specified parameters. By screening out these weak devices, overall reliability is increased due to a reduction of infant mortality failures as well as a deletion of potential future failures.

Motorola Stress T.E.S.T. consists of two basic test modes: Overvoltage or stress testing and leakage testing. The overvoltage tests screen out any device elements with voltage sensitive oxide or diffusion faults which constitute latent reliability field hazards under normal operating conditions. The leakage tests eliminate any devices which have low leakage current paths which would exist due to soft or shorted junctions, diffusion faults or surface problems.

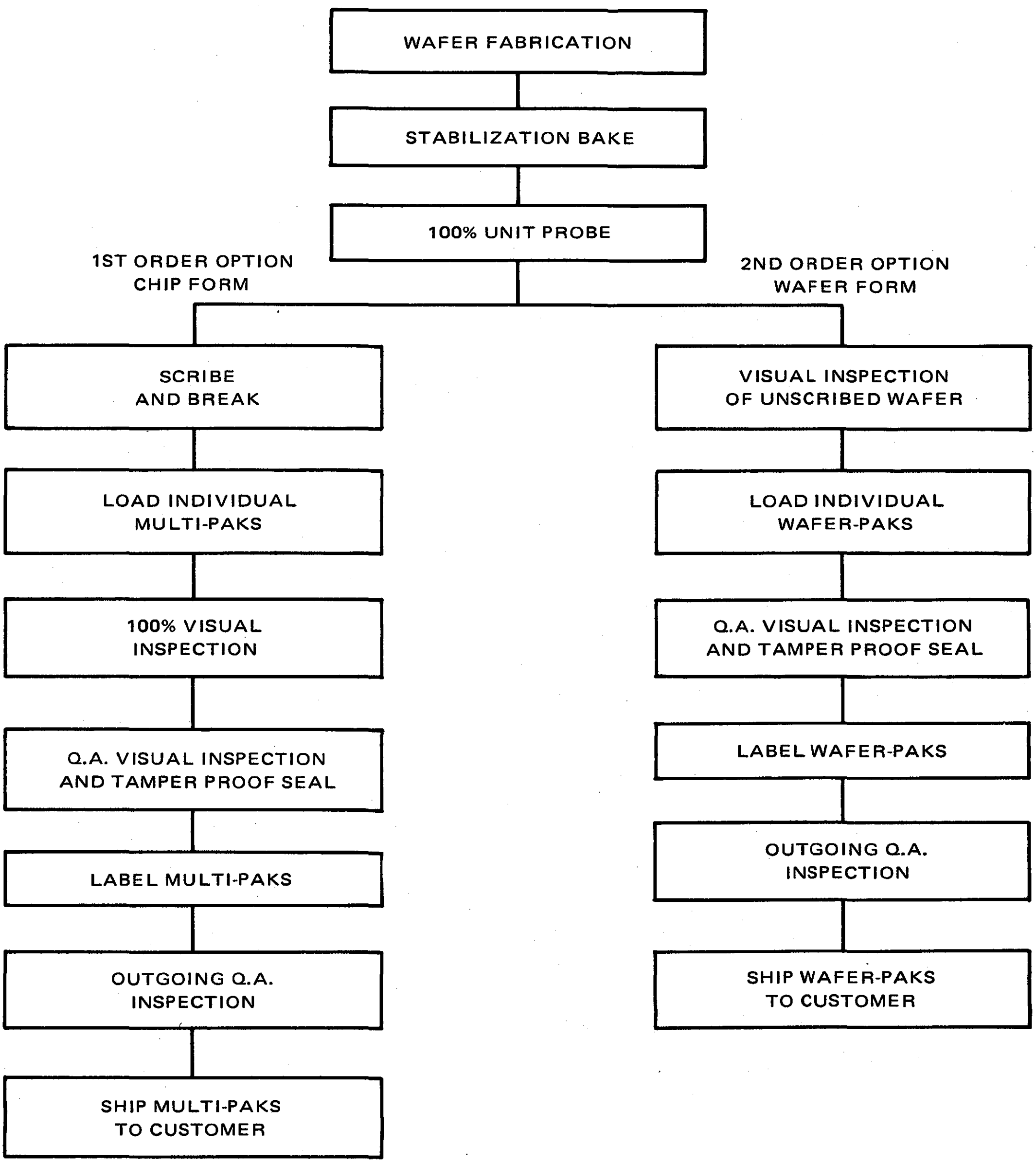
Overall, the Motorola Stress T.E.S.T. provides several important features:

1. Overall reliability on a level with "burned-in" product.
2. Reduced Infant-Mortality rate.
3. Higher reliability than devices 100% visually screened to Level A criteria.
4. A truly objective means of screening for improved reliability.

Each Digital Saturated logic chip and wafer receives 100% electrical probe and visual inspection. Every die is glass passivated and gold alloy backed,

Specific processing received by each die and wafer is detailed on the following flow chart.

DIGITAL SATURATED LOGIC CHIP PROCESSING FLOW CHART



PROCESS DESCRIPTION

Stabilization Bake:

Each wafer is subjected to stabilization bake at elevated temperature without electrical stress as a preconditioning treatment.

100% Unit Probe:

All Digital Saturated Logic Chips are 100% probed to ensure meeting the DC electrical specifications presented on Motorola standard data sheets. Probe limits are guard-banded at 25°C to separate chips into Commercial and Military temperature ranges. The 100% probe testing usually consists of all DC parameters and functionality tests; Total Electrical Stress Testing (T.E.S.T.) is also available as an optional screen. AC and DC parameters which cannot be tested directly to data sheet limits are guaranteed to an LTPD of 20/accept on 2 (over rated operating temperatures).

SECOND ORDER OPTION— WAFER FORM

Visual Inspection:

Each unscribed wafer is visually inspected for gross processing and handling defects. Reject wafers are removed.

Load Wafer-Paks:

The individual wafer-paks are loaded with one wafer per wafer-pak.

Q.A. Visual Inspection:

The wafers are reinspected and "tamper-proof" seals affixed by Q.A. personnel.

Label Wafer-Paks:

A label is affixed to each wafer-pak which includes device type, mask number, wafer lot number, date code and quantity of good die per wafer.

Outgoing Q.A. Inspection:

All lots are inspected and labeling, counts, and final packaging are verified.

Ship Wafer-Paks to Customer.

FIRST ORDER OPTION— CHIP FORM

Scribe and Break:

The probed wafer is scribed and broken into individual chips and electrical rejects are removed.

Load Multi-Paks:

Chips are loaded into a waffle type carrier using a vacuum needle.

100% Visual Inspection:

Each chip is visually inspected and rejects are removed.

Military temperature range chips are inspected to Motorola specification 12M55367J which meets or exceeds MIL-STD-883 method 2010.2 condition B. Commercial temperature range chips are inspected to Motorola specification 12M53030J, which meets the intent of MIL-STD-883B.

Q.A. Visual Inspection:

A sample is taken from each lot and visually inspected to the same criteria as the total lot. Military temperature range product must meet 1.5% A.O.Q.L. (Average Outgoing Quality Level) and commercial temperature range product must meet 2.5% A.O.Q.L. All Carriers have "tamper-proof" seals affixed by Q.A. personnel.

Label Multi-Paks:

Each individual carrier receives a label which includes device type, mask number, wafer lot number, date code and quantity.

Outgoing Q.A. Inspection:

All lots are inspected to verify labeling, counts and final packaging.

Ship Multi-Paks to Customer.

NON-STANDARD CHIP PROCESSING CAPABILITIES

The standard Digital Saturated Logic Chips as presented in this data book are selected by many customers to meet a wide variety of application requirements.

Nevertheless, there are situations when a designer can benefit from a non-standard device for a specific circuit requirement.

To satisfy these needs, any device from Motorola's extensive lines of Digital Saturated Logic circuits may be purchased on a specially negotiated basis. Non-standard capabilities include, but are not limited to the following:

- Encapsulation of samples from chip lot for lot qualification
- Temperature testing on encapsulated sample lots to guarantee performance over temperature range
- Special visual criteria
- SEM inspection of metallization
- Bondability testing
- Maintenance of diffusion lot integrity
- Additional electrical testing and selection
- Special labeling
- Flip-chip technology for high volume, low cost hybrid microcircuits
- Generic data
- Reliability data
- Layout tolerances
- Custom chip design
- Total Electrical Stress Testing (T.E.S.T.)

GENERAL PHYSICAL CHARACTERISTICS OF DIGITAL SATURATED LOGIC CHIPS

The following characteristics represent the vast majority of all Digital Saturated Logic Chips. Since an individual chip type may vary slightly, contact Motorola for information regarding physical characteristics critical to a particular application. The overall size and final metallization pattern is shown on the following pages for each chip. The metallization patterr. shows the position and identification for each pad.

1. Chip thickness 9 ± 1 mil
2. Passivation 9-11 kÅ
3. Front metallization type:
   TTL, SUHL — Silicon Aluminum
   DTL, RTL, HTL,
   Diode Arrays — Pure Aluminum
4. Metallization thickness:
   Single layer metal — 11-14 kÅ
   Double layer metal — 1st layer 7-8.5 kÅ
   Double layer metal — 2nd layer 20-22 kÅ
5. Back metallization — Gold, alloyed
6. Pad dimensions
   Typical 4.5 x 4.5 mils
   Minimum 4.0 x 4.0 mils
7. Overall chip dimensions
   As given for individual device type. ± 5.0 mils should be allowed for scribe tolerance.

PACKAGING

Digital Saturated Logic Chips are available in three package options: Multi-Pak for chips, Wafer-Pak for wafers, and prebonded onto a continuous reel of tape (M.E.S.A.-Pak).

Multi-Pak

The Multi-Pak is a non-spill type waffle carrier consisting of a two-inch square with 100 compartments arranged in a 10 by 10 matrix tray with a transparent cover. The chips are covered within the carrier by antistatic inert filter paper. The Multi-Pak carrier is designed to provide maximum device protection, permit partial removal of chips and resealing of carrier, and supply a convenient container for unused device storage.

Wafer-Pak

Wafers are placed in a plastic box, between two layers of mylar or inert filter paper sandwiched between two layers of polyfoam. The plastic box is securely taped shut and allows no movement of the wafer.

M.E.S.A-Pak

The M.E.S.A.-Pak (Motorola Etched Strip Assembly) is a new innovation within the chip industry.

Dice may be ordered pre-bonded to an etched metal tape pattern. The pattern is etched onto a continuous reel of tape and registered to align with bonding pads of conventional die.

The M.E.S.A. method of chip mounting offers excellent heat conductivity away from the die. Bond strength of die/foil connections far exceeds conventional wire bonds.

The reel carriers provide a low cost means of automated handling, assembly and testing. Not all device types are presently available in the M.E.S.A.-Pak. Consult your local Motorola representative for assistance.

DEVICE DATA

Detailed information is presented in Motorola data books and on detailed data sheets. The following pages contain a description of each device, logic diagram, chip geometry and pin identification.

All pin numbers are referenced to the equivalent pinout of dual-in-line packages.

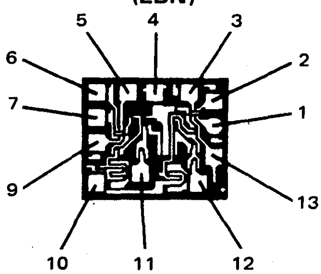
MCC400/450 Series (0 to +75°C)
MCC500/550 Series (–55 to +125°C)

These integrated circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a medium operating speed (20 MHz clock rate), good external noise immunity, high fan-out, and the capability of driving lines up to 600 pF capacitance.

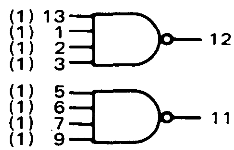
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC400	MCC500	Dual 4 Input NAND Gate	2BN	35x42
MCC401	MCC501	Exp. 4 Wide 2-2-2-3 Input AOI Gate	58E	36x50
MCC402	MCC502	8 Input NAND Gate	6DN	36x38
MCC403	MCC503	2 Wide 3 Input AOI Gate w/Gated Complement	30F	48x53
MCC404	MCC504	Exp. 3 Wide 3 Input AOI Gate	89A	49x36
MCC405	MCC505	Exp. 2 Wide 4 Input AOI Gate	4DA	36x38
MCC406	MCC506	Exp. 8 Input NAND Gate	6DN	36x38
MCC407	MCC507	Line Driver	76P	39x53
MCC408	MCC508	Quad 2 Input NAND Gate	8DB	44x45
MCC409	MCC509	4 Wide 3-2-2-3 Input Exp. for AOI Gates	89A	49x36
MCC410	MCC510	Dual 4 Input Exp. for AOI Gates	4DA	36x38
MCC411	MCC511	Dual 4 Input Exp. for NAND Gates	4DA	36x38
MCC412	MCC512	Triple 3 Input NAND Gate	45V	44x45
MCC413	MCC513	R-S Flip-Flop	24A	41x47
MCC414	MCC514	Gated R-S Flip-Flop	03A	47x52
MCC415	MCC515	AND J-K Flip-Flop	8EX	53x63
MCC416	MCC516	OR J-K Flip-Flop	8EX	53x63
MCC419	MCC519	Triple 2-Input Buss Driver	78E	50x50
MCC420	MCC520	Exp. Dual 2 Wide 2-Input AOI Gate	9RW	40x45
MCC421	MCC521	AC Coupled R-S Flip-Flop	03A	47x52
MCC422	MCC522	Dual Type D Flip-Flop	80V	62x65
MCC423	MCC523	Dual J-K Flip-Flop (separate clock)	2TJ	59x66
MCC424	MCC524	Dual J-K Flip-Flop (common clock)	2TJ	59x66
MCC425	MCC525	Hex Inverter	80E	68x54
MCC426	MCC526	Dual 3-Input Pulse Shaper/Delay AND Gate	76E	43x48
MCC427	MCC527	OR Exp. Dual 4-Input AND Gate	76E	43x48
MCC428	MCC528	Dual 2-Wide 2-3 Input OR Expander	76E	43x48
MCC429	MCC529	Hex Inverter	79M	53x61
MCC450	MCC550	Dual 4 Input NAND Gate	2BN	35x42
MCC451	MCC551	Exp. 4 Wide 2-2-2-3 Input AOI Gate	58E	36x50
MCC452	MCC552	8 Input NAND Gate	6DN	36x38
MCC453	MCC553	2 Wide 3 Input AOI Gate w/Gated Complement	30F	48x53
MCC454	MCC554	Exp. 3 Wide 3 Input AOI Gate	89A	49x36
MCC455	MCC555	Exp. 2 Wide 4 Input AOI Gate	4DA	36x38
MCC456	MCC556	Exp. 8 Input NAND Gate	6DN	36x38
MCC457	MCC557	Line Driver	76P	39x53
MCC458	MCC558	Quad 2 Input NAND Gate	8DB	44x45
MCC459	MCC559	4 Wide 3-2-2-3 Input Exp. for AOI Gates	89A	49x36
MCC460	MCC560	Dual 4 Input Exp. for AOI Gates	4DA	36x38
MCC461	MCC561	Dual 4 Input Exp. for NAND Gates	4DA	36x38
MCC462	MCC562	Triple 3 Input NAND Gate	45V	44x45
MCC463	MCC563	R-S Flip-Flop	24A	41x47
MCC464	MCC564	Gated R-S Flip-Flop	03A	47x52
MCC465	MCC565	AND J-K Flip-Flop	8EX	53x63
MCC466	MCC566	OR J-K Flip-Flop	8EX	53x63
MCC469	MCC569	Triple 2-Input Buss Driver	78E	50x50
MCC470	MCC570	Exp. Dual 2 Wide 2-Input AOI Gate	9RW	40x45
MCC471	MCC571	AC Coupled R-S Flip-Flop	03A	47x52
MCC472	MCC572	Dual Type D Flip-Flop	80V	62x65
MCC473	MCC573	Dual J-K Flip-Flop (separate clock)	2TJ	59x66
MCC474	MCC574	Dual J-K Flip-Flop (common clock)	2TJ	59x66
MCC475	MCC575	Hex Inverter	80E	68x54
MCC476	MCC576	Dual 3-Input Pulse Shaper/Delay AND Gate	76E	43x48
MCC477	MCC577	OR Exp. Dual 4-Input AND Gate	76E	43x48
MCC478	MCC578	Dual 2-Wide 2-3 Input OR Expander	76E	43x48
MCC479	MCC579	Hex Inverter	79M	53x61

MCC400/MCC450/MCC500/MCC550
Dual 4 Input NAND Gate

35 x 42
(2BN)



PIN CONNECTIONS

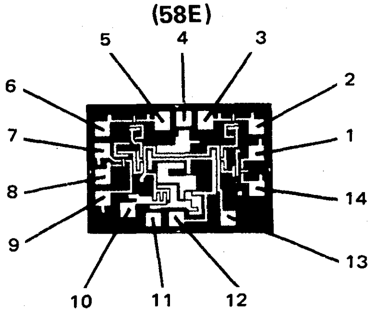


$12 = \overline{1 \cdot 2 \cdot 3 \cdot 13}$

V_{CC} = Pin 4 t_{pd} = 10 ns typ
GND = Pin 10 P_D = 30 mW typ/pkg

MCC401/MCC451/MCC501/MCC551
Expandable 4 Wide 2 2 2 3 Input AND OR INVERT Gate

36 x 50
(58E)



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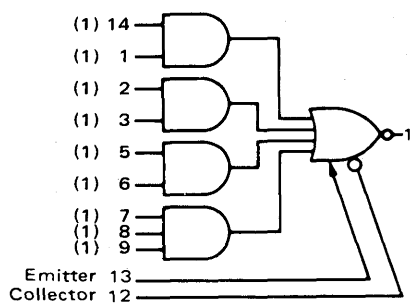
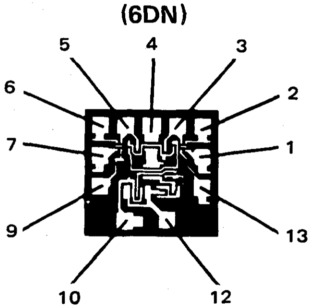


$11 = \overline{(14 \cdot 1) + (2 \cdot 3) + (5 \cdot 6) + (7 \cdot 8 \cdot 9) + \ldots}$

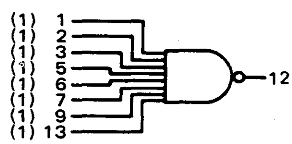
V_{CC} = Pin 4 t_{pd} = 12 ns typ
GND = Pin 10 P_D = 30 mW typ/pkg

MCC402/MCC452/MCC502/MCC552
8 Input NAND Gate

36 x 38
(6DN)



PIN CONNECTIONS



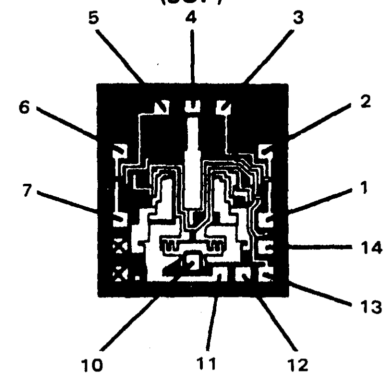
$12 = \overline{1 \cdot 2 \cdot 3 \cdot 5 \cdot 6 \cdot 7 \cdot 9 \cdot 13}$

V_{CC} = Pin 4 t_{pd} = 12 ns typ
GND = Pin 10 P_D = 15 mW typ/pkg

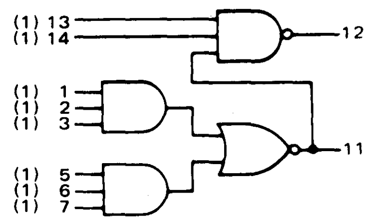
All dimensions are in mils.

MCC403/MCC453/MCC503/MCC553
2 Wide 3 Input AND OR INVERT Gate With Gated Complement

48 x 53
(3OF)



PIN CONNECTIONS



$12 = \overline{11 \cdot 13 \cdot 14}$

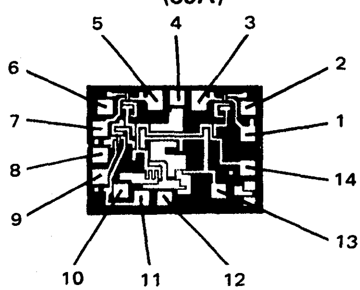
$11 = \overline{(1 \cdot 2 \cdot 3) + (5 \cdot 6 \cdot 7)}$

V_{CC} = Pin 4
GND = Pin 10

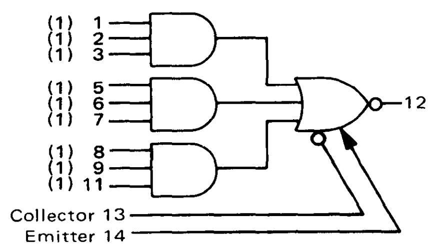
t_{pd} = 11 ns typ
P_D = 35 mW typ/pkg

MCC404/MCC454/MCC504/MCC554
Expandable 3 Wide 3 Input AND OR INVERT Gate

49 x 36
(89A)



PIN CONNECTIONS



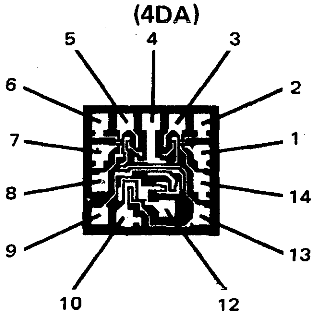
$12 = \overline{(1 \cdot 2 \cdot 3) + (5 \cdot 6 \cdot 7) + (8 \cdot 9 \cdot 11) + \ldots}$

V_{CC} = Pin 4
GND = Pin 10

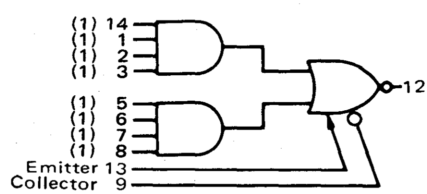
t_{pd} = 12 ns typ
P_D = 25 mW typ/pkg

MCC405/MCC455/MCC505/MCC555
Expandable 2 Wide 4 Input AND OR INVERT Gate

36 x 38
(4DA)



PIN CONNECTIONS



$12 = \overline{(14 \cdot 1 \cdot 2 \cdot 3) + (5 \cdot 6 \cdot 7 \cdot 8) + \ldots}$

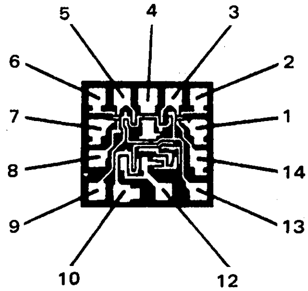
V_{CC} = Pin 4
GND = Pin 10

t_{pd} = 12 ns typ
P_D = 20 mW typ/pkg

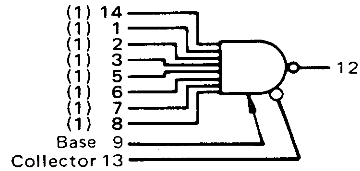
7

MCC406/MCC456/MCC506/MCC556
Expandable 8 Input NAND Gate

36 x 38
(6DN)



PIN CONNECTIONS

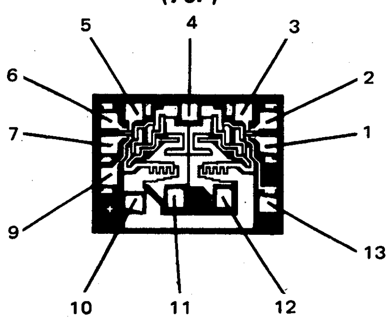


$12 = \overline{1 \cdot 3 \cdot 5 \cdot 7 \cdot 8 \cdot 14 \cdot \ldots}$

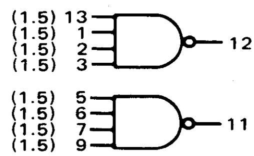
V_{CC} = Pin 4 t_{pd} = 18 ns typ
GND = Pin 10 P_D = 15 mW typ/pkg

MCC407/MCC457/MCC507/MCC557
Line Driver

39 x 53
(76P)



PIN CONNECTIONS

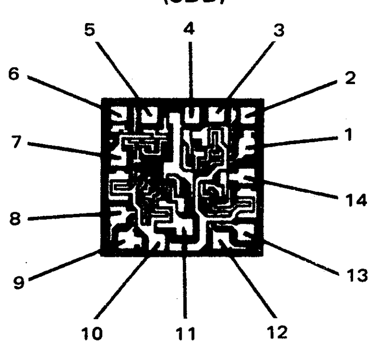


$12 = \overline{1 \cdot 2 \cdot 3 \cdot 13}$

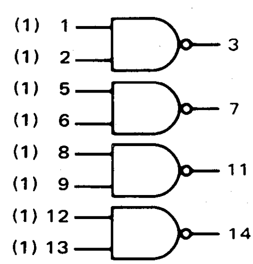
V_{CC} = Pin 4 t_{pd} = 25 ns typ
GND = Pin 10 @ 1000 pF Load
P_D = 60 mW typ/pkg

MCC408/MCC458/MCC508/MCC558
Quad 2 Input NAND Gate

44 x 45
(8DB)



PIN CONNECTIONS



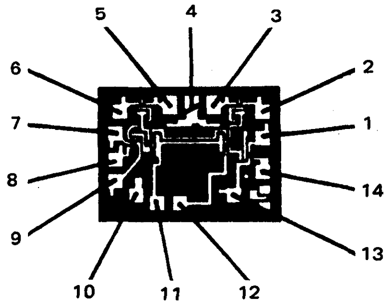
$3 = \overline{1 \cdot 2}$

V_{CC} = Pin 4 t_{pd} = 10 ns typ
GND = Pin 10 P_D = 60 mW typ/pkg

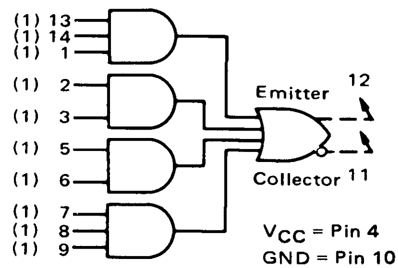
7

MCC409/MCC459/MCC509/MCC559
4 Wide 3 2 2 3 Input Expander for AND OR INVERT Gates

49 x 36
(89A)

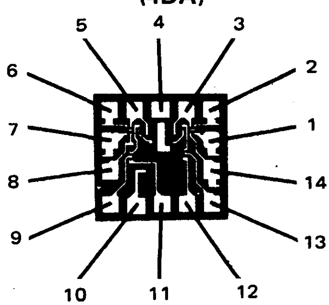


PIN CONNECTIONS



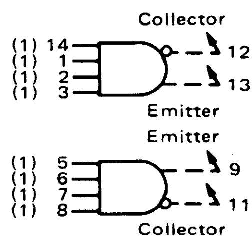
MCC410/MCC460/MCC510/MCC560
Dual 4 Input Expander for AND OR INVERT Gates

36 x 38
(4DA)



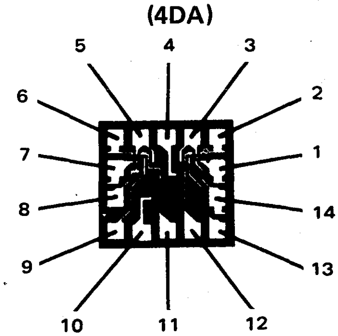
PIN CONNECTIONS

V_{CC} = Pin 4
GND = Pin 10



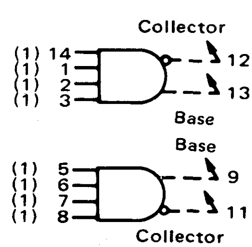
MCC411/MCC461/MCC511/MCC561
Dual 4 Input Expander for NAND Gates

36 x 38
(4DA)



PIN CONNECTIONS

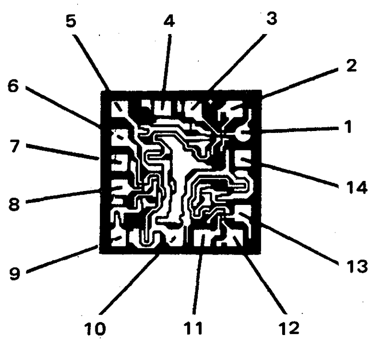
GND = Pin 10



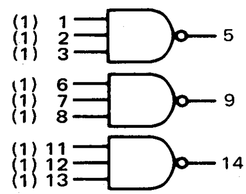
7

MCC412/MCC462/MCC512/MCC562
Triple 3 Input NAND Gate

44 x 45
(45V)



PIN CONNECTIONS



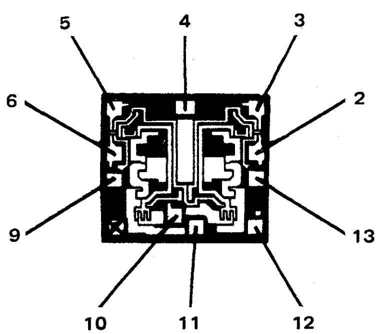
$5 = \overline{1 \cdot 2 \cdot 3}$

t_{pd} = 10 ns typ
P_D = 45 mW typ/pkg

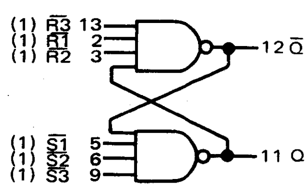
V_{CC} = Pin 4
GND = Pin 10

MCC413/MCC463/MCC513/MCC563
R-S Flip Flop

41 x 47
(24A)



PIN CONNECTIONS



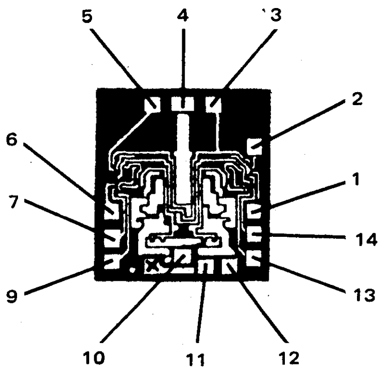
t+ = 15 ns typ
t− = 20 ns typ
P_D = 30 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

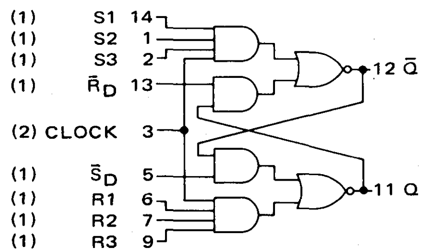
7

MCC414/MCC464/MCC514/MCC564
Gated R-S Flip Flop

47 x 52
(03A)



PIN CONNECTIONS

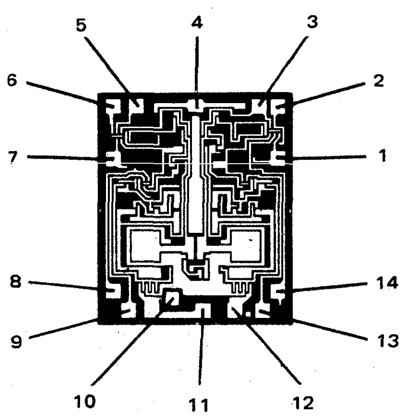


V_{CC} = Pin 4
GND = Pin 10

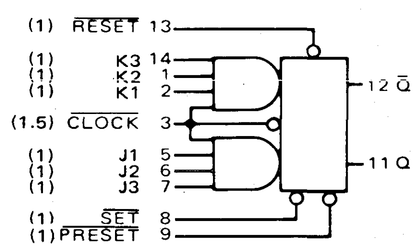
t+ = 7.5 ns typ
t− = 20 ns typ
P_D = 30 mW typ/pkg

MCC415/MCC465/MCC515/MCC565
AND J-K Flip Flop

53 x 63
(8EX)



PIN CONNECTIONS

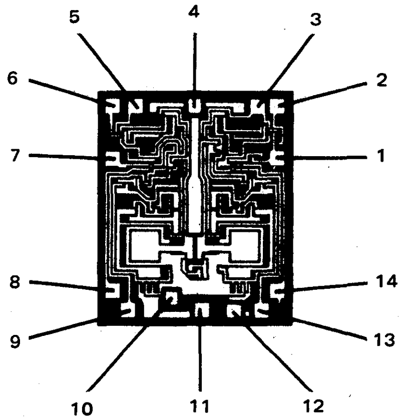


t_{pd-} = 25 ns typ
t_{pd+} = 13 ns typ
P_D = 40 mW typ/pkg
V_{CC} = Pin 4
GND = Pin 10

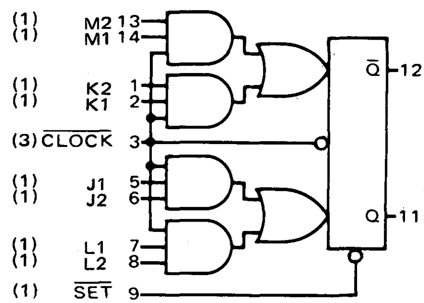
7

MCC416/MCC466/MCC516/MCC566
OR J-K Flip Flop

53 x 63
(8EX)



PIN CONNECTIONS

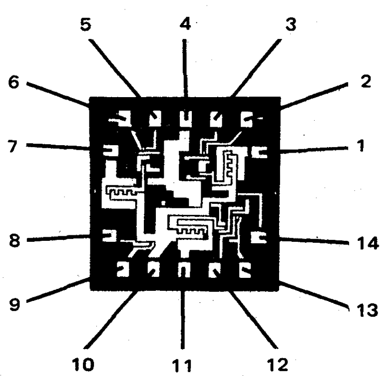


V_{CC} = Pin 4
GND = Pin 10

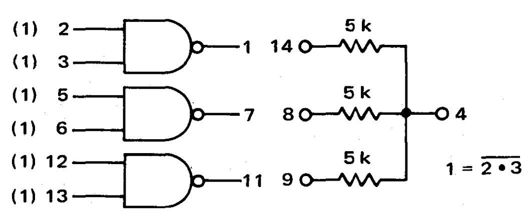
t_{pd-} = 25 ns typ
t_{pd+} = 13 ns typ
P_D = 50 mW typ/pkg

MCC419/MCC469/MCC519/MCC569
Triple 2-Input Buss Driver

50 x 50
(78E)



PIN CONNECTIONS



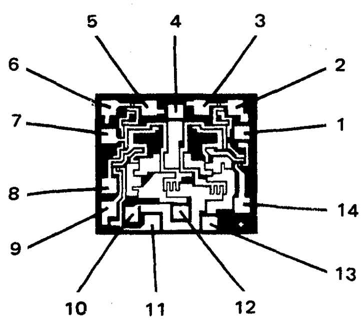
Propagation Delay Time (using 5.0 k ohm pullup resistor):
t_{pd+} = 50 ns typ
t_{pd-} = 15 ns typ
P_D = 54 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

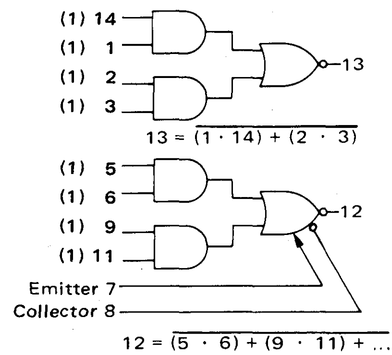
7

MCC420/MCC470/MCC520/MCC570
Expandable Dual 2-Wide 2-Input AND OR INVERT Gate

40 x 45
(9RW)



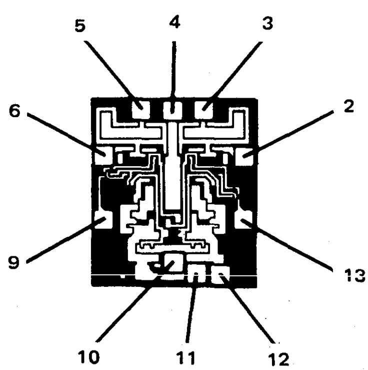
PIN CONNECTIONS



t_{pd} = 12 ns typ
P_D = 40 mW typ/pkg

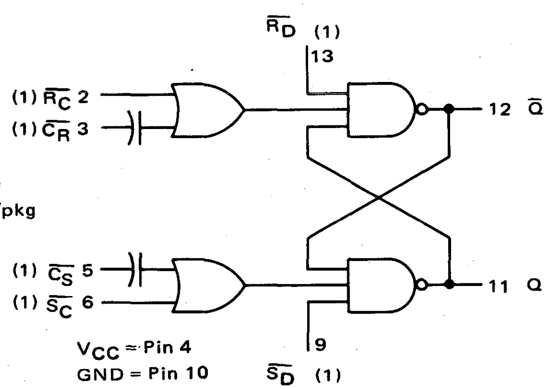
V_{CC} = Pin 4
GND = Pin 10

MCC421/MCC471/MCC521/MCC571
AC Coupled R-S Flip Flop



47 x 52
(03A)

PIN CONNECTIONS

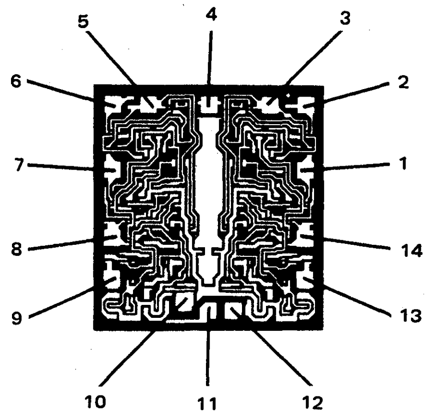


f = 10 MHz typ
P_D = 30 mW typ/pkg

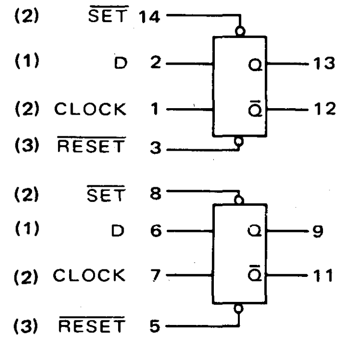
V_{CC} = Pin 4
GND = Pin 10

MCC422/MCC472/MCC522/MCC572
Dual Type D Flip Flop

62 x 65
(80V)



PIN CONNECTIONS

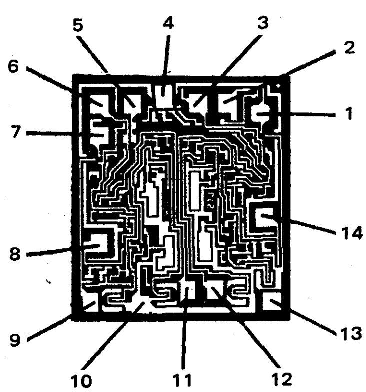


f = 30 MHz typ
P_D = 84 mW typ/pkg

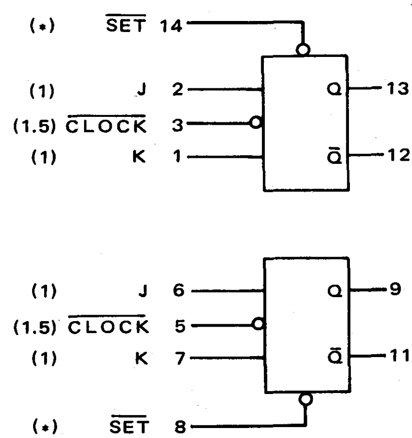
V_{CC} = Pin 4
GND = Pin 10

MCC423/MCC473/MCC523/MCC573
Dual J-K Flip Flop (separate clock)

59 x 66
(2TJ)



PIN CONNECTIONS

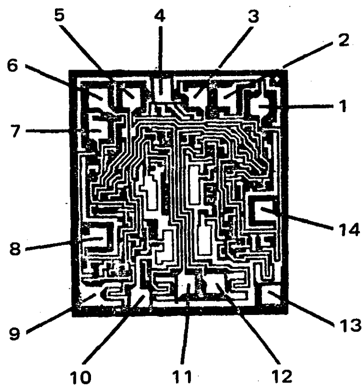


V_{CC} = Pin 4
GND = Pin 10
f = 45 MHz typ
P_D = 110 mW typ/pkg

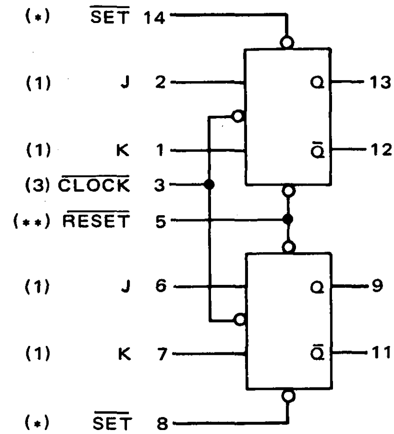
7

MCC424/MCC474/MCC524/MCC574
Dual J-K Flip Flop (common clock)

59 x 66
(2TJ)



PIN CONNECTIONS

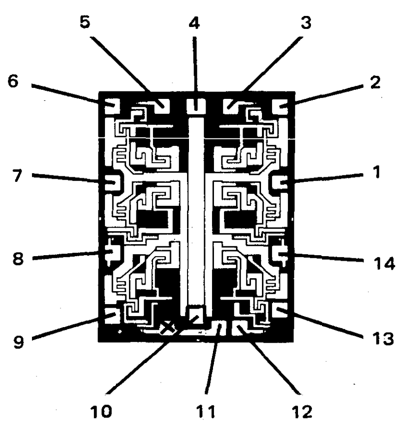


V_{CC} = Pin 4
GND = Pin 10

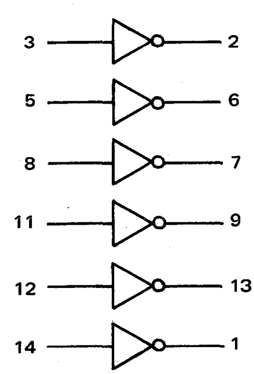
f = 45 MHz typ
P_D = 110 mW typ/pkg

MCC425/MCC475/MCC525/MCC575
Hex Inverter

68 x 54
(80E)



PIN CONNECTIONS



V_{CC} = Pin 4
GND = Pin 10

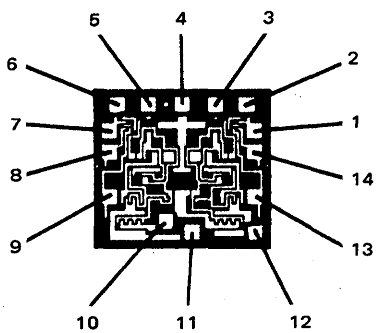
Positive Logic: $2 = \overline{3}$

Total Power Dissipation = 90 mW typ/pkg
Propagation Delay Time = 10 ns typ

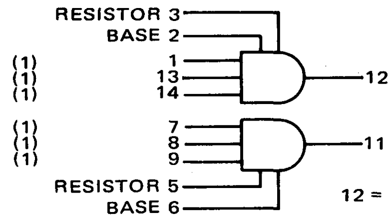
7

MCC426/MCC476/MCC526/MCC576
Dual 3-Input Pulse Shaper/Delay AND Gate

43 x 48
(76E)



PIN CONNECTIONS



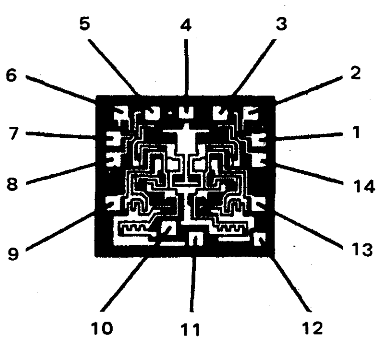
12 = 1 • 13 • 14

t_{pd} = 15 ns typ
P_D = 60 mW typ/pkg

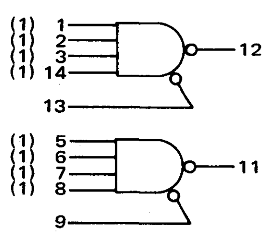
V_{CC} = Pin 4
GND = Pin 10

MCC427/MCC477/MCC527/MCC577
OR Expandable Dual 4-Input AND Gate

43 x 48
(76E)



PIN CONNECTIONS



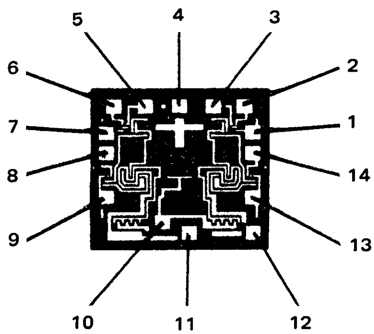
12 = 1 • 2 • 3 • 14 + · · ·

t_{pd} = 10 ns typ
P_D = 38 mW typ/pkg

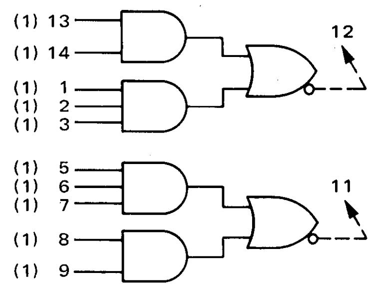
V_{CC} = Pin 4
GND = Pin 10

MCC428/MCC478/MCC528/MCC578
Dual 2-Wide 2-3 Input OR Expander

43 x 48
(76E)



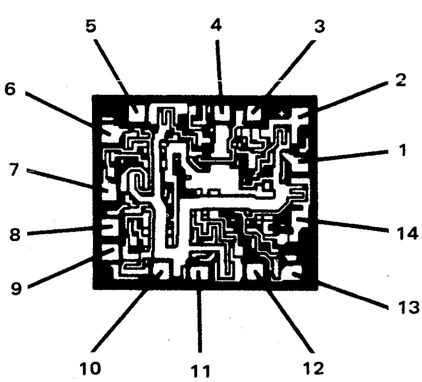
PIN CONNECTIONS



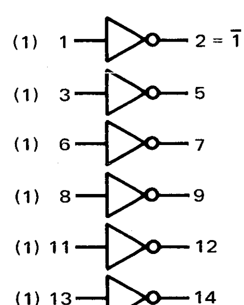
V_{CC} = Pin 4
GND = Pin 10

MCC429/MCC479/MCC529/MCC579
Hex Inverter

53 x 61
79M



PIN CONNECTIONS



t_{pd} = 10 ns typ
P_D = 90 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

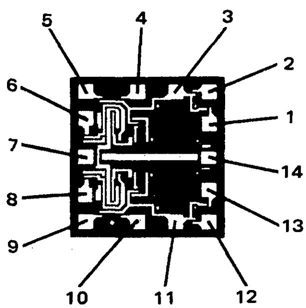
MCC660 Series (−30 to +75°C)

Motorola's MHTL integrated circuits are especially designed to meet the requirements of industrial applications because of the outstanding noise immunity. MHTL circuits provide error-free operation in high noise environments far beyond the tolerance of other integrated circuit families. Multifunction packages and broad operating temperature range further tailor this family to the industrial designer's requirements.

Type	Function	Wafer Mask Set #	Chip Size (Mils)
MCC660	Exp. Dual 4-Input Gate (active pullup)	8MG	45x43
MCC661	Exp. Dual 4-Input Gate (passive pullup)	8MG	45x43
MCC662	Exp. Dual 4-Input Line Driver	1TT	38x44
MCC663	Dual J-K Flip-Flop	2EA	61x62
MCC664	Master Slave R-S Flip-Flop	85M	60x50
MCC665	Triple Level Translator	5MG	40x40
MCC666	Triple Level Translator	4MF	42x49
MCC667	Dual Monostable Multivibrator	1GD	53x57
MCC668	Quad 2-Input Gate (passive pullup)	8MG	45x43
MCC669	Dual 4-Input Expander	59H	30x30
MCC670	Triple 3-Input Gate (passive pullup)	76H	50x58
MCC671	Triple 3-Input Gate (active pullup)	76H	50x58
MCC672	Quad 2-Input Gate (active pullup)	8MG	45x43
MCC673	Dual 2-Input AOI Gate	8MG	45x43
MCC674	Dual 2-Input AOI Gate	8MG	45x43
MCC675	Dual Pulse Stretcher	1MH	55x58
MCC676	BCD-to-Decimal Decoder-Driver	2ME	58x63
MCC677	Hex Inverter With Strobe (active pullup)	95R	52x54
MCC678	Hex Inverter With Strobe (without output resistors)	95R	54x52
MCC679	Dual Lamp Driver	6BE	48x56
MCC680	Hex Inverter	95R	52x54
MCC681	Hex Inverter (O.C.)	95R	52x54
MCC682	Quad Latch	2AP	64x67
MCC683	Quad 2-Input Exclusive OR	8TJ	53x61
MCC684	Decade Counter	3TA	85x86
MCC685	Binary Counter	3TA	85x86
MCC686	4-Bit Shift Register	3TA	85x86
MCC688	Dual J-K Flip-Flop	9TW	68x68
MCC689	Hex Inverter (high voltage)	48W	53x55
MCC690	Hex Inverter (active pullup)	48W	53x55
MCC691	Hex Inverter/Translator	48W	53x55
MCC696	Dual Line Driver Receiver	9DD	58x59
MCC697	Hex Inverter (Passive Pullup)	95R	54x52
MCC699	Dual 2-Input Power AND Gate	3NB	64x66

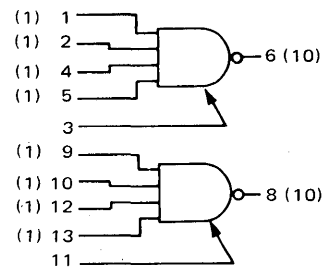
MCC660
Expandable Dual 4-Input Gate (active pullup)

45 x 43
(8MG)



V_{CC} = Pin 14
GND = Pin 7

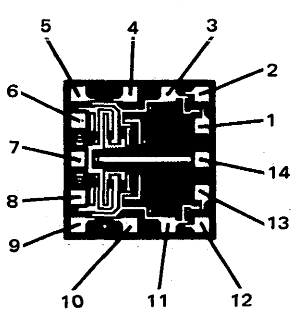
PIN CONNECTIONS



t_{pd} = 110 ns typ
P_D = 88 mW typ/pkg (Inputs High)
26 mW typ/pkg (Input Low)

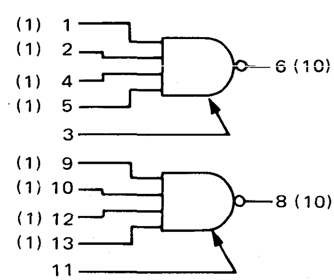
MCC661
Expandable Dual 4-Input Gate (passive pullup)

45 x 43
(8MG)



V_{CC} = Pin 14
GND = Pin 7

PIN CONNECTIONS

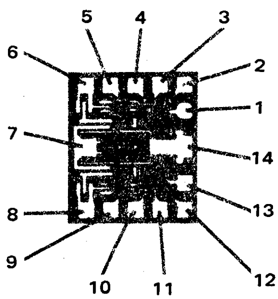


t_{pd} = 125 ns typ
P_D = 88 mW typ/pkg (Inputs High)
26 mW typ/pkg (Input Low)

All dimensions are in mils.

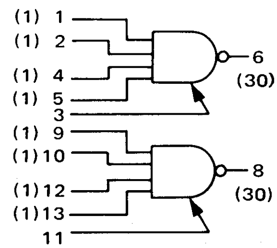
MCC662
Expandable Dual 4-Input Line Driver

38 x 44
(1TT)



V_{CC} = Pin 14
GND = Pin 7

PIN CONNECTIONS

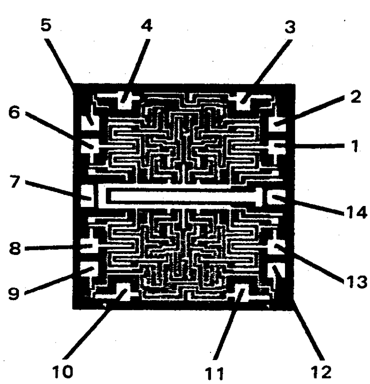


$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot [3]}$

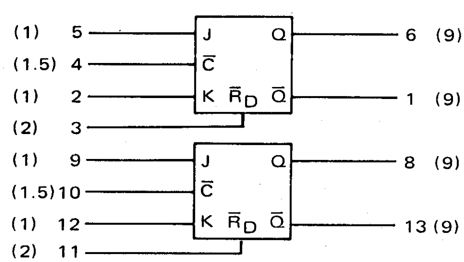
t_{pd} = 140 ns typ
P_D = 180 mW typ/pkg (Inputs High)
26 mW typ/pkg (Input Low)

MCC663
Dual J-K Flip Flop

61 x 62
(2EA)



PIN CONNECTIONS



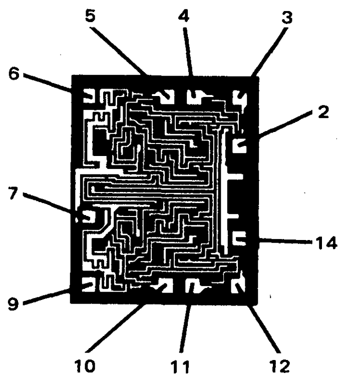
V_{CC} = Pin 14
GND = Pin 7

f_{Tog} = 3.0 MHz/typ
P_D = 200 mW typ/pkg

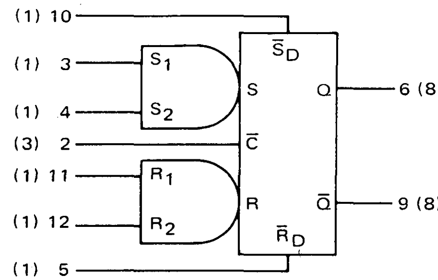
7

MCC664
Master-Slave R-S Flip Flop

60 x 50
(85M)



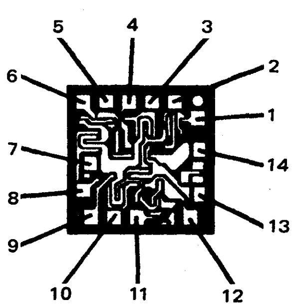
PIN CONNECTIONS



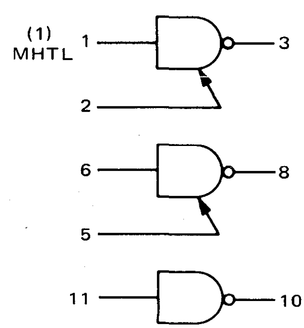
V_{CC} = Pin 14 f_{Tog} = 3.0 MHz typ
GND = Pin 7 P_D = 160 mW typ/pkg

MCC665
Triple Level Translator

40 x 40
(5MG)



PIN CONNECTIONS



(MDTL = 8)
(MTTL III = 5.5)
(MRTL = 5)

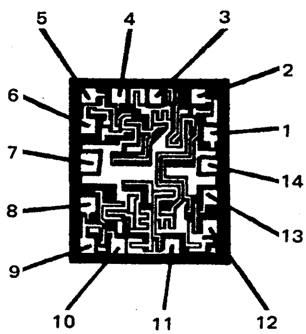
$3 = \overline{1 \cdot [2]}$

V_{CC} = Pin 14
GND = Pin 7

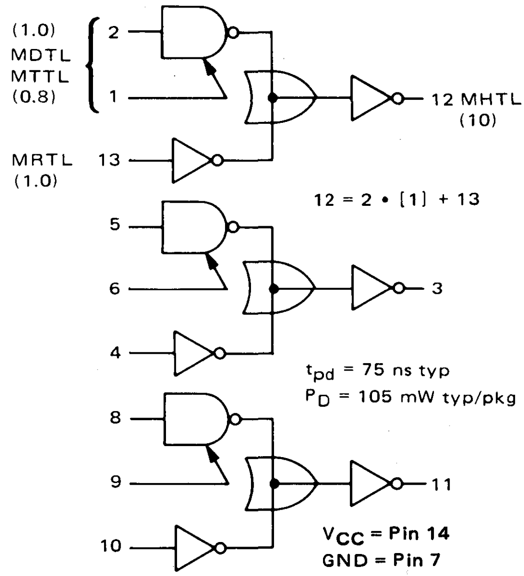
7

MCC666
Triple Level Translator

42 x 49
(4MF)



PIN CONNECTIONS



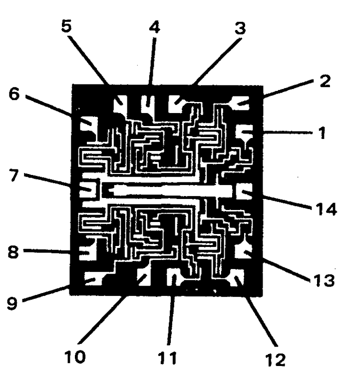
12 = 2 • [1] + 13

t_{pd} = 75 ns typ
P_D = 105 mW typ/pkg

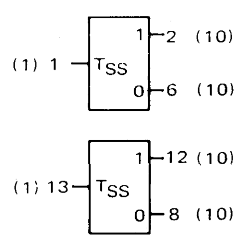
V_{CC} = Pin 14
GND = Pin 7

MCC667
Dual Monostable Multivibrator

53 x 57
1GD



PIN CONNECTIONS



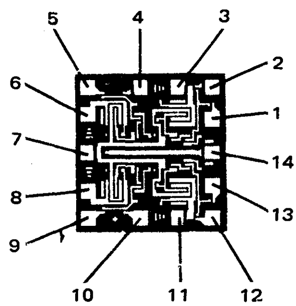
t_{pd} = 140 ns typ
P_D = 240 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

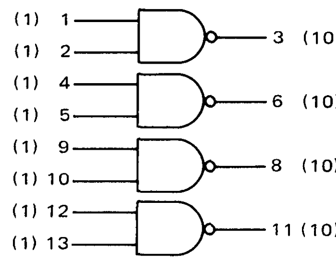
7

MCC668
Quad 2-Input Gate (passive pullup)

45 x 43
(8MG)



PIN CONNECTIONS



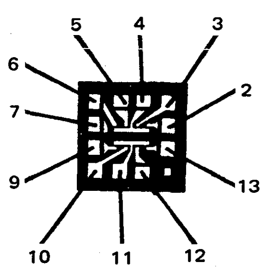
t_{pd} = 125 ns typ
P_D = 176 mW typ/pkg (Inputs High)
52 mW typ/pkg (Input Low)

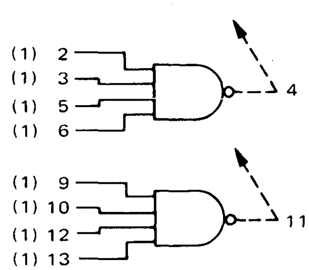
V_{CC} = Pin 14
GND = Pin 7

MCC669
Dual 4-Input Expander

PIN CONNECTIONS

30 x 30
(59H)



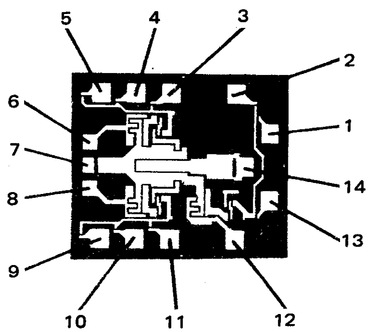


$4 = \overline{2 \cdot 3 \cdot 5 \cdot 6}$

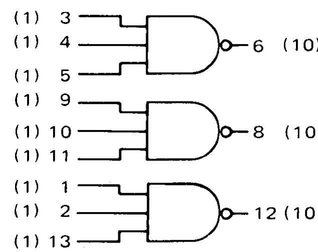
GND = Pin 7

MCC670
Triple 3-Input Gate (passive pullup)

50 x 58
(76H)



PIN CONNECTIONS

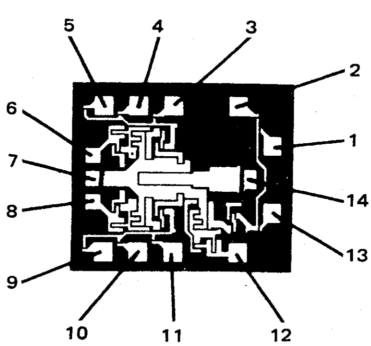


t_{pd} = 125 ns typ
P_D = 132 mW typ/pkg (Inputs High)
39 mW typ/pkg (Input Low)

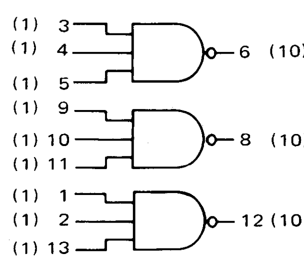
V_{CC} = Pin 14
GND = Pin 7

MCC671
Triple 3-Input Gate (active pullup)

50 x 58
(76H)



PIN CONNECTIONS



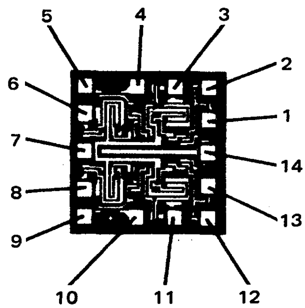
t_{pd} = 110 ns typ
P_D = 132 mW typ/pkg (Inputs High)
39 mW typ/pkg (Input Low)

V_{CC} = Pin 14
GND = Pin 7

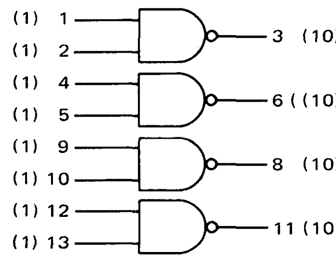
7

MCC672
Quad 2-Input Gate (active pullup)

45 x 43
(8MG)



PIN CONNECTIONS



t_{pd} = 110 ns typ
P_D = 176 mW typ/pkg (Inputs High)
52 mW typ/pkg (Input Low)

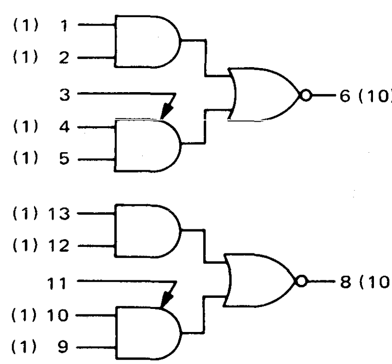
V_{CC} = Pin 14
GND = Pin 7

MCC673
Dual 2-Input AND OR INVERT Gate

45 x 43
(8MG)

CONSULT FACTORY

PIN CONNECTIONS



t_{pd} = 110 ns typ
P_D = 160 mW typ/pkg (Inputs High)
50 mW typ/pkg (Input Low)

V_{CC} = Pin 14
GND = Pin 7

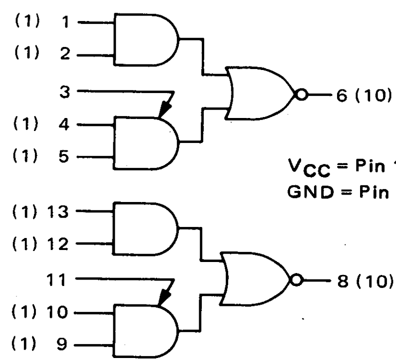
7

MCC674
Dual 2-Input AND OR INVERT Gate

45 x 43
(8MG)

CONSULT FACTORY

PIN CONNECTIONS

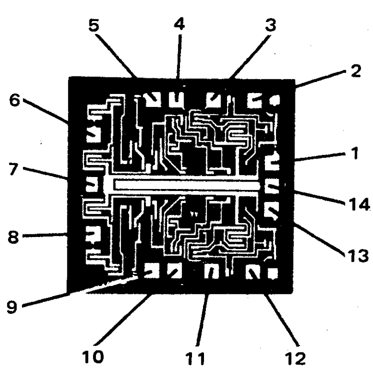


V_{CC} = Pin 14
GND = Pin 7

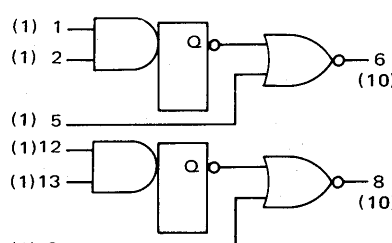
t_{pd} = 125 ns typ
P_D = 160 mW typ/pkg (Inputs High)
50 mW typ/pkg (Input Low)

MCC675
Dual Pulse Stretcher

55 x 58
(1MH)



PIN CONNECTIONS



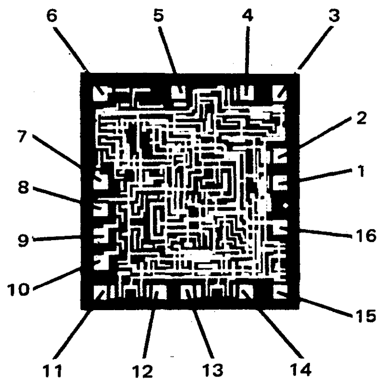
t_{pd} = 150 ns typ (Pins 1, 6)
110 ns typ (Pins 5, 6)
P_D = 180 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

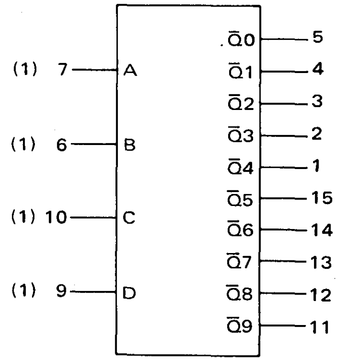
7

MCC676
BCD to Decimal Decoder Driver

58 x 63
(2ME)



PIN CONNECTIONS

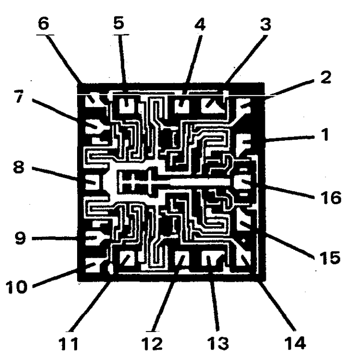


Power Dissipation = 380 mW typ/pkg

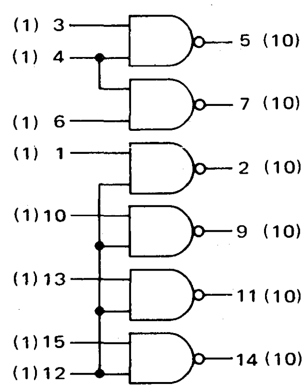
V_{CC} = Pin 16
GND = Pin 8

MCC677
Hex Inverter With Strobe (active pullup)

52 x 54
(95R)



PIN CONNECTIONS

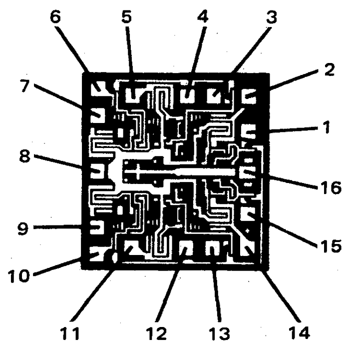


V_{CC} = Pin 16
GND = Pin 8

t_{pd} = 110 ns typ
P_D = 246 mW typ/pkg (Inputs High)
96 mW typ/pkg (Input Low)

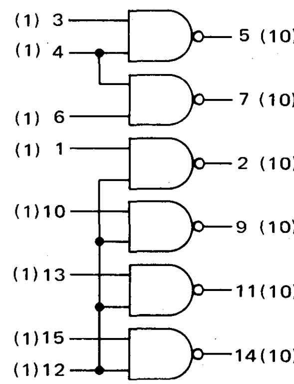
MCC678
Hex Inverter With Strobe (without output resistors)

54 x 52
(95R)



V_{CC} = Pin 16
GND = Pin 8

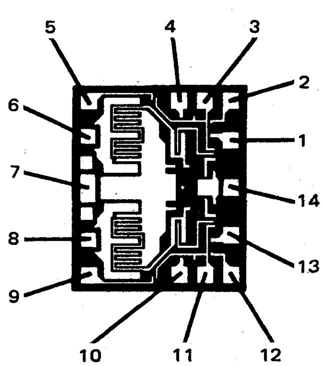
PIN CONNECTIONS



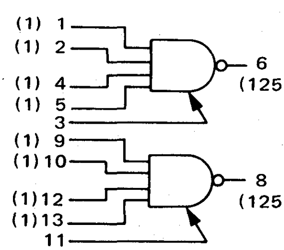
t_{pd} = 125 ns typ
P_D = 192 mW typ/pkg (Inputs High)
96 mW typ/pkg (Inputs Low)

MCC679
Dual Lamp Driver

48 x 56
(6BE)



PIN CONNECTIONS



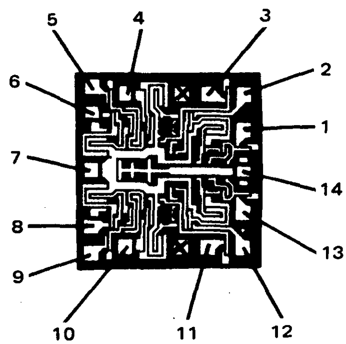
t_{pd} = 0.5 μs typ
P_D = 250 mW (Inputs High)
30 mW (Input Low)

V_{CC} = Pin 14
GND = Pin 7

7

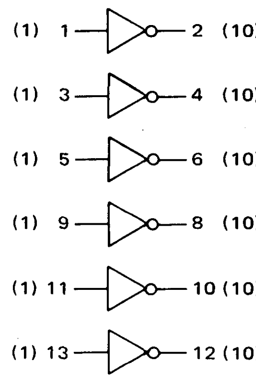
MCC680
Hex Inverter

52 x 54
(95R)



V_{CC} = Pin 14
GND = Pin 7

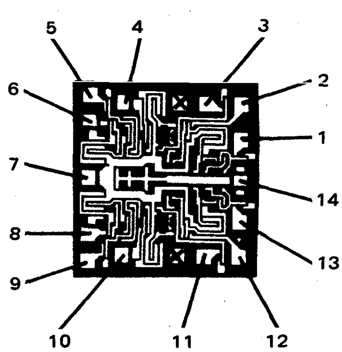
PIN CONNECTIONS



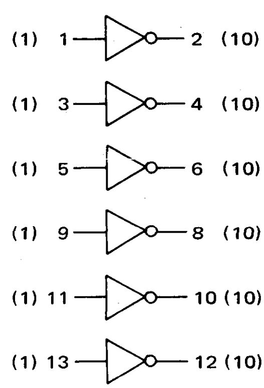
t_{pd} = 110 ns typ
P_D = 246 mW typ/pkg (Inputs High)
96 mW typ/pkg (Input Low)

MCC681
Hex Inverter (open collector)

52 x 54
(95R)



PIN CONNECTIONS



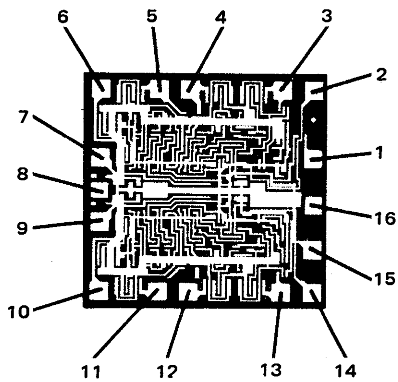
t_{pd} = 125 ns typ
P_D = 192 mW typ/pkg (Inputs High)
96 mW typ/pkg (Input Low)

V_{CC} = Pin 14
GND = Pin 7

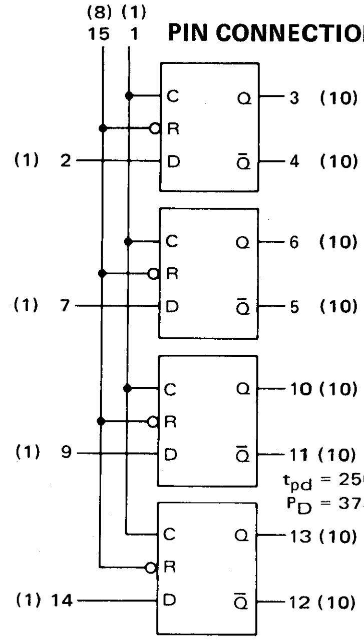
7

MCC682
Quad Latch

64 x 67
(2AP)



PIN CONNECTIONS



t_{pd} = 250 ns typ
P_D = 375 mW typ/pkg

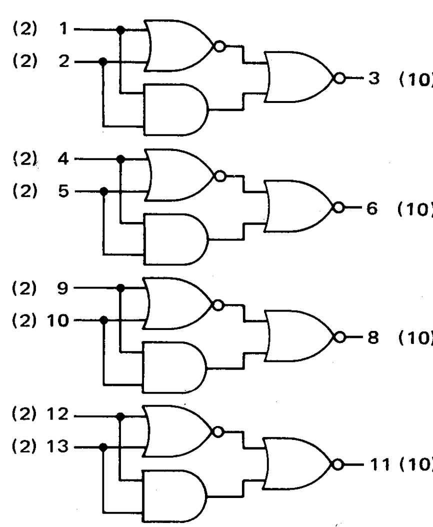
V_{CC} = Pin 16
GND = Pin 8

MCC683
Quad 2-Input Exclusive OR

53 x 61
(8TJ)

CONSULT FACTORY

PIN CONNECTIONS



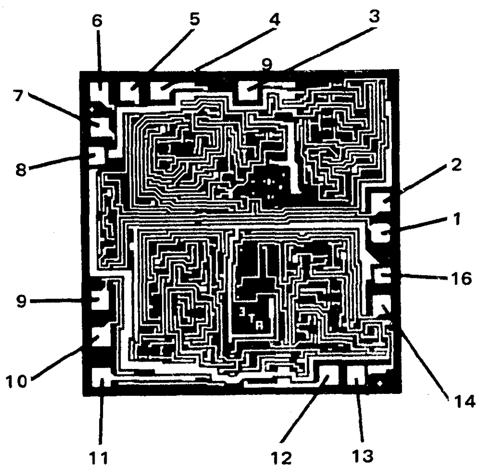
V_{CC} = Pin 14
GND = Pin 7

P_D = 380 mW typ/pkg

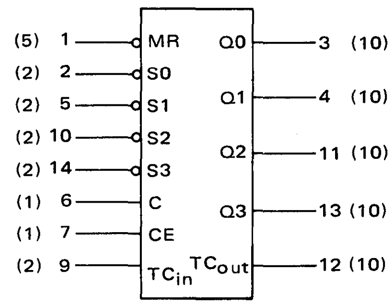
7

MCC684
Decode Counter

85 x 86
(3TA)



PIN CONNECTIONS

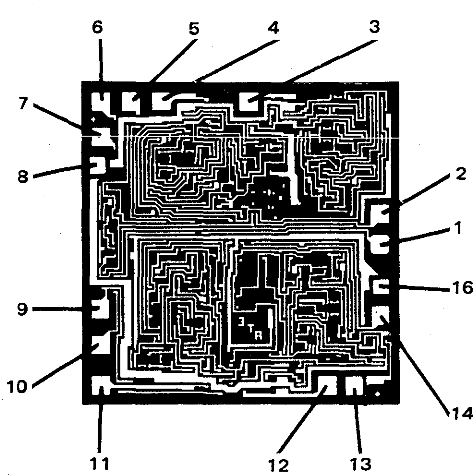


V_{CC} = Pin 16
GND = Pin 8

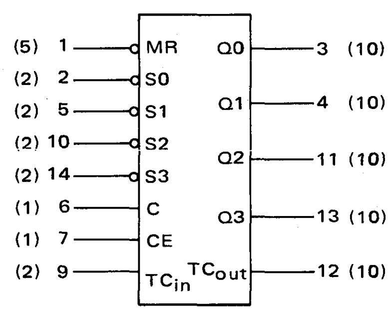
f_{Tog} = 0.5 MHz min
P_D = 480 mW typ/pkg

MCC685
Binary Counter

85 x 86
(3TA)



PIN CONNECTIONS



V_{CC} = Pin 16
GND = Pin 8

f_{Tog} = 0.5 MHz min
P_D = 480 mW typ/pkg

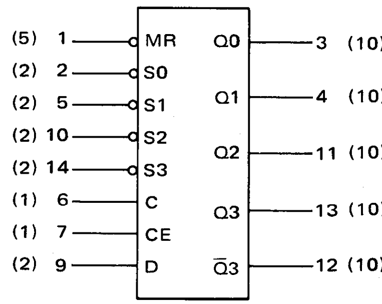
7

MCC686
4-Bit Shift Register

85 x 86
(3TA)

CONSULT FACTORY

PIN CONNECTIONS



V_{CC} = Pin 16
GND = Pin 8

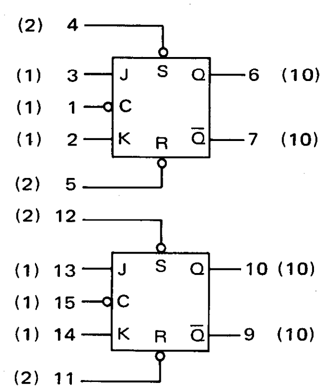
f_{Tog} = 0.5 MHz min
P_D = 480 mW typ/pkg

MCC688
Dual J-K Flip Flop

68 x 68
(9TW)

CONSULT FACTORY

PIN CONNECTIONS

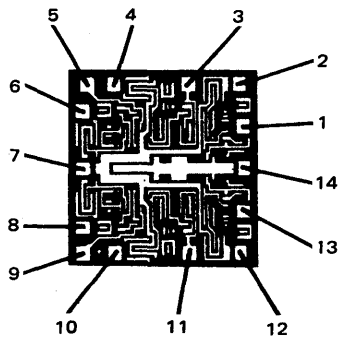


f_{Tog} = 2.5 MHz typ
P_D = 375 mW typ/pkg

V_{CC} = Pin 16
GND = Pin 8

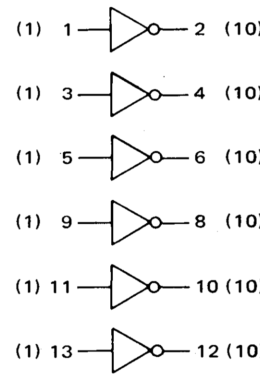
MCC689
Hex Inverter (high voltage)

53 x 55
(48W)



V_{CC} = Pin 14
GND = Pin 7

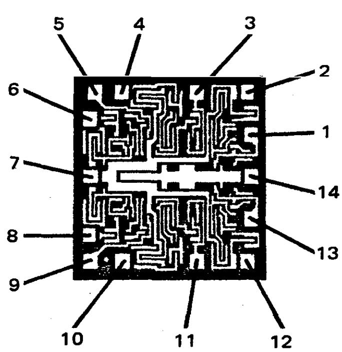
PIN CONNECTIONS



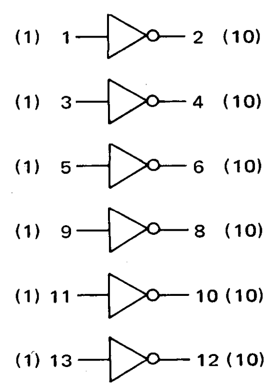
t_{pd} = 150 ns typ
P_D = 173 mW typ/pkg (Inputs High)
55 mW typ/pkg (Inputs Low)

MCC690
Hex Inverter (active pullup)

53 x 55
(48W)



PIN CONNECTIONS

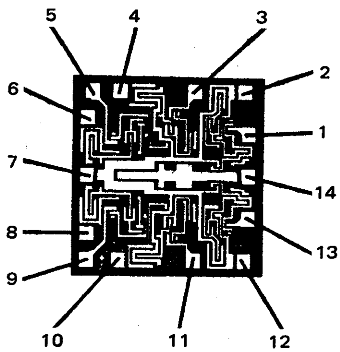


t_{pd} = 150 ns typ
P_D = 173 mW typ/pkg (Inputs High)
55 mW typ/pkg (Inputs Low)

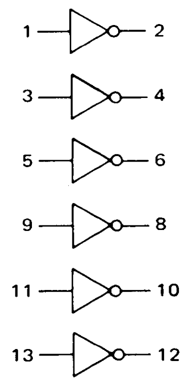
V_{CC} = Pin 14
GND = Pin 7

MCC691
Hex Inverter/Translator

53 x 55
(48W)



PIN CONNECTIONS

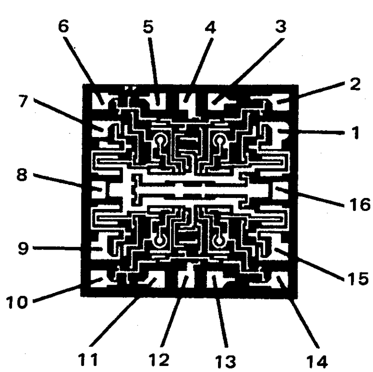


V_{CC} = Pin 14
GND = Pin 7

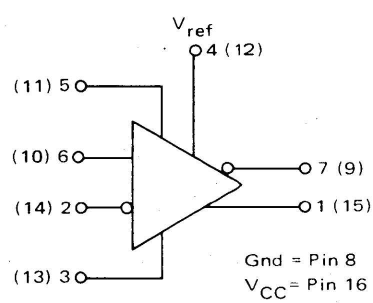
t_{pd} = 150 ns typ
P_D = 173 mW typ/pkg (Inputs High)
55 mW typ/pkg (Inputs Low)

MCC696
Dual Line Driver Receiver

58 x 59
(9DD)



PIN CONNECTIONS



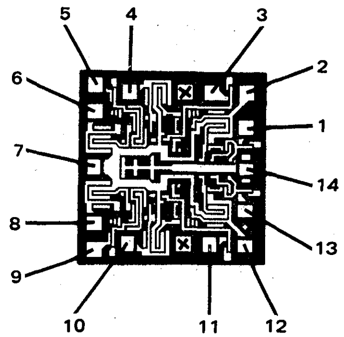
t_{pd} = 750 ns typ
P_D = 225 mW typ/pkg (Inputs High)
96 mW typ/pkg (Inputs Low)

V_{CC} = Pin 16
GND = Pin 8

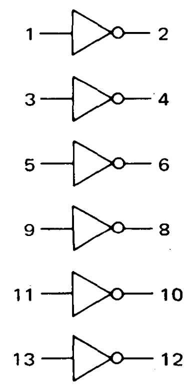
7

MCC697
Hex Inverter (passive pullup)

54 x 52
(95R)



PIN CONNECTIONS

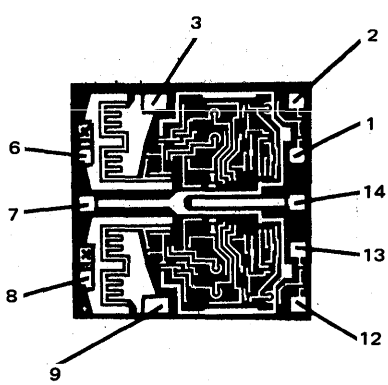


V_{CC} = Pin 16
GND = Pin 8

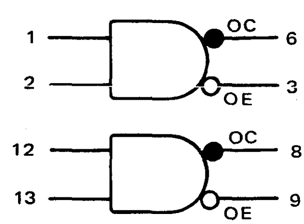
t_{pd} = 150 ns typ
P_D = 173 mW typ/pkg (Inputs High)
55 mW typ/pkg (Inputs Low)

MCC699
Dual 2-Input Power AND Gate

64 x 66
(3NB)



PIN CONNECTIONS



OE = Open Emitter
OC = Open Collector

V_{CC} = Pin 14
GND = Pin 7

MRTL

MCC700 Series (+15 to +55°C)
MCC800 Series (0 to +100°C)
MCC900 Series (-55 to 125°C)

MRTL integrated circuits provide a broad line of low-cost, multi-function, digital circuits. Typical gate speed is 12 ns, with power dissipation averages of 19 mW (input high) and 5.0 mW (inputs low) per logic node.

Type			Function	Wafer Mask Set #	Chip Size (Mils)
+15 to +55°C	0 to +100°C	-55 to +125°C			
MCC700	MCC800	MCC900	Buffer	67D	25 x 35
MCC701	MCC801	MCC901	Counter Adapter	5MH	32 x 34
MCC702	MCC802	MCC902	R-S Flip Flop	6ML	25 x 30
MCC703	MCC803	MCC903	3-Input NOR Gate	2MH	25 x 27
MCC704	MCC804	MCC904	Half Adder	6JC	39 x 36
MCC705	MCC805	MCC905	Half Shift Register	C02	40 x 40
MCC706	MCC806	MCC906	Half Shift Register (w/o inverter)	8ME	40 x 40
MCC707	MCC807	MCC907	4-Input NOR Gate	B77	25 x 35
MCC708	MCC808*	MCC908	Half Adder	3JB	43 x 34
MCC709	MCC809*	MCC909	2-Input Buffer	C15	32 x 39
MCC710	MCC810*	MCC910	Dual 2-Input NOR Gate	7JC	38 x 31
MCC711	MCC811*	MCC911	4-Input OR/NOR Gate	4JC	48 x 57
MCC712	MCC812*	MCC912	Half Adder	3JB	43 x 34
MCC713	MCC813*	MCC913	Type D Flip Flop	1JD	48 x 57
MCC714	MCC814	MCC914	Dual 2-Input NOR Gate	9KM	30 x 37
MCC715	MCC815	MCC915	Dual 3-Input NOR Gate	1MF	35 x 33
Not Avail.	MCC816	MCC916	J-K Flip Flop	78M	43 x 43
MCC717	MCC817*	MCC917	Quad 2-Input NOR Gate	2KD	35 x 35
MCC718	MCC818*	MCC918	Dual 3-Input NOR Gate	1MF	35 x 33
MCC719	MCC819*	MCC919	Dual 4-Input NOR Gate	1MF	35 x 33
MCC720	MCC820*	MCC920	J-K Flip Flop	810	60 x 60
MCC721	MCC821*	MCC921	Dual 2-Input Gate Expander	7JC	38 x 31
MCC722	MCC822*	MCC922	J-K Flip Flop	87A	54 x 58
MCC723	Not Avail.	Not Avail.	J-K Flip Flop	78M	43 x 43
MCC724	MCC824	MCC924	Quad 2-Input NOR Gate	2KD	35 x 35
MCC725	MCC825	MCC925	Dual 4-Input NOR Gate	1MF	35 x 33
MCC726	MCC826	MCC926	J-K Flip Flop	12C	51 x 57
MCC727	MCC827	MCC927	Quad Inverter	12L	29 x 29
MCC728	MCC828*	MCC928	5-Input NOR Gate	774	45 x 45
MCC729	MCC829	MCC929	5-Input NOR Gate	B86	33 x 35
MCC764	MCC864*	MCC964	Dual Exclusive OR/NOR Gate	31A	42 x 49
MCC767	MCC867*	MCC967	Quad Latch	69A	60 x 64
MCC770	MCC870*	MCC970	BCD to Decimal Decoder	88G	54 x 71
MCC771	MCC871	MCC971	Quad Exclusive OR Gate	30A	47 x 55
MCC774	MCC874	MCC974	J-K Flip Flop	12C	51 x 57
MCC775	MCC875	MCC975	Dual Half Adder	19K	36 x 37
MCC776	MCC876*	MCC976	Dual J-K Flip Flop	E90	50 x 58
MCC777	MCC877	MCC977	Binary Up Counter	80D	72 x 80
MCC778	MCC878*	MCC978	Dual Type D Flip Flop	49D	45 x 73
MCC779	MCC879	MCC979	J-K Flip Flop, 1 Expander, 2 Buffers	2MK	39 x 46
MCC780	MCC880	MCC980	Decade Up Counter	80D	72 x 80
MCC781	MCC881*	MCC981	Dual Buffer	37B	43 x 45
MCC782	MCC882*	MCC982	J-K Flip Flop	28C	50 x 50
MCC783	MCC883	MCC983	Dual Half Shift Register	54K	43 x 37
MCC784	MCC884	MCC984	Dual Half Shift Register (w/inverter)	E24	42 x 63
MCC785	MCC885	MCC985	Quad 2-Input Expander	2KD	35 x 35
MCC786	MCC886	MCC986	Dual 4-Input Expander	1MF	35 x 33
MCC787	MCC887	MCC987	1 J-K Flip Flop, 1 Inverter, 2 Buffers	2MK	39 x 46
MCC788	MCC888	MCC988	Dual 3-Input Buffer, non-Inverting	19H	37 x 38
MCC789	MCC889	MCC989	Hex Inverter	3KD	34 x 36
MCC790	MCC890	MCC990	Dual J-K Flip Flop	9KE	48 x 51

*These device types are guaranteed over the operating range 0 to +75°C.

(continued)

MRTL (continued)

Type			Function	Wafer Mask Set #	Chip Size (Mils)
+15 to +55°C	0 to +100°C	-55 to +125°C			
MCC791	MCC891	MCC991	Dual J-K Flip Flop	08K	48 x 55
MCC792	MCC892	MCC992	Triple 3-Input NOR Gate	90G	35 x 36
MCC793	MCC893*	MCC993	Triple 3-Input NOR Gate	90G	35 x 36
MCC794	MCC894	MCC994	Serial-Parallel Shift Register	2EF	64 x 72
MCC796	MCC896	MCC996	Dual Full Adder	94D	60 x 74
MCC797	MCC897	MCC997	Dual Full Subtractor	94D	60 x 74
MCC798	MCC898*	MCC998	Dual 2-Input Buffer	A66	45 x 50
MCC799	MCC899	MCC999	Dual Buffer	85H	30 x 34
MCC9701	MCC9801	MCC9901	Dual 4 Channel Data Selector	35F	48 x 54
MCC9702	MCC9802	MCC9902	Dual J-K Flip Flop	07P	52 x 59
MCC9704	MCC9804	MCC9904	4-Bit Parallel Full Adder	87H	55 x 72
MCC9707	MCC9807	MCC9907	Dual 4 Channel Data Distributor	85F	49 x 51
MCC9709	MCC9809	MCC9909	Quad Schmitt Trigger	47F	39 x 43
MCC9713	MCC9813	MCC9913	Quad 2-Input AND Gate	26G	42 x 44
MCC9714	MCC9814	MCC9914	Quad 2-Input NAND Gate	26G	42 x 44
MCC9715	MCC9815	MCC9915	Quad 2-Input OR Gate	1MK	37 x 37
MCC9718	MCC9818*	MCC9918	Hex Inverter	87C	35 x 41
MCC9719	MCC9819	MCC9919	Hex Expander	3KD	34 x 36
MCC9720	MCC9830*	MCC9920	Hex Expander	87C	35 x 41
MCC9721	MCC9821*	MCC9921	Quad 2-Input Expander	2KD	35 x 35
MCC9722	MCC9822*	MCC9922	Dual J-K Flip Flop	98A	56 x 61
MCC9723	MCC9823*	MCC9923	Quad 2-Input AND Gate	27K	42 x 44
MCC9724	MCC9824*	MCC9924	Quad 2-Input NAND Gate	27K	42 x 44
MCC9725	MCC9825*	MCC9925	Quad 2-Input OR Gate	29K	37 x 38

*These device types are guaranteed over the operating range 0 to +75°C.

7

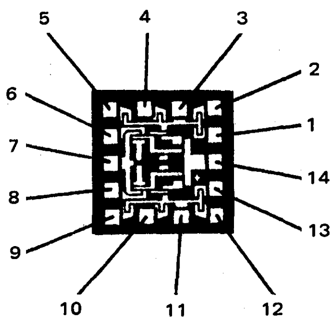
MCC830 Series (0 to +75°C)
MCC930 Series (–55 to +125°C)

MDTL integrated circuits provide an excellent balance of speed, power dissipation, and noise immunity for general purpose digital applications. The line includes many multifunction types. Additional logic power is provided by the "wired OR" capability of the basic MDTL gate.

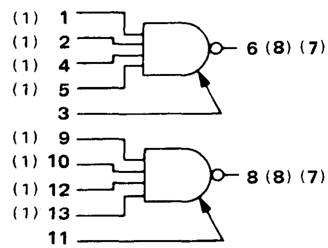
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC830	MCC930	Exp. Dual 4-Input NAND Gate	18N	38x39
MCC831	MCC931	Clocked Flip-Flop	56H	55x55
MCC832	MCC932	Exp. Dual 4-Input Buffer	84N	39x40
MCC833	MCC933	Dual 4-Input Expander	32H	30x30
MCC834	MCC934	Hex Inverter	57H	47x64
MCC835	MCC935	Hex Inverter (w/o Output Resistors)	4AE	44x44
MCC836	MCC936	Hex Inverter	4AE	44x44
MCC837	MCC937	Hex Inverter	4AE	44x44
MCC838	MCC938	Decade Counter	84L	60x66
MCC839	MCC939	Divide by Sixteen Counter	84L	60x66
MCC840	MCC940	Hex Inverter (w/o Input Diodes)	4AE	44x44
MCC841	MCC941	Hex Inverter (w/o Output Resistors and Input Diodes)	4AE	44x44
MCC842	MCC942	Dual D Flip-Flop Plus Gates	72A	59x59
MCC844	MCC944	Exp. Dual 4-Input Power Gate	84N	39x40
MCC845	MCC945	Clocked Flip-Flop	47P	44x46
MCC846	MCC946	Quad 2-Input NAND Gate	98M	40x41
MCC847	MCC947	Quad 2-Input Gate Expander	86D	39x41
MCC848	MCC948	Clocked Flip-Flop	47P	44x46
MCC849	MCC949	Quad 2-Input NAND Gate (2K Pullups)	98M	40x41
MCC850	MCC950	Pulse Triggered Binary	B93	60x60
MCC851	MCC951	Monostable Multivibrator	29H	55x55
MCC852	MCC952	Dual J-K Flip Flop (common Clock and CD)	45N	60x62
MCC853	MCC953	Dual J-K Flip Flop (Separate Clock and SD)	45N	60x62
MCC855	MCC955	Dual J-K Flip Flop (2K Pullup Resistor)	45N	60x62
MCC856	MCC956	Dual J-K Flip Flop (2K Pullup Resistor)	45N	60x62
MCC857	MCC957	Quad 2-Input Buffer	14P	44x49
MCC858	MCC958	Quad 2-Input NAND Power Gate	14P	44x49
MCC861	MCC961	Exp. Dual 4-Input NAND Gate (2K Pullup)	18N	38x39
MCC862	MCC962	Triple 3-Input NAND Gate	83N	39x41
MCC863	MCC963	Triple 3-Input NAND Gate (2K Pullups)	83N	39x41
MCC1800	MCC1900	Dual 6-Input NAND Gate	62C	34x35
MCC1801	MCC1901	Dual 5-Input NAND Gate (2K Pullups)	62C	34x35
MCC1802	MCC1902	Exp. 8-Input NAND Gate	62C	34x35
MCC1803	MCC1903	Exp. 8-Input NAND Gate (2K Pullups)	62C	34x35
MCC1804	MCC1904	10-Input NAND Gate	62C	34x35
MCC1805	MCC1905	10-Input NAND Gate (2K Pullup Resistor)	62C	34x35
MCC1806	MCC1906	Quad 2-Input AND Gate	7DM	46x48
MCC1807	MCC1907	Quad 2-Input AND Gate (2K Pullup Resistor)	7DM	46x48
MCC1808	MCC1908	Quad 2-Input OR Gate	7DM	46x48
MCC1809	MCC1909	Quad 2-Input OR Gate (2K Pullup Resistor)	7DM	46x48
MCC1810	MCC1910	Quad 2-Input NOR Gate	7DM	46x48
MCC1811	MCC1911	Quad 2-Input NOR Gate (2K Pullup Resistor)	7DM	46x48
MCC1812	MCC1912	Quad 2-Input Exclusive OR Gate	2AB	48x53
MCC1813	MCC1913	Quad Latch	16C	74x57
MCC1814	MCC1914	Quad Latch	16C	74x57
MCC1818	MCC1918	Quad 2-Input NAND Gate	98M	40x41
MCC1820		High Voltage Hex Inverter	4AE	42x50

MCC830/MCC930
Expandable Dual 4-Input NAND Gate

38 x 39
(18N)



PIN CONNECTIONS



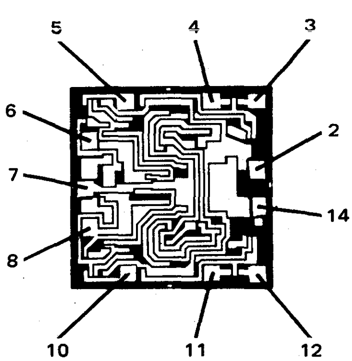
$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot [3]}$

*Applies to MC861/MC961

V_{CC} = Pin 14
GND = Pin 7

MCC831/MCC931
Clocked Flip Flop

55 x 55
(56H)



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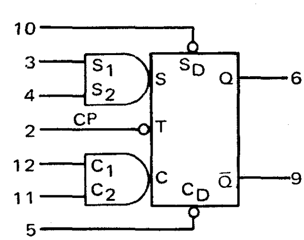
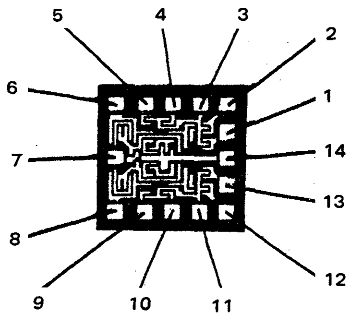


V_{CC} = Pin 14
GND = Pin 7

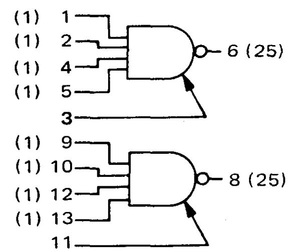
All dimensions are in mils.

MCC832/MCC932
Expandable Dual 4-Input Buffer

39 x 40
(84N)



PIN CONNECTIONS

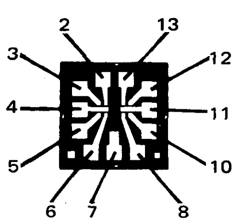


$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot [3]}$

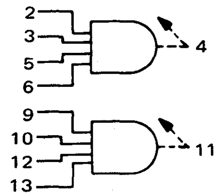
V_{CC} = Pin 14
GND = Pin 7

MCC833/MCC933
Dual 4-Input Expander

30 x 30
(32H)



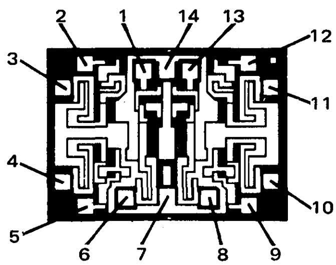
PIN CONNECTIONS



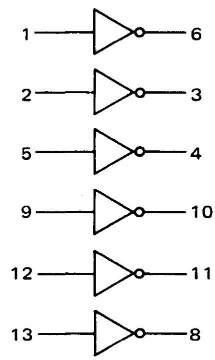
Gnd = Pin 7
V_{CC} = Pin 14

MCC834/MCC934
Hex Inverter

47 x 64
(57H)



PIN CONNECTIONS

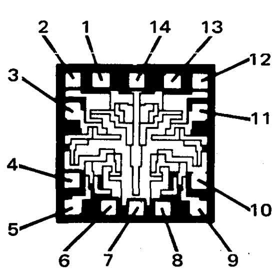


6 = $\bar{1}$

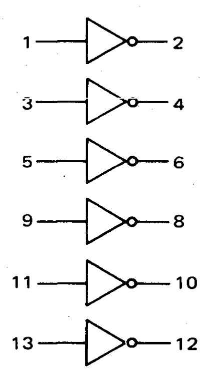
V_{CC} = Pin 14
GND = Pin 7

MCC835/MCC935/MCC836/MCC936/MCC837/MCC937
Hex Inverter (w/o output resistors)

44 x 44
(4AE)

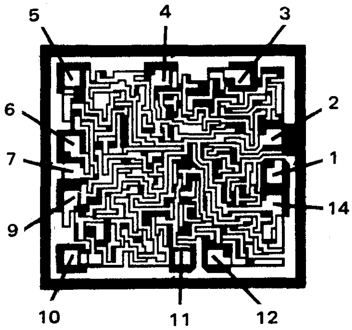


PIN CONNECTIONS



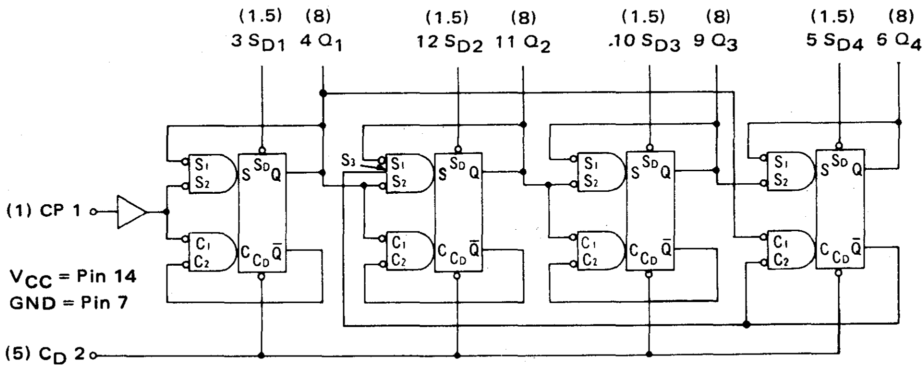
V_{CC} = Pin 14
GND = Pin 7

MCC838/MCC938
Decade Counter

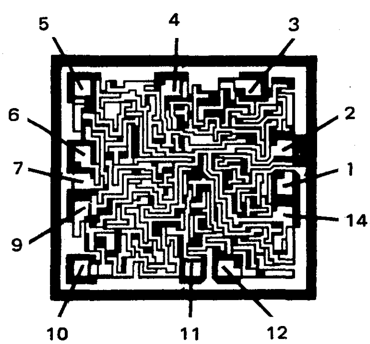


60 x 66
(84L)

PIN CONNECTIONS

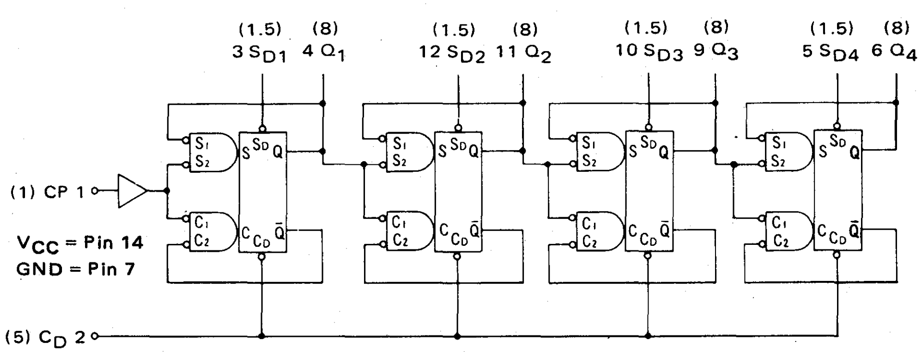


MCC839/MCC939
Divide by Sixteen Counter



60 x 66
(84L)

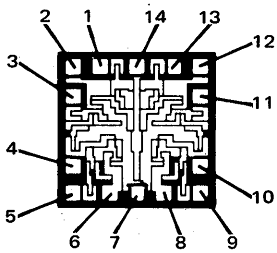
PIN CONNECTIONS



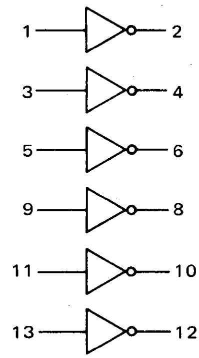
7

MCC840/MCC940
Hex Inverter (w/o input diodes)

44 x 44
(4AE)



PIN CONNECTIONS

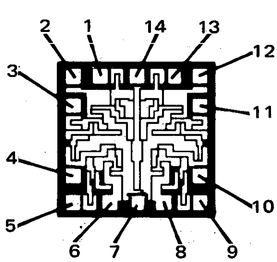


2 = $\overline{1}$

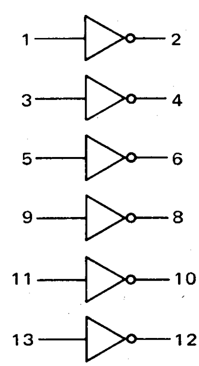
V_{CC} = Pin 14
GND = Pin 7

MCC841/MCC941
Hex Inverter (w/o output resistors and input diodes)

44 x 44
(4AE)



PIN CONNECTIONS



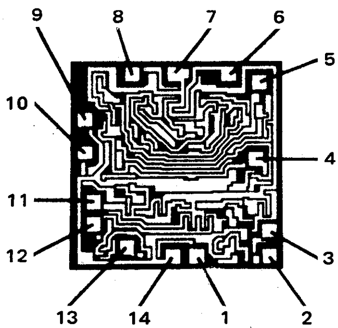
2 = $\overline{1}$

V_{CC} = Pin 14
GND = Pin 7

7

MCC842/MCC942
Type D Flip-Flop plus 2-Wide 2-Input NAND Gate

59 x 59
(72A)

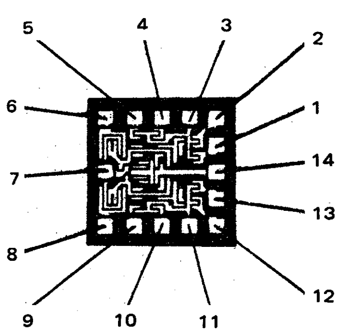


PIN CONNECTIONS

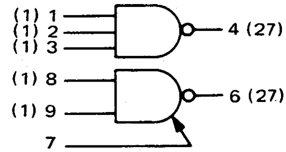
CONSULT FACTORY

MCC844/MCC944
Expandable Dual 4-Input Power Gate

39 x 40
(84N)



PIN CONNECTIONS



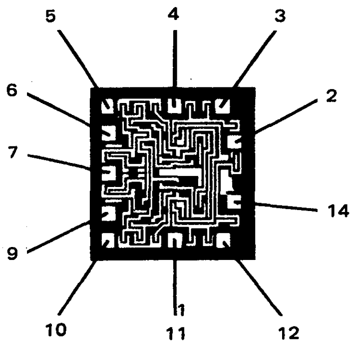
$4 = \overline{1 \cdot 2 \cdot 3}$

V_{CC} = Pin 14
GND = Pin 7

7

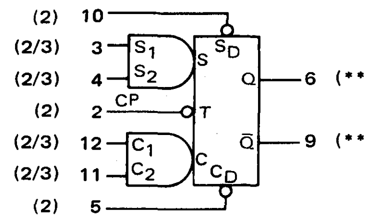
MCC845/MCC945
Clocked Flip Flop

44 x 46
(47P)

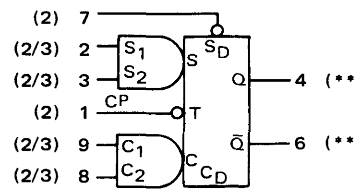


PIN CONNECTIONS

F,L, & P PACKAGES



G PACKAGES

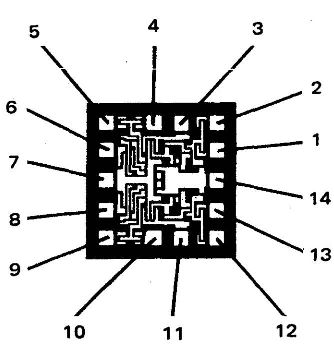


** Q and $\overline{Q}$ loading factor: 12 for MC845 types
10 for MC945 types
11 for MC848 types
9 for MC948 types

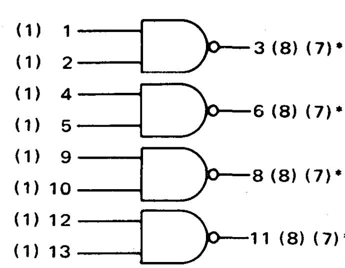
V_{CC} = Pin 14
GND = Pin 7

MCC846/MCC946
Quad 2-Input NAND Gate

40 x 41
(98M)



PIN CONNECTIONS

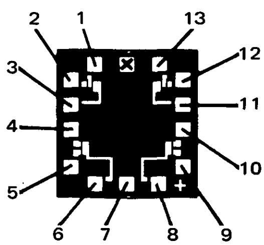


$3 = \overline{1 \cdot 2}$

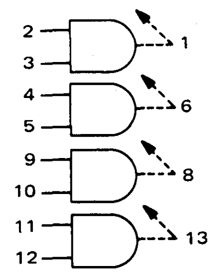
V_{CC} = Pin 14
GND = Pin 7
*Applies to MC849/MC949

MCC847/MCC947
Quad 2-Input Gate Expander

39 x 41
(86D)



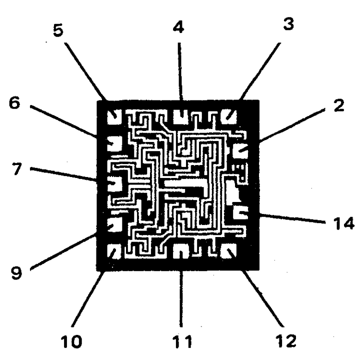
PIN CONNECTIONS



V_{CC} = Pin 14
GND = Pin 7

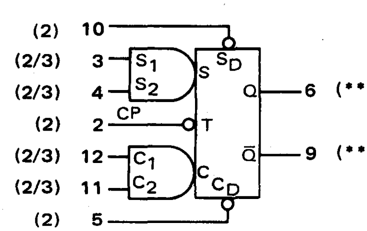
MCC848/MCC948
Clocked Flip Flop

44 x 46
(47P)

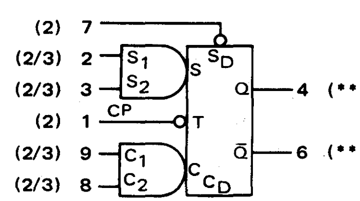


PIN CONNECTIONS

F,L, & P PACKAGES



G PACKAGES



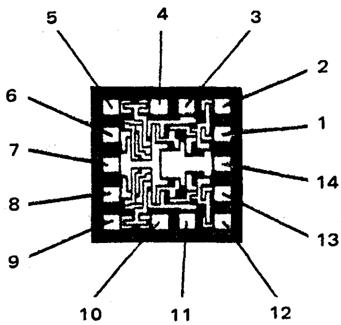
** Q and Q̄ loading factor: 12 for MC845 types
10 for MC945 types
11 for MC848 types
9 for MC948 types

V_{CC} = Pin 14
GND = Pin 7

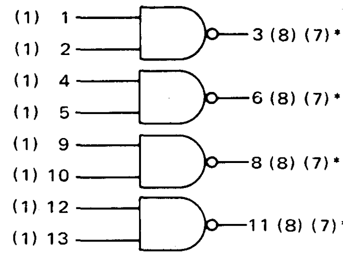
7

MCC849/MCC949
Quad 2-Input NAND Gate (2k pullups)

40 x 41
(98M)



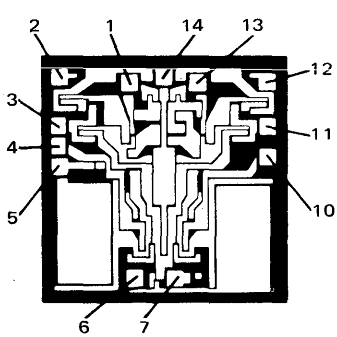
PIN CONNECTIONS



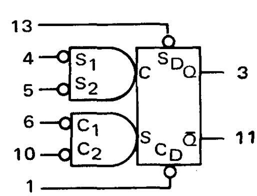
$3 = \overline{1 \cdot 2}$
V_{CC} = Pin 14
GND = Pin 7
*Applies to MC849/MC949

MCC850/MCC950
Pulse Triggered Binary

60 x 60
(B93)



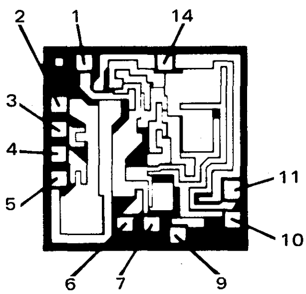
PIN CONNECTIONS



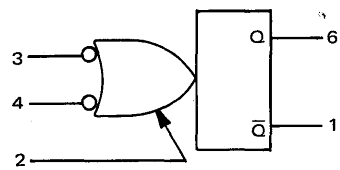
V_{CC} = Pin 14
GND = Pin 7

MCC851/MCC951
Monostable Multivibrator

55 x 55
(29H)



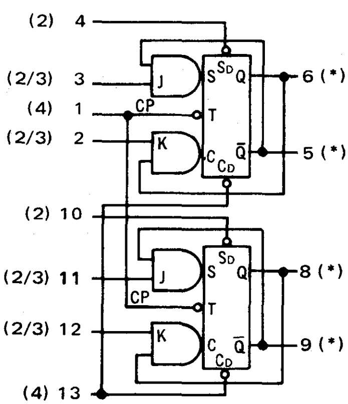
PIN CONNECTIONS



V_{CC} = Pin 14
GND = Pin 7

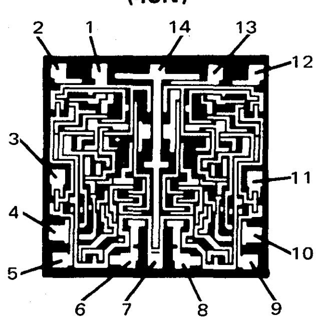
MCC852/MCC952
Dual J-K Flip Flop (common clock and C_D)

MCC855/MCC955
Dual J-K Flip Flop (2k pullup resistor)



*Q and $\overline{Q}$ loading factor:
12 – MC852
10 – MC952
11 – MC855
9 – MC955

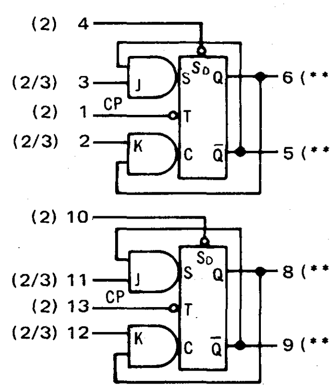
60 x 62
(45N)



V_{CC} = Pin 14
GND = Pin 7

MCC853/MCC953
Dual J-K Flip Flop (separate clock and S_D)

MCC856/MCC956
Dual J-K Flip Flop (2k pullup resistor)

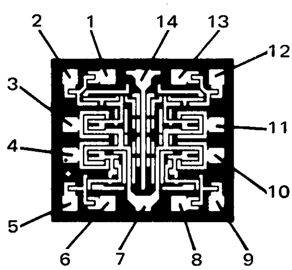


**Q and $\overline{Q}$ loading factor:
12 – MC853
10 – MC953
11 – MC856
9 – MC956

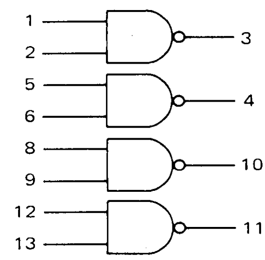
7

MCC857/MCC957
Quad 2-Input Buffer

44 x 49
(14P)



PIN CONNECTIONS

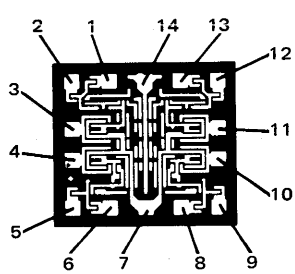


$3 = \overline{1 \cdot 2}$

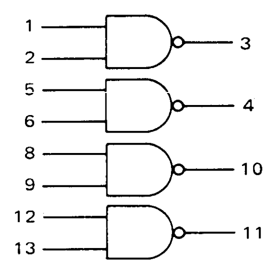
V_{CC} = Pin 14
GND = Pin 7

MCC858/MCC958
Quad 2-Input NAND Power Gate

44 x 49
(14P)



PIN CONNECTIONS



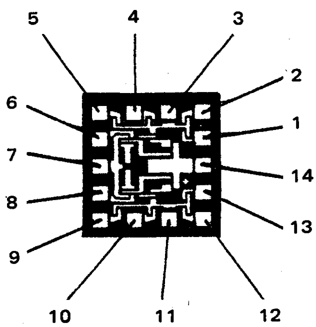
$3 = \overline{1 \cdot 2}$

V_{CC} = Pin 14
GND = Pin 7

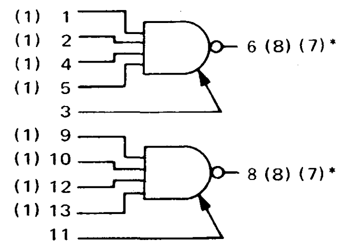
7

MCC861/MCC961
Expandable Dual 4-Input NAND Gates (2k pullup)

38 x 39
(18N)



PIN CONNECTIONS



$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot [3]}$

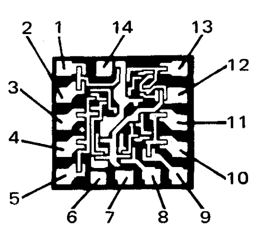
*Applies to MC861/MC961

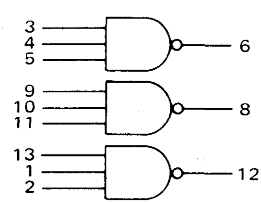
V_{CC} = Pin 14
GND = Pin 7

MCC862/MCC962
Triple 3-Input NAND Gate

PIN CONNECTIONS

39 x 41
(83N)





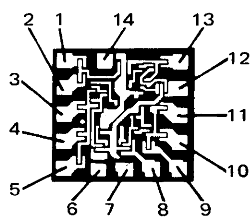
$6 = \overline{3 \cdot 4 \cdot 5}$

V_{CC} = Pin 14
GND = Pin 7

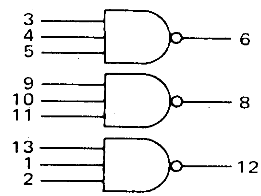
7

MCC863/MCC963
Triple 3-Input NAND Gate (2k pullups)

39 x 41
(83N)



PIN CONNECTIONS

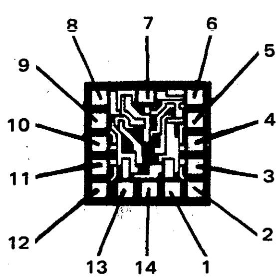


$6 = \overline{3 \cdot 4 \cdot 5}$

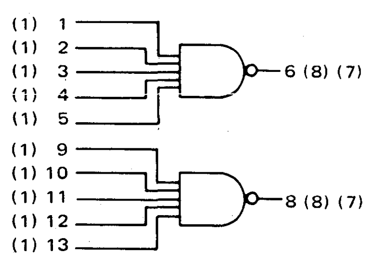
V_{CC} = Pin 14
GND = Pin 7

MCC1800/MCC1900
Dual 5-Input NAND Gate

34 x 35
(62C)



PIN CONNECTIONS



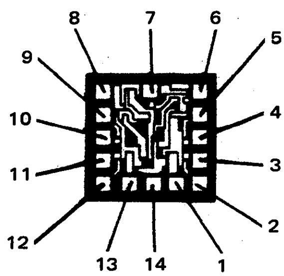
$6 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5}$

*Applies to MC1801/MC1901

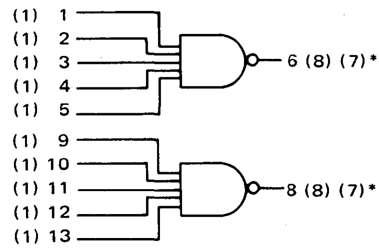
V_{CC} = Pin 14
GND = Pin 7

MCC1801/MCC1901
Dual 5-Input NAND Gate (2k pullups)

34 x 35
(62C)



PIN CONNECTIONS

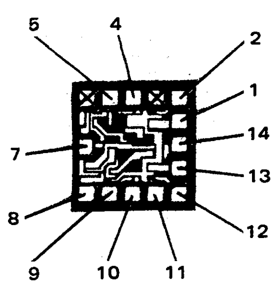


$$6 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5}$$

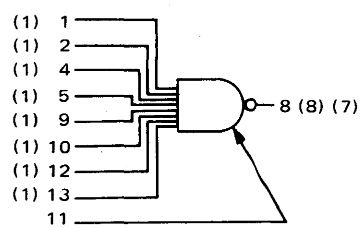
*Applies to MC1801/MC1901
V_{CC} = Pin 14
GND = Pin 7

MCC1802/MCC1902
Expandable 8-Input NAND Gate

34 x 35
(62C)



PIN CONNECTIONS



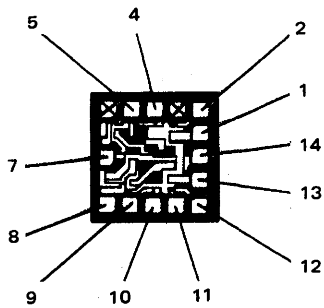
$$8 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot 9 \cdot 10 \cdot 12 \cdot 13 \cdot [11]}$$

*Applies to MC1803/MC1903
V_{CC} = Pin 14
GND = Pin 7

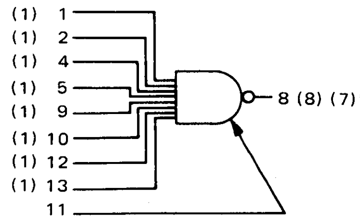
7

MCC1803/MCC1903
Expandable 8-Input NAND Gate (2k pullups)

34 x 35
(62C)



PIN CONNECTIONS

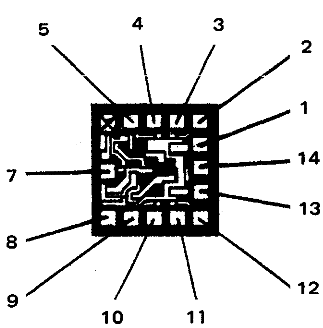


$8 = \overline{1 \cdot 2 \cdot 4 \cdot 5 \cdot 9 \cdot 10 \cdot 12 \cdot 13 \cdot [11]}$

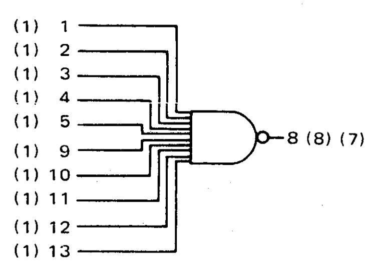
*Applies to MC1803/MC1903
V_{CC} = Pin 14
GND = Pin 7

MCC1804/MCC1904
10 Input NAND Gate

34 x 35
(62C)



PIN CONNECTIONS



$8 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 9 \cdot 10 \cdot 11 \cdot 12 \cdot 13}$

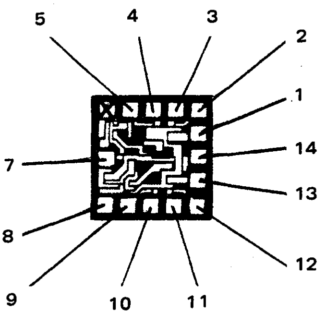
*Applies to MC1805/MC1905

V_{CC} = Pin 14
GND = Pin 7

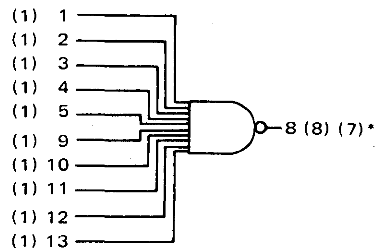
7

MCC1805/MCC1905
10 Input NAND Gate (2k pullup resistor)

34 x 35
(62C)



PIN CONNECTIONS



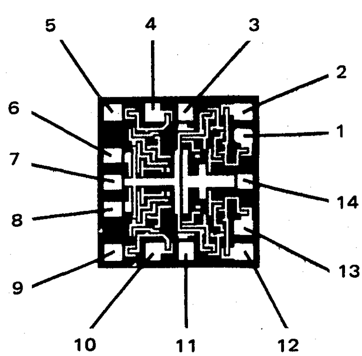
$8 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 9 \cdot 10 \cdot 11 \cdot 12 \cdot 13}$

V_{CC} = Pin 14
GND = Pin 7

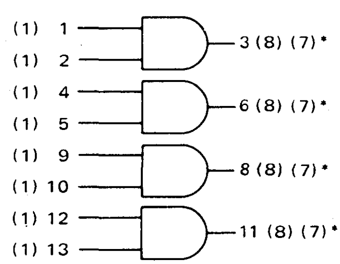
*Applies to MC1805/MC1905

MCC1806/MCC1906
Quad 2-Input AND Gate

46 x 48
(7DM)



PIN CONNECTIONS



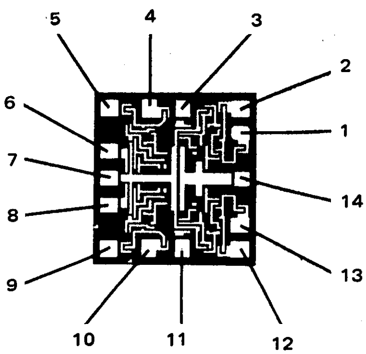
$3 = 1 \cdot 2$

*Applies to MC1807/MC1907

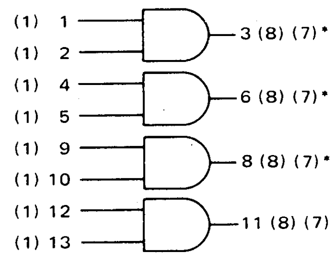
V_{CC} = Pin 14
GND = Pin 7

MCC1807/MCC1907
Quad 2-Input AND Gate (2k pullup resistor)

46 x 48
(7DM)



PIN CONNECTIONS



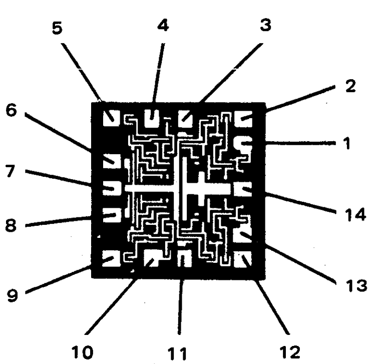
3 = 1 • 2

*Applies to MC1807/MC1907

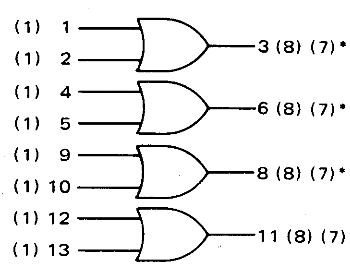
V_{CC} = Pin 14
GND = Pin 7

MCC1808/MCC1908
Quad 2-Input OR Gate

46 x 48
(7DM)



PIN CONNECTIONS



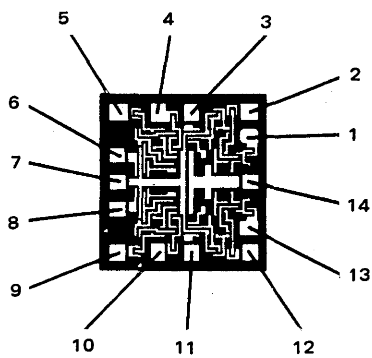
3 = 1 + 2

*Applies to MC1809/MC1909

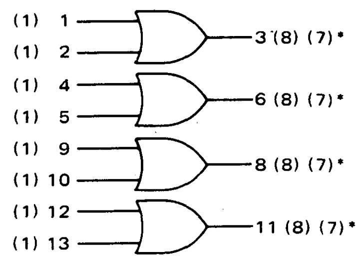
V_{CC} = Pin 14
GND = Pin 7

MCC1809/MCC1909
Quad 2-Input OR Gate (2k pullup resistor)

46 x 48
(7DM)



PIN CONNECTIONS



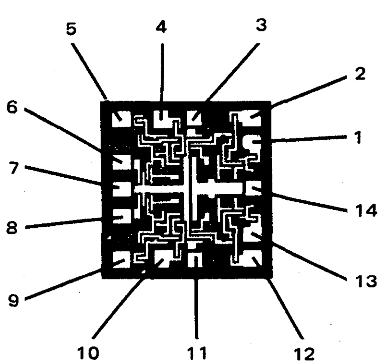
3 = 1 + 2

*Applies to MC1809/MC1909

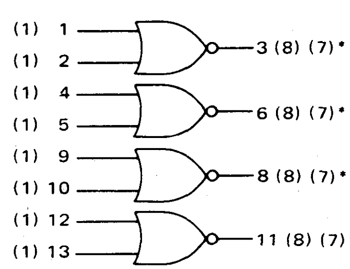
V_{CC} = Pin 14
GND = Pin 7

MCC1810/MCC1910
Quad 2-Input NOR Gate

46 x 48
(7DM)



PIN CONNECTIONS

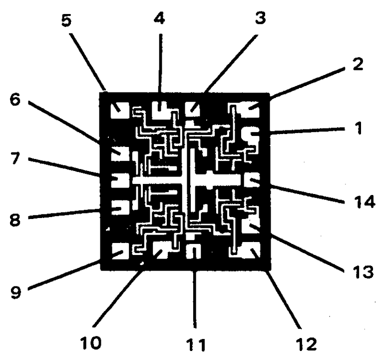


$3 = \overline{1 + 2}$

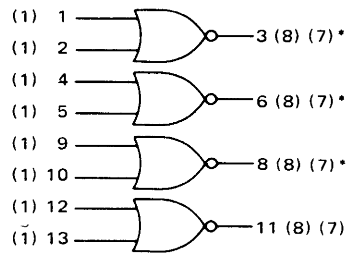
*Applies to MC1811/MC1911
V_{CC} = Pin 14
GND = Pin 7

MCC1811/MCC1911
Quad 2-Input NOR Gate (2k pullup resistor)

46 x 48
(7DM)



PIN CONNECTIONS



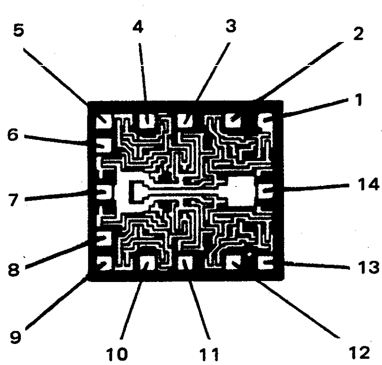
$3 = \overline{1 + 2}$

V_{CC} = Pin 14
GND = Pin 7

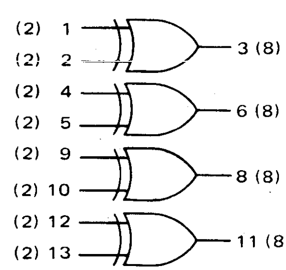
*Applies to MC1811/MC1911

MCC1812/MCC1912
Quad 2-Input Exclusive OR Gate

48 x 53
(2AB)



PIN CONNECTIONS

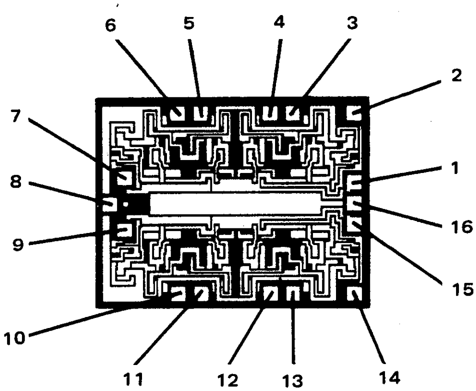


$3 = 1 \cdot \overline{2} + \overline{1} \cdot 2$

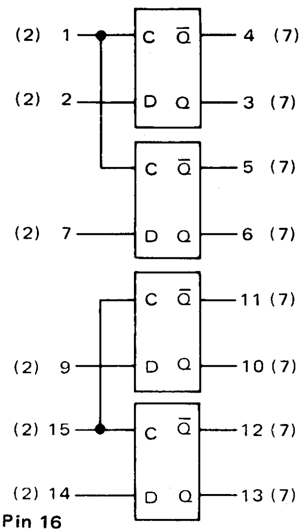
V_{CC} = Pin 14
GND = Pin 7

MCC1813/MCC1913
Quad Latch

74 x 57
(16C)



PIN CONNECTIONS

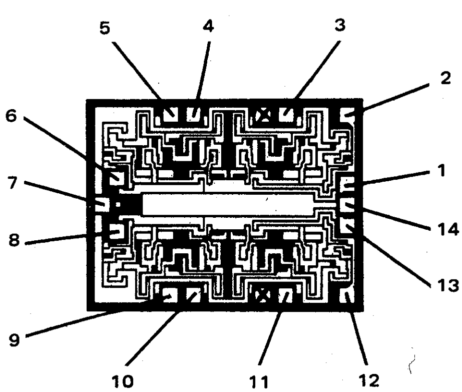


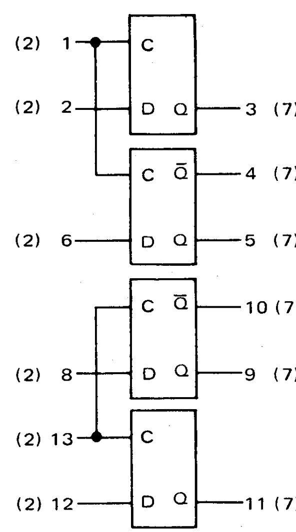
V_{CC} = Pin 16
GND = Pin 8

MCC1814/MCC1914
Quad Latch

PIN CONNECTIONS

74 x 57
(16C)



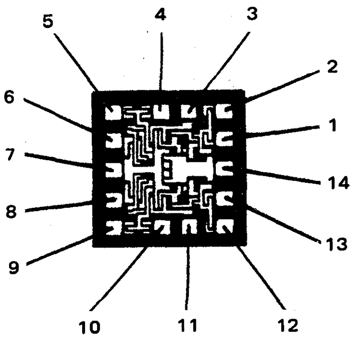


V_{CC} = Pin 14
GND = Pin 7

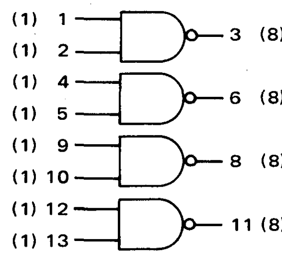
7

MCC1818/MCC1918
Quad 2-Input NAND Gate

40 x 41
(98M)



PIN CONNECTIONS

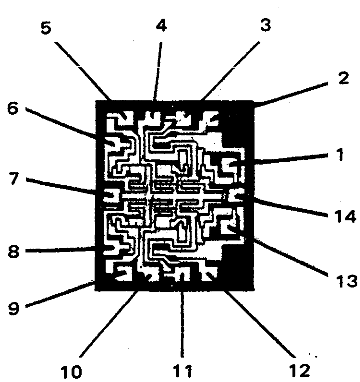


$3 = \overline{1 \cdot 2}$

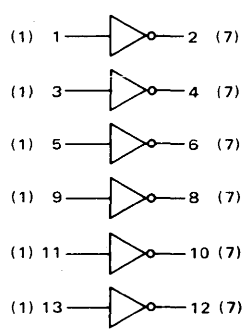
V_{CC} = Pin 14
GND = Pin 7

MCC1820/ –
(MCC1920 Not Available)
High Voltage Hex Inverter

42 x 50
(4AE)



PIN CONNECTIONS



$2 = \overline{1}$

V_{CC} = Pin 14
GND = Pin 7

7

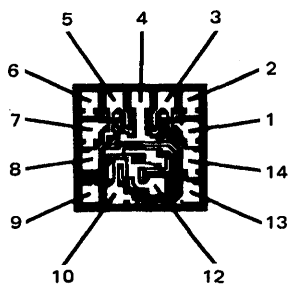
MCC2000/2050 Series (0 to +75°C)
MCC2100/2150 Series (–55 to +125°C)

These integrated circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a high operating speed (30-50 MHz clock rate), good external noise immunity, high fan out, and the capability of driving capacitive loads to 600 pF.

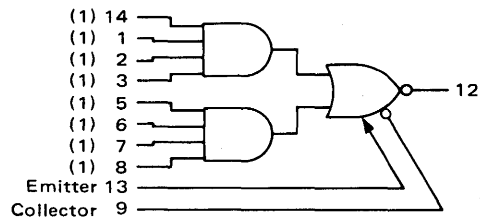
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC2000	MCC2100	Exp. 2 Wide 4-Input AOI Gate	4DA	36x38
MCC2001	MCC2101	Quad 2-Input NAND Gate	8DB	44x45
MCC2002	MCC2102	4 Wide 3-2-2-3 Input Exp. for AOI Gates	89A	36x49
MCC2003	MCC2103	Dual 4-Input NAND Gate	2BN	35x42
MCC2004	MCC2104	Exp. 4 Wide 2-2-2-3 Input AOI Gate	89A	36x49
MCC2005	MCC2105	8 Input NAND Gate	85N	34x38
MCC2006	MCC2106	Dual 4-Input Exp. for AOI Gates	4DA	36x38
MCC2007	MCC2107	Triple 3-Input NAND Gate	45V	44x45
MCC2011	MCC2111	Exp. 8-Input NAND Gate	85N	34x38
MCC2012	MCC2112	Exp. 3-Wide 3-Input AOI Gate	89A	49x36
MCC2013	MCC2113	Exp. Dual 2-Wide 2-Input AOI Gate	9RW	40x45
MCC2016	MCC2116	Hex Inverter	79M	53x61
MCC2018	MCC2118	Quad 2-Input Lamp/Line Driver (O.C.)	4RR	50x52
MCC2023	MCC2123	Dual J-K Flip-Flop (separate clock)	2TJ	59x66
MCC2024	MCC2124	Dual J-K Flip-Flop (common clock)	2TJ	59x66
MCC2025	MCC2125	AND J-K Flip-Flop	47E	56x66
MCC2026	MCC2126	OR J-K Flip-Flop	47E	56x66
MCC2028	MCC2128	OR J-K Flip-Flop	47E	56x66
MCC2050	MCC2150	Exp. 2 Wide 4-Input AOI Gate	4DA	36x38
MCC2051	MCC2151	Quad 2-Input NAND Gate	8DB	44x45
MCC2052	MCC2152	4 Wide 3-2-2-3 Input Exp. for AOI Gates	89A	36x49
MCC2053	MCC2153	Dual 4-Input NAND Gate	2BN	35x42
MCC2054	MCC2154	Exp. 4 Wide 2-2-2-3 Input AOI Gate	89A	36x49
MCC2055	MCC2155	8 Input NAND Gate	85N	34x38
MCC2056	MCC2156	Dual 4-Input Exp. for AOI Gates	4DA	36x38
MCC2057	MCC2157	Triple 3-Input NAND Gate	45V	44x45
MCC2061	MCC2161	Exp. 8-Input NAND Gate	85N	34x38
MCC2062	MCC2162	Exp. 3-Wide 3-Input AOI Gate	89A	49x36
MCC2063	MCC2163	Exp. Dual 2-Wide 2-Input AOI Gate	9RW	40x45
MCC2065	MCC2165	Quad 2-Input Lamp/Line Driver	5PJ	46x50
MCC2066	MCC2166	Hex Inverter	79M	53x61
MCC2068	MCC2168	Quad 2-Input Lamp/Line Driver (O.C.)	4RR	50x52
MCC2073	MCC2173	Dual J-K Flip-Flop (separate clock)	2TJ	59x66
MCC2074	MCC2174	Dual J-K Flip-Flop (common clock)	2TJ	59x66
MCC2075	MCC2175	AND J-K Flip-Flop	47E	56x66
MCC2076	MCC2176	OR J-K Flip-Flop	47E	56x66
MCC2078	MCC2178	OR J-K Flip-Flop	47E	56x66

MCC2000/MCC2050/MCC2100/MCC2150
Expandable 2 Wide 4-Input AND-OR-INVERT Gate

36 x 38
(4DA)



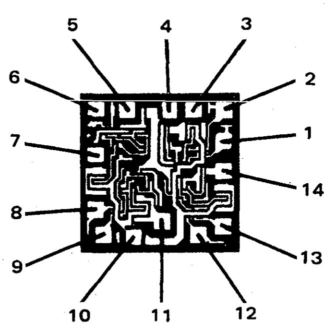
EQUIVALENT CIRCUIT AND PIN CONNECTIONS



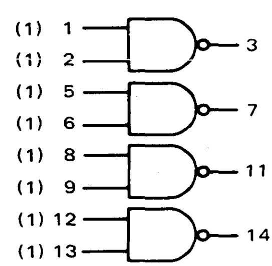
t_{pd} = 7.0 ns typ
P_D = 27 mW typ/pkg
V_{CC} = Pin 4
GND = Pin 10

MCC2001/MCC2051/MCC2101/MCC2151
Quad 2-Input NAND Gate

44 x 45
(8DB)



EQUIVALENT CIRCUIT AND PIN CONNECTIONS



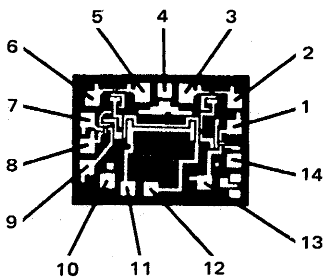
t_{pd} = 6.0 ns typ
P_D = 88 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

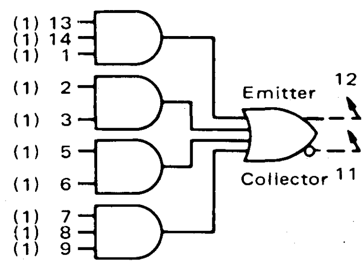
All dimensions are in mils.

MCC2002/MCC2052/MCC2102/MCC2152
4 Wide 3-2-2-3 Input Expander for AND-OR-INVERT Gates

36 x 49
(89A)



EQUIVALENT CIRCUIT
AND PIN CONNECTIONS

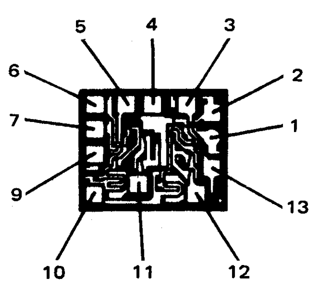


P_D = 28 mW typ/pkg

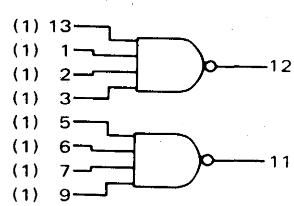
V_{CC} = Pin 4
GND = Pin 10

MCC2003/MCC2053/MCC2103/MCC2153
Dual 4-Input NAND Gate

35 x 42
(2BN)



EQUIVALENT CIRCUIT
AND PIN CONNECTIONS



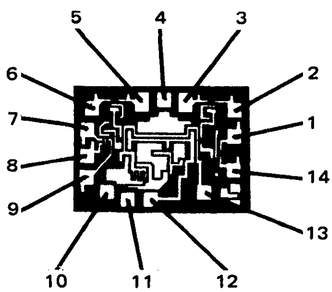
t_{pd} = 6.0 ns typ
P_D = 44 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

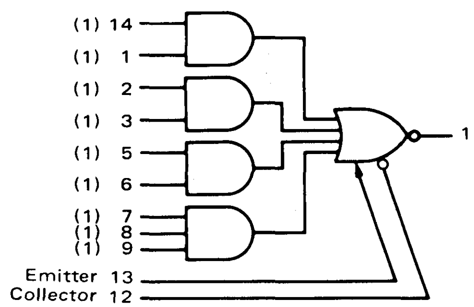
7

MCC2004/MCC2054/MCC2104/MCC2154
Expandable 4-Wide 2-2-2-3 Input AND-OR-INVERT Gate

36 x 49
(89A)



PIN CONNECTIONS

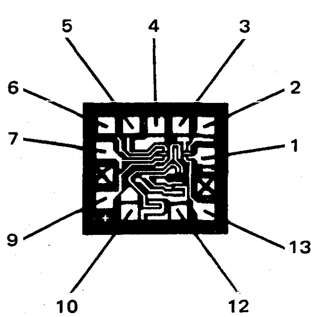


t_{pd} = 7.0 ns typ
P_D = 36 mW typ/pkg

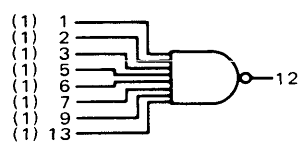
V_{CC} = Pin 4
GND = Pin 10

MCC2005/MCC2055/MCC2105/MCC2155
8 Input NAND Gate

34 x 38
(85N)



PIN CONNECTIONS

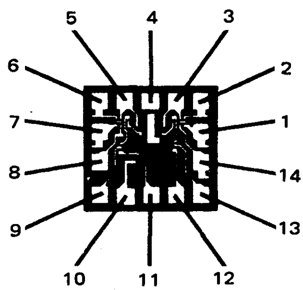


t_{pd} = 8.0 ns typ
P_D = 22 mW typ/pkg

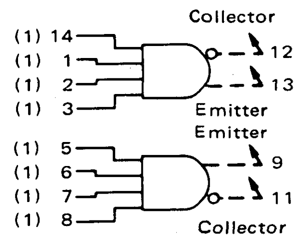
V_{CC} = Pin 4
GND = Pin 10

MCC2006/MCC2056/MCC2106/MCC2156
Dual 4-Input Expander for AND-OR-INVERT Gates

36 x 38
(4DA)



PIN CONNECTIONS

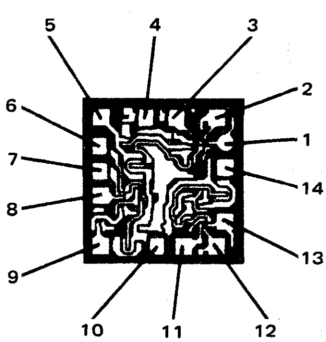


P_D = 14 mW typ/pkg

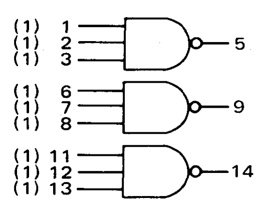
V_{CC} = Pin 4
GND = Pin 10

MCC2007/MCC2057/MCC2107/MCC2157
Triple 3-Input NAND Gate

44 x 45
(45V)



PIN CONNECTIONS



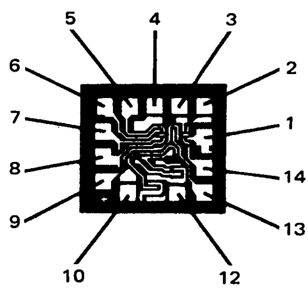
t_{pd} = 6.0 ns typ
P_D = 66 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

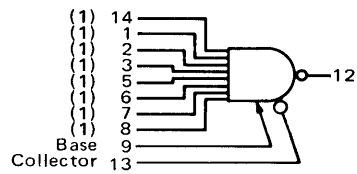
7

MCC2011/MCC2061/MCC2111/MCC2161
Expandable 8-Input NAND Gate

34 x 38
(85N)



PIN CONNECTIONS

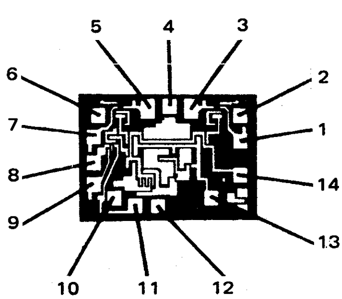


t_{pd} = 11 ns typ
P_D = 22 mW typ/pkg

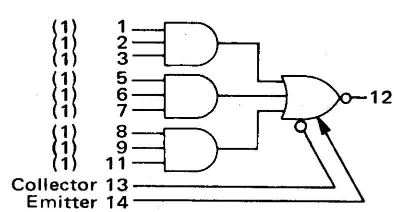
V_{CC} = Pin 4
GND = Pin 10

MCC2012/MCC2062/MCC2112/MCC2162
Expandable 3-Wide 2-Input AND-OR-INVERT Gate

49 x 36
(89A)



PIN CONNECTIONS

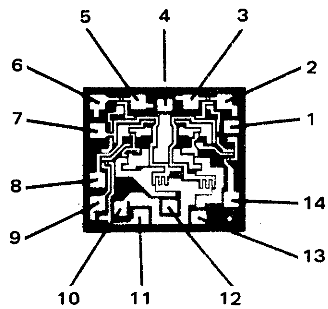


t_{pd} = 6.0 ns typ
P_D = 39 mW typ/pkg

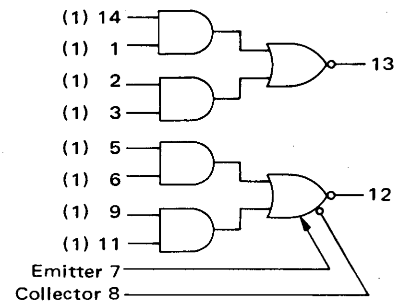
V_{CC} = Pin 4
GND = Pin 10

MCC2013/MCC2063/MCC2113/MCC2163
Expandable Dual 2-Wide 2-Input AND-OR-INVERT Gate

40 x 45
(9RW)



PIN CONNECTIONS

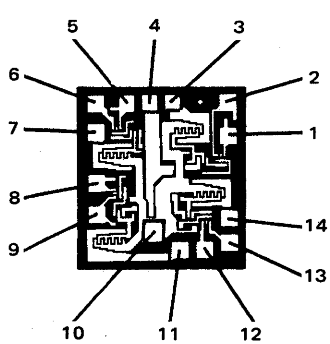


t_{pd} = 7.0 ns typ
P_D = 58 mW typ/pkg

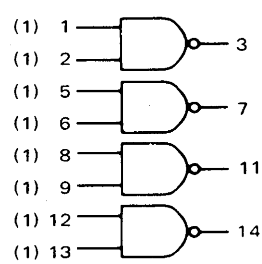
V_{CC} = Pin 4
GND = Pin 10

–/MCC2065/–/MCC2165
Quad 2-Input Lamp/Line Driver

46 x 50
(5PJ)



PIN CONNECTIONS

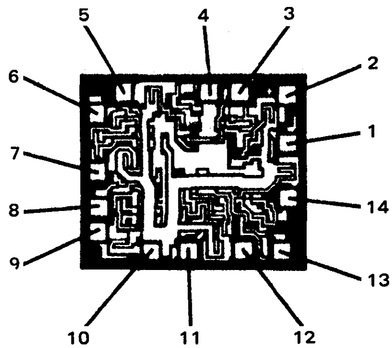


t_{pd} = 20 ns typ
P_D = 105 mW typ/pkg

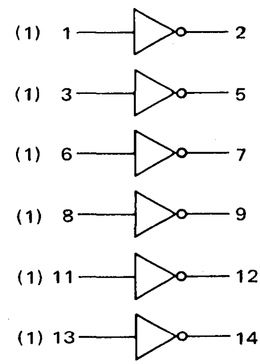
V_{CC} = Pin 4
GND = Pin 10

MCC2016/MCC2066/MCC2116/MCC2166
Hex Inverter

53 x 61
(79M)



PIN CONNECTIONS

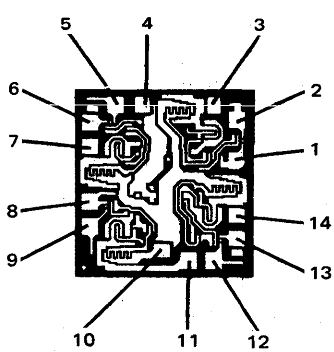


V_{CC} = Pin 4
GND = Pin 10

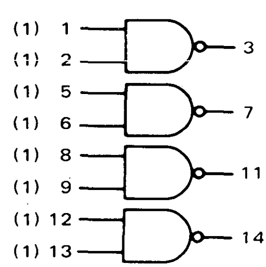
t_{pd} = 6.0 ns typ
P_D = 132 mW typ/pkg

MCC2018/MCC2068/MCC2118/MCC2168
Quad 2-Input Lamp/Line Drive (open collector)

50 x 52
(4RR)



PIN CONNECTIONS

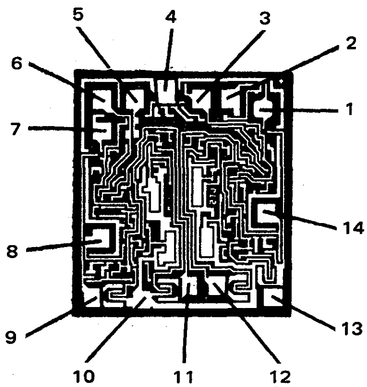


V_{CC} = Pin 4
GND = Pin 10

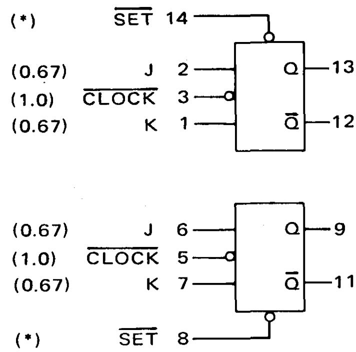
7

MCC2023/MCC2073/MCC2123/MCC2173
Dual J-K Flip Flop (separate clock)

59 x 66
(2TJ)



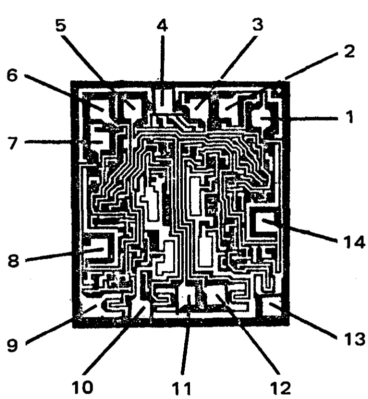
PIN CONNECTIONS



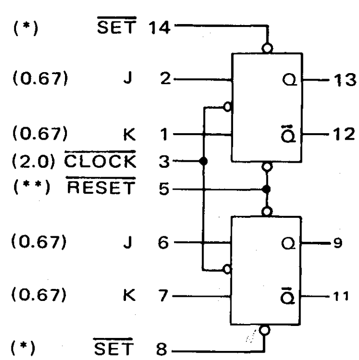
V_{CC} = Pin 4 f = 70 MHz typ
GND = Pin 10 P_D = 110 mW typ/pkg

MCC2024/MCC2074/MCC2124/MCC2174
Dual J-K Flip Flop (common clock)

59 x 66
(2TJ)



PIN CONNECTIONS

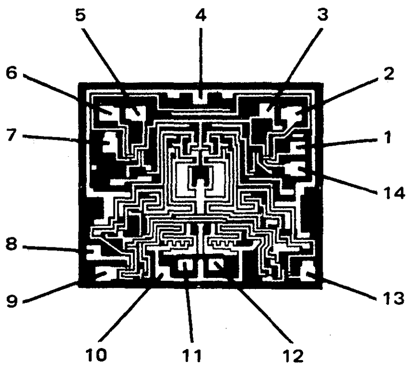


V_{CC} = Pin 4 f = 70 MHz typ
GND = Pin 10 P_D = 110 mW typ/pkg

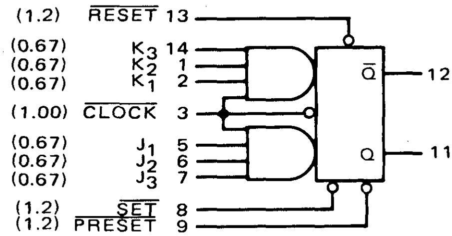
7

MCC2025/MCC2075/MCC2125/MCC2175
AND J-K Flip Flop

56 x 66
(47E)



PIN CONNECTIONS

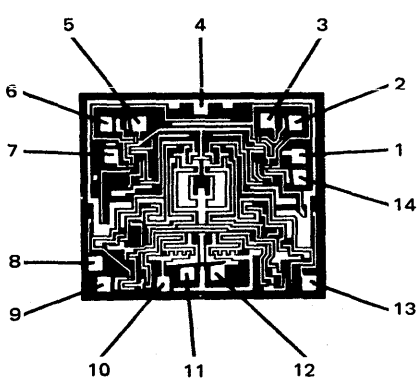


f = 50 MHz typ
P_D = 50 mW typ/pkg

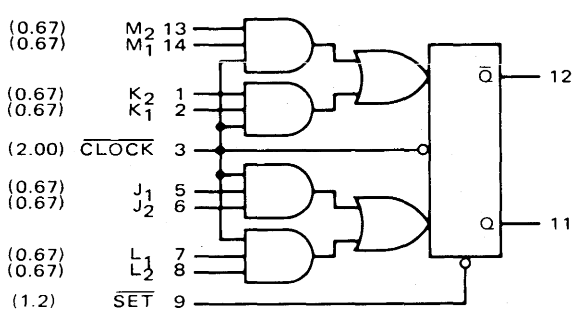
V_{CC} = Pin 4
GND = Pin 10

MCC2026/MCC2076/MCC2126/MCC2176
OR J-K Flip Flop

56 x 66
(47E)



PIN CONNECTIONS



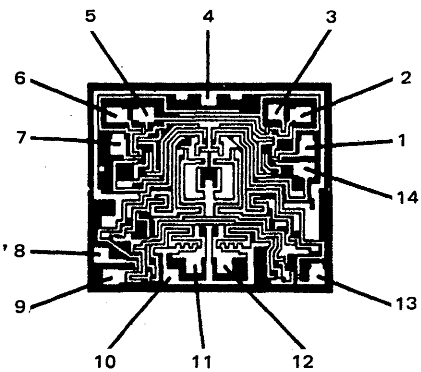
V_{CC} = Pin 4
GND = Pin 10

f = 50 MHz typ
P_D = 60 mW typ/pkg

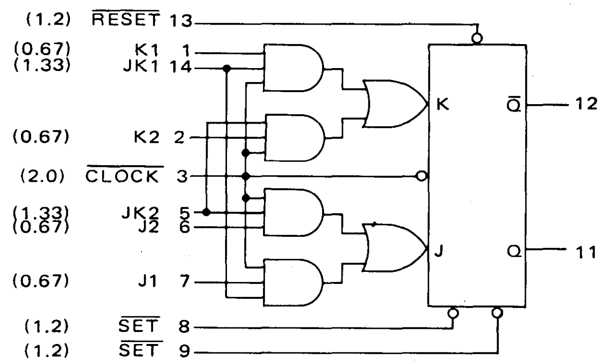
7

MCC2028/MCC2078/MCC2128/MCC2178
OR J-K Flip Flop

56 x 66
(47E)



PIN CONNECTIONS



V_{CC} = Pin 4 f = 35 MHz typ
GND = Pin 10 P_D = 60 mW typ/pkg

7

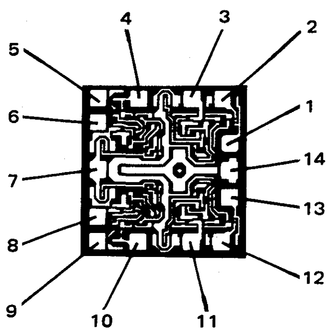
MCC3000 Series (0 to +75°C) – 74H00 Series Replacements
MCC3100 Series (–55 to +125°C) – 54H00 Series Replacements

These integrated circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a high operating speed (30-50 MHz clock rate), good external noise immunity, high fan-out, and the capability of driving lines up to 600 pF capacitance.

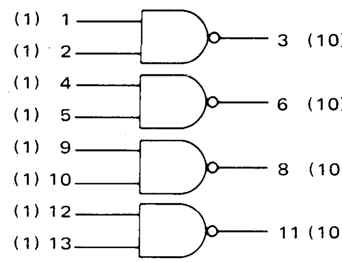
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC3000/74H00	MCC3100/54H00	Quad 2-Input NAND Gate	5CA	46x49
MCC3001/74H08	MCC3101/54H08	Quad 2-Input AND Gate	5CA	46x49
MCC3002	MCC3102	Quad 2-Input NOR Gate	59N	47x57
MCC3003	MCC3103	Quad 2-Input OR Gate	59N	47x57
MCC3004/74H01	MCC3104/54H01	Quad 2-Input NAND Gate (O.C.)	16K	43x46
MCC3005/74H10	MCC3105/54H10	Triple 3-Input NAND Gate	35T	46x46
MCC3006/74H11	MCC3106/54H11	Triple 3-Input AND Gate	35T	46x46
MCC3007	MCC3107	Triple 3-Input NAND Gate (O.C.)	35T	46x46
MCC3008/74H04	MCC3108/54H04	Hex Inverter	09L	58x57
MCC3009/74H05	MCC3109/54H05	Hex Inverter (O.C.)	09L	58x57
MCC3010/74H20	MCC3110/54H20	Dual 4-Input NAND Gate	1GH	39x42
MCC3011/74H21	MCC3111/54H21	Dual 4-Input AND Gate	1GH	39x42
MCC3012/74H22	MCC3112/54H22	Dual 4-Input NAND Gate (O.C.)	1GH	39x42
MCC3015	MCC3115	8-Input NAND Gate	6GH	35x35
MCC3016/74H30	MCC3116/54H30	8-Input NAND Gate	88K	37x39
MCC3018/74H62	MCC3118/54H62	4 Wide 3-2-2-3 Input Exp. for AOI Gates	98K	37x37
MCC3019/74H61	MCC3119/54H61	Triple 3-Input Exp. for AND-OR Gates	99K	39x44
MCC3020/74H50	MCC3120/54H50	Exp. Dual 2 Wide 2-Input AOI Gate	27W	41x41
MCC3021	MCC3121	Quad 2-Input Exclusive OR Gate	53H	61x70
MCC3022	MCC3122	Quad 2-Input Exclusive NOR Gate	53H	61x70
MCC3023/74H51	MCC3123/54H51	Dual 2 Wide 2-Input AOI Gate	27W	41x41
MCC3024/74H40	MCC3124/54H40	Dual 4-Input NAND Buffer Gate	6AL	42x42
MCC3025	MCC3125	Dual 4-Input NAND Power Gate	6AL	42x42
MCC3026	MCC3126	Dual 4-Input AND Power Gate	6AL	42x42
MCC3028	MCC3128	Dual 3-In 3-Out AND Series Term. Line Driver	32A	41x56
MCC3029	MCC3129	Dual 3-In 3-Out NAND Series Term. Line Driver	32A	41x56
MCC3030	MCC3130	Dual 4-Input Exp. for AOI Gates	63A	33x37
MCC3031/74H52	MCC3131/54H52	Exp. 4-W 2-2-2-3 Input AND-OR Gate	97K	47x47
MCC3032/74H53	MCC3132/54H53	Exp. 4-W 2-2-2-3 Input AOI Gate	48K	39x45
MCC3033/74H54	MCC3133/54H54	4-W 2-2-2-3 Input AOI Gate	48K	39x45
MCC3034/74H55	MCC3134/54H55	Exp. 2-W 4-Input AOI Gate	93K	38x42
MCC3050	MCC3150	AND J-K Flip-Flop	68A	61x66
MCC3051	MCC3151	AND Input J-K Flip-Flop	58D	61x57
MCC3052	MCC3152	AND Input J$\overline{J}$-K$\overline{K}$ Flip-Flop	55B	70x75
MCC3053	MCC3153	Double Edge Triggered Master Slave Type D FF	84D	70x63
MCC3054/74H71	MCC3154/54H71	OR Input J-K Flip-Flop	43H	63x63
MCC3055/74H72	MCC3155/54H72	AND Input J-K Flip-Flop	43H	63x63
MCC3060	MCC3160	Dual Type D Flip-Flop	80V	65x62
MCC3061	MCC3161	Dual J-K Flip-Flop	9CW	58x68
MCC3062	MCC3162	Dual J-K Flip-Flop	9CW	58x68
MCC3063	MCC3163	Dual J-K Flip-Flop	60N	59x65
MCC3064/74H74	MCC3164/54H74	Dual D Flip-Flop	80V	65x62
MCC3065/74H101	MCC3165/54H101	J-K Flip-Flop	8AD	54x59

MCC3000/74H00/MCC3100/MCC54H00
Quad 2-Input NAND Gate

46 x 49
(5CA)



PIN CONNECTIONS

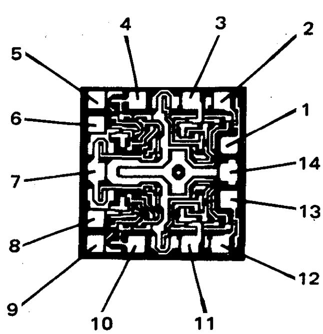


V_{CC} = Pin 14
GND = Pin 7

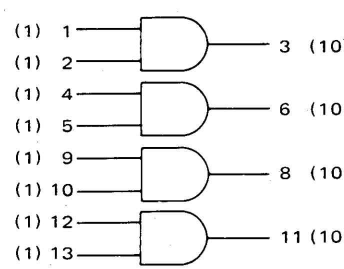
t_{pd} - 6.0 ns typ
P_D - 88 mW typ/pkg

MCC3001/74H08/MCC3101/54H08
Quad 2-Input AND Gate

46 x 49
(5CA)



PIN CONNECTIONS



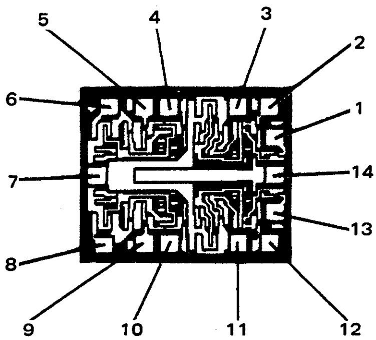
t_{pd} = 9.0 ns typ
P_D = 112 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

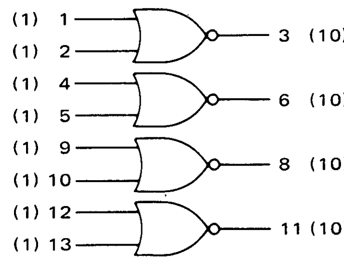
All dimensions are in mils.
Numbers at ends of terminals represent pin numbers.

MCC3002/MCC3102
Quad 2-Input NOR Gate

47 x 57
(59N)



PIN CONNECTIONS

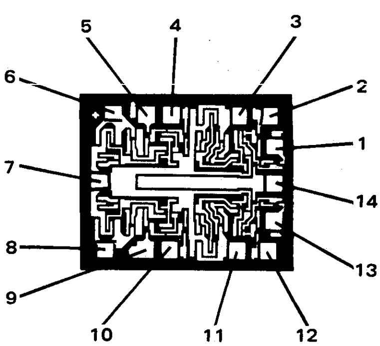


t_{pd} = 6.0 ns typ
P_D = 112 mW typ/pkg

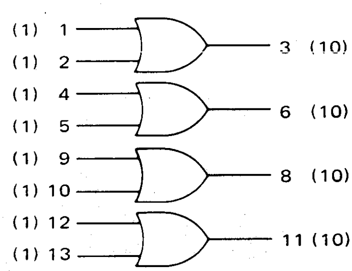
V_{CC} = Pin 14
GND = Pin 7

MCC3003/MCC3103
Quad 2-Input OR Gate

47 x 57
(59N)



PIN CONNECTIONS

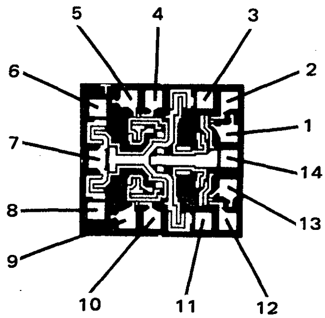


t_{pd} = 9.0 ns typ
P_D = 150 mW typ/pkg

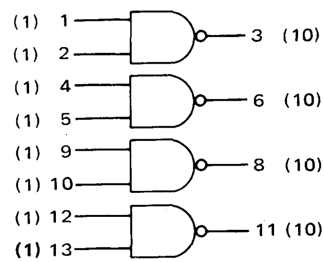
V_{CC} = Pin 14
GND = Pin 7

MCC3004/74H01/MCC3104/54H01
Quad 2-Input Nand Gate (open Collector)

43 x 46
(16K)



PIN CONNECTIONS

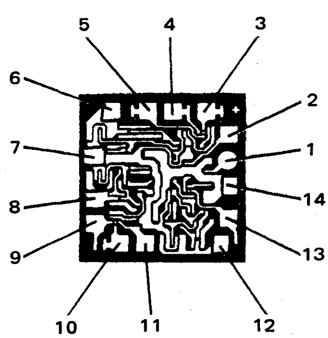


t_{pd} = 8.0 ns typ
P_D = 88 mW typ/pkg

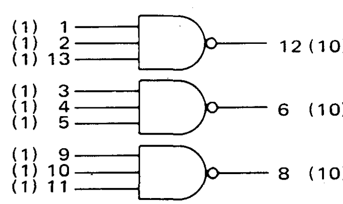
V_{CC} = Pin 14
GND = Pin 7

MCC3005/74H10/MCC3105/54H10
Triple 3-Input NAND Gate

46 x 46
(35T)



PIN CONNECTIONS



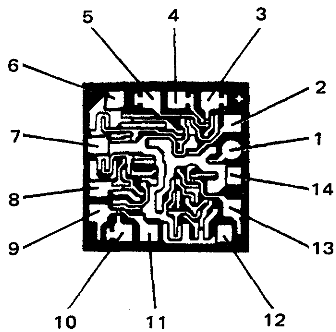
t_{pd} = 6.0 ns typ
P_D = 66 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

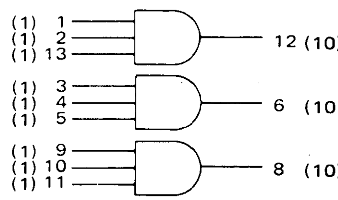
7

MCC3006/74H11/MCC3106/54H11
Triple 3-Input AND Gate

46 x 46
(35T)



PIN CONNECTIONS

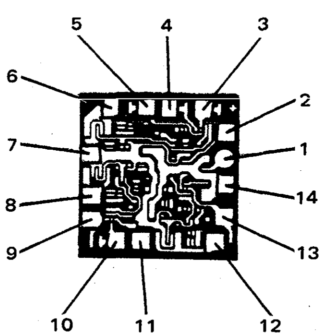


t_{pd} = 9.0 ns typ
P_D = 84 mW typ/pkg

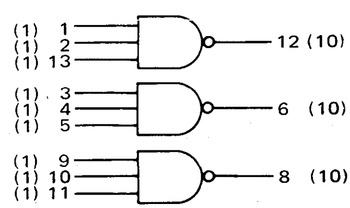
V_{CC} = Pin 14
GND = Pin 7

MCC3007/MCC3107
Triple 3-Input NAND Gate (open collector)

46 x 46
(35T)



PIN CONNECTIONS



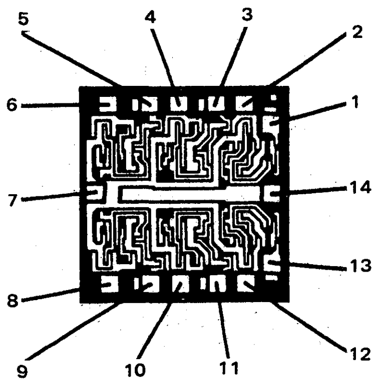
t_{pd} = 8.0 ns typ
P_D = 66 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

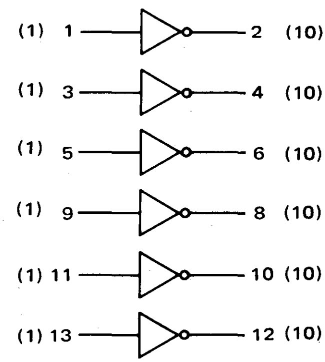
7

MCC3008/74H04/MCC3108/54H04
Hex Inverter

58 x 57
(09L)



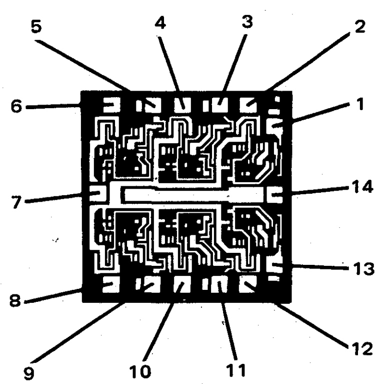
PIN CONNECTIONS



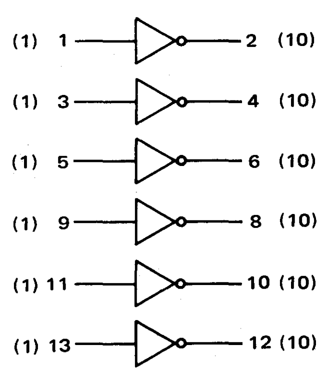
t_{pd} = 6.0 ns typ
P_D = 140 mW typ/pkg
V_{CC} = Pin 14
GND = Pin 7

MCC3009/74H05/MCC3109/54H05
Hex Inverter (OC)

58 x 57
(09L)



PIN CONNECTIONS

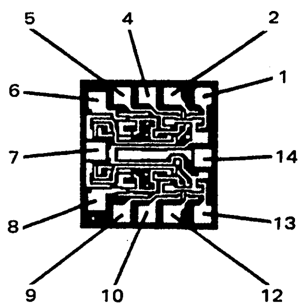


V_{CC} = Pin 14 t_{pd} = 8.0 ns typ
GND = Pin 7 P_D = 90 mW typ/pkg

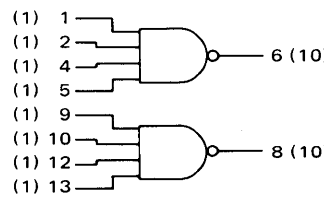
7

MCC3010/74H20/MCC3110/54H20
Dual 4-Input NAND Gate

39 x 42
(1GH)



PIN CONNECTIONS

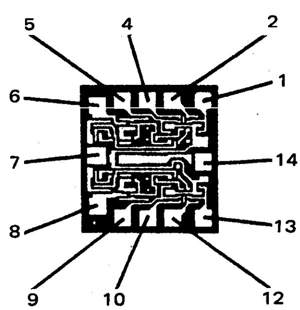


t_{pd} = 6.0 ns typ
P_D = 44 mW typ/pkg

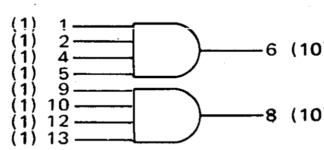
V_{CC} = Pin 14
GND = Pin 7

MCC3011/74H21/MCC3111/54H21
Dual 4-Input AND Gate

39 x 42
(1GH)



PIN CONNECTIONS



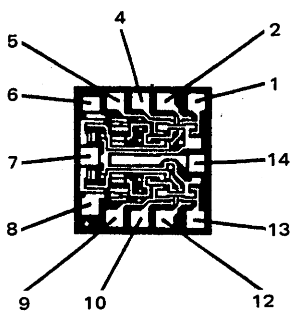
t_{pd} = 9.0 ns typ
P_D = 56 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

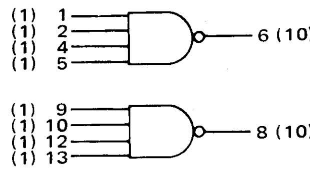
7

MCC3012/74H22/MCC3112/54H22
Dual 4-Input NAND Gate (open collector)

39 x 42
(1GH)



PIN CONNECTIONS

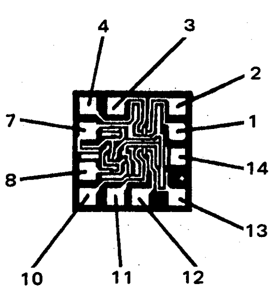


t_{pd} = 8.0 ns typ
P_D = 44 mW typ/pkg

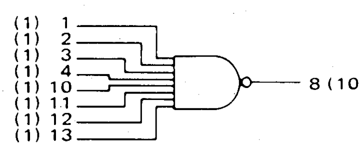
V_{CC} = Pin 14
GND = Pin 7

MCC3015/74H31/MCC3115/54H31
8-Input NAND Gate

35 x 35
(6GH)



PIN CONNECTIONS

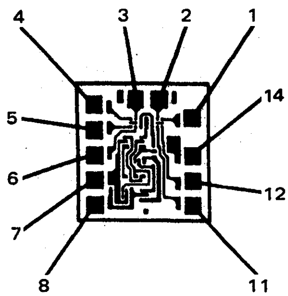


t_{pd} = 8.0 ns typ
P_D = 22 mW typ/pkg

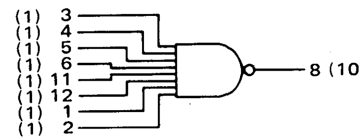
V_{CC} = Pin 14
GND = Pin 7

MCC3016/74H30/MCC3116/54H30
8-Input NAND Gate

37 x 39
(88K)



PIN CONNECTIONS

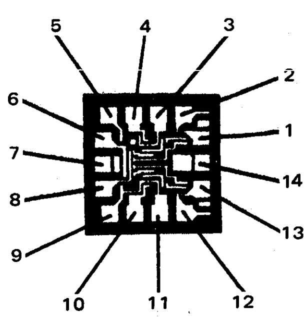


t_{pd} = 8.0 ns typ
P_D = 22 mW typ/pkg

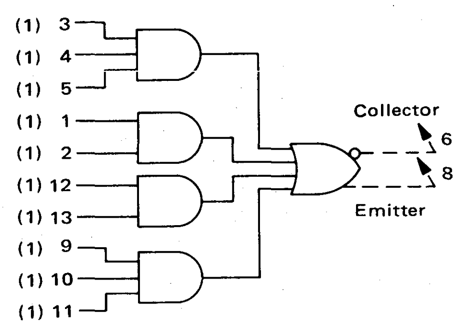
V_{CC} = Pin 14
GND = Pin 7

MCC3018/74H62/MCC3118/54H62
4 Wide 3-2-2-3 Input Expander for AND-OR-INVERT Gates

37 x 37
(98K)



PIN CONNECTIONS



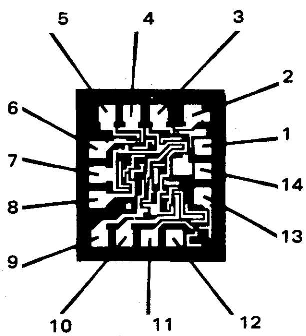
P_D = 40 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

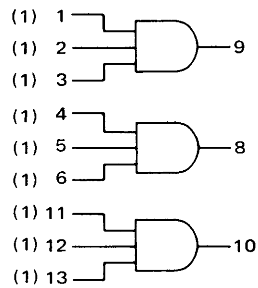
7

MCC3019/74H61/MCC3119/54H61
Triple 3-Input Expander for AND-OR Gates

39 x 44
(99K)



PIN CONNECTIONS

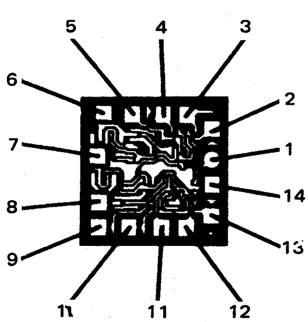


P_D = 25 mW typ/pkg

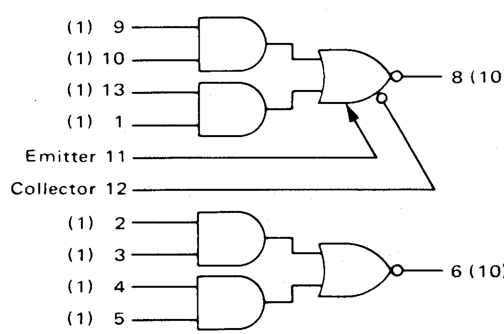
V_{CC} = Pin 14
GND = Pin 7

MCC3020/74H50/MCC3120/54H50
Expandable Dual 2 Wide 2-Input AND-OR-INVERT Gate

41 x 41
(27W)



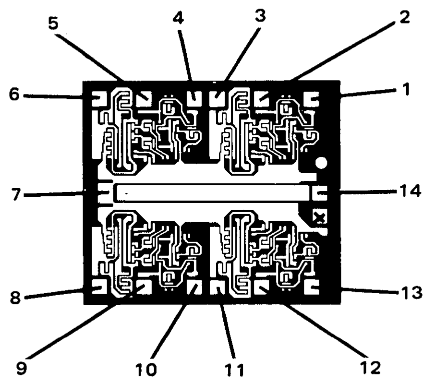
PIN CONNECTIONS



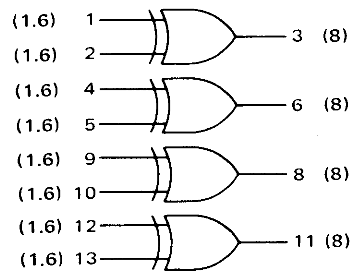
t_{pd} = 6.0 ns typ
P_D = 62.5 mW typ/pkg
V_{CC} = Pin 14
GND = Pin 7

MCC3021/MCC3121
Quad 2-Input Exclusive OR Gate

61 x 70
(53H)



PIN CONNECTIONS

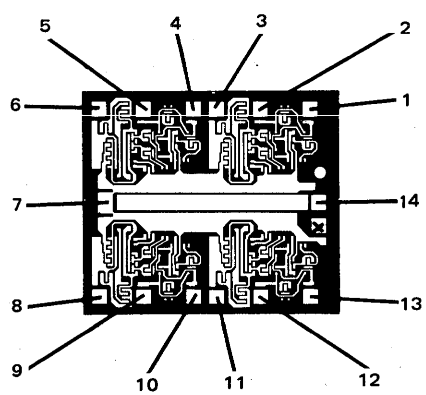


t_{pd} = 14 ns typ
P_D = 100 mW typ/pkg

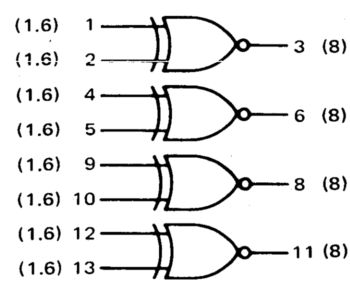
V_{CC} = Pin 14
GND = Pin 7

MCC3022/MCC3122
Quad 2-Input Exclusive NOR Gate

61 x 70
(53H)



PIN CONNECTIONS

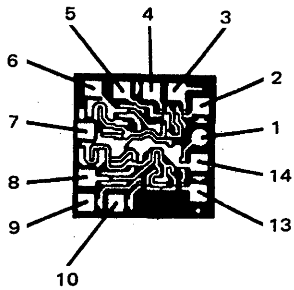


t_{pd} = 14 ns typ
P_D = 85 mW typ/pkg

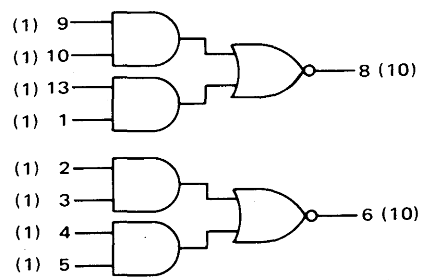
V_{CC} = Pin 14
GND = Pin 7

MCC3023/74H51/MCC3123/54H51
Dual 2 Wide 2-Input AOI Gate

41 x 41
(27W)



PIN CONNECTIONS

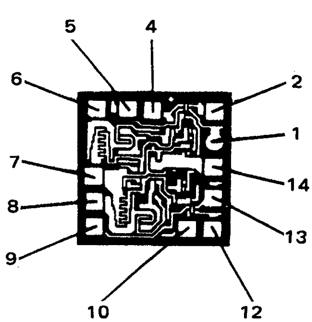


t_{pd} = 6.0 ns typ
P_D = 62.5 mW typ/pkg

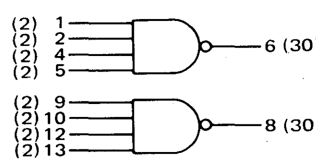
V_{CC} = Pin 14
GND = Pin 7

MCC3024/74H40/MCC3124/54H40
Dual 4-Input NAND Buffer Gate

42 x 42
(6AL)



PIN CONNECTIONS

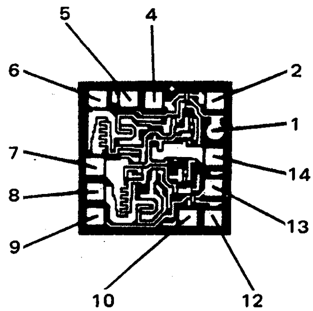


typ = 6.0 ns typ
P_D = 90 mW typ/pkg

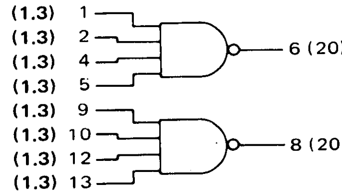
V_{CC} = Pin 14
GND = Pin 7

MCC3025/MCC3125
Dual4-Input NAND Power Gate

42 x 42
(6AL)



PIN CONNECTIONS

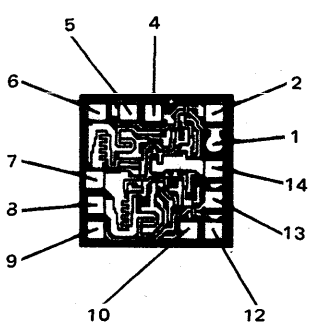


t_{pd} = 6.0 ns typ
P_D = 70 mW typ/pkg

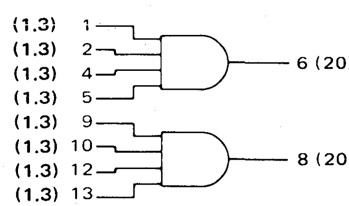
V_{CC} = Pin 14
GND = Pin 7

MCC3026/MCC3126
Dual 4-Input AND Power Gate

42 x 42
(6AL)



PIN CONNECTIONS



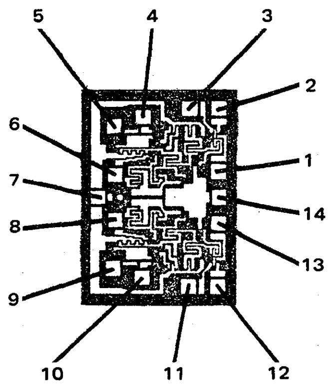
t_{pd} = 9.0 ns typ
P_D = 90 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

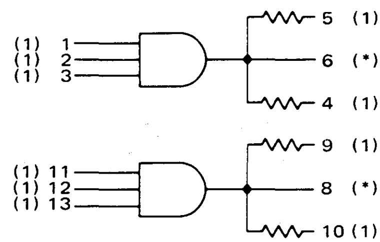
7

MCC3028/MCC3128
Dual 3-Input 3-Output AND Series Terminated Line Driver

41 x 56
(32A)



PIN CONNECTIONS

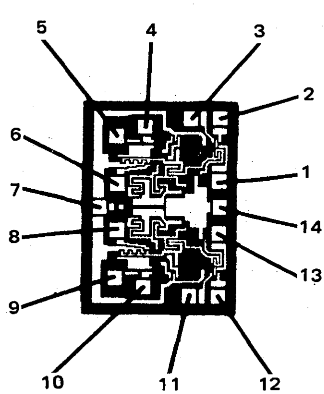


t_{pd} = 9.0 ns typ
P_D = 56 mW typ/pkg

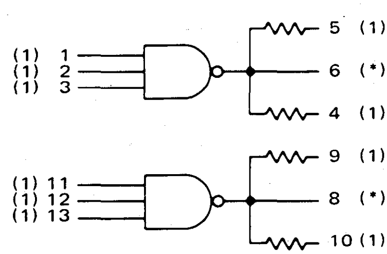
V_{CC} = Pin 14
GND = Pin 7

MCC3029/MCC3129
Dual 3-Input 3-Output NAND Series Terminated Line Driver

41 x 56
(32A)



PIN CONNECTIONS



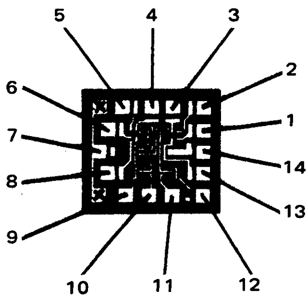
t_{pd} = 6.0 ns typ
P_D = 44 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

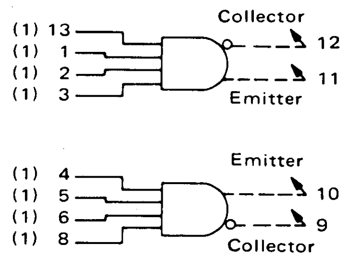
7

MCC3030/MCC3130
Dual 4-Input Expander for AND-OR-INVERT Gates

33 x 37
(63A)



PIN CONNECTIONS

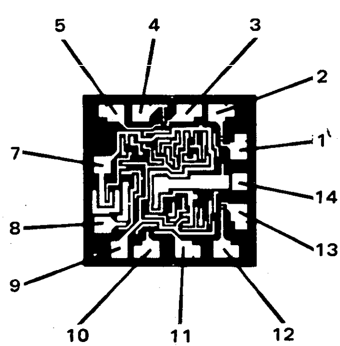


P_D = 15 mW typ/Pkg

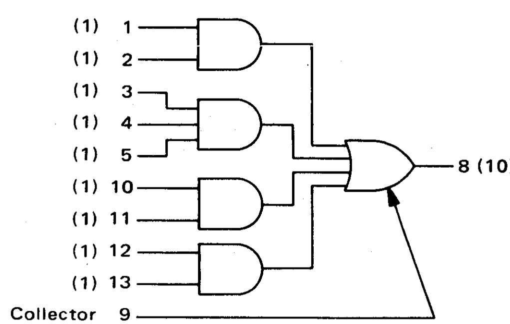
V_{CC} = Pin 14
GND = Pin 7

MCC3031/74H52/MCC3131/54H52
Expandable 4 Wide 2-2-2-3 Input AND OR Gate

47 x 47
(97K)



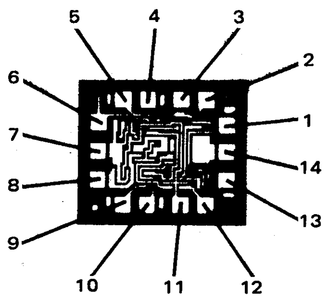
PIN CONNECTIONS



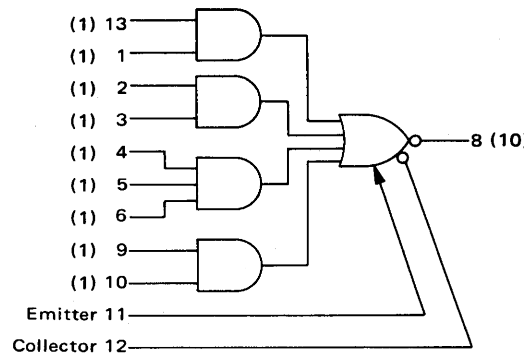
V_{CC} = Pin 14 t_{pd} = 10 ns typ
GND = Pin 7 P_D = 87.5 mW typ/pkg

MCC3032/74H53/MCC3132/54H53
Expandable 4 Wide 2-2-2-3 Input AND OR INVERT Gate

39 x 45
(48K)



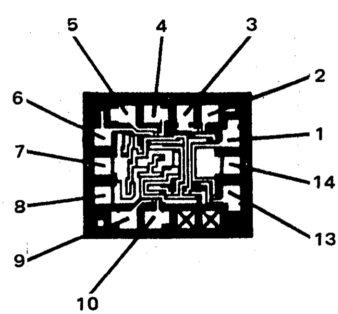
PIN CONNECTIONS



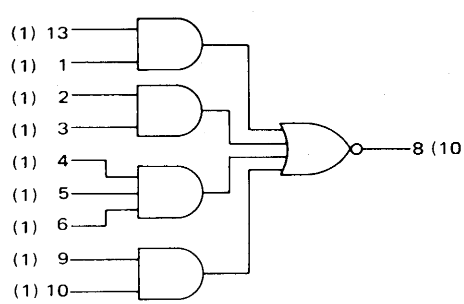
V_{CC} = Pin 14
GND = Pin 7
t_{pd} = 7 ns typ
P_D = 40 mW typ/pkg

MCC3033/74H54/MCC3133/54H54
4 Wide 2-2-2-3 Input AND OR INVERT Gate

39 x 45
(48K)



PIN CONNECTIONS

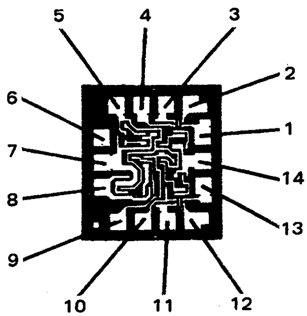


t_{pd} = 7 ns typ
P_D = 40 mW typ/pkg
V_{CC} = Pin 14
GND = Pin 7

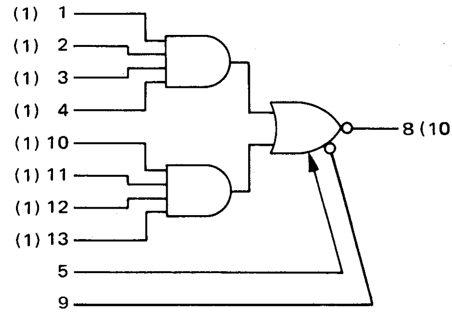
7

MCC3034/74H55/MCC3134/54H55
Expandable 2 Wide 4-Input AND OR INVERT Gate

38 x 42
(93K)



PIN CONNECTIONS

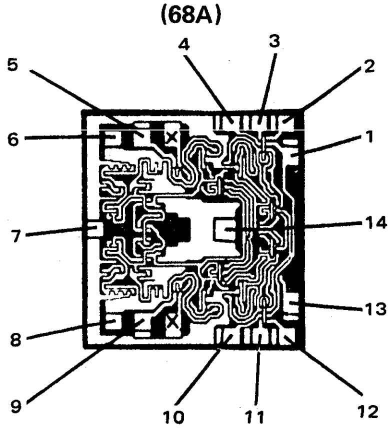


t_{pd} = 7.0 ns typ
P_D = 30 mW typ/pkg

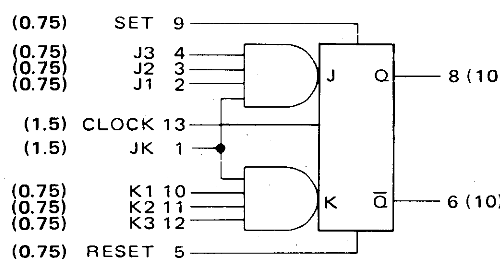
V_{CC} = Pin 14
GND = Pin 7

MCC3050/MCC3150
AND J-K Flip Flop

61 x 66
(68A)



PIN CONNECTIONS

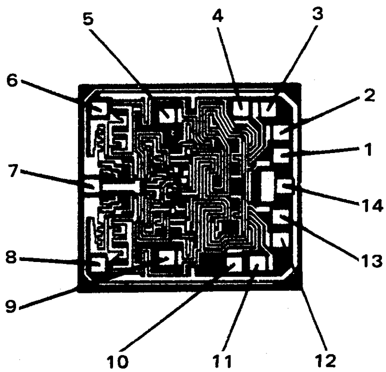


f = 40 MHz
P_D = 80 mW typ/pkg

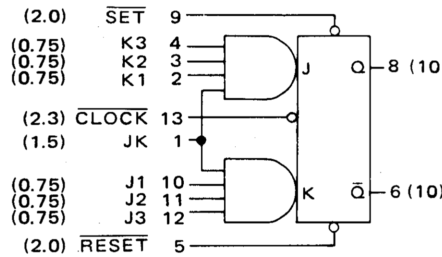
V_{CC} = Pin 14
GND = Pin 7

MCC3051/MCC3151
AND Input J-K Flip Flop

61 x 57
(58D)



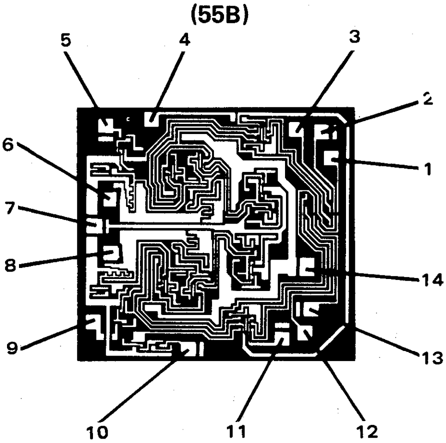
PIN CONNECTIONS



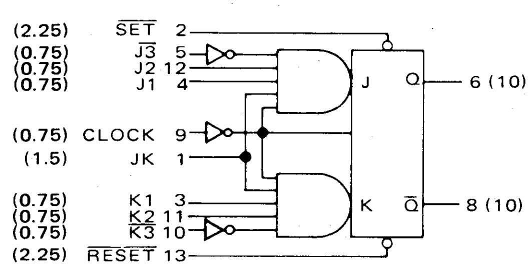
f = 50 MHz
P_D = 50 mW typ/pkg
V_{CC} = Pin 14
GND = Pin 7

MCC3052/MCC3152
AND Input JJ-KK Flip Flop

70 x 75
(55B)



PIN CONNECTIONS

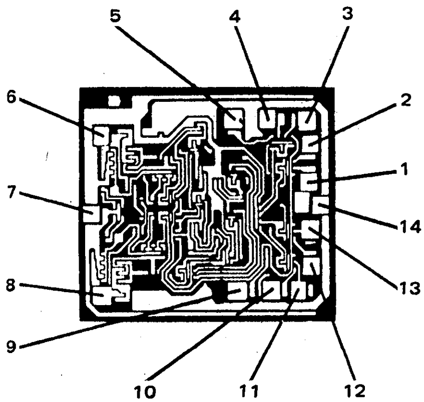


f = 40 MHz
P_D = 75 mW typ/pkg
V_{CC} = Pin 14
GND = Pin 7

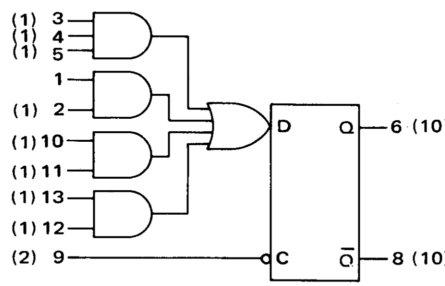
7

MCC3053/MCC3153
Double Edge Triggered Master-Slave Type D Flip Flop

70 x 63
(84D)



PIN CONNECTIONS

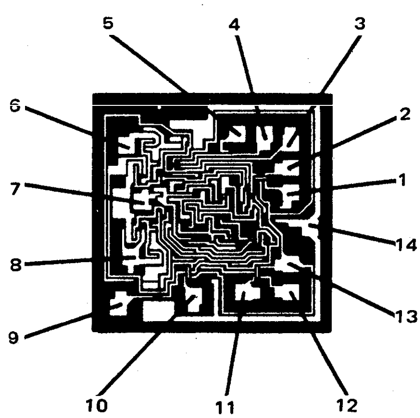


P_D = 100 mW typ/pkg

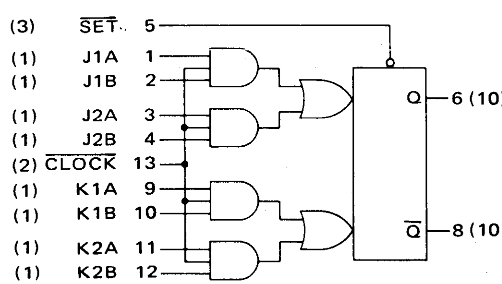
V_{CC} = Pin 14
GND = Pin 7

MCC3054/74H71/MCC3154/54H71
OR Input J-K Flip Flop

63 x 63
(43H)



PIN CONNECTIONS



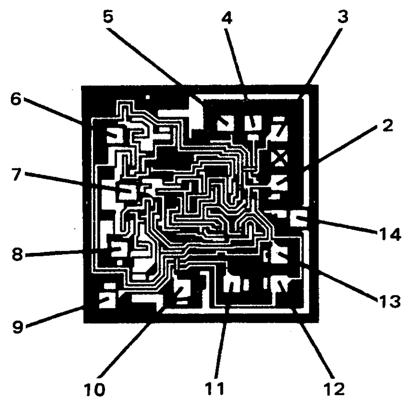
t_{pd} = 20 ns typ
f = 30 MHz typ
P_D = 95 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

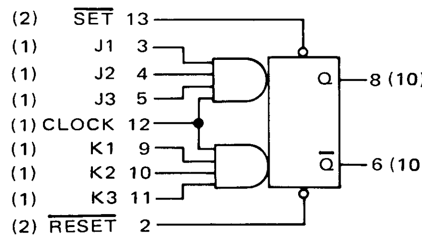
7

MCC3055/74H72/MCC3155/54H72
AND Input J-K Flip Flop

63 x 63
(43H)



PIN CONNECTIONS

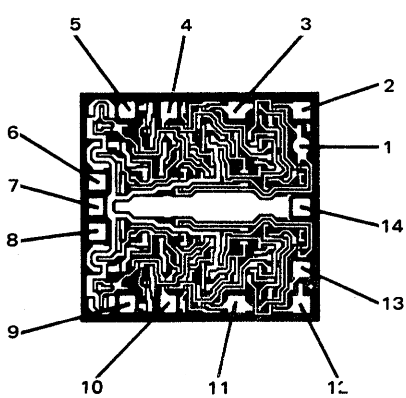


t_{pd} = 10 ns typ
f = 30 MHz typ
P_D = 80 mW typ/pkg

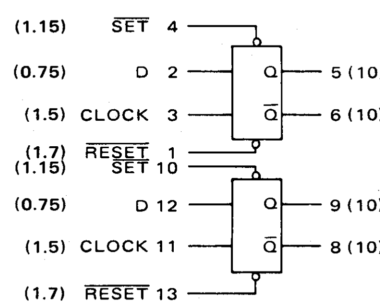
V_{CC} = Pin 14
GND = Pin 7

MCC3060/MCC3160
Dual Type D Flip Flop

65 x 62
(80V)



PIN CONNECTIONS

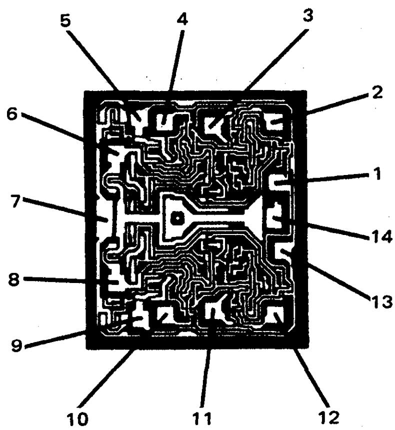


f = 30 MHz
P_D = 120 mW typ/pkg

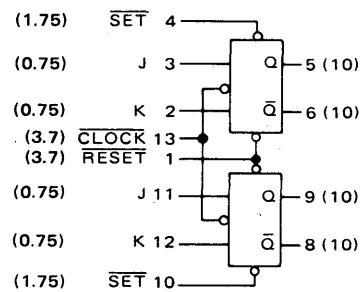
V_{CC} = Pin 14
GND = Pin 7

MCC3061/MCC3161
Dual J-K Flip Flop

58 x 68
(9CW)



PIN CONNECTIONS

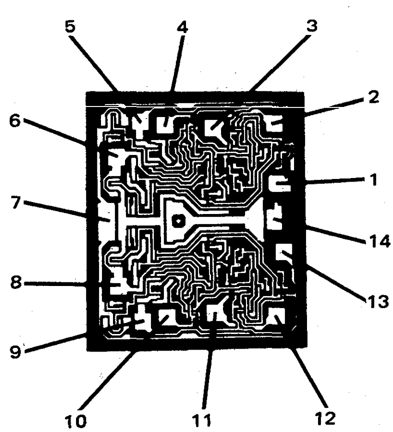


f = 50 MHz
P_D = 100 mW typ/pkg

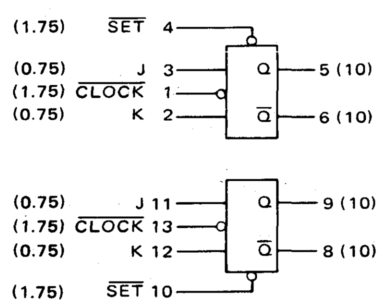
V_{CC} = Pin 14
GND = Pin 7

MCC3062/MCC3162
Dual J-K Flip Flop

58 x 68
(9CW)



PIN CONNECTIONS



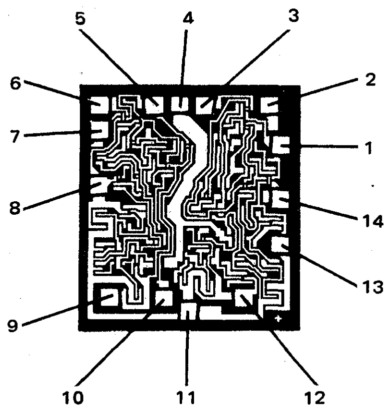
f = 50 MHz
P_D = 100 mW typ/pkg

V_{CC} = Pin 14
GND = Pin 7

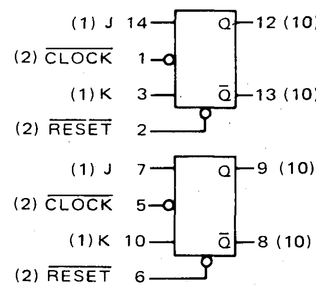
7

MCC3063/MCC3163
Dual J-K Flip Flop

59 x 65
(60N)



PIN CONNECTIONS

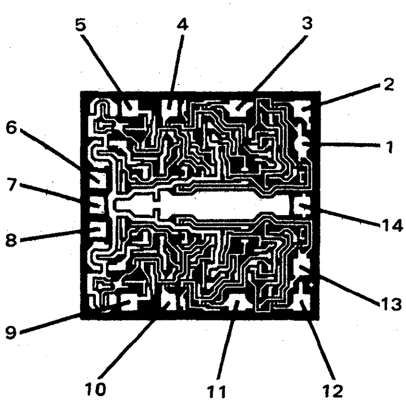


P_D = 176 mW typ/pkg
t_{pd} = 10 ns typ
f = 30 MHz typ

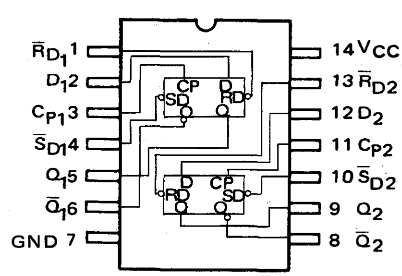
V_{CC} = Pin 4
GND = Pin 11

MCC3064/74H74
Dual D Flip Flop

65 x 62
(80V)



PIN CONNECTIONS

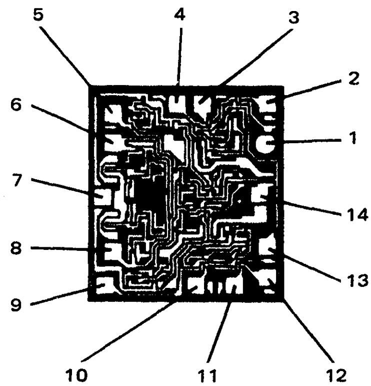


V_{CC} = Pin 14
GND = Pin 7

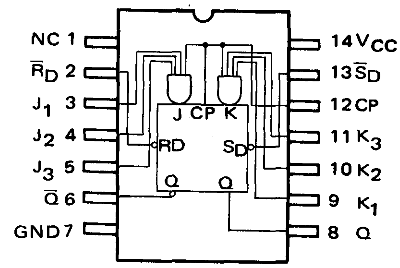
7

MCC3065/74H101
J-K Flip Flop

54 x 59
(8AD)



PIN CONNECTIONS



V_{CC} = Pin 14
GND = Pin 7

7

MCC4000 Series (0 to +75°C)
MCC4300 Series (–55 to +125°C)

The MTTL complex functions are designed for digital applications in the medium to high-speed range.

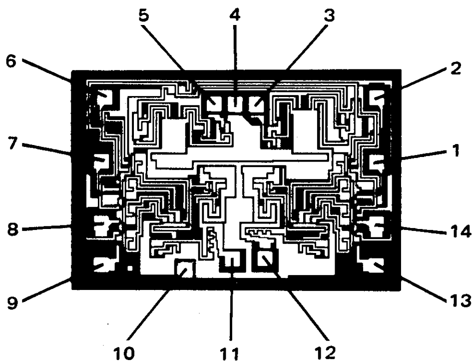
These MTTL devices provide significant reduction in package count and increased logic per function over devices in the basic MTTL and MDTL families.

Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC4000	MCC4300	Dual 4 Channel Data Selector	18E	58x86
MCC4002	MCC4302	Dual Data Distributor	59B	60x90
MCC4003	MCC4303	Dual Binary to NBCD Converter	06T	73x75
MCC4004	MCC4304	16 Bit Scratch Pad Memory Cell	1PR	77x82
MCC4005	MCC4305	16 Bit Scratch Pad Memory Cell	1PR	77x82
MCC4006	MCC4306	Binary to one of eight Line Decoder	31C	88x88
MCC4007	MCC4307	Dual Binary to one of four Line Decoder	31C	88x88
MCC4008/74408	MCC4308	8 Bit Parity Tree	8HT	53x59
MCC4010	MCC4310	Dual 4 Bit Parity Tree	94F	78x79
MCC4012	MCC4312	4 Bit Shift Register	43L	58x74
MCC4015	MCC4315	Quad Type D Flip-Flop	87N	68x74
MCC4016/74416	MCC4316	Program. Modulo-N Decade Counter	30P	79x89
MCC4017/74417	MCC4317	Modulo 2, Modulo 5 Program. Counter	30P	79x89
MCC4018/74418	MCC4318	Program. Modulo-N Hexadecimal Counter	30P	79x89
MCC4019/74419	MCC4319	Dual Modulo 4 Program. Counter	30P	79x89
MCC4021	MCC4321	Dual 4 Bit Comparator (O.C.)	04R	63x69
MCC4022	MCC4322	Dual 4 Bit Comparator	04R	63x69
MCC4023	MCC4323	4-Bit Universal Counter	74H	94x95
MCC4024	MCC4324	Dual Voltage Controlled Multivibrator	54H	66x53
MCC4026	MCC4326	Full Adder	33K	58x60
MCC4027	MCC4327	Full Adder	33K	58x60
MCC4028	MCC4328	Adder (Dependent Carry)	33K	58x60
MCC4029	MCC4329	Adder (Dependent Carry)	33K	58x60
MCC4030	MCC4330	Adder (Independent Carry)	33K	58x60
MCC4031	MCC4331	Adder (Independent Carry)	33K	58x60
MCC4032	MCC4332	Carry Decoder	50K	39x43
MCC4035	MCC4335	Quad Latch (O.C.)	1DB	60x61
MCC4037	MCC4337	Quad Latch	1DB	60x61
MCC4042	MCC4342	Quad Predriver	31E	55x67
MCC4043	MCC4343	Dual Line Selector	32E	61x61
MCC4044	MCC4344	Phase Frequency Detector	46K	62x66
MCC4050/74450	MCC4350	Counter-Latch Decoder/Driver	09R	92x94
MCC4051	MCC4351	Counter-Latch Decoder/Driver	09R	92x94
MCC4052/74452	MCC4352	Dual Decade Counter	91R	80x84
MCC4053/74453	MCC4353	Dual Hexadecimal Counter	91R	80x84
MCC4054/74454	MCC4354	Dual Decade Up/Down Counter	66W	102x99
MCC4055/74455	MCC4355	Dual Binary Up/Down Counter	66W	102x99
MCC4056/74456	MCC4356	NBCD Adder	74V	69x90
MCC4058/74458	MCC4358	Nines Complement/Zero Element	1DK	61x62
MCC4060/74460	MCC4360	Bus Transfer Switch	38T	64x66
MCC4062	MCC4362	Dual Majority Logic Gate	62T	50x45
MCC4068/74468	MCC4368	Dual MOS to TTL Level Translator	2AG	50x50

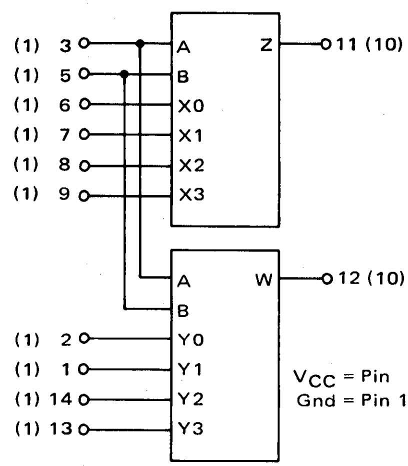
7

MCC4000/MCC4300
Dual 4 Channel Data Selector

58 x 86
(18E)



PIN CONNECTIONS

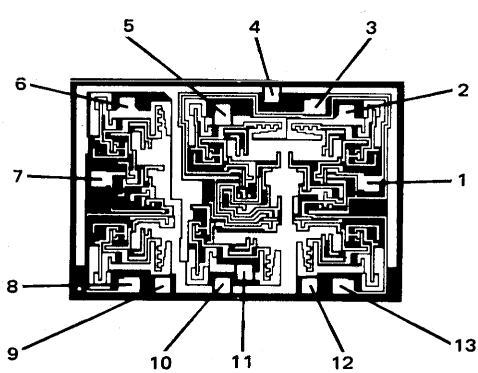


V_{CC} = Pin 4
Gnd = Pin 10

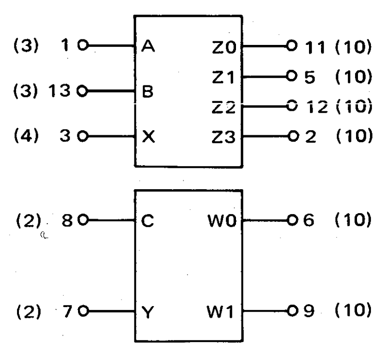
t_{pd} = 11 ns typ
P_D = 150 mW typ/pkg

MCC4002/MCC4302
Dual Data Distributor

60 x 90
(59B)



PIN CONNECTIONS



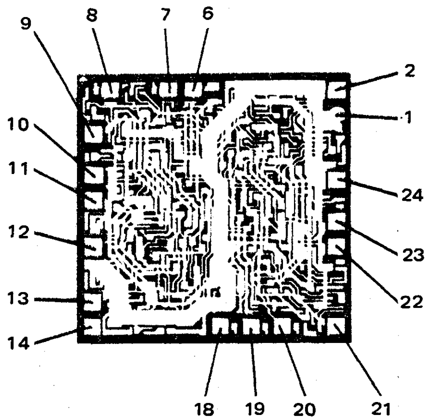
t_{pd} = 10.5 ns typ
P_D = 175 mW typ/pkg
V_{CC} = Pin 4
GND = Pin 10

All dimensions are in mils.

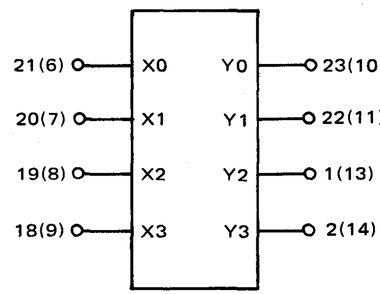
7

MCC4003/MCC4303
Dual Binary to NBCD Converter

73 x 75
(06T)



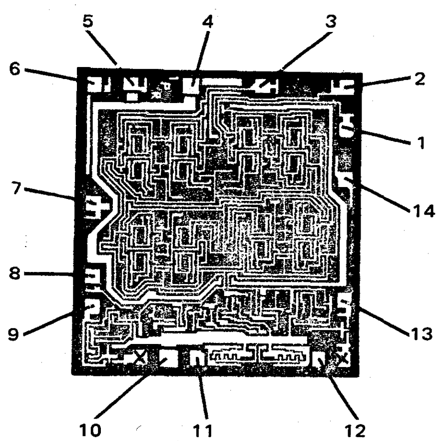
PIN CONNECTIONS



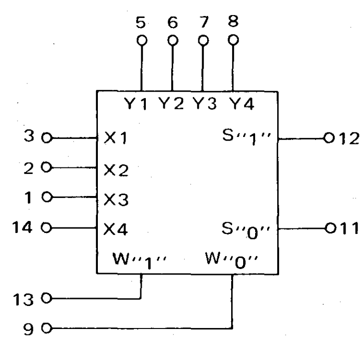
V_{CC} = Pin 24
GND = Pin 12

MCC4004/MCC4304
16 Bit Scratch Pad Memory Cell

77 x 82
(1PR)



PIN CONNECTIONS



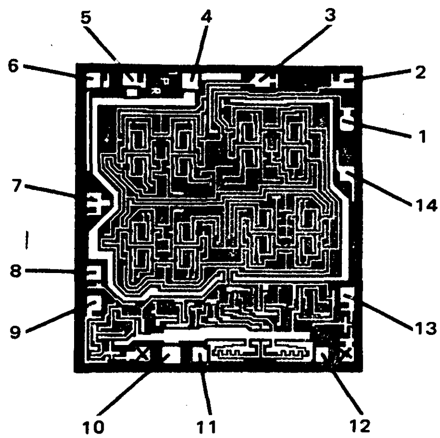
t_{pd}: Write Mode = 25 ns typ
Read Mode = 15 ns typ
P_D = 250 mW typ/pkg

V_{CC} = Pin 4
GND = Pin 10

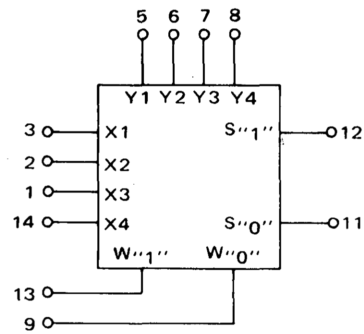
7

MCC4005/MCC4305
16 Bit Scratch Pad Memory Cell

77 x 82
(1PR)



PIN CONNECTIONS

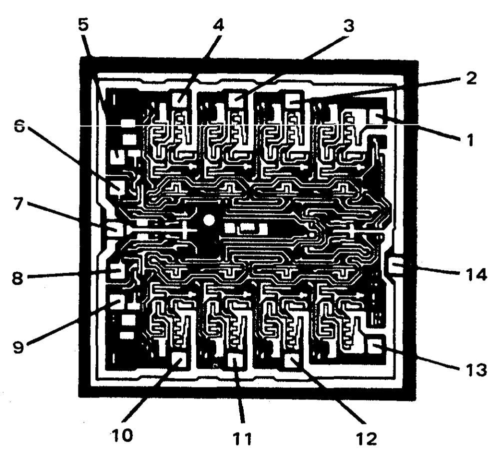


t_{pd}: Write Mode = 25 ns typ
Read Mode = 15 ns typ
P_D = 250 mW typ/pkg

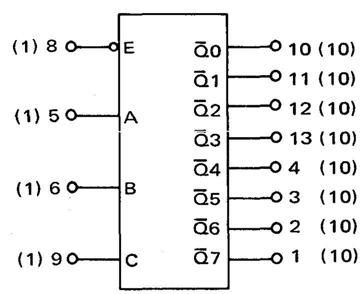
V_{CC} = Pin 4
GND = Pin 10

MCC4006/MCC4306
Binary to one of eight Line Decoder

88 x 88
(31C)



PIN CONNECTIONS

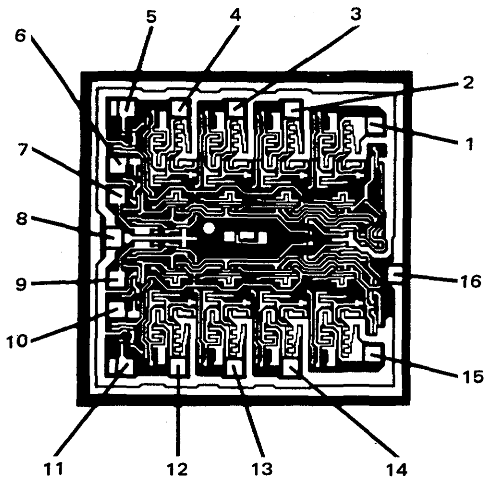


t_{pd} = 14 ns typ
P_D = 100 mW typ/pkg

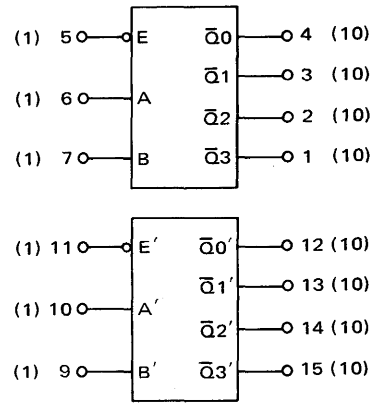
V_{CC} = Pin 14
GND = Pin 7

MCC4007/MCC4307
Dual Binary to one of four Line Decoder

88 x 88
(31C)



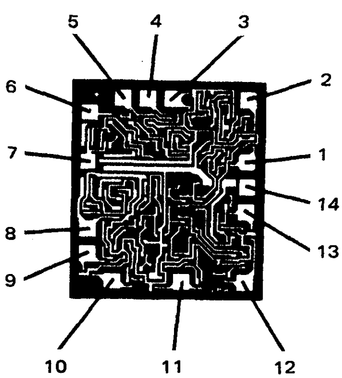
PIN CONNECTIONS



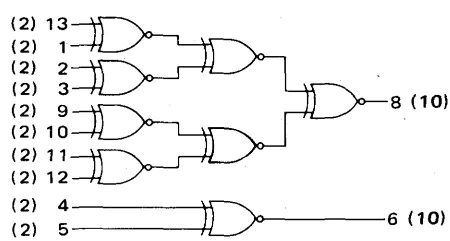
t_{pd} = 14 ns typ
P_D = 125 mW typ/pkg
V_{CC} = Pin 16
GND = Pin 8

MCC4008/74408/MCC4308/54408
8 Bit Parity Tree

53 x 59
(8HT)



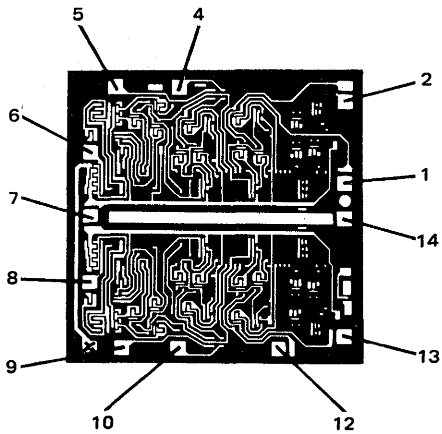
PIN CONNECTIONS



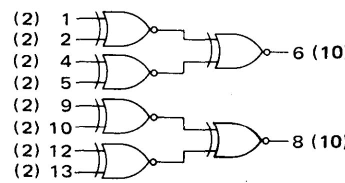
t_{pd} = 15-30 ns typ
P_D = 150 mW typ/pkg
V_{CC} = Pin 14
GND = Pin 7

MCC4010/MCC4310
Dual 4 Bit Parity Tree

78 x 79
(94F)



PIN CONNECTIONS

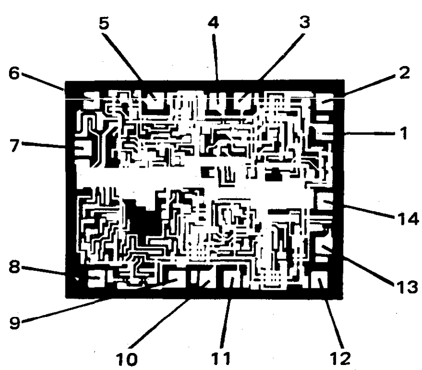


t_{pd} = 9.5-22 ns typ
P_D = 125 mW typ/pkg

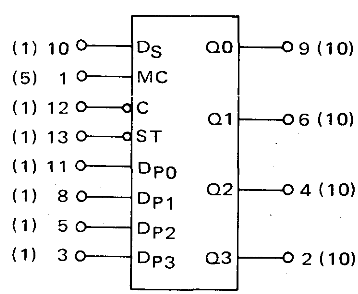
V_{CC} = Pin 14
GND = Pin 7

MCC4012/MCC4312
4 Bit Shift Register

58 x 74
(43L)



PIN CONNECTIONS

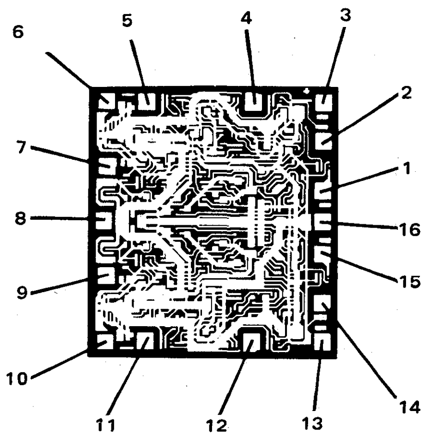


t_{pd} = 22 ns typ/bit
P_D = 180 mW typ/pkg

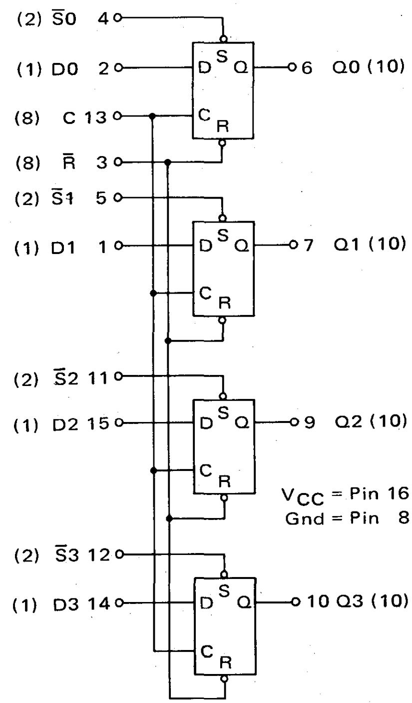
V_{CC} = Pin 14
GND = Pin 7

MCC4015/MCC4315
Quad Type D Flip Flop

68 x 74
(87N)



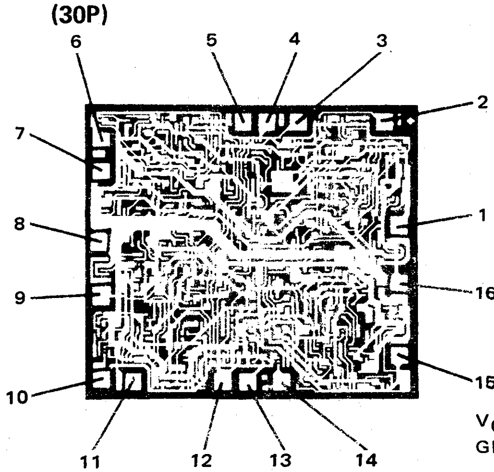
PIN CONNECTIONS



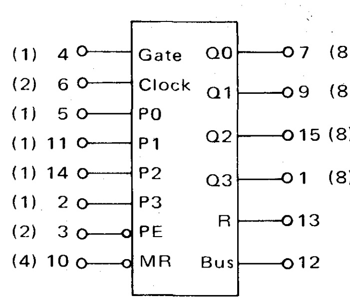
V_{CC} = Pin 16 t_{pd} = 16 ns typ
GND = Pin 8 P_D = 190 mW typ/pkg

MCC4016/74416/MCC4316/54416
Programmable Modulo-N Decade Counter

79 x 89
(30P)



PIN CONNECTIONS

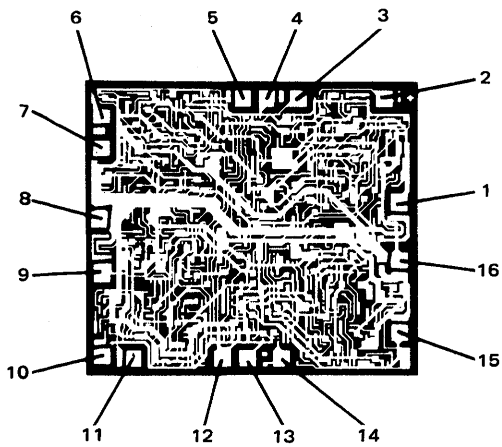


V_{CC} = Pin 16
GND = Pin 8

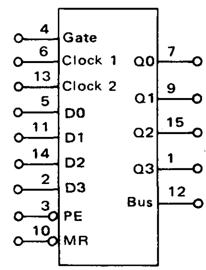
t_{pd}, Clock to Q3 = 50 ns typ
Clock to Bus = 35 ns typ
P_D = 250 mW typ/pkg

MCC4017/74417/MCC4317/54417
Modulo 2, Modulo 5 Programmable Counter

79 x 89
(30P)



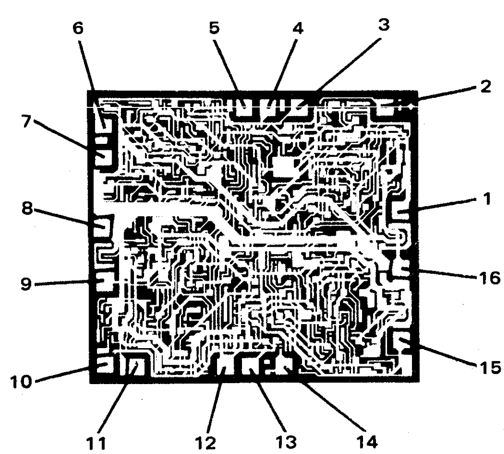
PIN CONNECTIONS



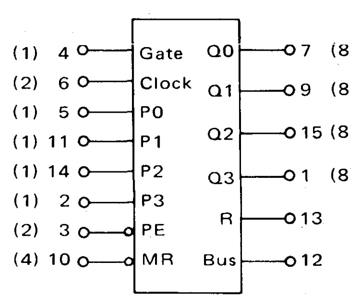
V_{CC} = Pin 16
Gnd = Pin 8

MCC4018/74418/MCC4318/54418
Programmable Modulo-N Hexadecimal Counter

79 x 89
(30P)



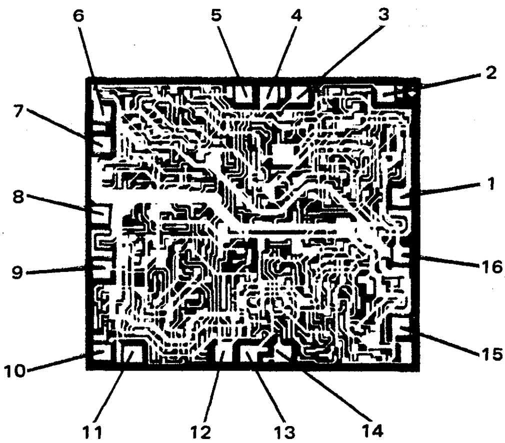
PIN CONNECTIONS



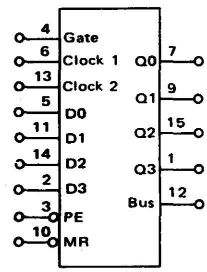
t_{pd}, Clock to Q3 = 50 ns typ
Clock to Bus = 35 ns typ
P_D = 250 mW typ/pkg
V_{CC} = Pin 16
GND = Pin 8

MCC4019/74419/MCC4319/54419
Dual Modulo 4 Programmable Counter

79 x 89
(30P)



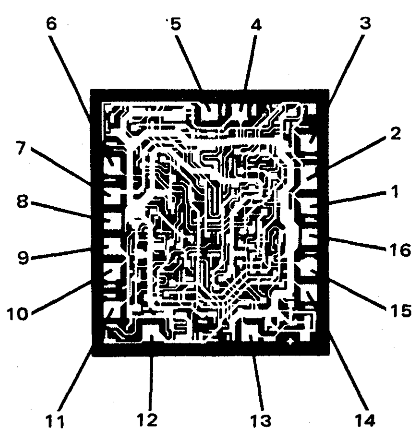
PIN CONNECTIONS



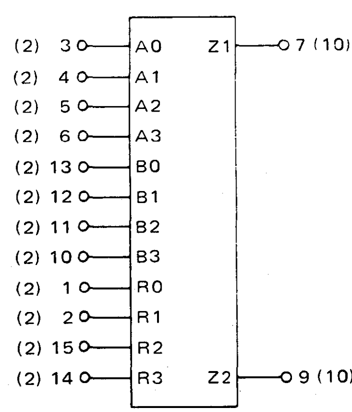
V_{CC} = Pin 16
Gnd = Pin 8

MCC4021/MCC4321
Dual 4 Bit Comparator (open collector)

63 x 69
(04R)



PIN CONNECTIONS

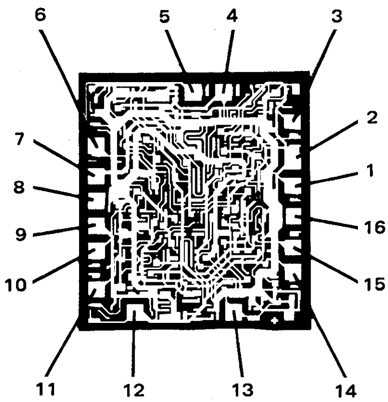


V_{CC} = Pin 16 t_{pd} = 20 ns typ
GND = Pin 8 P_D = 250 mW typ/pkg

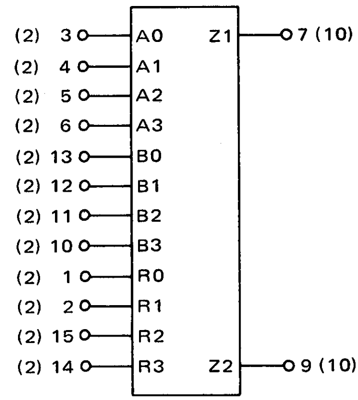
7

MCC4022/MCC4322
Dual 4 Bit Comparator

63 x 69
(04R)



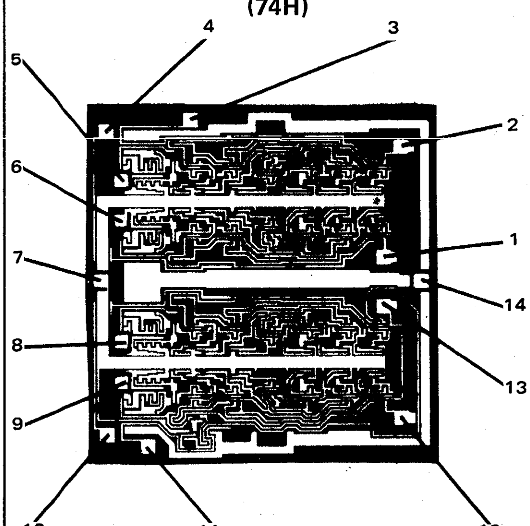
PIN CONNECTIONS



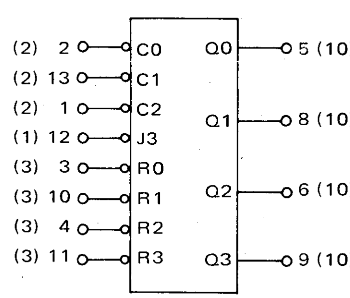
V_{CC} = Pin 16 t_{pd} = 20 ns typ
GND = Pin 8 P_D = 250 mW typ/pkg

MCC4023/MCC4323
4-Bit Universal Counter

94 x 95
(74H)



PIN CONNECTIONS

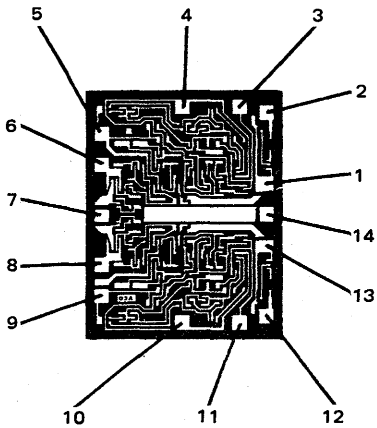


t_{pd} = 16 ns typ/bit
P_D = 200 mW typ/pkg
f = 30 MHz typ
V_{CC} = Pin 16
GND = Pin 8

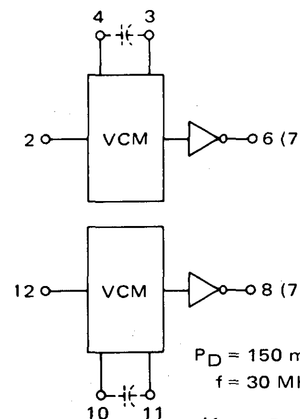
7

MCC4024/MCC4324
Dual Voltage Controlled Multivibrator

66 x 53
(54H)



PIN CONNECTIONS

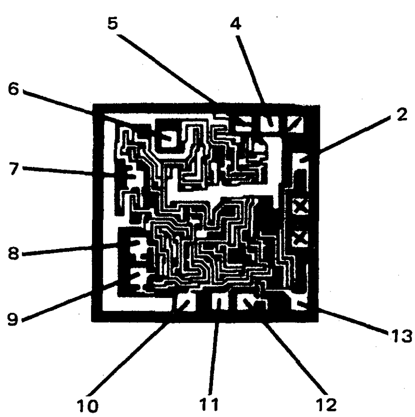


P_D = 150 mW typ/pkg
f = 30 MHz typ

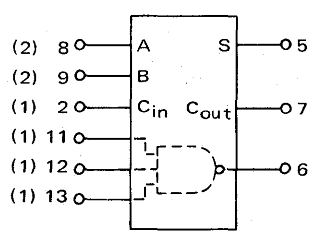
V_{CC} = Pin 13 & 1, 14
GND = Pin 5, 9, 7

MCC4026/MCC4326
Full Adder

58 x 60
(33K)



PIN CONNECTIONS

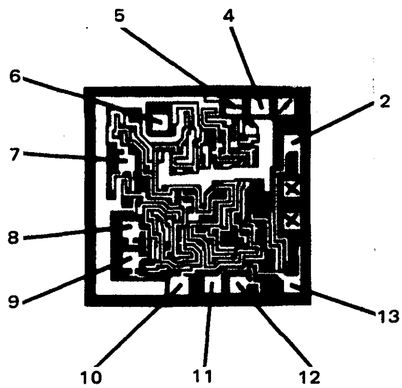


t_{pd} = (Add Delay) = 25 ns typ
t_{pd} (Carry Delay) = 13 ns typ
P_D = 90 mW typ/pkg

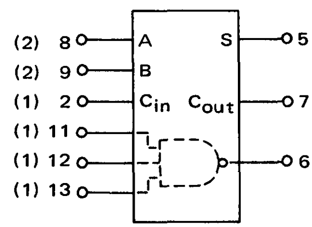
V_{CC} = Pin 4
GND = Pin 10

MCC4027/MCC4327
Full Adder

58 x 60
(33K)



PIN CONNECTIONS

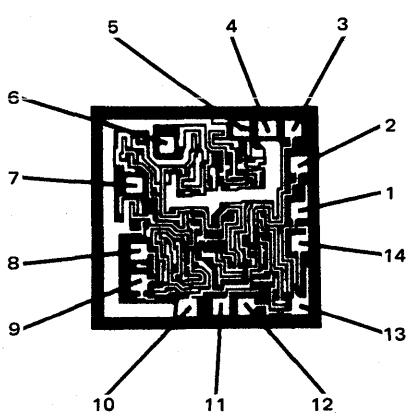


t_{pd} = (Add Delay) = 25 ns typ
t_{pd} (Carry Delay) = 13 ns typ
P_D = 90 mW typ/pkg

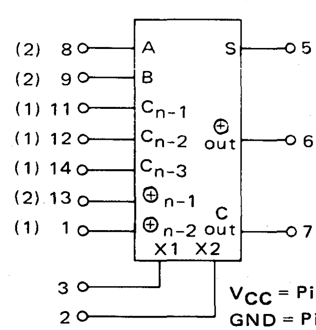
V_{CC} = Pin 4
GND = Pin 10

MCC4028/MCC4328
Adder (dependent carry)

58 x 60
(33K)



PIN CONNECTIONS

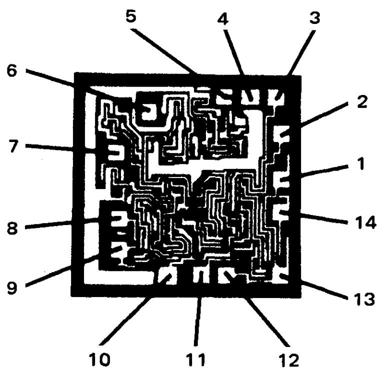


V_{CC} = Pin 4
GND = Pin 10

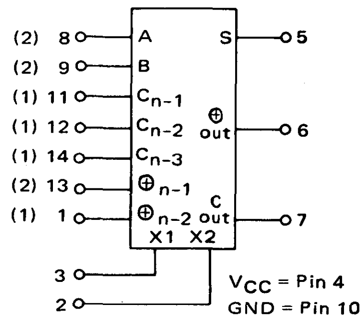
t_{pd} = (Add Delay) = 25 ns typ
t_{pd} (Carry Delay) = 13 ns typ
P_D = 125 mW typ/pkg

MCC4029/MCC4329
Adder (dependent carry)

58 x 60
(33K)



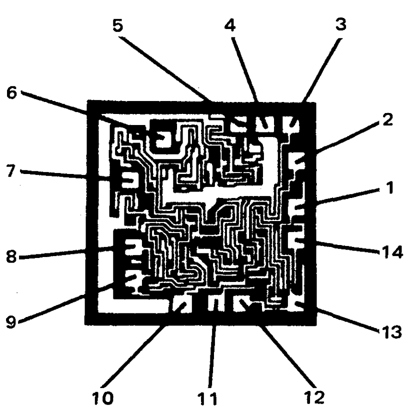
PIN CONNECTIONS



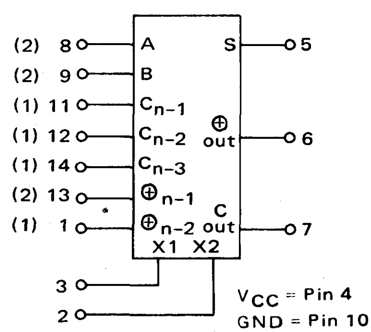
t_{pd} = (Add Delay) = 25 ns typ
t_{pd} (Carry Delay) = 13 ns typ
P_D = 125 mW typ/pkg

MCC4030/MCC4330
Adder (independent carry)

58 x 60
(33K)



PIN CONNECTIONS

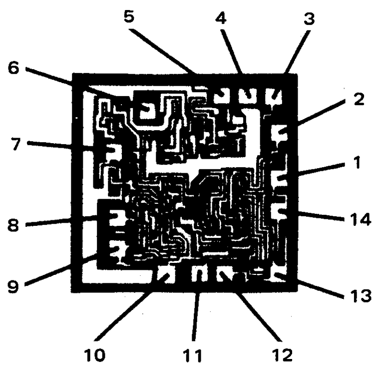


t_{pd} = (Add Delay) = 25 ns typ
t_{pd} (Carry Delay) = 13 ns typ
P_D = 125 mW typ/pkg

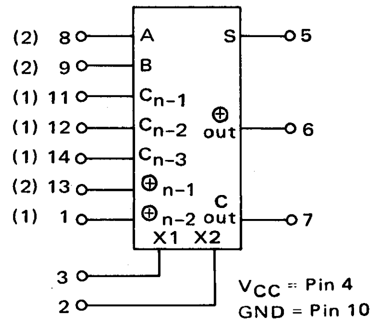
7

MCC4031/MCC4331
Adder (independent carry)

58 x 60
(33K)



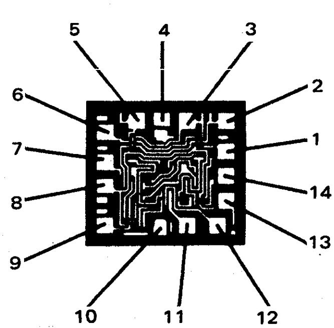
PIN CONNECTIONS



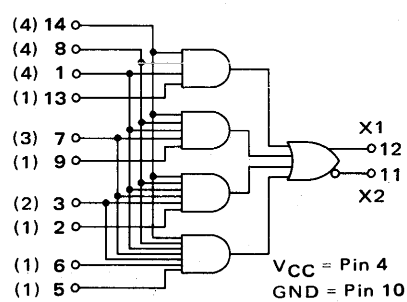
t_{pd} = (Add Delay) = 25 ns typ
t_{pd} (Carry Delay) = 13 ns typ
P_D = 125 mW typ/pkg

MCC4032/MCC4332
Carry Decoder

39 x 43
(50K)



PIN CONNECTIONS

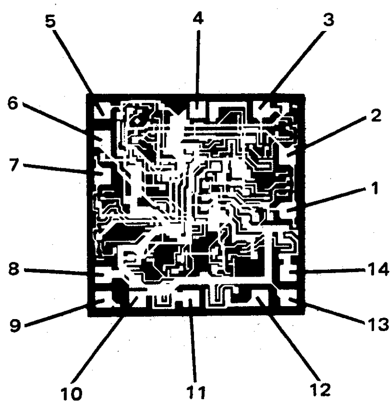


Δt_{pd} = 4.0 ns typ/decoder
1.0 ns typ/pF at expander nodes
P_D = 20 mW typ/pkg

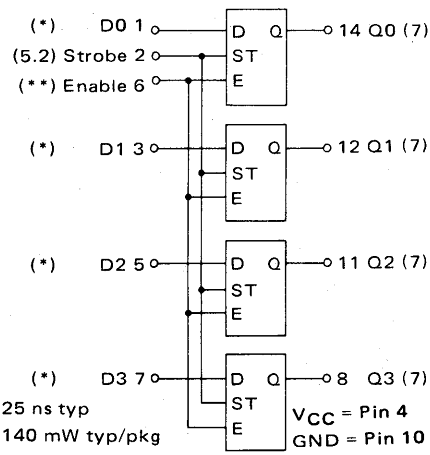
7

MCC4035/MCC4335
Quad Latch (open collector)

60 x 61
(1DB)



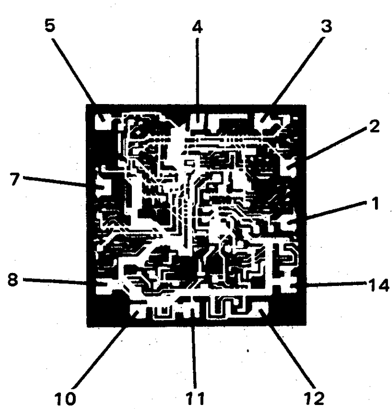
PIN CONNECTIONS



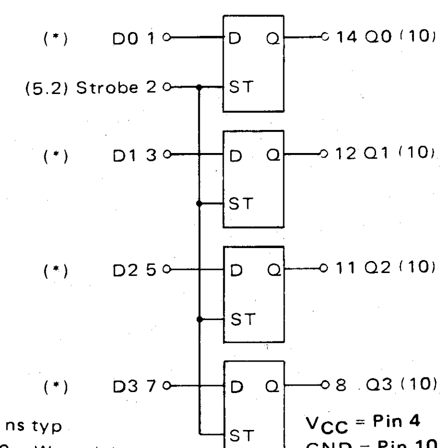
t_{pd} = 25 ns typ
P_D = 140 mW typ/pkg

MCC4037/MCC4337
Quad Latch

60 x 61
(1DB)



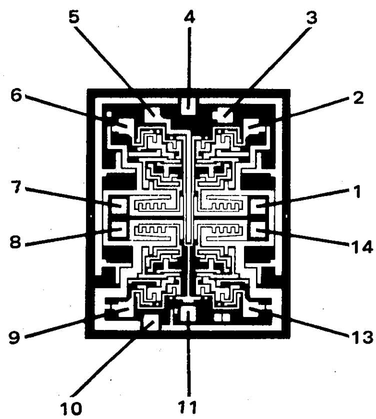
PIN CONNECTIONS



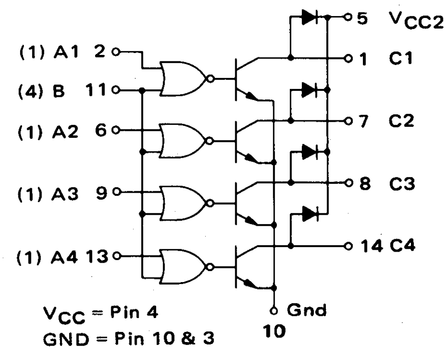
t_{pd} = 25 ns typ
P_D = 150 mW typ/pkg

MCC4042/MCC4342
Quad Predriver

55 x 67
(31E)



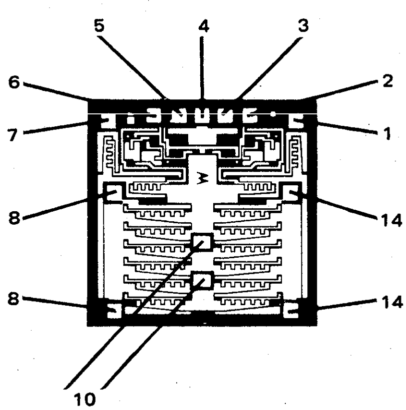
PIN CONNECTIONS



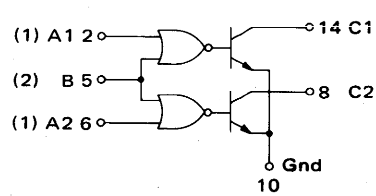
t_{pd} = 15 ns typ
P_D = 120 mW typ/pkg

MCC4043/MCC4343
Dual Line Selector

61 x 61
(32E)



PIN CONNECTIONS

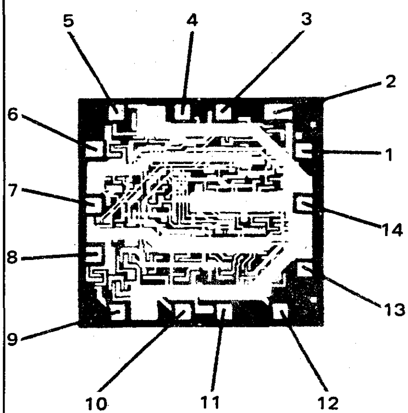


t_{pd} = 20 ns typ
P_D = 70 mW typ/pkg

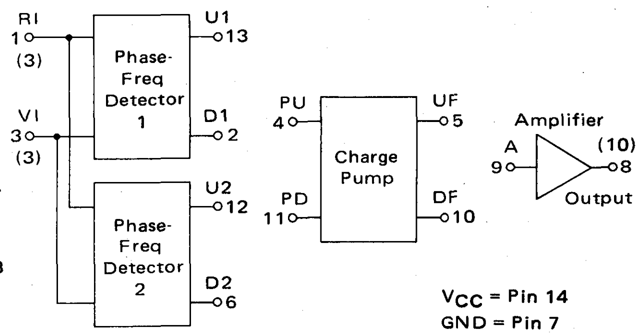
V_{CC} = Pin 4
GND = Pin 10 & 3

MCC4044/MCC4344
Phase Frequency Detector

62 x 66
(46K)



PIN CONNECTIONS

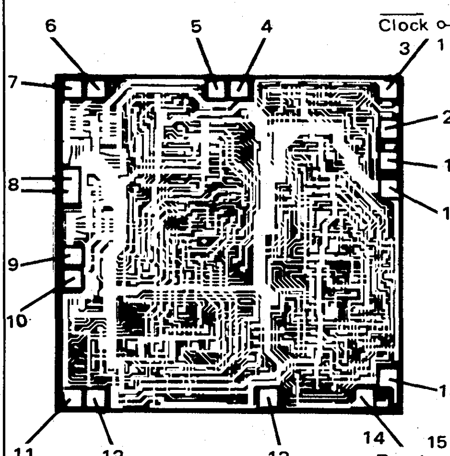


V_{CC} = Pin 14
GND = Pin 7

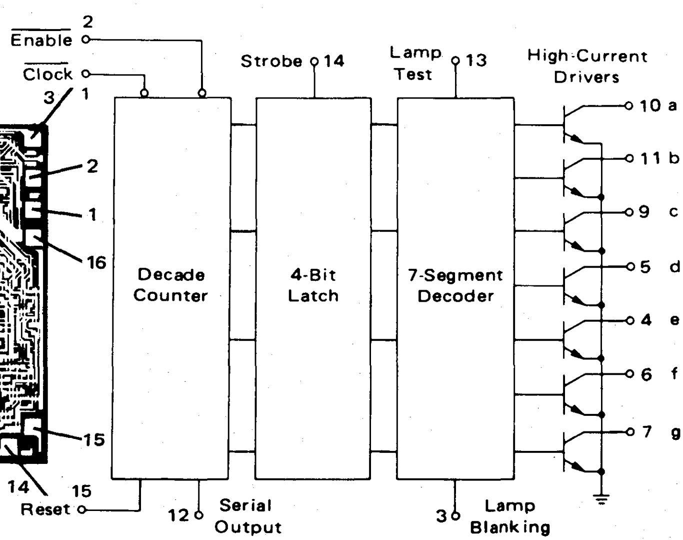
t_{pd} (thru phase detector) = 9.0 ns typ
P_D = 85 mW typ/pkg

MCC4050/74450/MCC4350/54450
Counter-Latch Decoder/Driver

92 x 94
(09R)



PIN CONNECTIONS

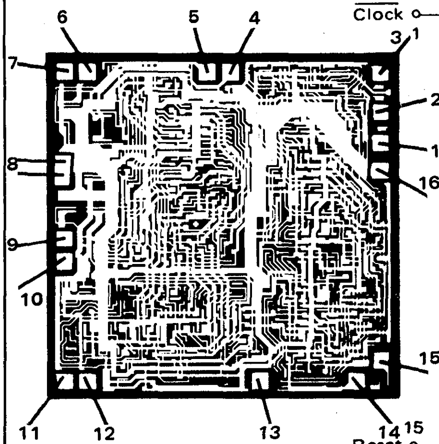


f_{Tog} = 35 MHz typ
P_D = 450 mW typ/pkg

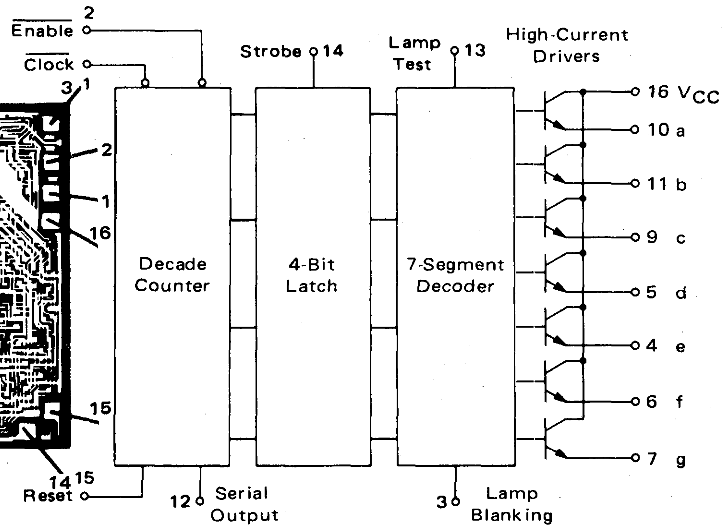
V_{CC} = Pin 16
GND = Pin 8

MCC4051/MCC4351
Counter-Latch Decoder/Driver

92 x 94
(09R)



PIN CONNECTIONS

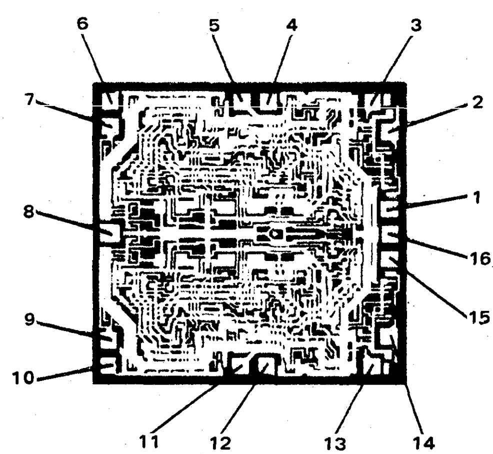


f_{Tog} = 35 MHz typ
P_D = 450 mW typ/pkg

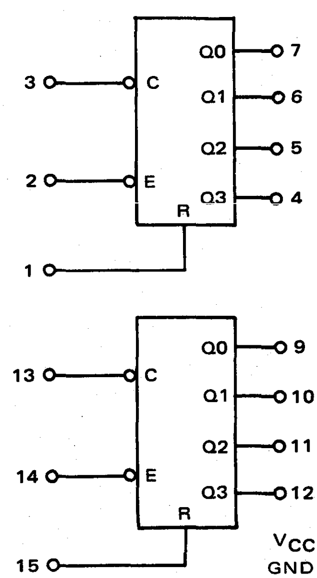
V_{CC} = Pin 16
GND = Pin 8

MCC4052/74452/MCC4352/54452
Dual Decade Counter

80 x 84
(91R)



PIN CONNECTIONS

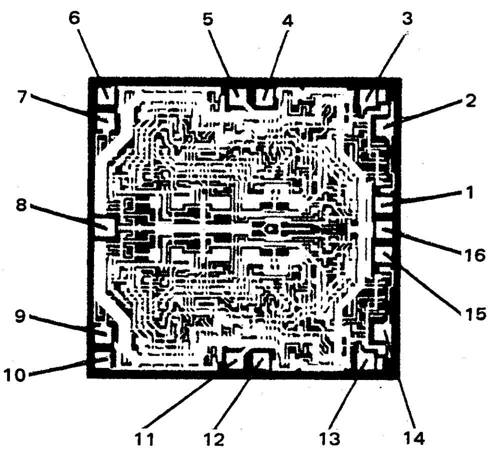


V_{CC} = Pin 16
GND = Pin 8

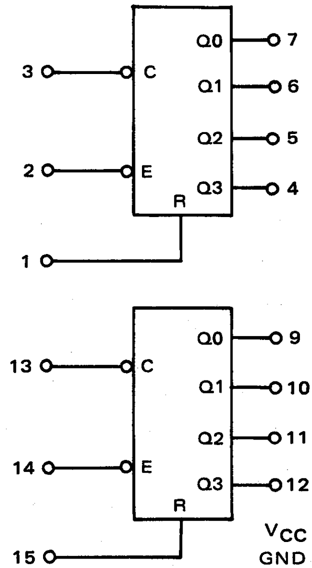
7

MCC4053/74453/MCC4353/54453
Dual Hexadecimal Counter

80 x 84
(91R)



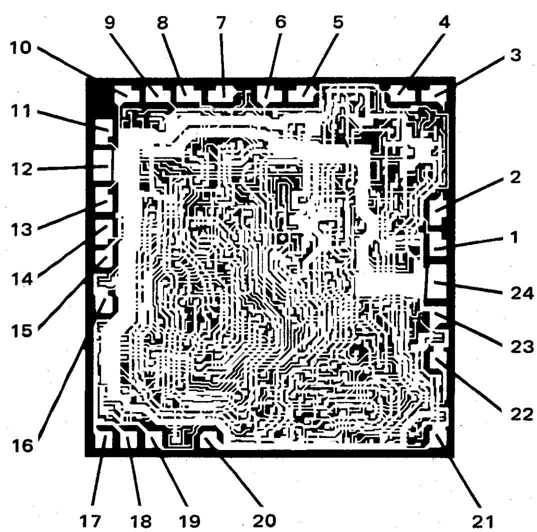
PIN CONNECTIONS



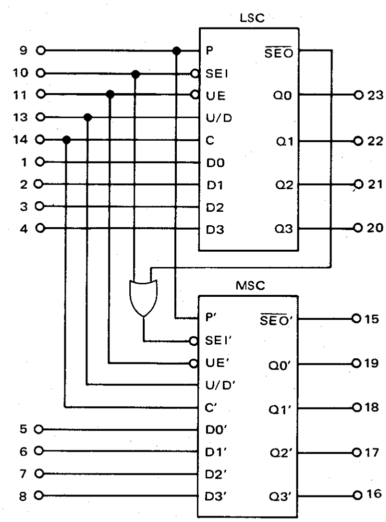
V_{CC} = Pin 16
GND = Pin 8

MCC4054/74454/MCC4354/54454
Dual Decade Up/Down Counter

102 x 99
(66W)



PIN CONNECTIONS

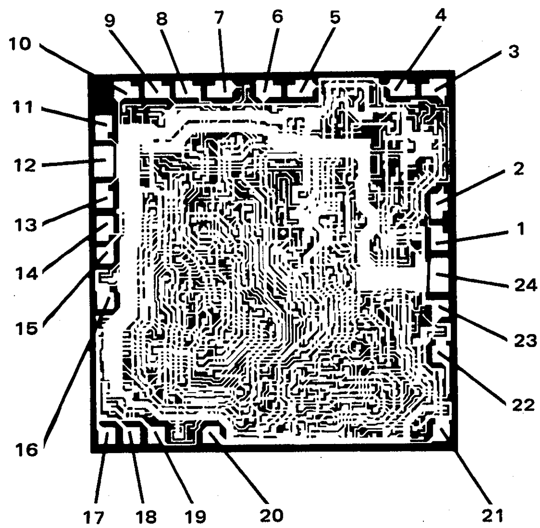


V_{CC} = Pin 24
Gnd = Pin 12

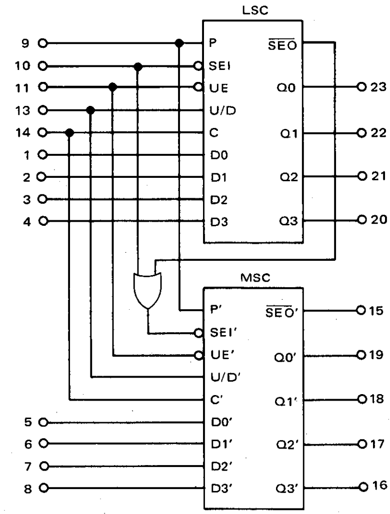
7

MCC4055/74455/MCC4355/54455
Dual Binary Up/Down Counter

102 x 99
(66W)



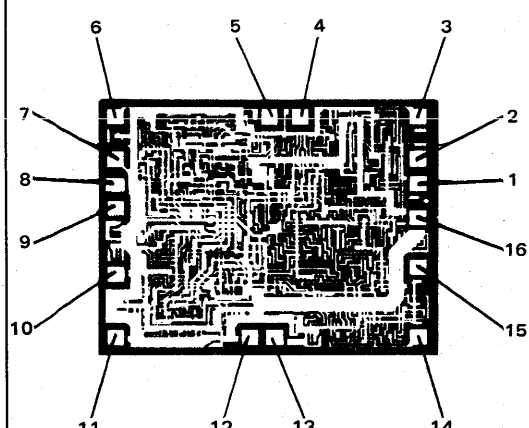
PIN CONNECTIONS



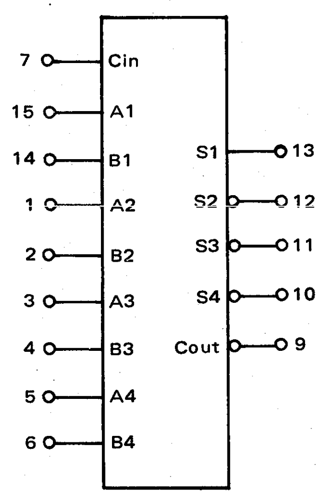
V_{CC} = Pin 24
Gnd = Pin 12

MCC4056/74456/MCC4356
NBCD Adder

69 x 90
(74V)



PIN CONNECTIONS

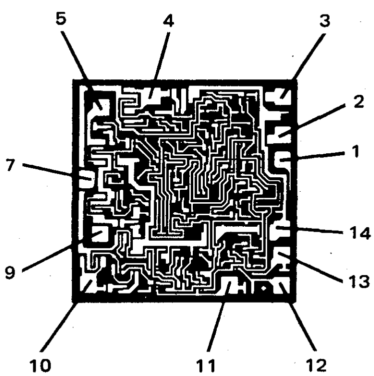


V_{CC} = Pin 16
GND = Pin 8

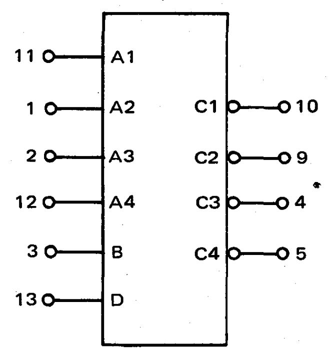
7

MCC4058/74458/MCC4358/54458
Nines Complement/Zero Element

61 x 62
(1DK)



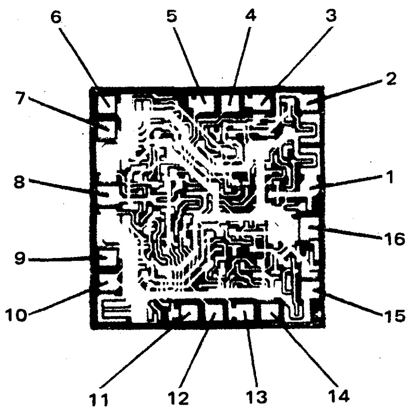
PIN CONNECTIONS



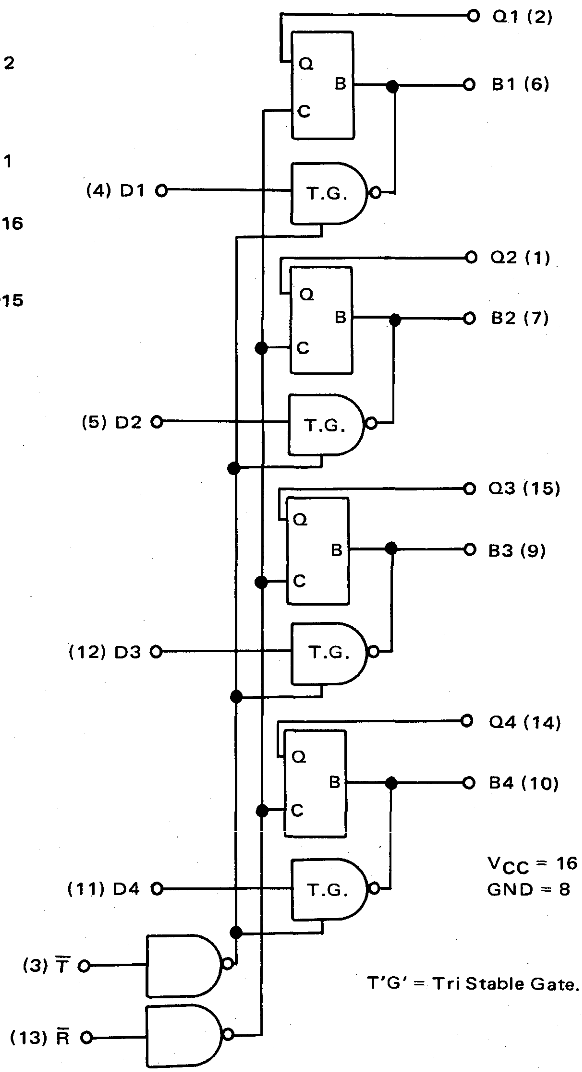
V_{CC} = Pin 14
GND = Pin 7

MCC4060/74460/MCC4360/54460
Bus Transfer Switch

64 x 66
(38T)



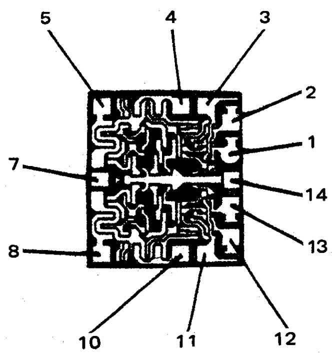
PIN CONNECTIONS



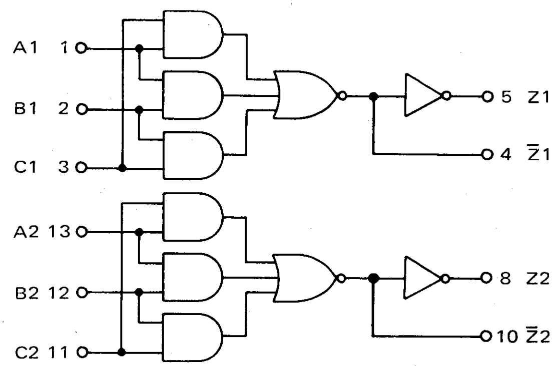
7

MCC4062/MCC4362
Dual Majority Logic Gate

50 x 45
(62T)



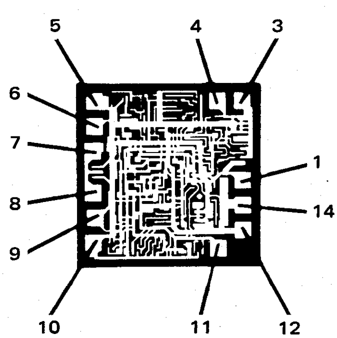
PIN CONNECTIONS



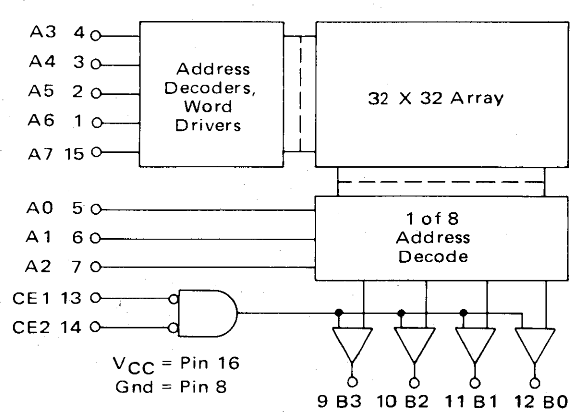
t_{pd} = 20 ns typ (Z Output)
11 ns typ ($\bar{Z}$ Output)
P_D = 75 mW typ/pkg

MCC4068/74468/MCC4368/54468
Dual MOS to TTL Level Translator

50 x 50
(2AG)



PIN CONNECTIONS



V_{CC} = Pin 16
Gnd = Pin 8

7

MTTL – SUHL COMPLEX FUNCTIONS

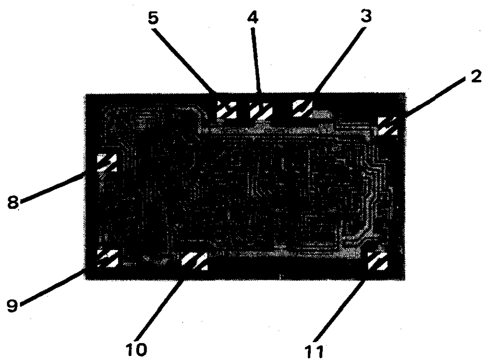
MCC5xx2 Series
MCC5xx3 Series } **(0 to +75°C)**
MCC5xx0 Series
MCC5xx1 Series } **(–55 to +125°C)**

These complex functions are designed for digital applications in the medium to high-speed range, with significant reduction in package count and increased logic per function over devices in the basic MTTL-SUHL family.

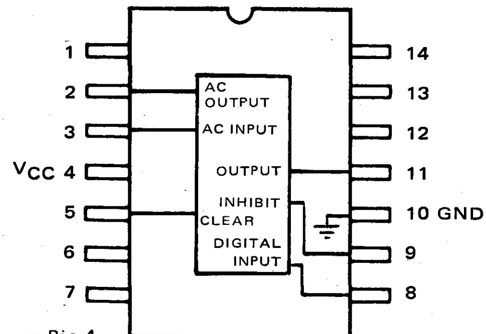
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC5092	MCC5090	Fixed Frequency Decade Divider	12V	80x48
MCC5113	MCC5111	4-Bit Shift Register	13V	89x68
MCC5123	MCC5121	Dual 4-Bit Parity Generator Checker	14V	86x55
MCC5133	MCC5131	Dual 4-Bit Comparator	14V	86x55
MCC5143	MCC5141	Binary Programmable Divider	15V	93x84
MCC5153	MCC5151	BCD Programmable Divider	4LW	82x81
MCC5163	–	4-Bit Binary Counter	16V	78x72
MCC5173	–	4-Bit BCD Counter	16V	78x72
MCC5183	MCC5181	4-Bit Binary Up/Down Counter	17V	92x100
MCC5193	MCC5191	4-Bit BCD Up/Down Counter	17V	92x100

MCC5092/MCC5090
Fixed Frequency Decade Divider

80 x 48
(13V)



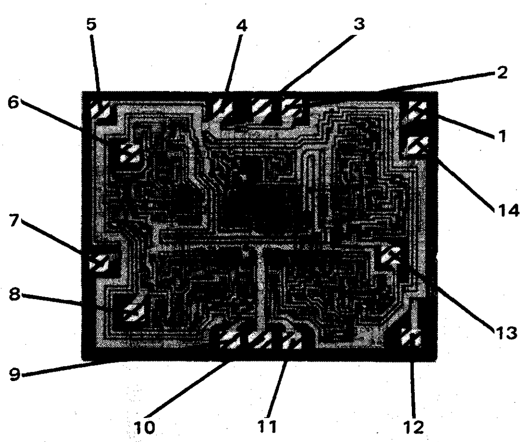
EQUIVALENT CIRCUIT AND PIN CONNECTIONS



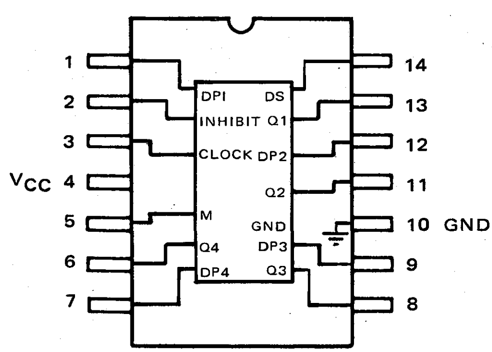
V_{CC} = Pin 4
GND = Pin 10

MCC5113/MCC5111
4-Bit Shift Register

89 x 68
(13V)



EQUIVALENT CIRCUIT AND PIN CONNECTIONS



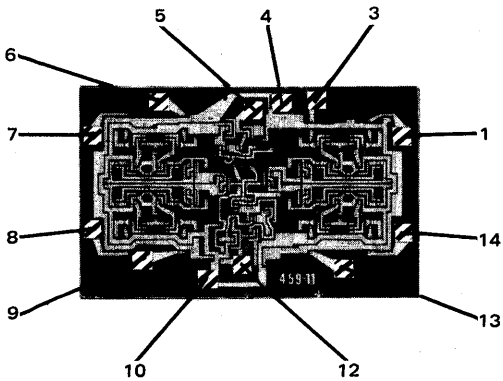
V_{CC} = Pin 4
GND = Pin 10

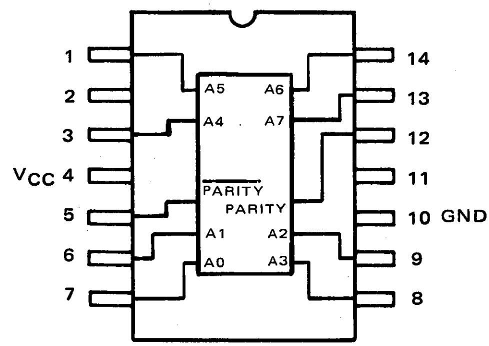
All dimensions are in mils.

MCC5123/MCC5121
Dual 4-Bit Parity Generator Checker

86 x 55
(14V)

EQUIVALENT CIRCUIT AND PIN CONNECTIONS



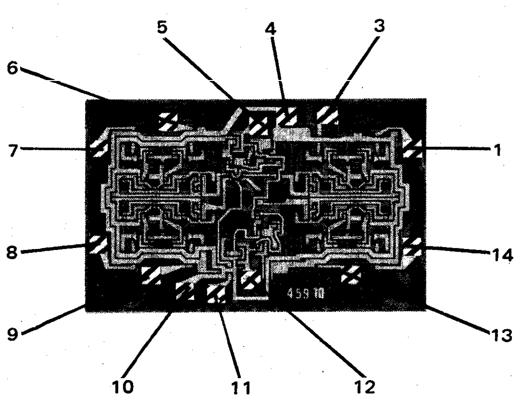


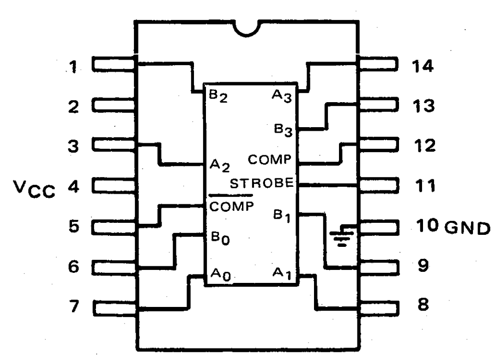
V_{CC} = Pin 4
GND = Pin 10

MCC5133/MCC5131
Dual 4-Bit Comparator

86 x 55
(14V)

EQUIVALENT CIRCUIT AND PIN CONNECTIONS



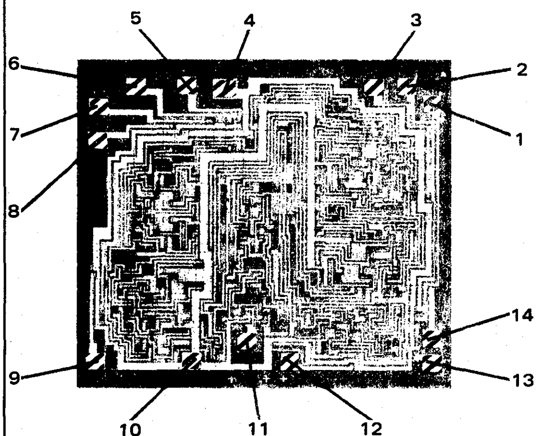


V_{CC} = Pin 4
GND = Pin 10

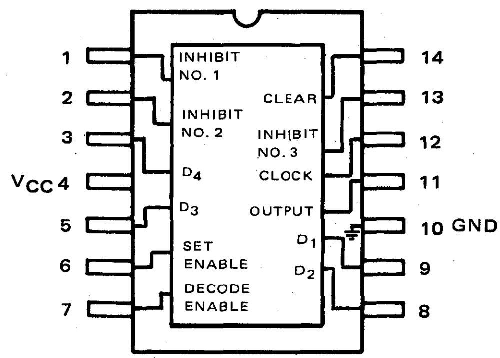
7

MCC5143/MCC5141
Binary Programmable Divider

93 x 84
(15V)



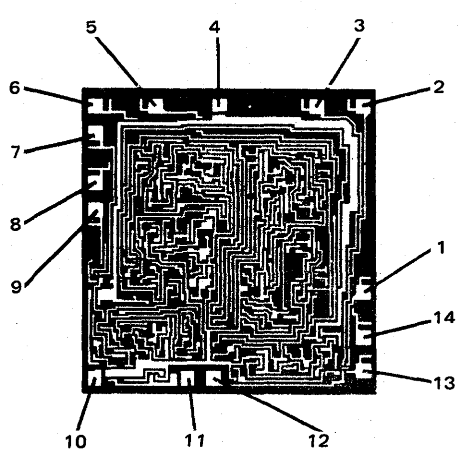
EQUIVALENT CIRCUIT AND PIN CONNECTIONS



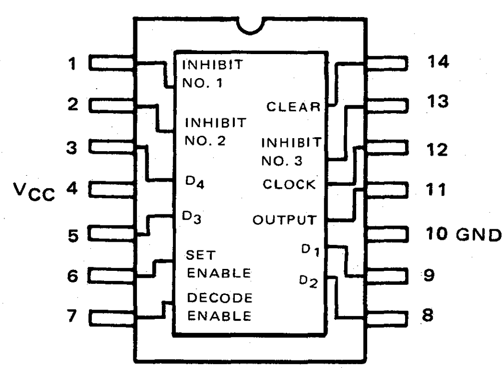
V_{CC} = Pin 4
GND = Pin 10

MCC5153/MCC5151
BCD Programmable Divider

82 x 81
(4LW)



EQUIVALENT CIRCUIT AND PIN CONNECTIONS

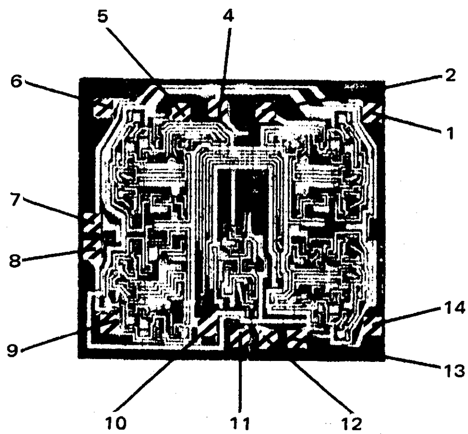


V_{CC} = Pin 4
GND = Pin 10

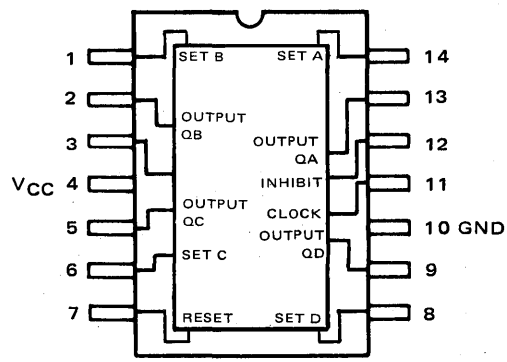
7

MCC5163
4-Bit Bianary Counter

78 x 72
(16V)



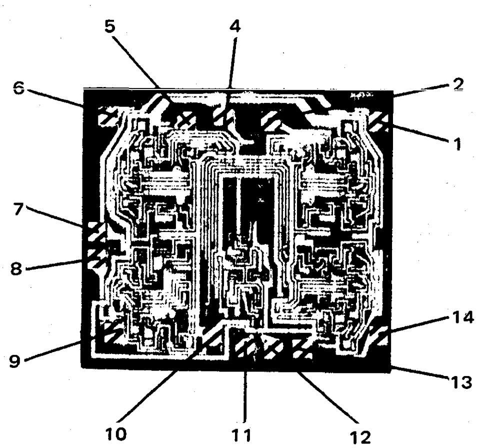
EQUIVALENT CIRCUIT
AND PIN CONNECTIONS



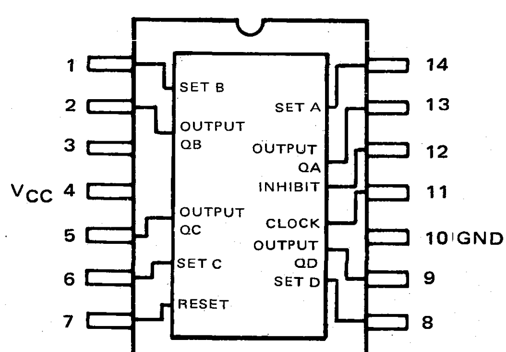
V_{CC} = Pin 4
GND = Pin 10

MCC5173
4-Bit BCD Counter

78 x 72
(16V)



EQUIVALENT CIRCUIT
AND PIN CONNECTIONS

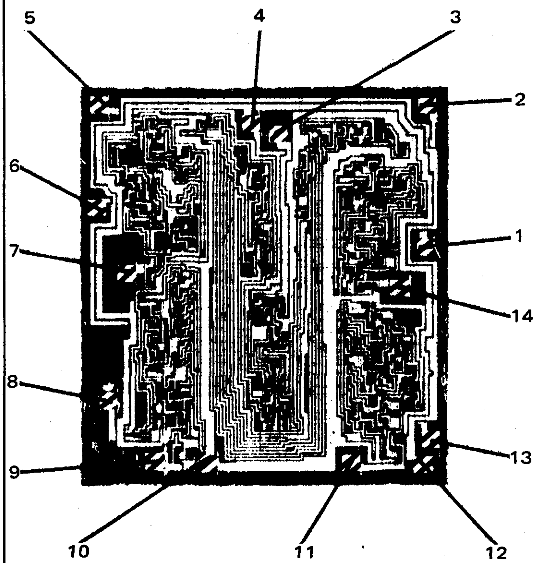


V_{CC} = Pin 4
GND = Pin 10

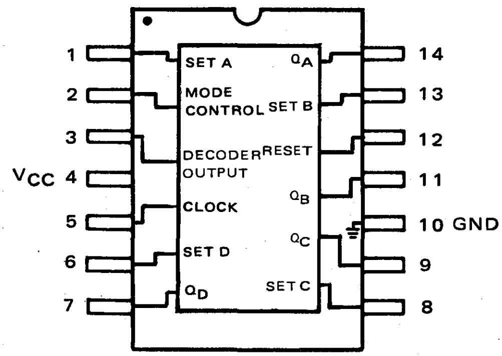
7

MCC5183/MCC5181
4-Bit Binary Up/Down Counter

92 x 100
(17V)

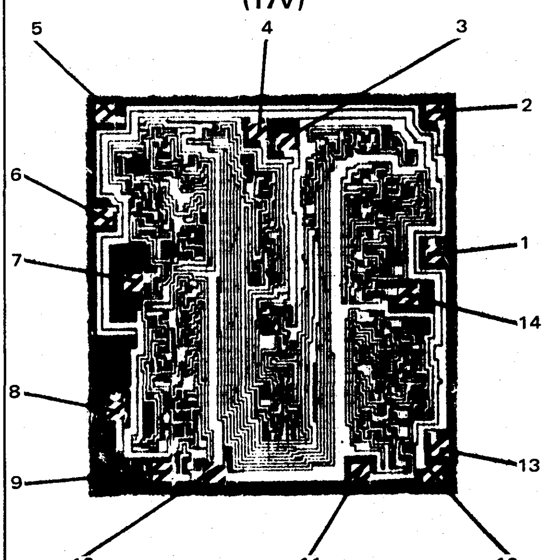


EQUIVALENT CIRCUIT
AND PIN CONNECTIONS

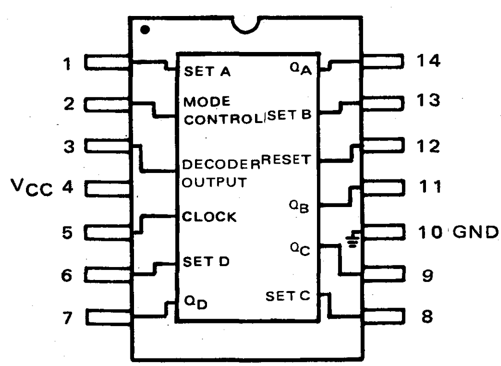


MCC5193/MCC5191
4-Bit BCD Up/Down Counter

92 x 100
(17V)



EQUIVALENT CIRCUIT
AND PIN CONNECTIONS



MCC54H00 Series (–55 to +125°C)
MCC74H00 Series (0 to +75°C)

These integrated circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a high operating speed (30-50 MHz clock rate), good external noise immunity, high fan-out, and the capability of driving lines up to 600 pF capacitance. Many of these devices have been replaced by Motorola's MCC3000/3100 Series; bonding diagrams are shown with that Series.

Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC74H00	MCC54H00	Quad 2-Input NAND Gate	5CA	46x49
MCC74H00F	MCC54H00F	Quad 2-Input NAND Gate	06L	50x50
MCC74H01	MCC54H01	Quad 2-Input NAND Gate (O.C.)	16K	43x46
MCC74H01F	MCC54H01F	Quad 2-Input NAND Gate (O.C.)	06L	50x50
MCC74H04	MCC54H04	Hex Inverter	09L	58x57
MCC74H05	MCC54H05	Hex Inverter	09L	58x57
MCC74H08	MCC54H08	Quad 2-Input AND Gate	5CA	46x49
MCC74H10	MCC54H10	Triple 3-Input NAND Gate	35T	46x46
MCC74H10F	MCC54H10F	Triple 3-Input NAND Gate	67M	45x47
MCC74H11	MCC54H11	Triple 3-Input AND Gate	35T	46x46
MCC74H11F	MCC54H11F	Triple 3-Input AND Gate	72H	62x47
MCC74H20	MCC54H20	Dual 4-Input NAND Gate	1GH	39x42
MCC74H20F	MCC54H20F	Dual 4-Input NAND Gate	31L	38x47
MCC74H21	MCC54H21	Dual 4-Input AND Gate	1GH	39x42
MCC74H21F	MCC54H21F	Dual 4-Input AND Gate	72H	62x47
MCC74H22	MCC54H22	Dual 4-Input NAND Gate (O.C.)	1GH	39x42
MCC74H22F	MCC54H22F	Dual 4-Input NAND Gate (O.C.)	31L	38x47
MCC74H30	MCC54H30	8-Input NAND Gate	88K	37x39
MCC74H40	MCC54H40	Dual 4-Input NAND Buffer Gate	6AL	42x42
MCC74H40F	MCC54H40F	Dual 4-Input NAND Buffer Gate	12M	43x44
MCC74H50	MCC54H50	Exp. Dual 2 Wide 2-Input AOI Gate	27W	41x41
MCC74H51	MCC54H51	Dual 2 Wide 2-Input AOI Gate	27W	41x41
MCC74H52	MCC54H52	Exp. 4 Wide 2-2-2-3 Input AND-OR Gate	97K	47x47
MCC74H53	MCC54H53	Exp. 4 Wide 2-2-2-3 Input AOI Gate	48K	39x45
MCC74H54	MCC54H54	4 Wide 2-2-2-3 Input AOI Gate	48K	39x45
MCC74H55	MCC54H55	Exp. 2 Wide 4-Input AOI Gate	93K	38x42
MCC74H60	MCC54H60	Dual 4-Input Exp. for AOI Gates	63A	33x37
MCC74H61	MCC54H61	Triple 3-Input Exp. for AND-OR Gates	99K	39x44
MCC74H62	MCC54H62	4 Wide 3-2-2-3 Input Exp. for AOI Gates	98K	37x37
MCC74H71	MCC54H71	OR Input J-K Flip-Flop	43H	63x63
MCC74H72	MCC54H72	AND Input J-K Flip-Flop	43H	63x63
MCC74H73	MCC54H73	Dual J-K Flip-Flop	60N	59x65
MCC74H74A	MCC54H74A	Dual D positive edge triggered FF	80V	65x62
MCC74H101	MCC54H101	AND-OR Gated J-K Neg. edge Triggered FF W/Preset	8AD	54x59
MCC74H103	MCC54H103	Dual J-K Neg. edge Triggered FF	6AD	65x79

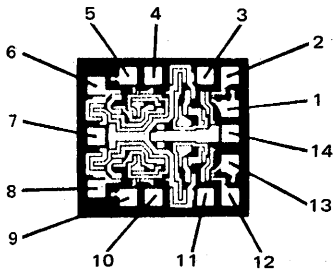
MCC5400 Series (–55 to +125°C)
MCC7400 Series (0 to +75°C)

MC5400/MC7400 Series SSI circuits comprise a family of transistor-transistor logic designed for general purpose digital applications. The family has a medium operating speed (15-30 MHz clock rate), good external noise immunity, high fan out, and the capability of driving capacitive loads of up to 600 pF.

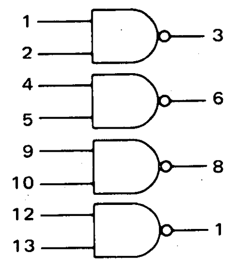
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC7400	MCC5400	Quad 2-Input NAND Gate	16K	43x46
MCC7400F	MCC5400F	Quad 2-Input NAND Gate	81L	43x50
MCC7401	MCC5401	Quad 2-Input NAND Gate (O.C.)	22K	40x44
MCC7402	MCC5402	Quad 2-Input NOR Gate	53T	43x49
MCC7403	MCC5403	Quad 2-Input NAND Gate (O.C.)	16K	43x46
MCC7404	MCC5404	Hex Inverter	1CR	48x51
MCC7405	MCC5405	Hex Inverter (O.C.)	1CR	48x51
MCC7406	MCC5406	Hex Inverter Buffer/Driver (O.C.)	2AW	47x51
MCC7407	MCC5407	Hex Buffer/Driver (O.C.)	2AW	47x51
MCC7408	MCC5408	Quad 2-Input AND Gate	23T	51x46
MCC7409	MCC5409	Quad 2-Input AND Gate (O.C.)	23T	51x46
MCC7410	MCC5410	Triple 3-Input NAND Gate	11N	46x41
MCC7410F	MCC5410F	Triple 3-Input NAND Gate	61N	43x44
MCC7411	MCC5411	Triple 3-Input AND Gate	85W	43x46
MCC7412	MCC5412	Triple 3-Input NAND Gate (O.C.)	11N	46x41
MCC7416	MCC5416	Hex Inverter Buffer/Driver (O.C.)	2AW	47x51
MCC7417	MCC5417	Hex Buffer/Driver	2AW	47x51
MCC7420	MCC5420	Dual 4-Input NAND Gate	51N	34x42
MCC7420F	MCC5420F	Dual 4-Input NAND Gate	90L	39x40
MCC7423	MCC5423	Dual 4-Input NOR Gate w/Strobe (Exp.)	5AG	41x49
MCC7425	MCC5425	Dual 4-Input NOR Gate w/Strobe	5AG	41x49
MCC7426	MCC5426	Quad 2-Input Interface NAND Gate	16K	43x46
MCC7427	MCC5427	Triple 3-Input NOR Gate	75W	46x44
MCC7430	MCC5430	8 Input NAND Gate	98L	34x35
MCC7437	MCC5437	Quad 2-Input Positive NAND Buffer	1AF	52x44
MCC7438	MCC5438	Quad 2-Input Positive NAND Buffer (O.C.)	1AF	52x44
MCC7440	MCC5440	Dual 4-Input NAND Buffer	10N	41x44
MCC7440F	MCC5440F	Dual 4-Input NAND Buffer	12M	43x44
MCC7450	MCC5450	Exp. Dual 2 Wide 2-Input AOI Gate	03R	41x42
MCC7451	MCC5451	Dual 2 Wide 2-Input AOI Gate	03R	41x42
MCC7453	MCC5453	Exp. 4 Wide 2-Input AOI Gate	11P	38x40
MCC7454	MCC5454	4 Wide 2-Input AOI Gate	11P	38x40
MCC7460	MCC5460	Dual 4-Input Exp. for AOI Gates	90B	36x49
MCC7470	MCC5470	AND Gated J-K FF Positive Edge Triggered	12N	56x60
MCC7472	MCC5472	AND Gated J-K Master Slave FF	56C	51x60
MCC7473	MCC5473	Dual J-K Flip-Flop	91M	66x66
MCC7474	MCC5474	Dual Positive Edge Triggered FF	80V	65x62
MCC7476	MCC5476	Dual J-K Flip-Flop	86N	71x65
MCC7479	MCC5479	Dual D Positive Edge Triggered FF	80V	65x62
MCC74107	MCC54107	Dual J-K Master Slave Flip-Flop	45P	69x63

43 x 46
(16K)

MCC7400, MCC5400
Quad 2-Input NAND Gate



PIN CONNECTIONS

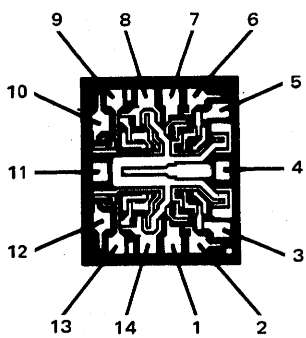


$3 = \overline{1 \cdot 2}$ t_{pd} = 10 ns typ

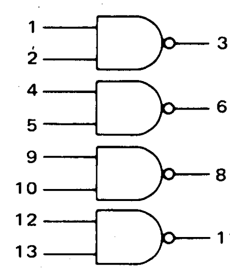
V_{CC} = Pin 14
Gnd = Pin 7

43 x 50
(81L)

MCC7400F/MCC5400F
Quad 2-Input NAND Gate



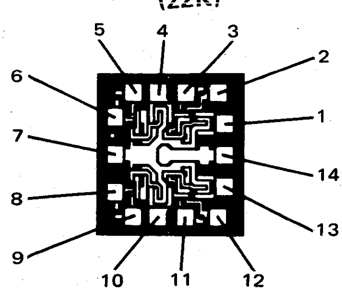
PIN CONNECTIONS



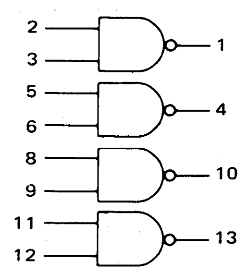
V_{CC} = Pin 14
Gnd = Pin 7

40 x 44
(22K)

MCC7401/MCC5401
Quad 2-Input NAND Gate
(Open Collector Output)



PIN CONNECTIONS



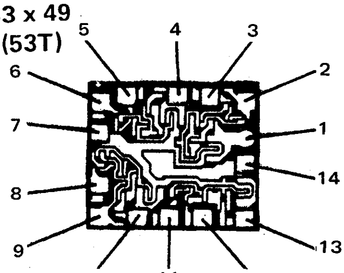
t_{pd} = 35 ns typ
$1 = \overline{2 \cdot 3}$

V_{CC} = Pin 14
Gnd = Pin 7

7

All dimensions are in mils.

43 x 49
(53T)

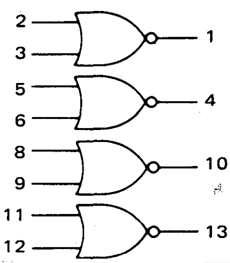


$1 = \overline{2+3}$ t_{pd} = 10 ns typ

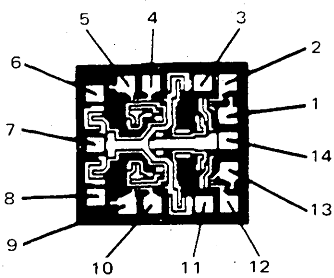
MCC7402/MCC5402
Quad 2-Input NOR Gate

V_{CC} = Pin 14
Gnd = Pin 7

PIN CONNECTIONS



43 x 46
(16K)

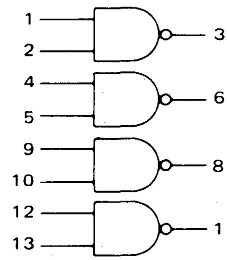


$3 = \overline{1 \cdot 2}$ t_{pd} = 35 ns typ

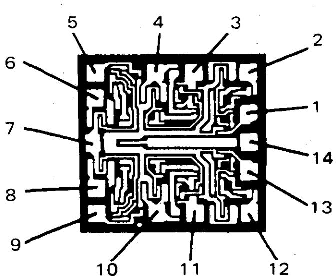
MCC7403/MCC5403
Quad 2-Input NAND Gate

V_{CC} = Pin 14
Gnd = Pin 7

PIN CONNECTIONS



48 x 51
(1CR)



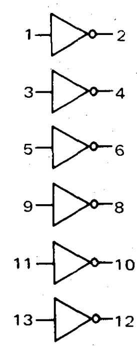
$2 = \overline{1}$

MCC7404/MCC5404
Hex Inverter

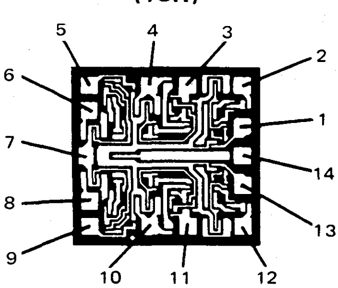
V_{CC} = Pin 14
Gnd = Pin 7

t_{pd} = 13 ns typ

PIN CONNECTIONS



48 x 51
(1CR)



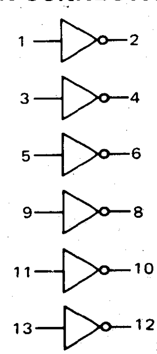
$2 = \overline{1}$

MCC7405/MCC5405
Hex Inverter
(Open Collector)

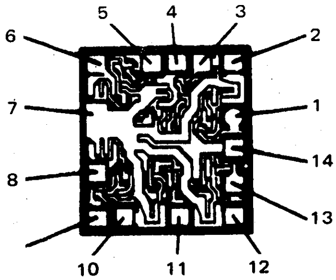
V_{CC} = Pin 14
Gnd = Pin 7

t_{pd} = 35 ns typ

PIN CONNECTIONS



MCC7406/MCC5406
Hex Inverter
Buffers/Drivers (open collectors)



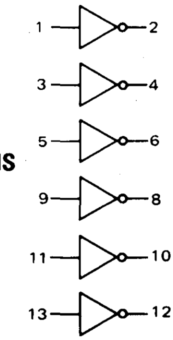
47 x 51
(2AW)

V_{CC} = Pin 14
Gnd = Pin 7

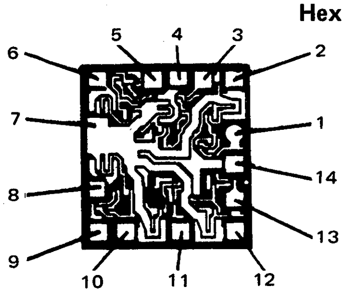
t_{pd} = 15 ns typ

$2 = \overline{1}$

PIN CONNECTIONS

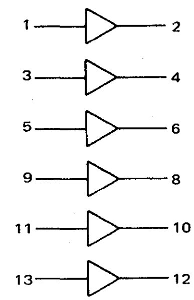


MCC7407/MCC5407
Hex Buffers/Drivers (open collectors)



47 x 51
(2AW)

PIN CONNECTIONS

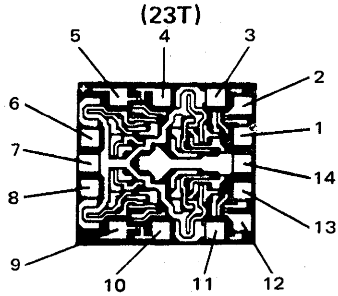


Positive Logic: 2 = 1

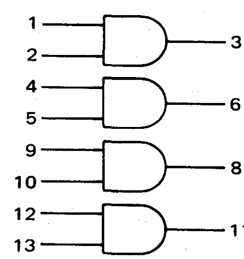
V_{CC} = Pin 14
Gnd = Pin 7

51 x 46
(23T)

MCC7408/MCC5408
Quad 2-Input AND Gate



PIN CONNECTIONS



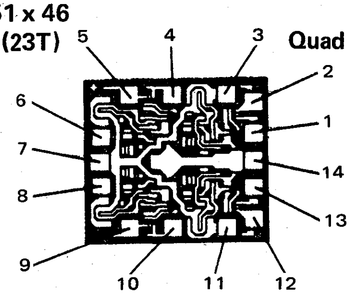
Positive Logic: $3 = 1 \cdot 2$

Negative Logic: $3 = 1 + 2$

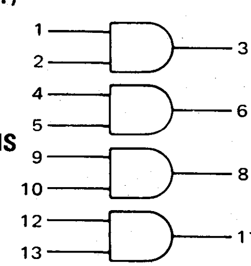
V_{CC} = Pin 14
Gnd = Pin 7

51 x 46
(23T)

MCC7409/MCC5409
Quad 2-Input AND Gate (open collector)



PIN CONNECTIONS



Positive Logic: $3 = 1 \cdot 2$

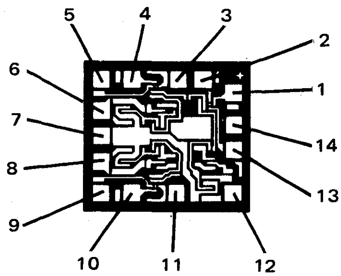
Negative Logic: $3 = 1 + 2$

V_{CC} = Pin 14
Gnd = Pin 7

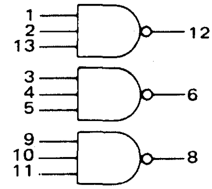
7

MCC7410/MCC5410
Triple 3-Input NAND Gate

46 x 41
(11N)



PIN CONNECTIONS



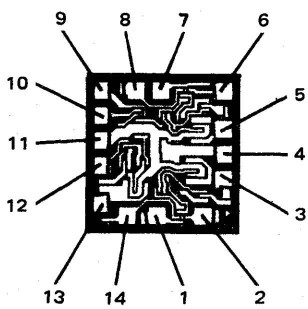
$12 = \overline{1 \cdot 2 \cdot 13}$

t_{pd} = 10 ns typ

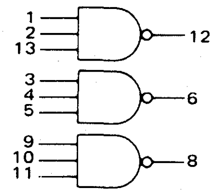
V_{CC} = Pin 14
Gnd = Pin 7

MCC7410F/MCC5410F
Triple 3-Input NAND Gate

43 x 44
(61N)



PIN CONNECTIONS



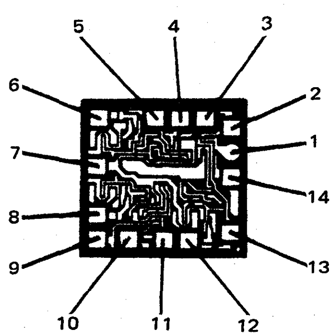
$12 = \overline{1 \cdot 2 \cdot 13}$

t_{pd} = 10 ns typ

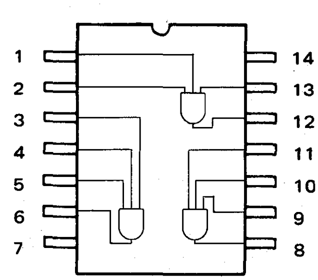
V_{CC} = Pin 14
Gnd = Pin 7

MCC7411/MCC5411
Triple 3-Input AND Gate

43 x 46
(85W)



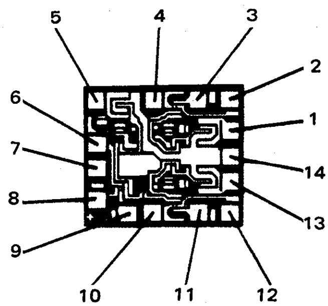
PIN CONNECTIONS



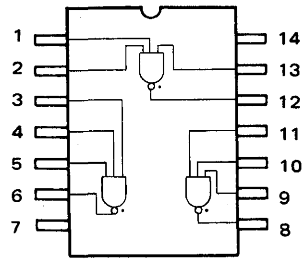
7

MCC7412/MCC5412
Triple 3-Input NAND Gate (open collector)

46 x 41
(11N)



PIN CONNECTIONS



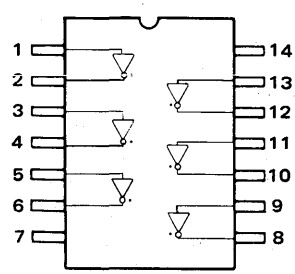
*Open Collector

MCC7416/MCC5416
Hex Inverter Buffer/Driver (open collector)

47 x 51
(2AW)

CONSULT FACTORY

PIN CONNECTIONS



*Open Collector

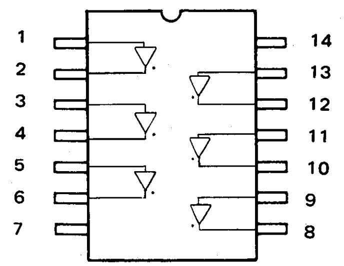
7

MCC7417/MCC5417
Hex Buffer/Driver

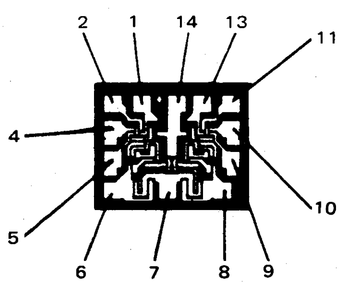
47 x 51
(2AW)

CONSULT FACTORY

PIN CONNECTIONS



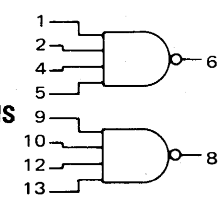
*Open Collector



MCC7420/MCC5420
Dual 4-Input NAND Gate

34 x 42
(5IN)

PIN CONNECTIONS

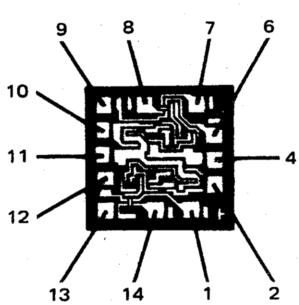


$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5}$

t_{pd} = 10 ns typ

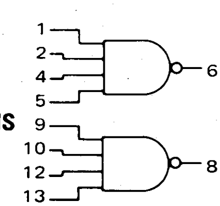
V_{CC} = Pin 14
Gnd = Pin 7

39 x 40
(90L)



MCC7420F/MCC5420F
Dual 4-Input NAND Gate

PIN CONNECTIONS



$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5}$

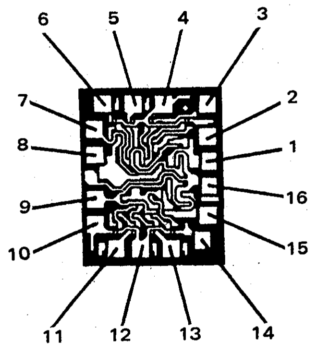
t_{pd} = 10 ns typ

V_{CC} = Pin 14
Gnd = Pin 7

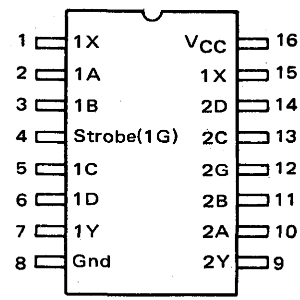
7

MCC7423/MCC5423
Dual 4-Input NOR Gate w/Strobe (expandable)

41 x 49
(5AG)



PIN CONNECTIONS

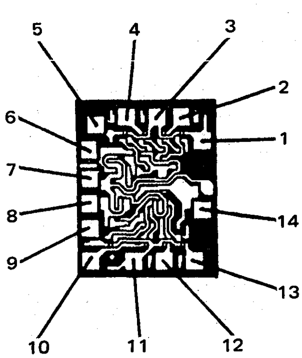


$1Y = \overline{1G(1A+1B+1C+1D)+X}$

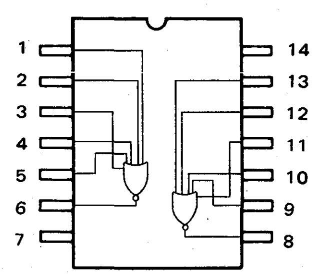
$2Y = \overline{2G(2A+2B+2C+2D)}$

MCC7425/MCC5425
Dual 4-Input NOR Gate w/strobe

41 x 49
(5AG)

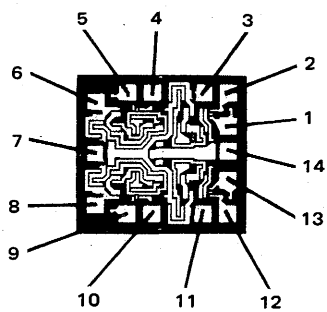


PIN CONNECTIONS

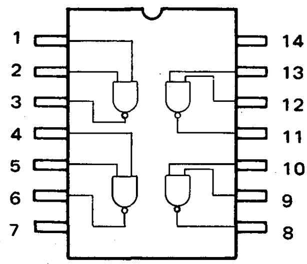


MCC7426/MCC5426
Quad 2-Input Interface NAND Gate

43 x 46
(16K)

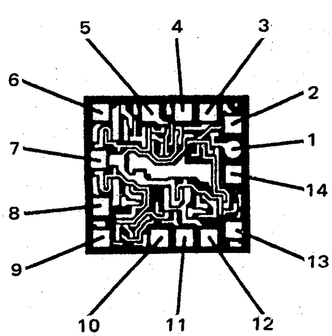


PIN CONNECTIONS

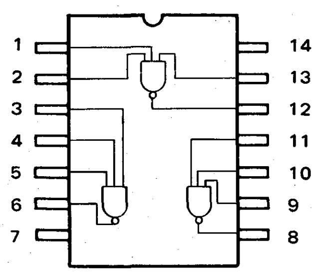


MCC7427/MCC5427
Triple 3-Input NOR Gate

46 x 44
(75W)

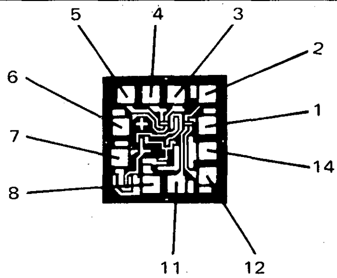


PIN CONNECTIONS



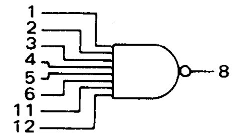
7

MCC7430/MCC5430
8 Input NAND Gate



34 x 35
(98L)

PIN CONNECTIONS

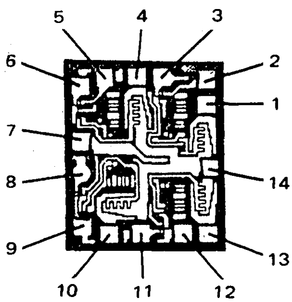


$8 = \overline{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 11 \cdot 12}$

t_{pd} = 10 ns typ

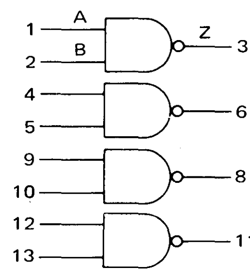
V_{CC} = Pin 14
Gnd = Pin 7

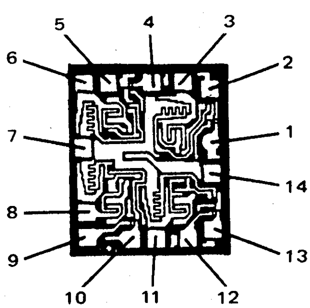
MCC7437/MCC5437
Quad Buffer



52 x 44
(1AF)

PIN CONNECTIONS





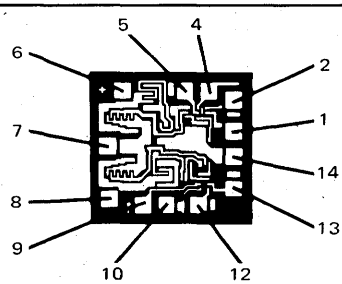
MCC7438/MCC5438

52 x 44
(1AF)

Positive Logic: $Z = \overline{A \bullet B}$
Negative Logic: $Z = \overline{A + B}$

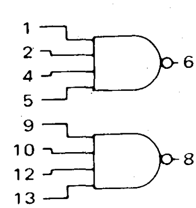
V_{CC} = Pin 14
Gnd = Pin 7

MCC7440/MCC5440
Dual 4-Input NAND Buffer



41 x 44
(10N)

PIN CONNECTIONS



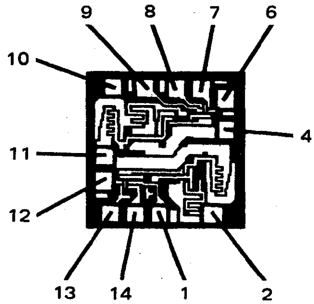
$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5}$

t_{pd} = 13 ns typ

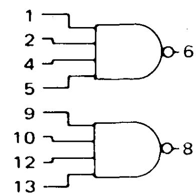
V_{CC} = Pin 14
Gnd = Pin 7

MCC7440F/MCC5440F
Dual 4-Input NAND Buffer

43 x 44
(12M)



PIN CONNECTIONS



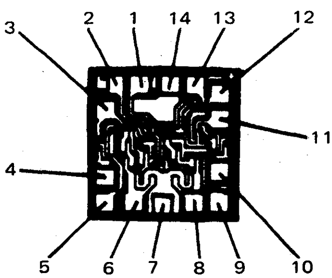
$6 = \overline{1 \cdot 2 \cdot 4 \cdot 5}$

t_{pd} = 13 ns typ

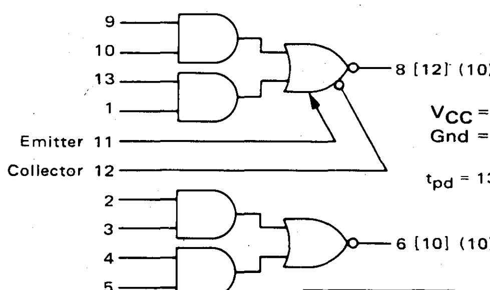
V_{CC} = Pin 14
Gnd = Pin 7

MCC7450/MCC5450
Expandable Dual 2 Wide 2 Input
AND OR INVERT Gate

41 x 42
(03R)



PIN CONNECTIONS

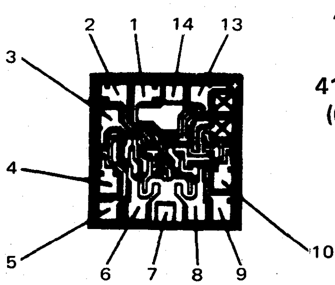


V_{CC} = Pin 14
Gnd = Pin 7

t_{pd} = 13 ns typ

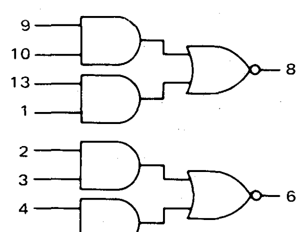
$8 = \overline{(9 \cdot 10) + (13 \cdot 1)}$ + (Expanders)

MCC7451/MCC5451
Dual 2 Wide 2 Input
AND OR INVERT Gate



41 x 42
(03R)

PIN CONNECTIONS



V_{CC} = Pin 14
Gnd = Pin 7

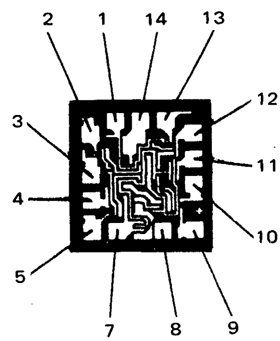
$8 = \overline{(9 \cdot 10) + (13 \cdot 1)}$

t_{pd} = 13 ns typ

7

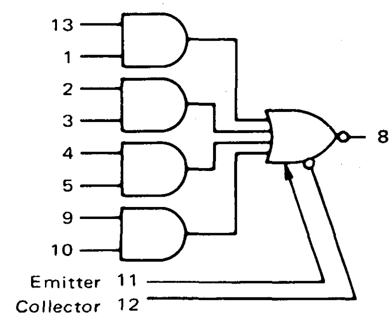
MCC7453/MCC5453
Expandable 4 Wide 2 Input
AND OR INVERT Gate

38 x 40
(11P)



Vcc = Pin 14
Gnd = Pin 7

PIN CONNECTIONS

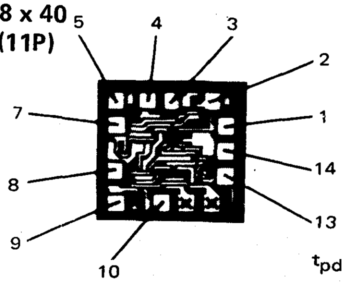


$8 = \overline{(13 \cdot 1) + (2 \cdot 3) + (4 \cdot 5) + (9 \cdot 10) + (\text{Expanders})}$

t_{pd} - 13 ns typ

MCC7454/MCC5454
4 Wide 2 Input
AND OR INVERT Gate

38 x 40
(11P)

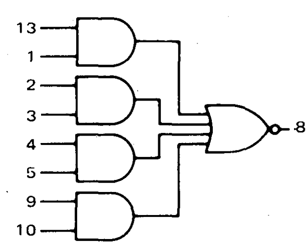


V_{CC} = Pin 14
Gnd = Pin 7

t_{pd} = 13 ns typ

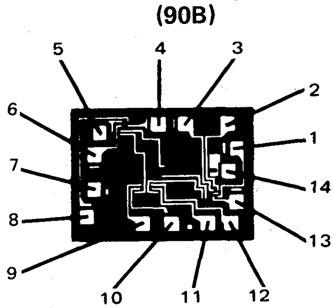
$8 = \overline{(13 \cdot 1) + (2 \cdot 3) + (4 \cdot 5) + (9 \cdot 10)}$

PIN CONNECTIONS



MCC7460/MCC5460
Dual 4 Input Expander for
AND OR INVERT Gates

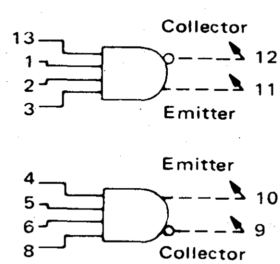
36 x 49
(90B)



PIN CONNECTIONS

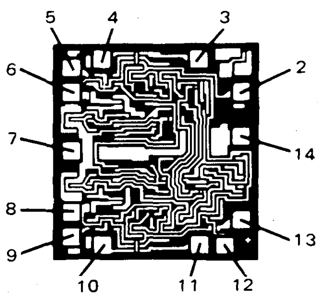
V_{CC} = Pin 14
Gnd = Pin 7

t_{pd} = 5.0 ns typ

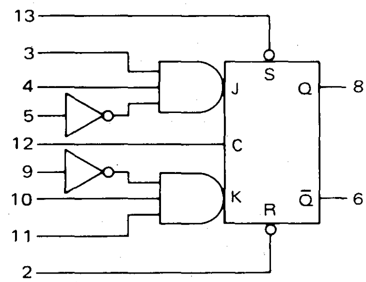


MCC7470/MCC5470
AND Gated J-K Flip Flop Positive Edge Triggered

56 x 60
(12N)



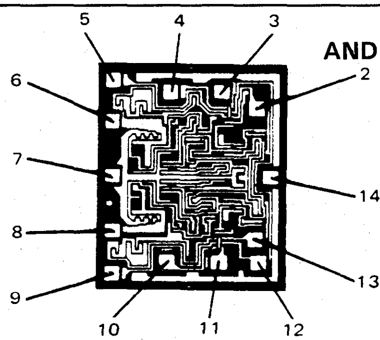
PIN CONNECTIONS



V_{CC} = Pin 14
Gnd = Pin 7

t_{pd} = 30 ns typ

MCC7472/MCC5472
AND Gated J-K Master Slave F-F

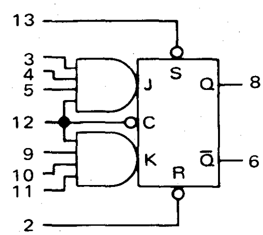


51 x 60
(56C)

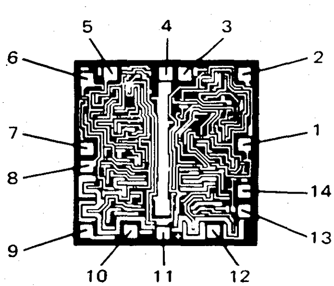
V_{CC} = Pin 14
Gnd = Pin 7

f = 20 MHz

PIN CONNECTIONS

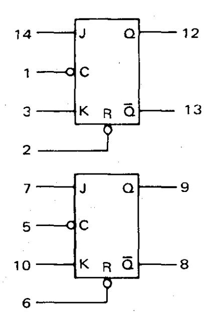


MCC7473/MCC5473
Dual J-K Flip Flop



66 x66
(91M)

PIN CONNECTIONS

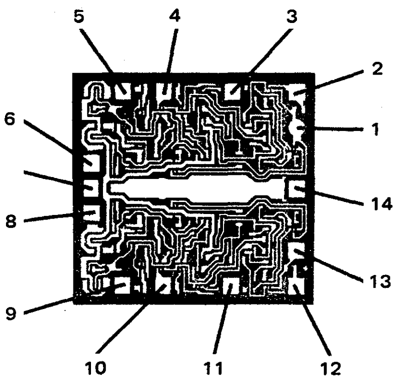


V_{CC} = Pin 4, Gnd = Pin 11

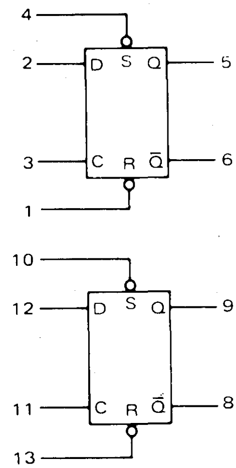
7

MCC7474/MCC5474
Dual Positive Edge Triggered Flip Flop

65 x 62
(80V)

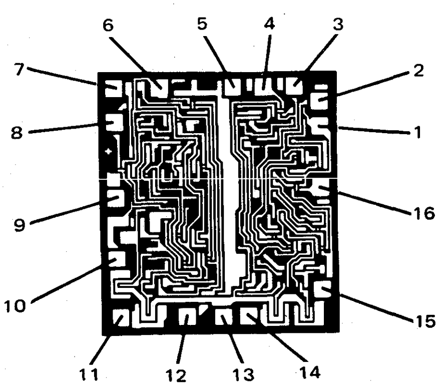


PIN CONNECTIONS



MCC7476/MCC5476
Dual J-K Flip Flop

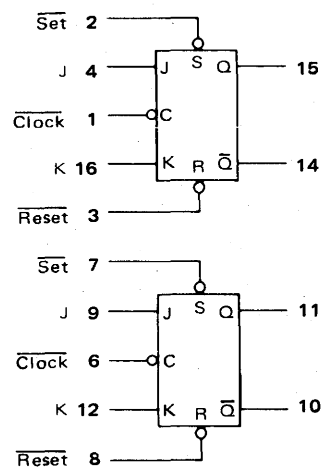
71 x 65
(86N)



f = 15 MHz

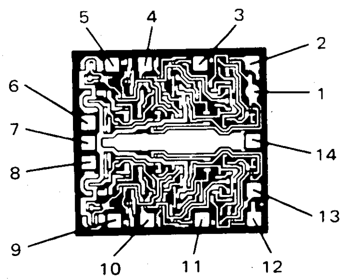
16 Pin Package
V_{CC} = Pin 5, Gnd = Pin 13

PIN CONNECTIONS



MCC7479/MCC5479
Dual Type D Flip Flop Positive Edge Triggered

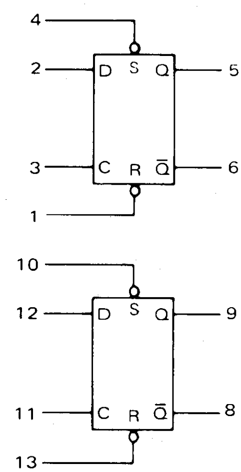
65 x 62
(80V)



f = 30 MHz

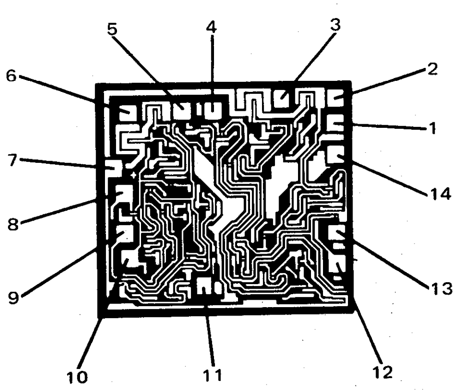
V_{CC} = Pin 14
Gnd = Pin 7

PIN CONNECTIONS



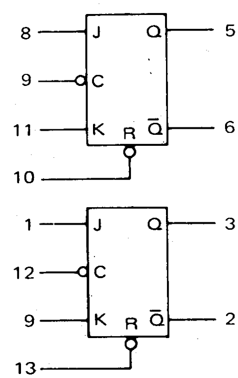
MCC74107/MCC54107
Dual J-K Master Slave Flip Flop

69 x 63
(45P)



V_{CC} = Pin 14
Gnd = Pin 7

PIN CONNECTIONS



7

MCC5400 Series (–55 to +125°C)
MCC7400 Series (0 to +75°C)

MC5400/7400 Series MSI circuits comprise a family of transistor-transistor logic similar in design to the SSI series but more complex in function. The family has a medium operating speed (15-30 MHz clock rate), good external noise immunity, high fan out, and capability of driving capacitive loads of up to 600 pF.

Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC74H87	MCC54H87	4-Bit True/Complement Zero/One Element	8GM	69x72
MCC7413	MCC5413	Dual 4-Input NAND Gate Schmitt Trigger	7KB	40x42
MCC7414	MCC5414	Hex Schmitt Trigger Inverter	2JA	56x62
MCC7441A	MCC5441A	BCD to Decimal Decoder/High Level Driver	17F	74x79
MCC7442	MCC5442	BCD to Decimal Decoder	6FE	64x66
MCC7443	MCC5443	Excess Three-to-Decimal Decoder	29R	68x67
MCC7444	MCC5444	Excess Three Gray to Decimal Decoder	29R	68x67
MCC7445	MCC5445	BCD to Decimal Decoder/Driver	96M	79x87
MCC7446	MCC5446	BCD to seven Segment Decoder/Driver	83M	65x76
MCC7447	MCC5447	BCD to seven Segment Decoder/Driver	83M	65x76
MCC7448	MCC5448	BCD to seven Segment Decoder/Driver	01L	88x79
MCC7449	MCC5449	BCD to seven Segment Decoder/Driver	01L	88x79
MCC7475	MCC5475	Quad Latch	7AJ	62x68
MCC7480	MCC5480	Gated Full Adder (1-Bit)	10L	58x58
MCC7481	MCC5481	16-Bit Scratch Pad Memory	1PR	77x82
MCC17482	MCC15482	2 Bit Full Adder	13E	65x82
MCC27482	MCC25482	2 Bit Full Adder	13E	65x82
MCC7483	MCC5483	4-Bit Full Adder	10M	69x80
MCC7484	MCC5484	16-Bit Scratch Pad Memory	1PR	77x82
MCC7485	MCC5485	4-Bit Magnitude Comparator	7GK	65x77
MCC7486	MCC5486	Quadruple 2-Input Exclusive OR Gate	8GM	69x72
MCC7490A	MCC5490A	Decade Counter	3HT	69x71
MCC7491A	MCC5491A	8-Bit Shift Register	05R	59x72
MCC7492A	MCC5492A	Divide by 12 Counter	3HT	69x71
MCC7493A	MCC5493A	4-Bit Binary Counter	3HT	69x71
MCC7494	MCC5494	4-Bit Shift Register	66N	66x76
MCC7495A	MCC5495A	4-Bit Shift Register (Parallel Access)	6RP	64x88
MCC7496	MCC5496	5-Bit Shift Register	8BG	86x77
MCC7497	MCC5497	Synchronous 6-Bit Binary Rate Multiplier	7MG	94x101
MCC74100	MCC54100	Dual 4-Bit Latch	31R	70x72
MCC74120	MCC54120	Dual Pulse Synchronizers/Drivers	7HG	68x69
MCC74121	MCC54121	Monostable Multivibrator	97M	50x53
MCC74122	MCC54122	Retriggerable Monostable Multivibrator	6GR	52x53
MCC74123	MCC54123	Dual Retriggerable Monostable Multivibrator	3HA	58x100
MCC74132	MCC54132	Quadruple 2-Input NAND Schmitt Trigger	1KD	49x52
MCC74136	MCC54136	Quadruple 2-Input Exclusive OR Gate (O.C.)	8GM	69x72
MCC74141	MCC54141	BCD to Decimal Decoder/Driver	8HF	77x78
MCC74145	MCC54145	BCD to Decimal Decoder/Driver	96M	79x87
MCC74150	MCC54150	16 Channel Data Selector/Multiplexer	68N	64x80

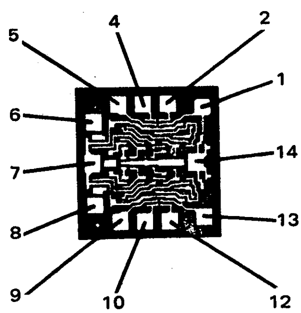
(continued)

MTTL—MSI (continued)

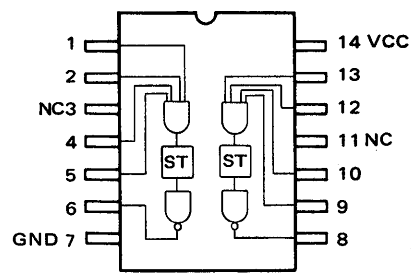
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	−55 to +125°C			
MCC74151	MCC54151	8 Channel Data Selector/Multiplexer	13W	60x65
MCC74152	MCC54152	8 Channel Data Selector/Multiplexer	13W	60x65
MCC74153	MCC54153	Dual 4 Line to 1 Line Data Selector/Multiplexer	02T	52x60
MCC74154	MCC54154	4 Line to 16 Line Decoder/Demultiplexer	11T	77x87
MCC74155	MCC54155	Dual 2-to-4 Line Decoder/1-to-4 Line Demultiplexer	66V	66x71
MCC74156	MCC54156	Dual 2-to-4 Line Decoder/1-to-4 Line Demultiplexer	66V	66x71
MCC74157	MCC54157	Quad 2-Input Data Selector/Multiplexer	62V	52x57
MCC74160	MCC54160	Decade Synchronous Counter	8GK	78x99
MCC74161	MCC54161	Synchronous 4-Bit Binary Counter	8GK	78x99
MCC74162	MCC54162	Synchronous Decade Counter	8GK	78x99
MCC74163	MCC54163	Synchronous 4-Bit Binary Counter	8GK	78x99
MCC74164A	MCC54164A	8 Bit Parallel-Out Serial Shift Register	20T	65x92
MCC74165	MCC54165	Parallel-Load 8-Bit Shift Register	5ET	73x80
MCC74167	MCC54167	Decade Rate Multiplexer (Synchronous)	7MG	44x101
MCC74174	MCC54174	Hex Type D Flip-Flop	5KS	78x88
MCC74175	MCC54175	Quadruple D Type Flip-Flop	5KS	78x88
MCC74176	MCC54176	Preset. Decade and Binary Counters/Latches	5GD	72x78
MCC74177	MCC54177	Preset. Decade and Binary Counter/Latch	5GD	72x78
MCC74180	MCC54180	8-Bit Odd/Even Parity Generator/Checker	17R	56x60
MCC74181	MCC54181	4-Bit ALU/Function Generator	4DW	87x89
MCC74182	MCC54182	Look Ahead Carry Generator	37V	62x55
MCC74190	MCC54190	BCD Synchronous Up/Down Counter	9GK	74x113
MCC74191	MCC54191	4 Bit Binary Synchronous Up/Down Counter	8RV	74x113
MCC74192	MCC54192	Preset. Decade Up/Down Counter	8RV	74x113
MCC74193	MCC54193	Preset. 4-Bit Binary Up/Down Counter	8RV	74x113
MCC74194	MCC54194	4-Bit Bidirectional Universal Shift Register	8FP	89x70
MCC74195	MCC54195	4-Bit Parallel Access Shift Register	8FP	89x70
MCC74196	MCC54196	Preset. Decade or Binary Counter/Latch	5GD	72x78
MCC74197	MCC54197	Preset. Decade or Binary Counter/Latch	5GD	72x78
MCC74221	MCC54221	Dual Monostable Multivibrator w/Schmitt-Trigger Inputs	5NG	59x80
MCC74290	MCC54290	Decade Counter	3HT	69x71
MCC74293	MCC54293	4-Bit Binary Counter	3HT	69x71
MCC74298	MCC54298	Quadruple 2-Input Multiplexer w/Storage	8FP	89x70

MCC7413/MCC5413
Dual 4-Input NAND Gate Schmitt Trigger

40 x 42
(7KB)

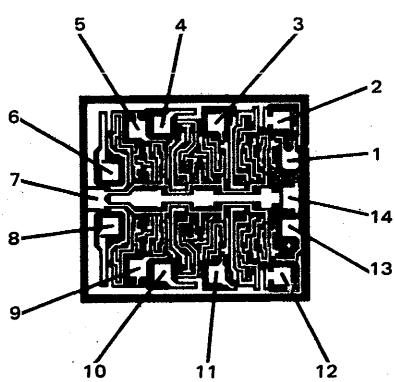


PIN CONNECTIONS

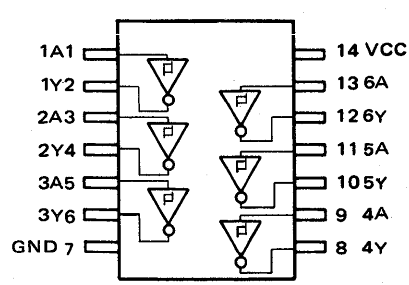


MCC7414/MCC5414
Hex Schmitt Trigger Inverter

56 x 62
(2JA)



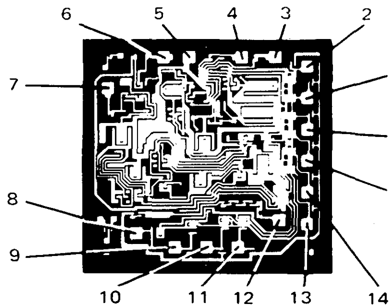
PIN CONNECTIONS



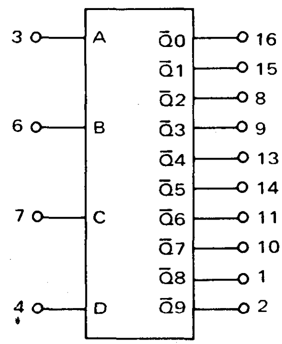
All dimensions are in mils.

MCC7441A/MCC5441A
BCD to Decimal Decoder/High Level Driver

74 x 79
(17F)



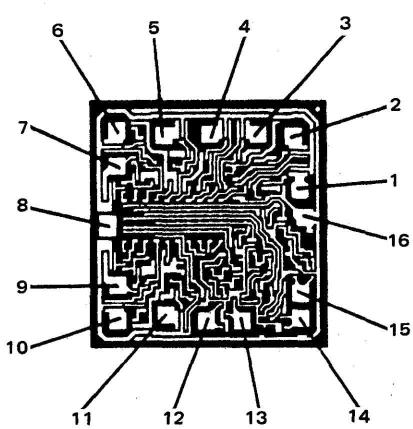
PIN CONNECTIONS



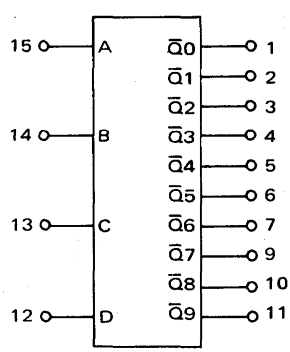
V_{CC} = Pin 5
GND = Pin 12

MCC7442/MCC5442
BCD to Decimal Decoder

64 x 66
(6FE)



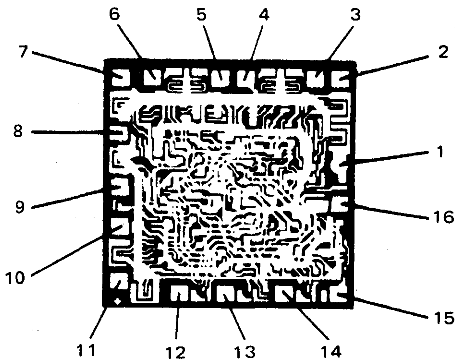
PIN CONNECTIONS



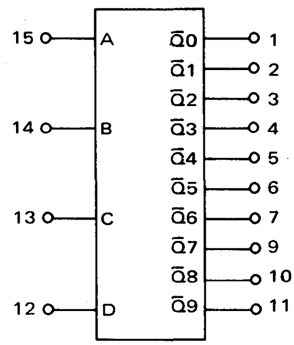
V_{CC} = Pin 16
Gnd = Pin 8

MCC7443/MCC5443
Excess Three-to-Decimal Decoder
MCC7444/MCC5444
Excess Three Gray to Decimal Decoder

68 x 67
(29R)



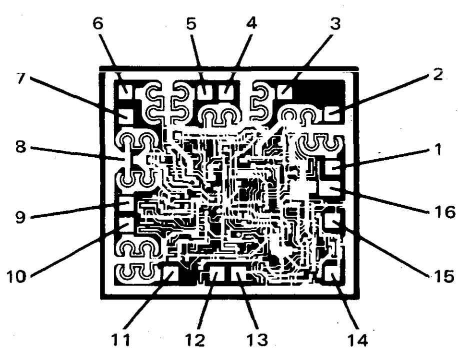
PIN CONNECTIONS



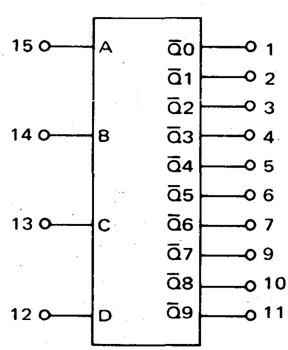
V_{CC} = Pin 16
Gnd = Pin 8

MCC7445/MCC5445
BCD to Decimal Decoder /Driver

79 x 87
(96M)



PIN CONNECTIONS



V_{CC} = Pin 16
GND = Pin 8

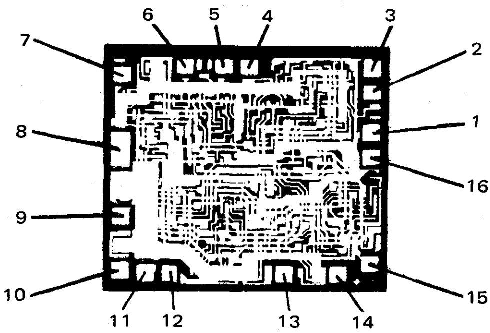
t_{pd} = 50 ns max

7

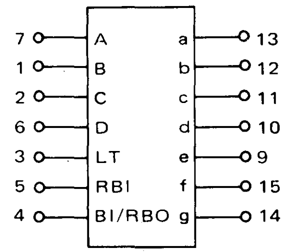
MCC5446, MCC7446
MCC5447, MCC7447
MCC5448, MCC7448
BCD-to-Seven Segment Decoder/Drivers

MCC5446/MCC7446

65 x 76
(83M)



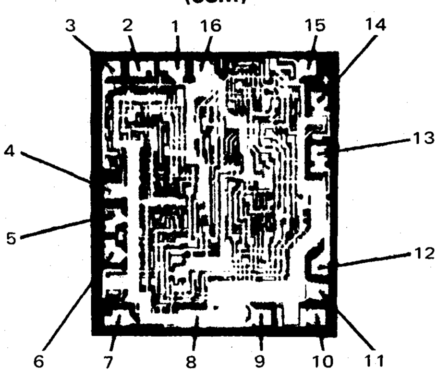
PIN CONNECTIONS



V_{CC} = Pin 16
GND = Pin 8

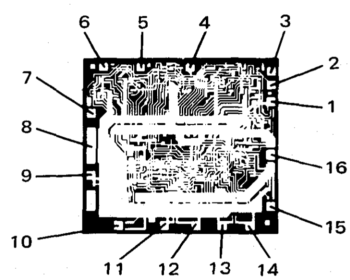
MCC5447/MCC7447

65 x 76
(83M)



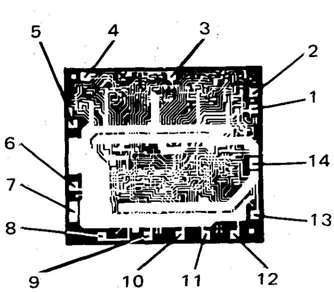
MCC5448/MCC7448

88 x 79
(01L)

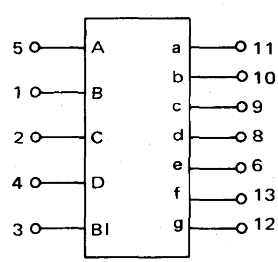


MCC7449/MCC5449
BCD to Seven Segment Decoder/Driver

88 x 79
(01L)



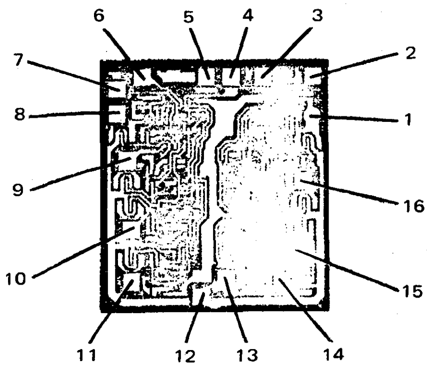
PIN CONNECTIONS



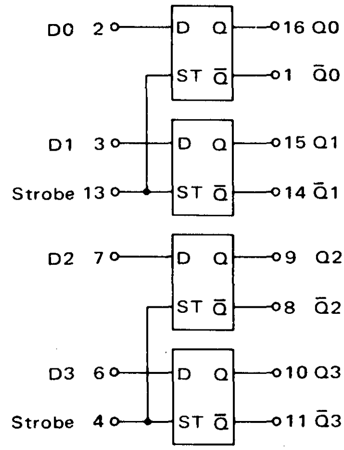
V_{CC} = Pin 14
GND = Pin 7

MCC7475/MCC5475
Quad Latch

62 x 68
(7AJ)



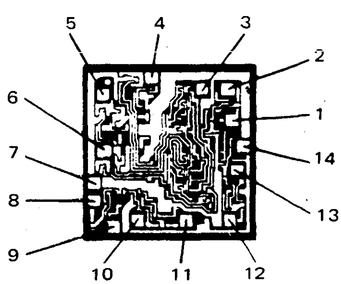
PIN CONNECTIONS



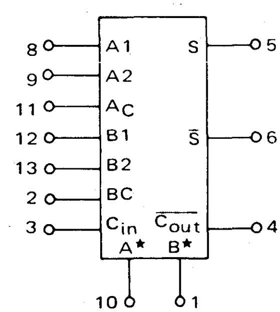
V_{CC} = Pin 5
GND = Pin 12

MCC7480/MCC5480
Gated Full Adder(1-Bit)

58 x 58
(10L)



PIN CONNECTIONS



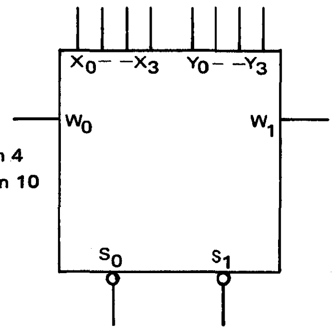
V_{CC} = Pin 7
Gnd = Pin 14

MCC7481/MCC5481
16-Bit Scratch Pad Memory

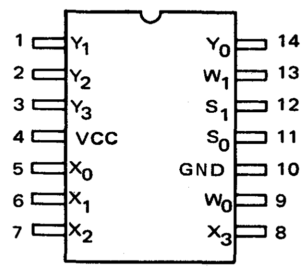
77 x 82
(1PR)

CONSULT FACTORY

PIN CONNECTIONS

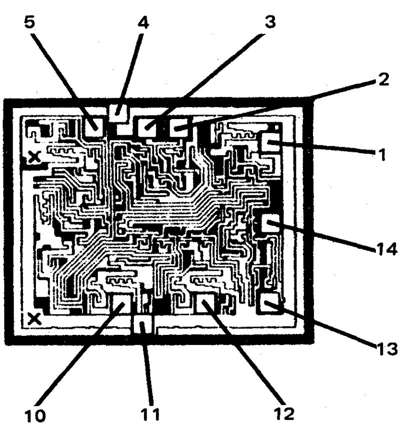


V_{CC} = Pin 4
GND = Pin 10

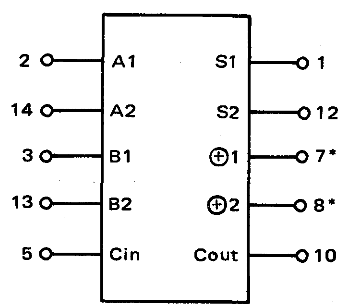


MCC17482/MCC15482
2 Bit Full Adder

65 x 82
(13E)



PIN CONNECTIONS



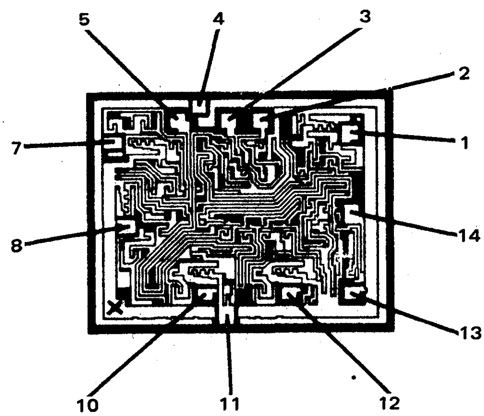
* Available only on MCC25482/27482

V_{CC} = Pin 4
GND = Pin 11

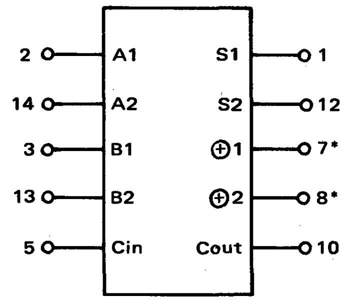
7

MCC27482/MCC25482
2 Bit Full Adder

65 x 82
(13E)



PIN CONNECTIONS

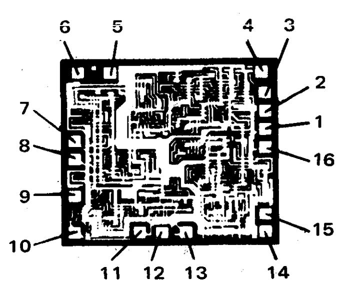


* Available only on MCC25482/27482

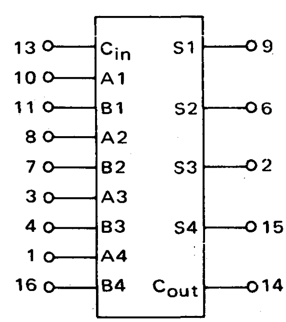
V_{CC} = Pin 4
GND = Pin 11

MCC7483/MCC5483
4-Bit Full Adder

69 x 80
(10M)



PIN CONNECTIONS



V_{CC} = Pin 5
Gnd = Pin 12

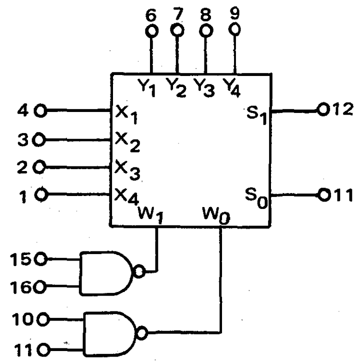
7

MCC7484/MCC5484
16-Bit Scratch Pad Memory

77 x 82
(1PR)

CONSULT FACTORY

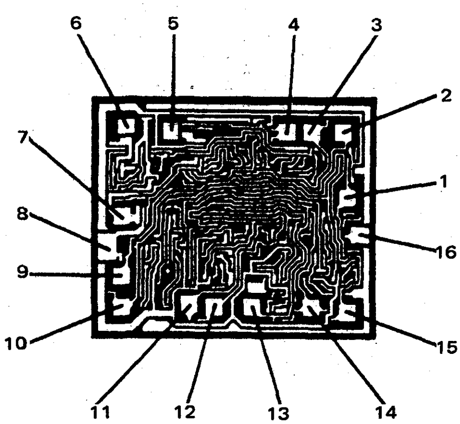
PIN CONNECTIONS



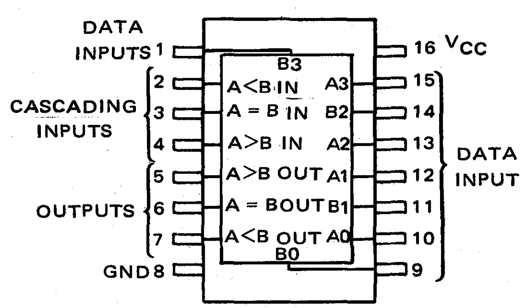
V_{CC} = Pin 5
GND = Pin 12

MCC7485/MCC5485
4-Bit Magnitude Comparator

65 x 77
(7GK)



PIN CONNECTIONS



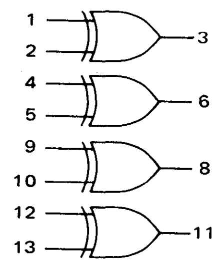
7

MCC7486/MCC5486
Quadruple 2-Input Exclusive OR Gate

69 x 72
(8GM)

CONSULT FACTORY

PIN CONNECTIONS

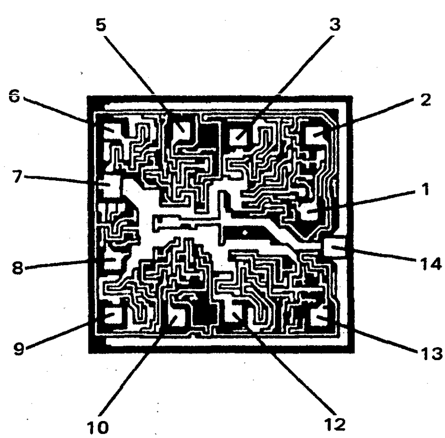


$3 = 1 \bullet \overline{2} + \overline{1} \bullet 2$

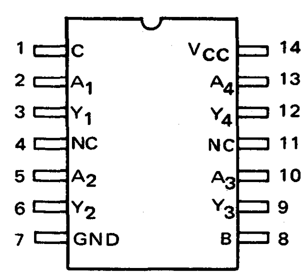
V_{CC} = Pin 14
Gnd = Pin 7

MCC74H87/MCC54H87
4 Bit True/Complement Zero/One Element

69 x 72
(8GM)

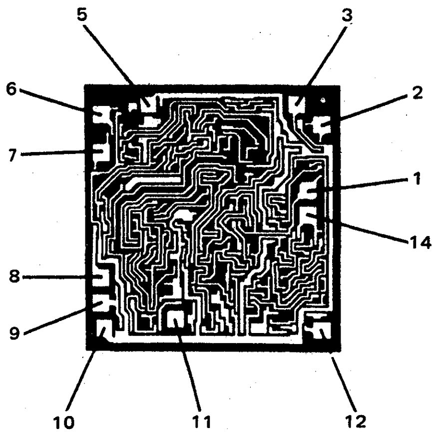


PIN CONNECTIONS

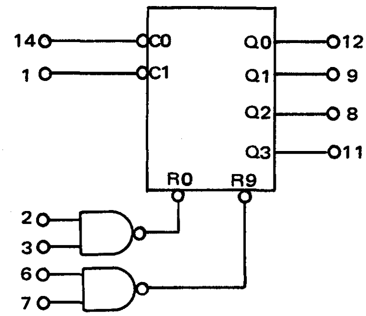


MCC7490A/MCC5490A
Decade Counter

69 x 71
(3HT)



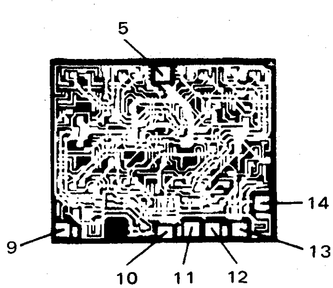
PIN CONNECTIONS



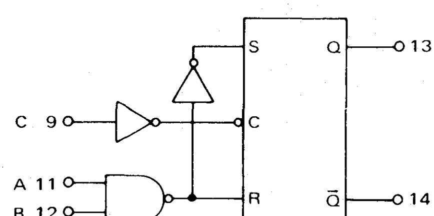
V_{CC} = Pin 5
GND = Pin 10

MCC7491A/MCC5491A
8-Bit Shift Register

59 x 72
(05R)



PIN CONNECTIONS

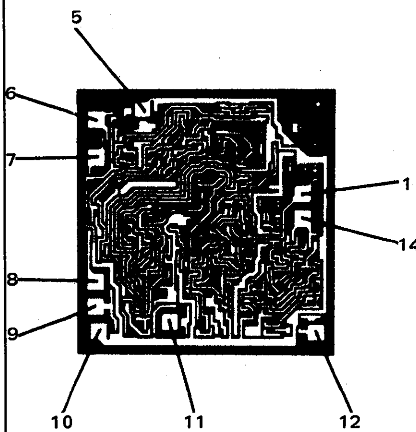


V_{CC} = Pin 5
GND = Pin 10

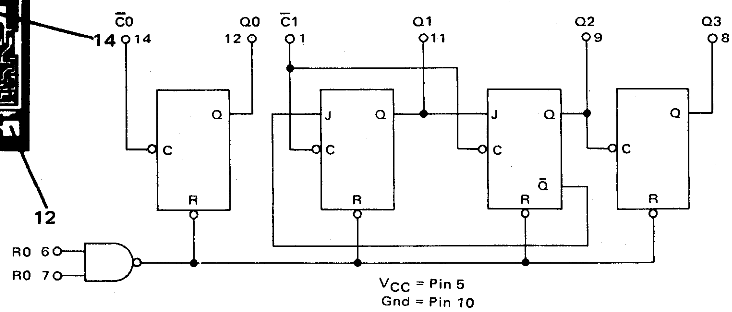
7

MCC7492A/MCC5492A
Divide by 12 Counter

69 x 71
(3HT)

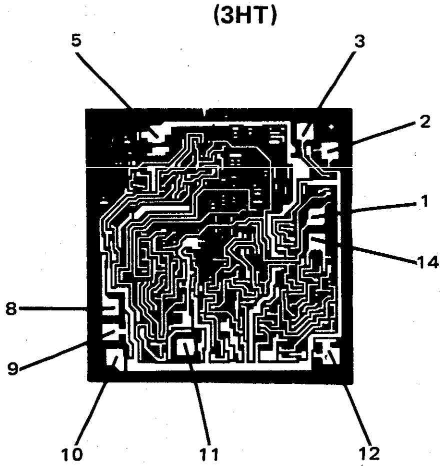


PIN CONNECTIONS

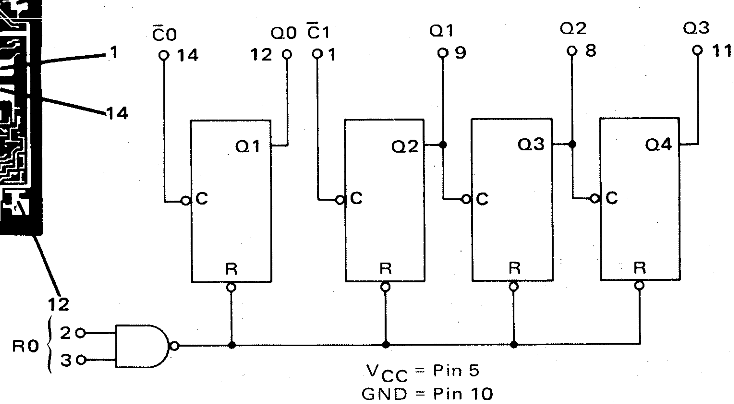


MCC7493A/MCC5493A
4-Bit Binary Counter

69 x 71
(3HT)

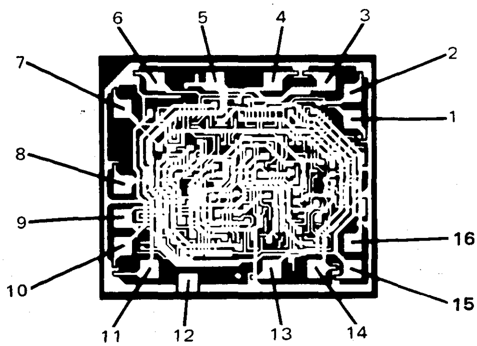


PIN CONNECTIONS

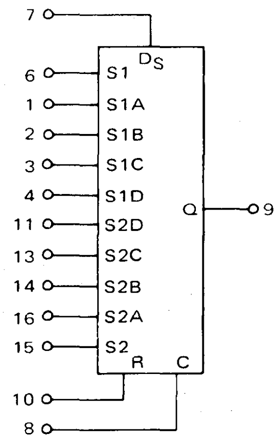


MCC7494/MCC5494
4-Bit Shift Register

66 x 76
(66N)



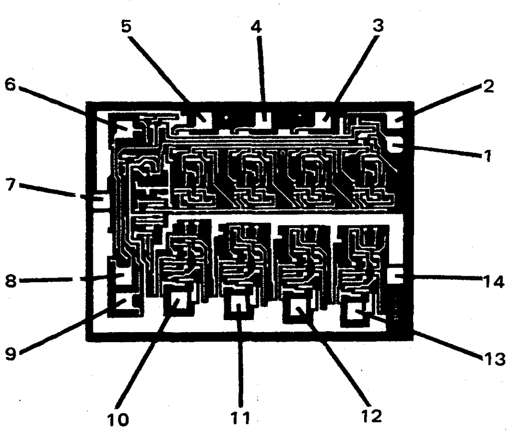
PIN CONNECTIONS



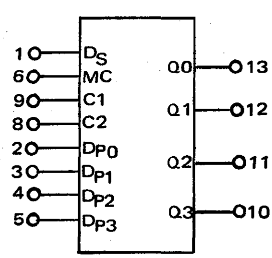
V_{CC} = Pin 5
GND = Pin 12

MCC7495A/MCC5495A
4-Bit Shift Register (parallel access)

64 x 88
(6RP)



PIN CONNECTIONS

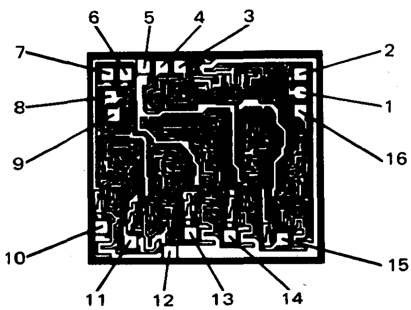


V_{CC} = Pin 14
GND= Pin 7

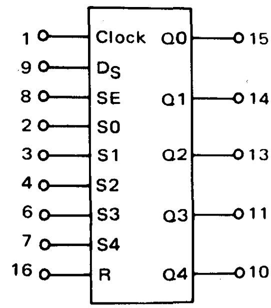
7

MCC7496/MCC5496
5-Bit Shift Register

86 x 77
(8BG)



PIN CONNECTIONS



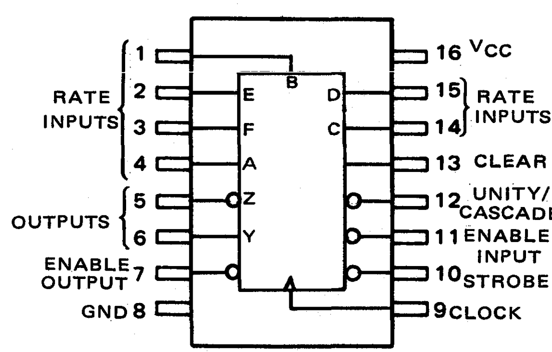
V_{CC} = Pin 5
Gnd = Pin 12

MCC7497/MCC5497
Synchronous 6-Bit Binary Rate Multiplier

94 x 101
(7MG)

CONSULT FACTORY

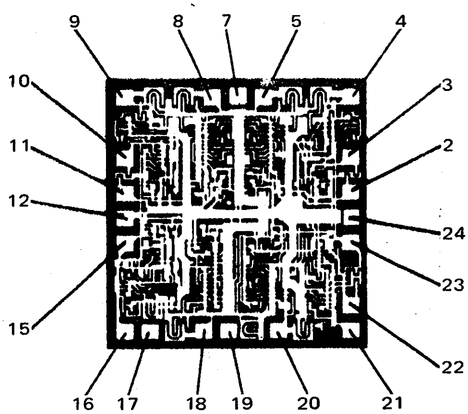
PIN CONNECTIONS



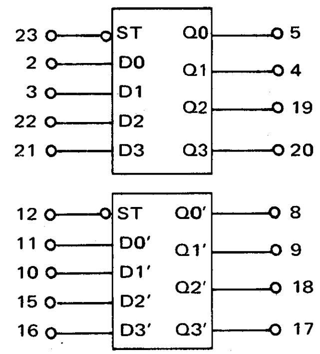
V_{CC} = Pin 16
Gnd = Pin 8

MCC74100/MCC54100
Dual 4-Bit Latch

70 x 72
(31R)



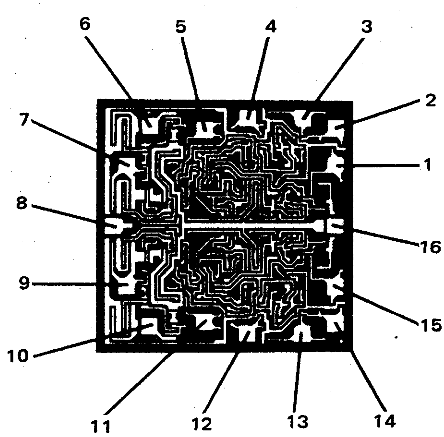
PIN CONNECTIONS



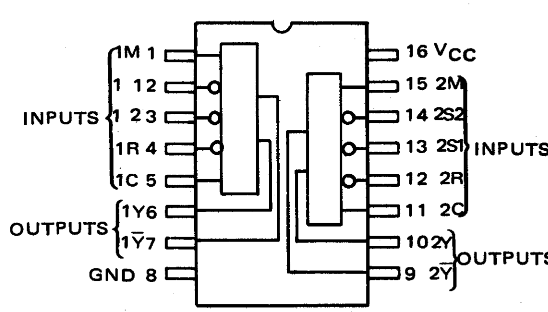
V_{CC} = Pin 24
V_{EE} = Pin 7

MCC74120/MCC54120
Dual Pulse Synchronizers/Drivers

68 x 69
(7HG)



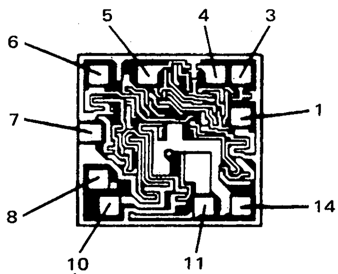
PIN CONNECTIONS



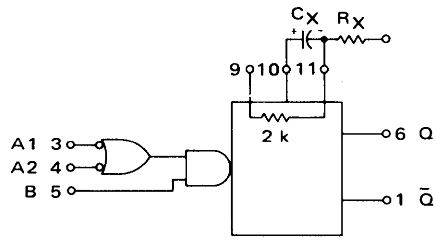
V_{CC} = Pin 16
GND = Pin 8

MCC74121/MCC54121
Monostable Multivibrator

50 x 53
(97M)



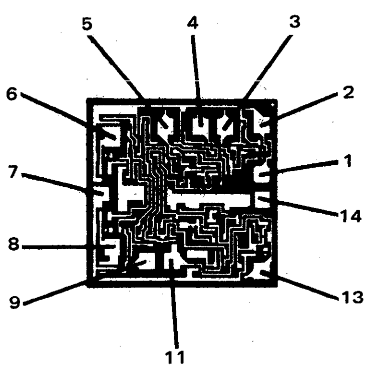
PIN CONNECTIONS



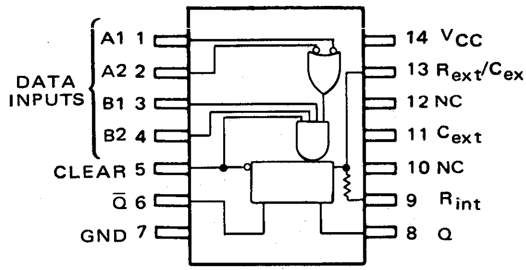
V_{CC} = Pin 14
Gnd = Pin 7

MCC74122/MCC54122
Retriggerable Monostable Multivibrator

52 x 53
(6GR)



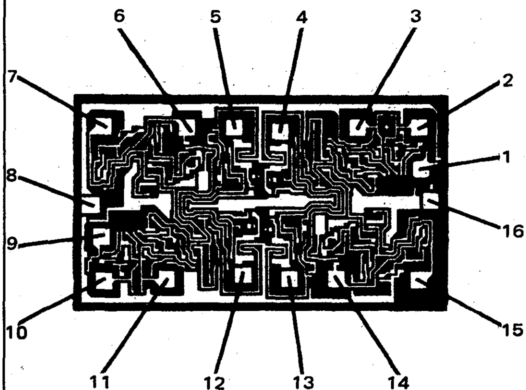
PIN CONNECTIONS



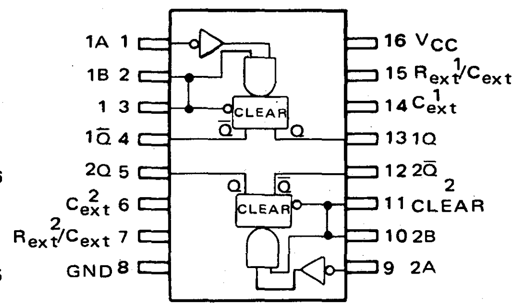
7

MCC74123/MCC54123
Dual Retriggerable Monostable Multivibrator

58 x 100
(3HA)

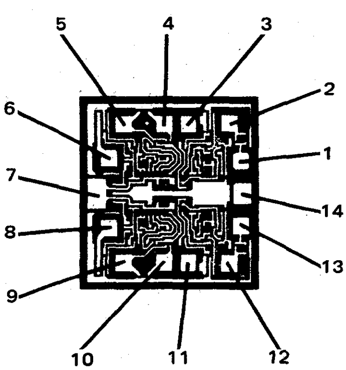


PIN CONNECTIONS

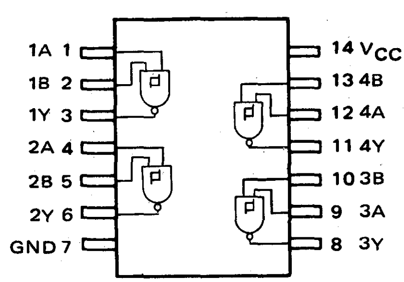


MCC74132/MCC54132
Quadruple 2-Input NAND Schmitt Trigger

49 x 52
(1KD)



PIN CONNECTIONS

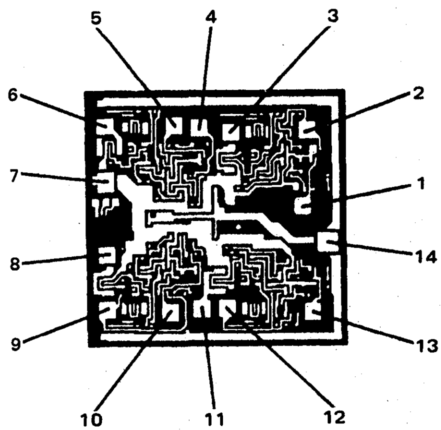


V_{CC} = Pin 14
GND = Pin 7

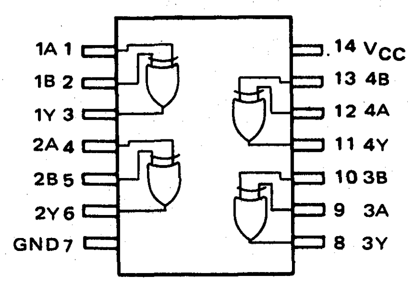
7

MCC74136/MCC54136
Quadruple 2-Input Exclusive OR Gate (oc)

69 x 72
(8GM)

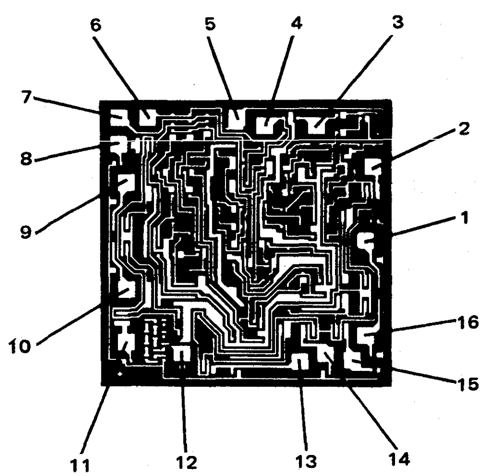


PIN CONNECTIONS

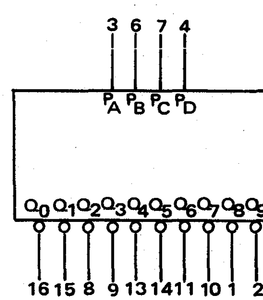


MCC74141/MCC54141
BCD to Decimal Decoder/Driver

77 x 78
(8HF)



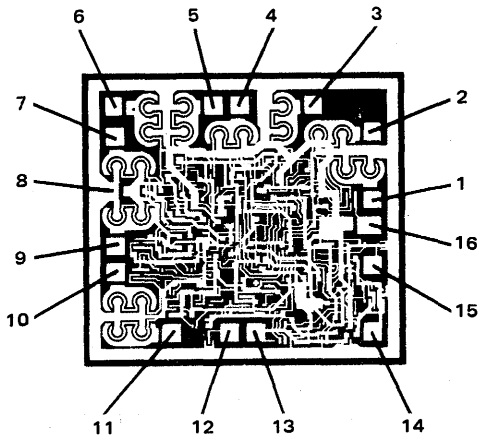
PIN CONNECTIONS



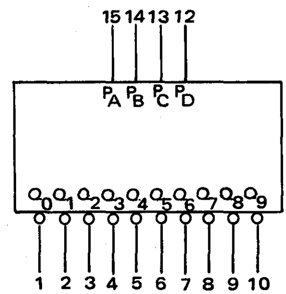
V_{CC} = Pin 5
GND = Pin 12

MCC74145/MCC54145
BCD to Decimal Decoder/Driver

79 x 87
(96M)



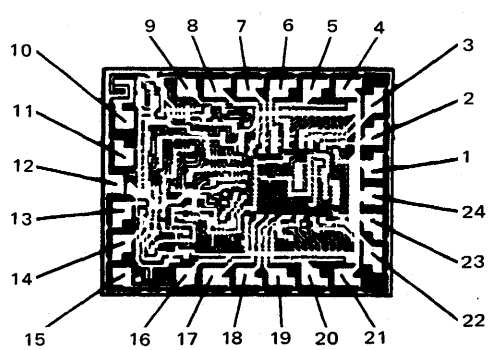
PIN CONNECTIONS



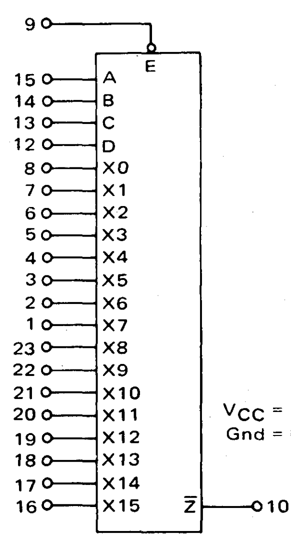
V_{CC} = Pin 16
GND = Pin 8

MCC74150/MCC54150
16 Channel Data Selector/Multiplexer

64 x 80
(68N)



PIN CONNECTIONS

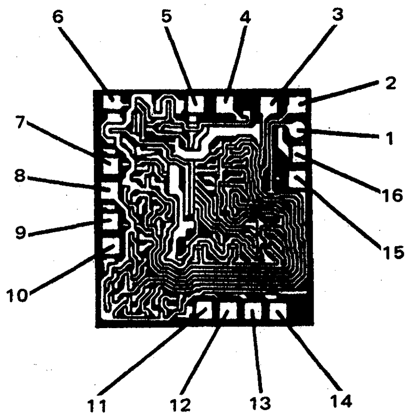


V_{CC} = Pin 24
Gnd = Pin 12

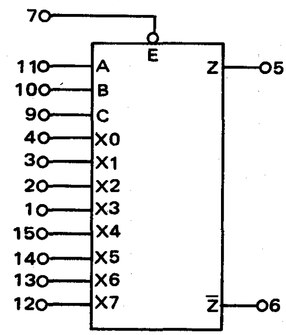
7

MCC74151/MCC54151
8 Channel Data Selector/Multiplexer

60 x 65
(13W)



PIN CONNECTIONS



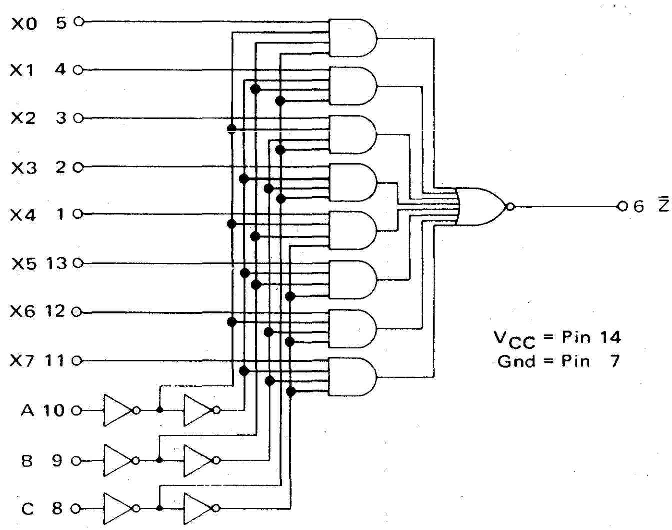
V_{CC} = Pin 16
GND = Pin 8

MCC74152/MCC54152
8 Channel Data Selector/Multiplexer

60 x 65
(13W)

CONSULT FACTORY

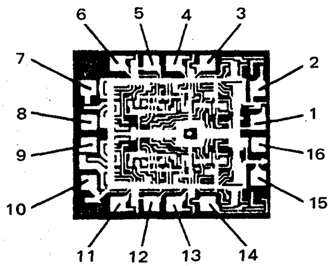
PIN CONNECTIONS



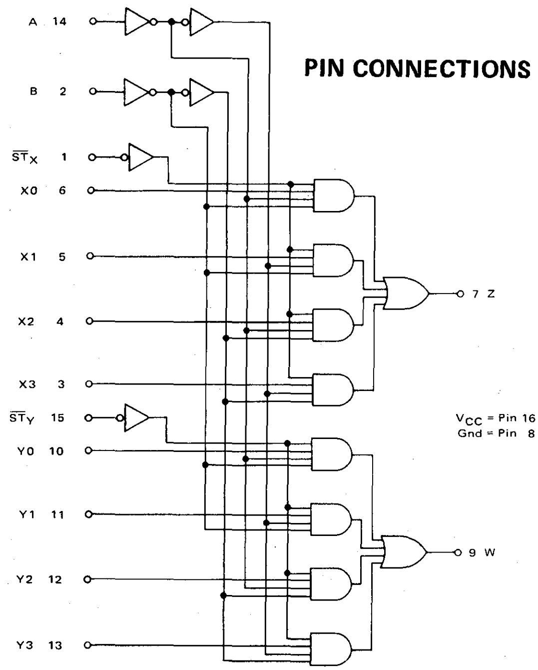
V_{CC} = Pin 14
Gnd = Pin 7

MCC74153/MCC54153
Dual 4 Line to 1 Line Data Selector/Multiplexer

52 x 60
(02T)

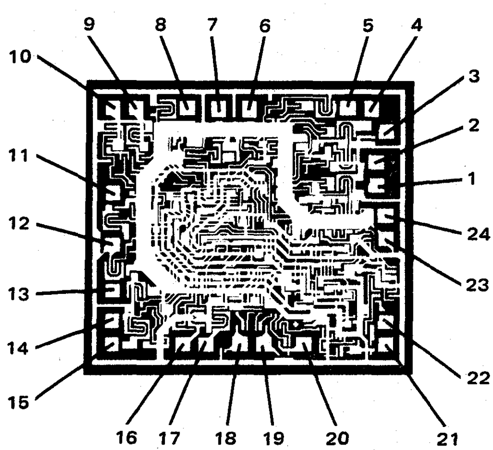


PIN CONNECTIONS

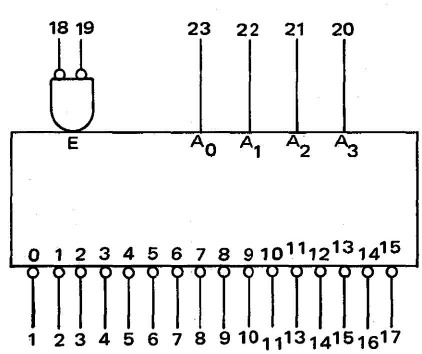


MCC74154/MCC54154
4 Line to 16 Line Decoder/Demultiplexer

77 x 87
(11T)



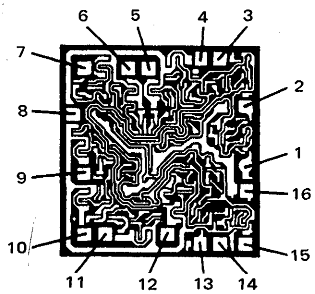
PIN CONNECTIONS



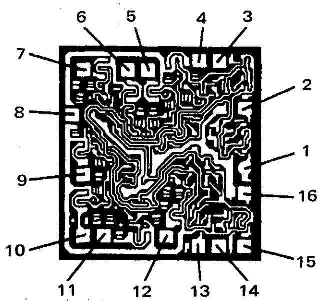
MCC74155/MCC54155
MCC74156/MCC54156
Dual 2 to 4 Line Decoder/
1 to 4 Line Demulitplexer

66 x 71
(66V)

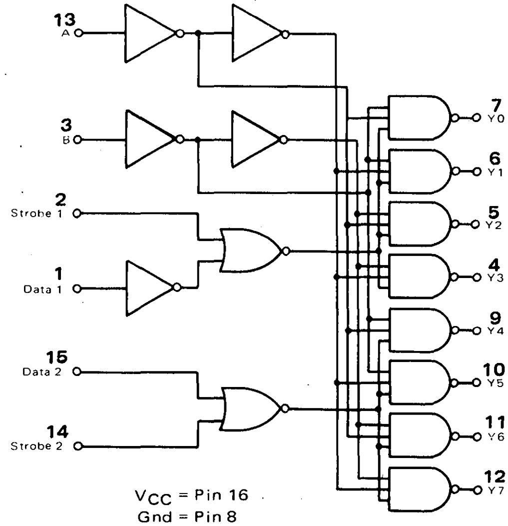
MC54155, MC74155



MC54156, MC74156

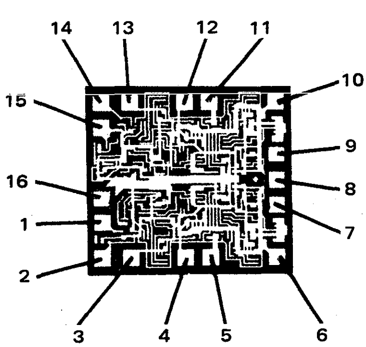


PIN CONNECTIONS

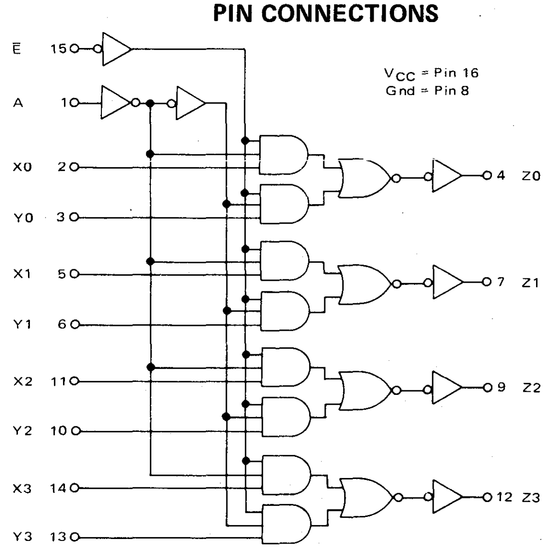


MCC74157/MCC54157
Quad 2-Input Data Selector/Multiplexer

52 x 57
(62V)



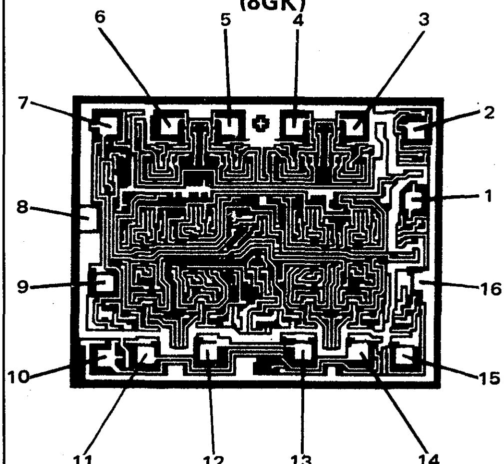
PIN CONNECTIONS



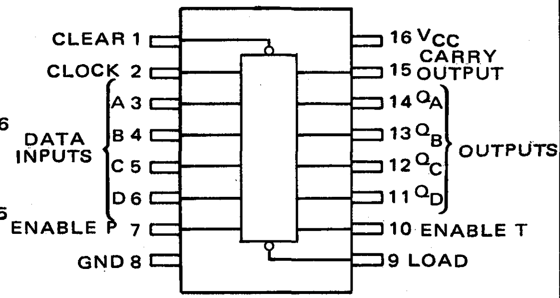
MCC74160/MCC54160
MCC74162/MCC54162
Synchronous Decade Counter

MCC74161/MCC54161
MCC74163/MCC54163
Synchronous 4-Bit Binary Counter

78 x 99
(8GK)

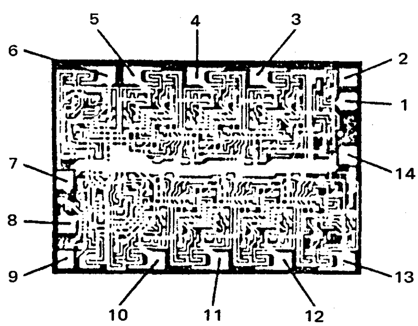


PIN CONNECTIONS

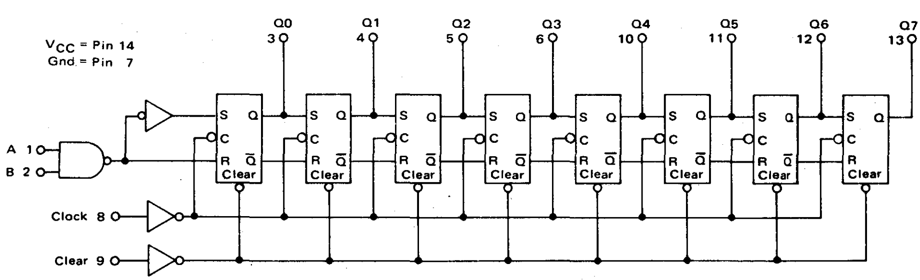


MCC74164A/MCC54164A
8-Bit Parallel-Out Serial Shift Register

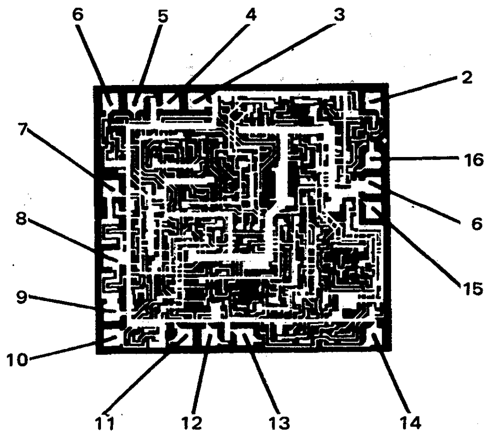
65 x 92
(20T)



PIN CONNECTIONS

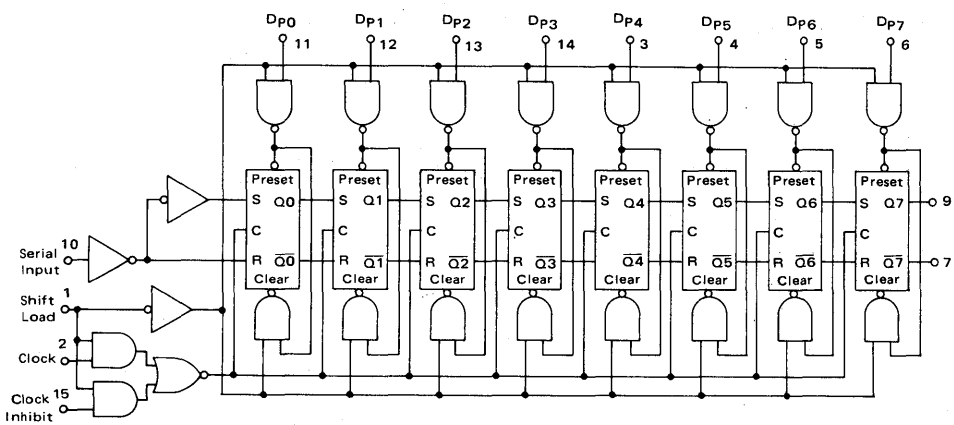


MCC74165/MCC54165
Parallel Load 8-Bit Shift Register



73 x 80
(5ET)

PIN CONNECTIONS

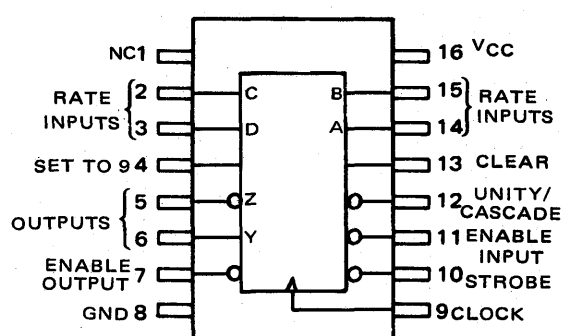


MCC74167/MCC54167
Decade Rate Multiplier (synchronous)

94 x 101
(7MG)

CONSULT FACTORY

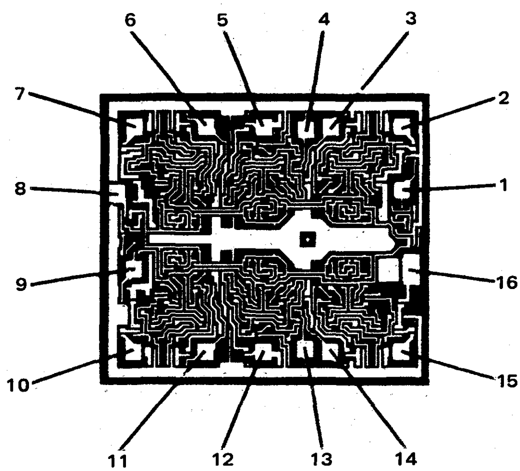
PIN CONNECTIONS



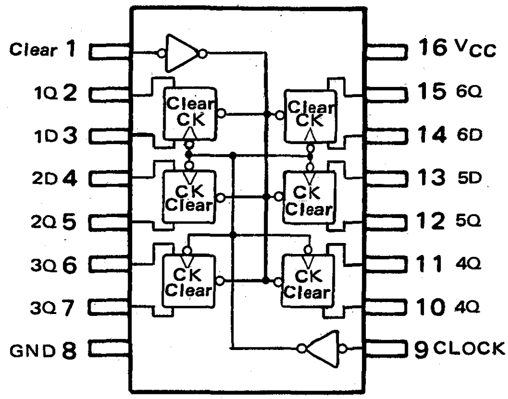
7

MCC74174/MCC54174
Hex Type D Flip Flop

78 x 88
(5KS)

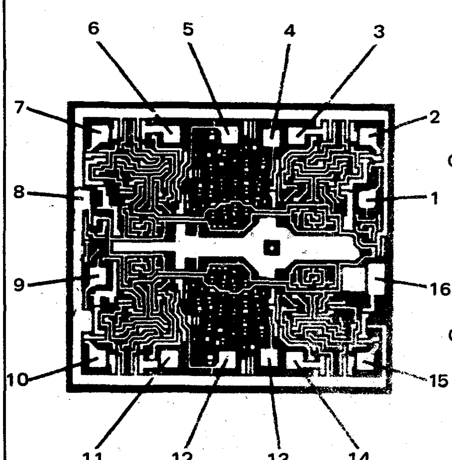


PIN CONNECTIONS

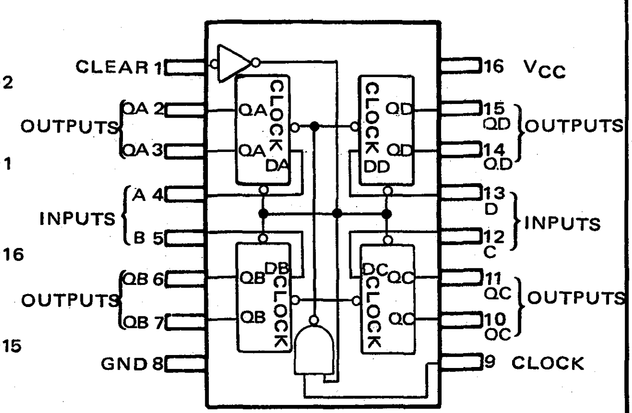


MCC74175/MCC54175
Quadruple D Type Flip-Flop

78 x 88
(5KS)



PIN CONNECTIONS

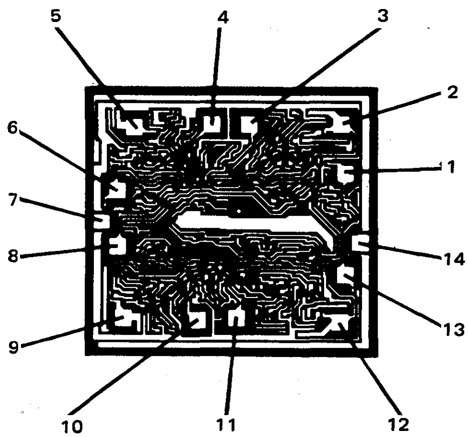


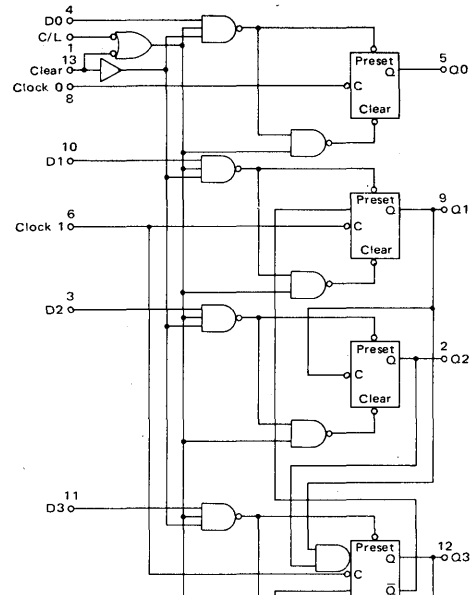
7

MCC74176/MCC54176
Presettable Decade and Binary Counters/Latches

PIN CONNECTIONS

72 x 78
(5GD)



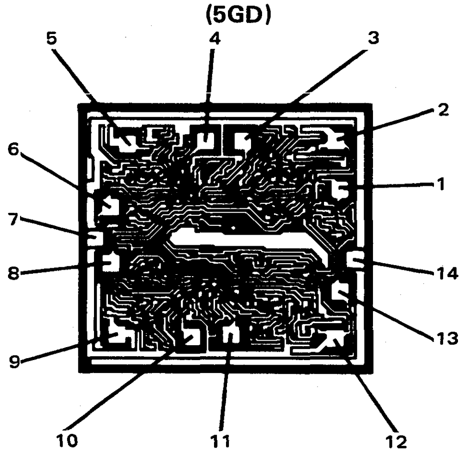


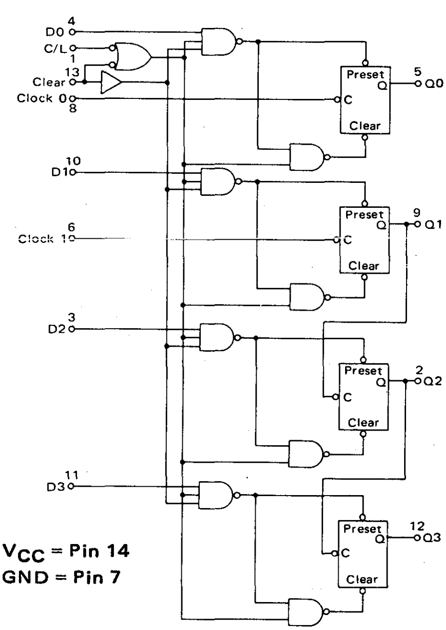
V_{CC} = Pin 14
GND = Pin 7

MCC74177/MCC54177
Presettable Decade and Binary Counter/Latch

PIN CONNECTIONS

72 x 78
(5GD)

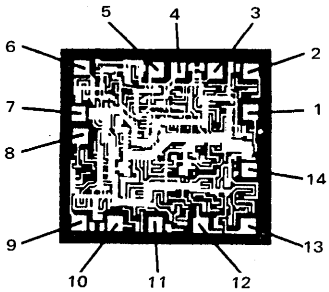




V_{CC} = Pin 14
GND = Pin 7

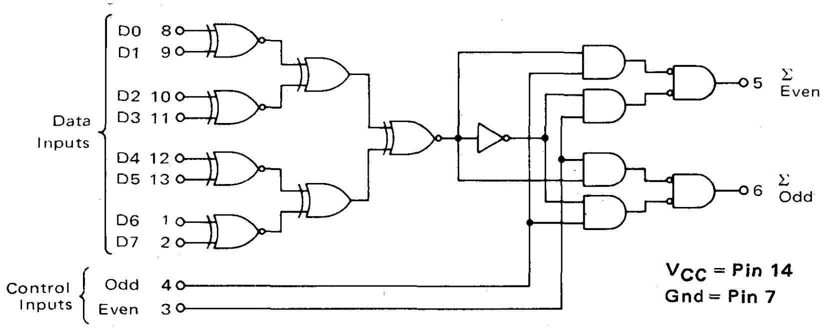
7

MCC74180/MCC54180
8-Bit Odd/Even Parity Generator/Checker



56 x 60
(17R)

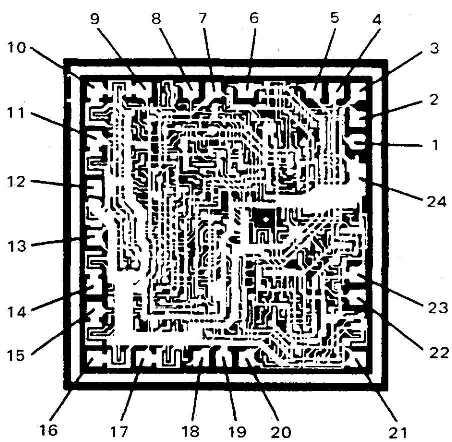
PIN CONNECTIONS



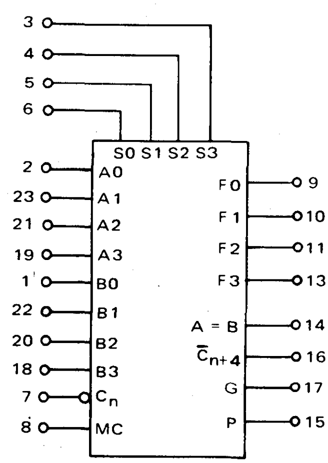
V_{CC} = Pin 14
Gnd = Pin 7

MCC74181/MCC54181
4-Bit ALU/Function Generator

87 x 89
(4DW)



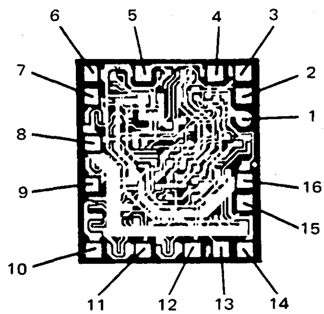
PIN CONNECTIONS



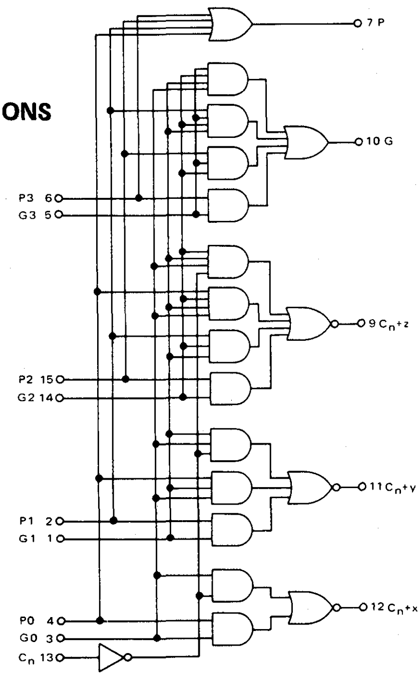
V_{CC} = Pin 24
Gnd = Pin 12

MCC74182/MCC54182
Look Ahead Carry Generator

62 x 55
(37W)



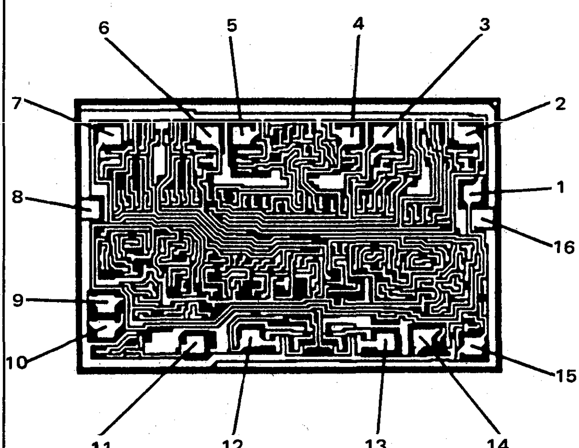
PIN CONNECTIONS



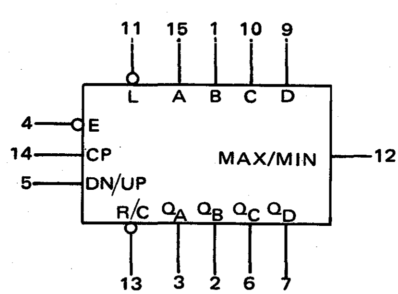
V_{CC} = Pin 16
GND = Pin 8

MCC74190/MCC54190
BCD Synchronous Up/Down Counter

74 x 113
(9GK)



PIN CONNECTIONS



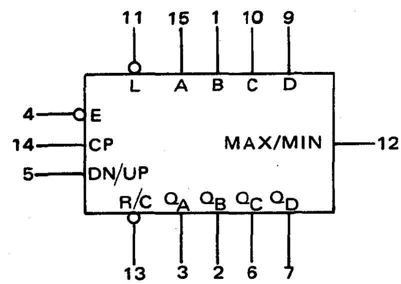
V_{CC} = Pin 16
GND = Pin 8

MCC74191/MCC54191
4 Bit Binary Synchronous Up/Down Counter

74 x 113
(8RV)

CONSULT FACTORY

PIN CONNECTIONS



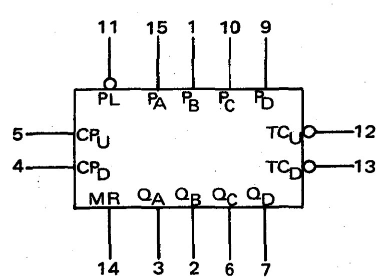
V_{CC} = Pin 16
GND = Pin 8

MCC74192/MCC54192
Presettable Decade Up/Down Counter

74 x 113
(8RV)

CONSULT FACTORY

PIN CONNECTIONS

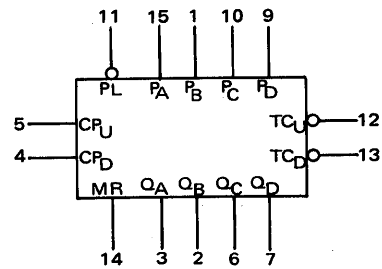


V_{CC} = Pin 16
GND = Pin 8

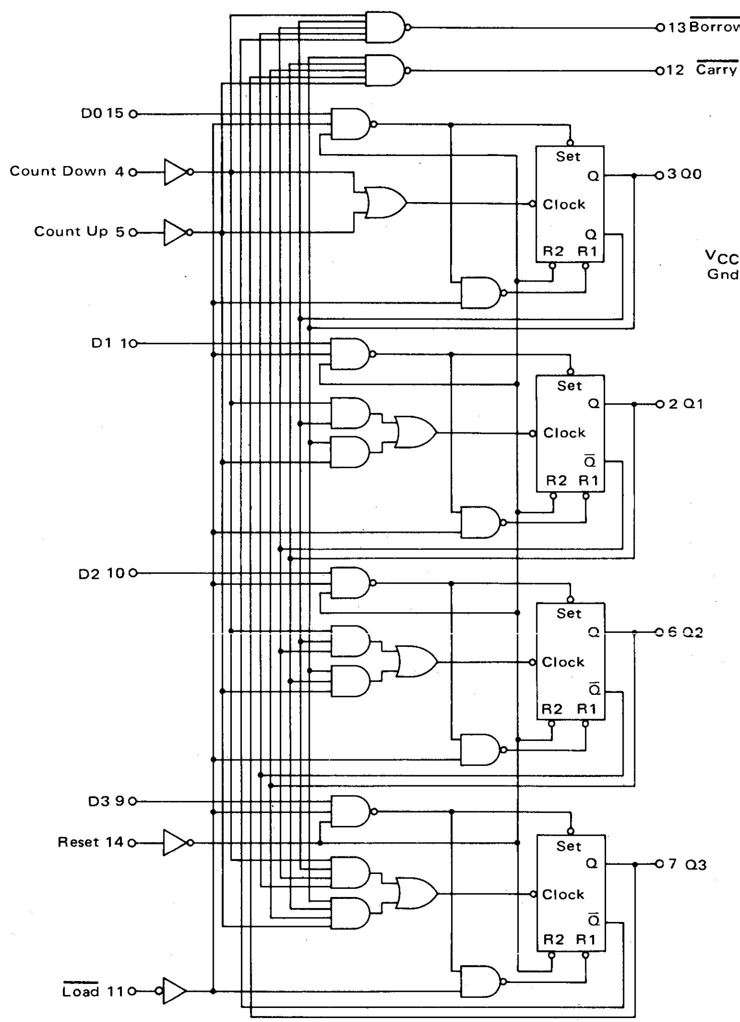
MCC74193/MCC54193
Presettable 4-Bit Binary Up/Down Counter

74 x 113
(8RV)

CONSULT FACTORY



PIN CONNECTIONS

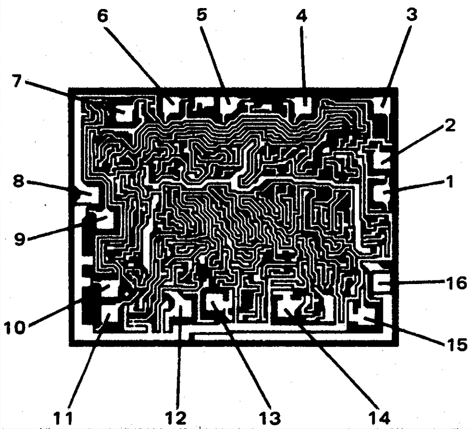


V_{CC} = Pin 16
Gnd = Pin 8

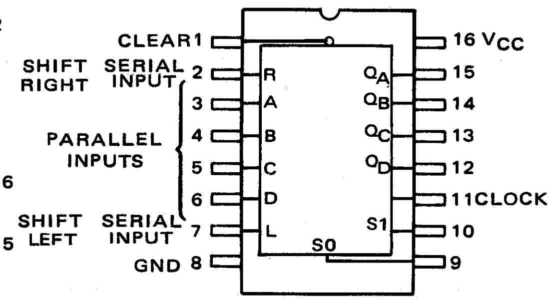
7

MCC74194/MCC54194
4-Bit Bidirectional Universal Shift Register

89 x 70
(8FP)

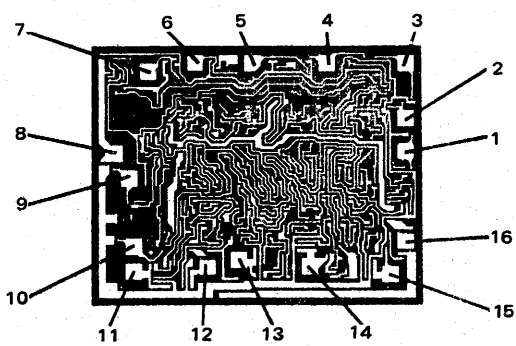


PIN CONNECTIONS

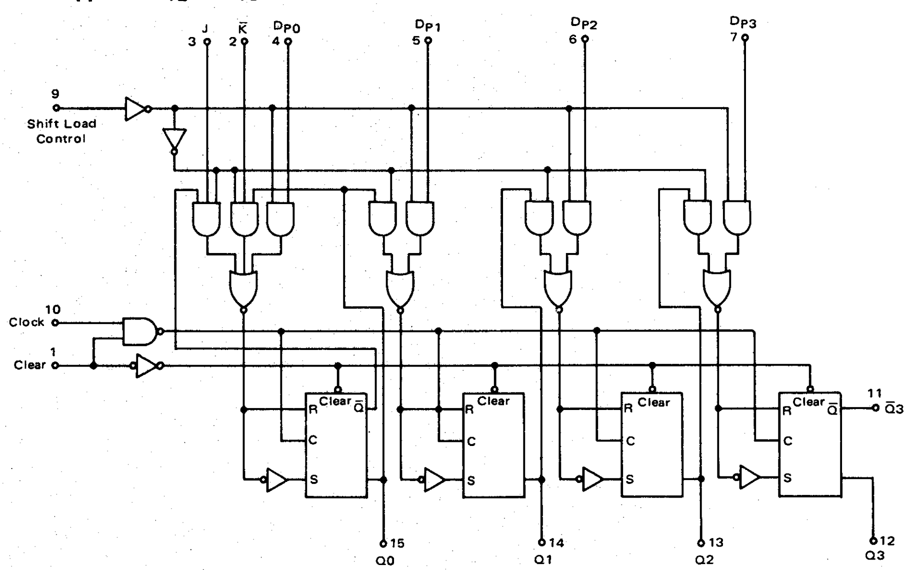


MCC74195/MCC54195
4-Bit Parallel Access Shift Register

89 x 70
(8FP)

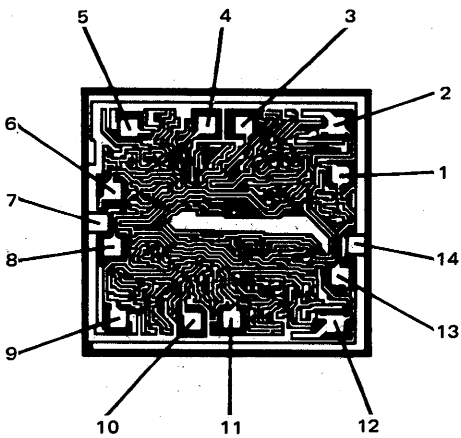


PIN CONNECTIONS

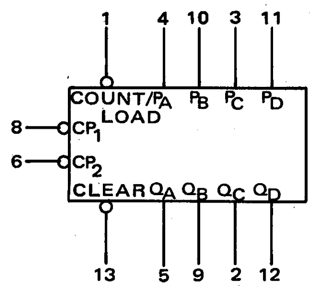


MCC74196/MCC54196
MCC74197/MCC54197
Presettable Decade or Binary Counter/Latch

72 x 78
(5GD)



PIN CONNECTIONS



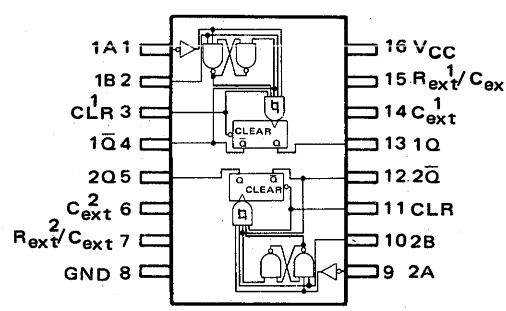
V_{CC} = Pin 14
GND = Pin 7

MCC74221/MCC54221
Dual Monostable Multivibrator w/Schmitt-Trigger Inputs

(5NG)

CONSULT FACTORY

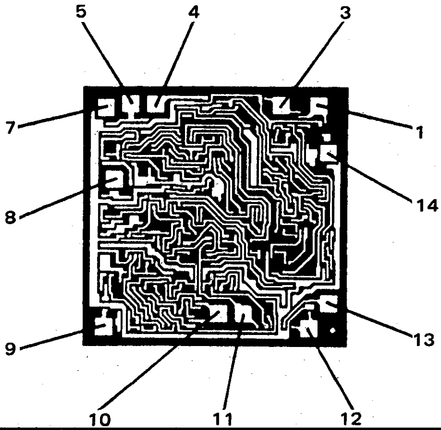
PIN CONNECTIONS



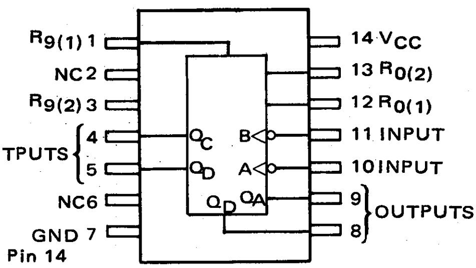
V_{CC} = Pin 16
GND = Pin 8

69 x 71
(3HT)

MCC74290/MCC54290
Decade Counter



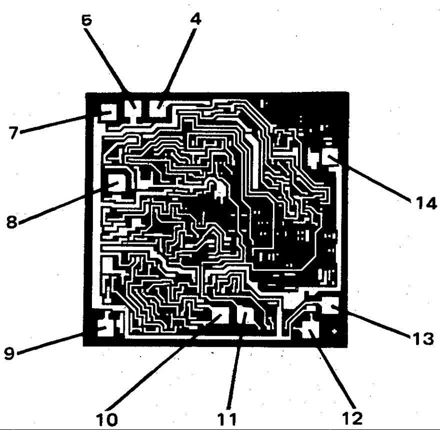
PIN CONNECTIONS



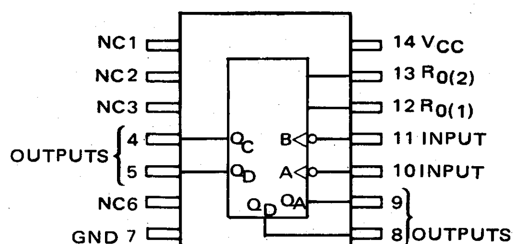
V_{CC} = Pin 14
GND = Pin 7

69 x 71
(3HT)

MCC74293/MCC54293
4-Bit Binary Counter



PIN CONNECTIONS

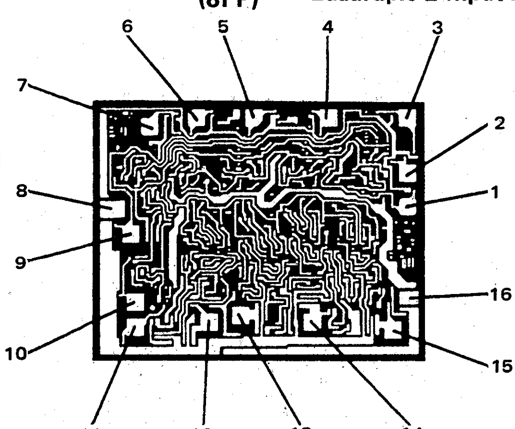


V_{CC} = Pin 14
GND = Pin 7

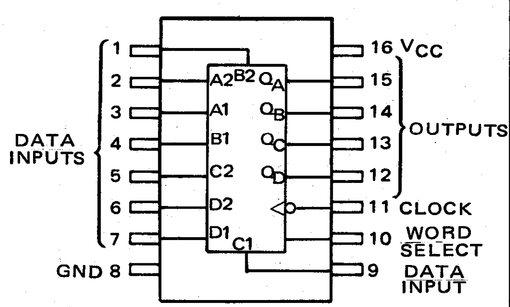
89 x 70
(8FP)

MCC74298/MCC54298
Quadruple 2-Input Multiplexer w/Storage

V_{CC} = Pin 16
GND = Pin 8



PIN CONNECTIONS



7

MTTL – COMPLEX FUNCTIONS

MCC7200 Series (0 to +75°C)
MCC8200 Series (–55 to +125°C)

These complex functions are designed for digital applications in the medium to high-speed range, with significant reduction in package count and increased logic per function over devices in the basic MTTL and MDTL families. They are direct replacements for S7200/8200 Series devices.

Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC7200	MCC8200	Dual 5-Bit Buffer Register	2JT	109x110
MCC7201	MCC8201	Dual 5-Bit Buffer Register w/D Complement	2JT	109x110
MCC7202	MCC8202	10-Bit Buffer Register	2JT	109x110
MCC7203	MCC8203	10-Bit Buffer Register w/D Complement	2JT	109x110
MCC7233	MCC8233	2-Input, 4-Bit digital Multiplexer	7EE	47x65
MCC7234	MCC8234	2-Input, 4-Bit digital Multiplexer (O.C.)	7EE	47x65
MCC7235	MCC8235	2-Input, 4-Bit digital Multiplexer (O.C.)	79T	54x63
MCC7241	MCC8241	Quad Exclusive OR Gate	57T	51x69
MCC7242	MCC8242	Quad Exclusive NOR Gate (O.C.)	57T	51x69
MCC7250	MCC8250	Binary to Octal Decoder	04P	63x64
MCC7251	MCC8251	BCD to Decimal Decoder	04P	63x64
MCC7260	MCC8260	Arithmetic Logic Element	40N	83x85
MCC7261	MCC8261	Fast Carry Extender	66P	43x50
MCC7266	MCC8266	2 Input, 4-Bit Data Selector	79T	54x63
MCC7267	MCC8267	2 Input, 4-Bit Data Selector (O.C.)	79T	54x63
MCC7270	MCC8270	4 Bit Shift Register	3RA	89x92
MCC7271	MCC8271	4 Bit Shift Register	3RA	89x92
MCC7280	MCC8280	Presettable Decade Counter	5GD	72x78
MCC7281	MCC8281	Presettable Binary Counter	5GD	72x78
MCC7284	MCC8284	Binary Up/Down Counter	51T	79x82
MCC7285	MCC8285	Decade Up/Down Counter	51T	79x82
MCC7288	MCC8288	Divide by 12 Counter	39N	92x78
MCC7290	MCC8290	High Speed Preset. Decade Counter	5GD	72x78
MCC7291	MCC8291	High Speed Preset. Binary Counter	5GD	72x78

7

MCC7200/MCC8200
Dual 5-Bit Buffer Register

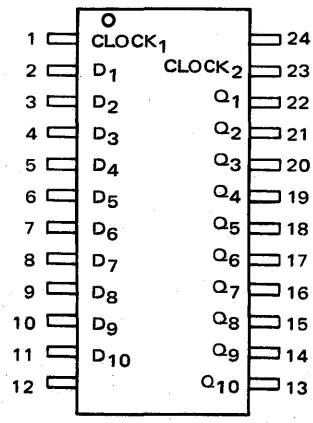
MCC7201/MCC8201
Dual 5-Bit Buffer Register W/D Complement

PIN CONNECTIONS

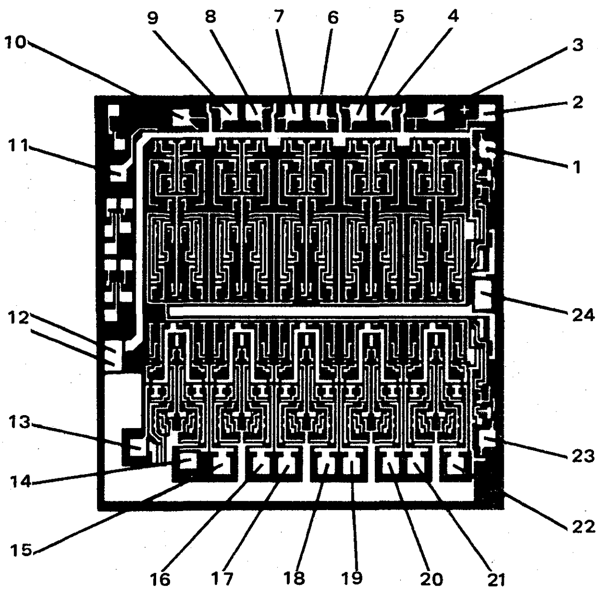
MCC7200/MCC8200

Dn	Qn+1
1	1
0	0

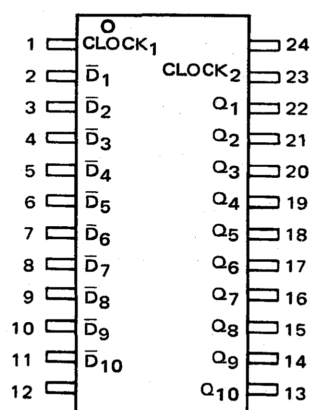
V_{CC} = 24
GND = 12
n = prior to clock
n + 1 = following clock



109 x 110
(2JT)



MCC7201/MCC8201



$\bar{D}n$	Qn +1
1	0
0	1

V_{CC} = 24
GND = 12

n = prior to clock
n + 1 = following clock

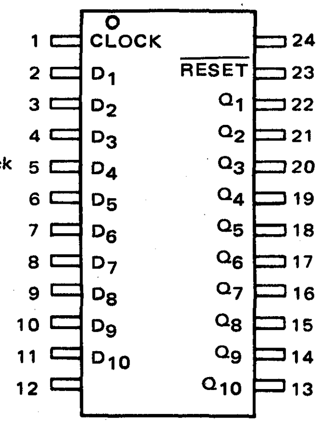
All dimensions are in mils.

7

MCC7202/MCC8202
10-Bit Buffer Register
MCC7203/MCC8203
10-Bit Buffer Register W/D Complement

PIN CONNECTIONS

MCC7202/MCC8202

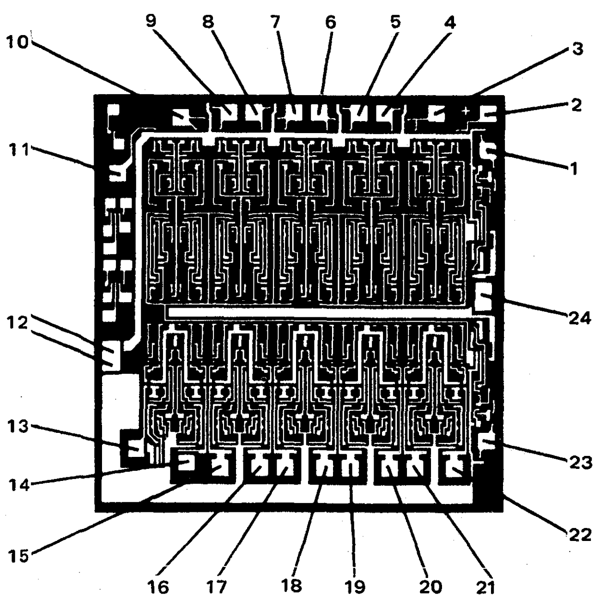


Dn	$\overline{RESET}$	Qn +1
1	1	1
0	1	0

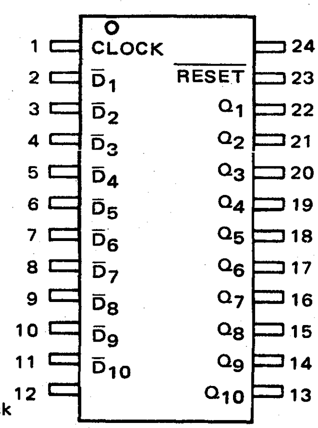
$V_{CC} = 24$
GND = 12

n = prior to clock
n + 1 = following clock

109 x 110
(2JT)



MCC7203/MCC8203

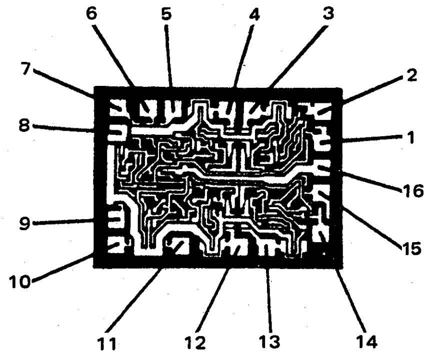


Dn	$\overline{RESET}$	Qn +1
0	1	1
1	1	0

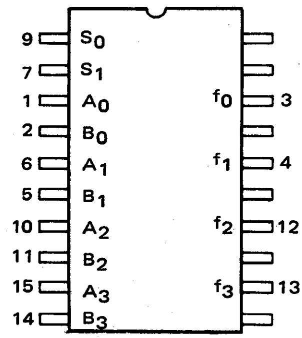
$V_{CC} = 24$
GND = 12
n is time prior to clock
n + 1 is time following clock

MCC7233/MCC8233
2-Input, 4-Bit, Digital Multiplexer

47 x 65
(7EE)



PIN CONNECTIONS

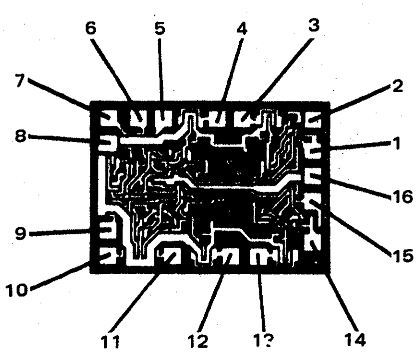


S0	S1	fn
0	0	B_n
1	0	A_n
0	1	B_n
1	1	0

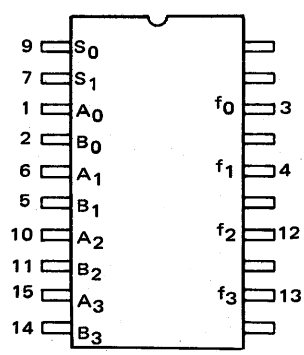
V_{CC} = 16
GND = 8

MCC7234/MCC8234
2-Input, 4-Bit, Digital Multiplexer (o.c.)

47 x 65
(7EE)



PIN CONNECTIONS

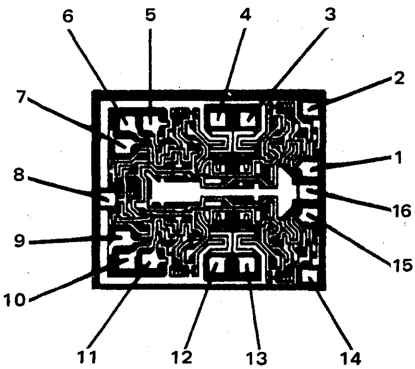


S_0	S_1	f_n
0	0	$\overline{B}_n$
1	0	$\overline{A}_n$
0	1	$\overline{B}_n$
1	1	1

V_{CC} = 16
GND = 8

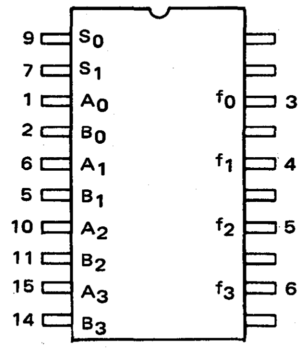
MCC7235/MCC8235
2-Input, 4-Bit, Digital Multiplexer (o.c.)

54 x 63
(79T)



S_0	S_1	f_n
0	0	$\overline{A}_n B_n$
0	1	B_n
1	0	$\overline{A}_n$
1	1	1

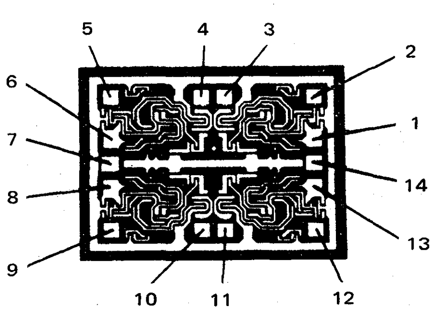
PIN CONNECTIONS



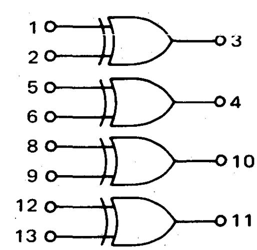
V_{CC} = 16
GND = 8

MCC7241/MCC8241
Quad Exclusive OR Gate

51 x 69
(57T)



PIN CONNECTIONS



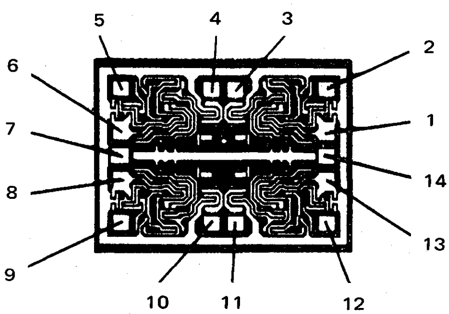
$3 = 1 \bullet \overline{2} + \overline{1} \bullet 2$

V_{CC} = Pin 14
Gnd = Pin 7

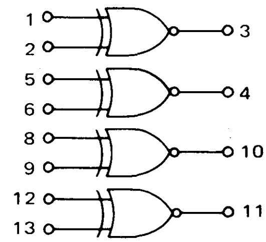
7

MCC7242/MCC8242
Quad Exclusive NOR Gate (o.c.)

51 x 69
(57T)



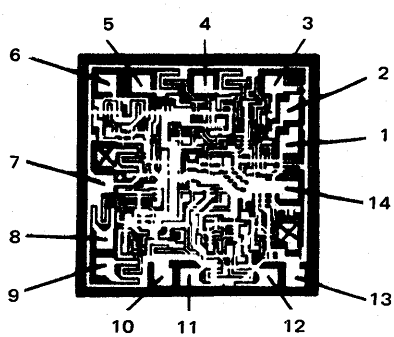
PIN CONNECTIONS



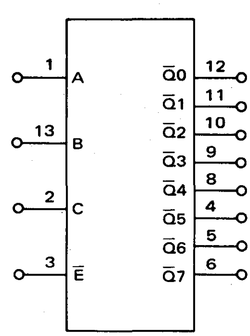
V_{CC} = Pin 14
GND = 7

MCC7250/MCC8250
Binary to Octal Decoder

63 x 64
(04P)



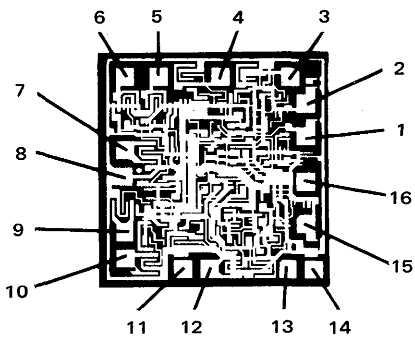
PIN CONNECTIONS



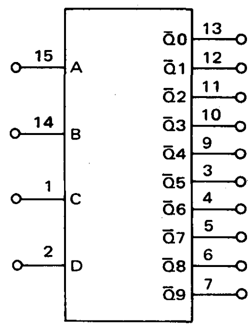
V = V_{CC} = Pin 14
GND = Pin 7

MCC7251/MCC8251
BCD to Decimal Decoder

63 x 64
(04P)



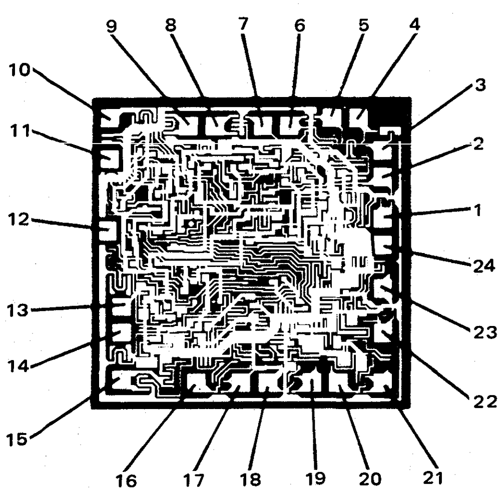
PIN CONNECTIONS



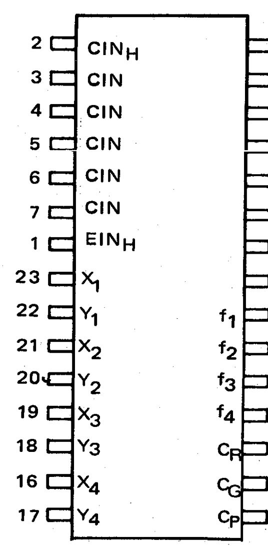
$V = V_{CC}$ = Pin 16
GND = Pin 8

MCC7260/MCC8260
Arithmetic Logic Element

83 x 85
(40N)



PIN CONNECTIONS

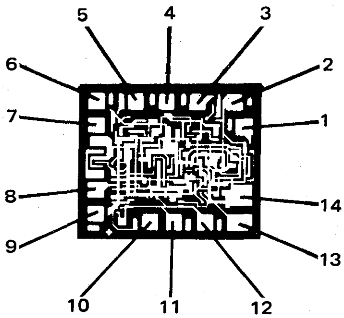


V_{CC} = 14
GND = 12

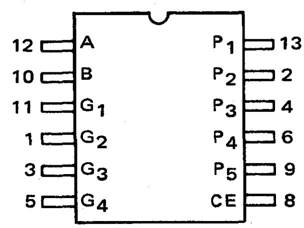
7

MCC7261/MCC8261
Fast Carry Extender

43 x 50
(66P)



PIN CONNECTIONS

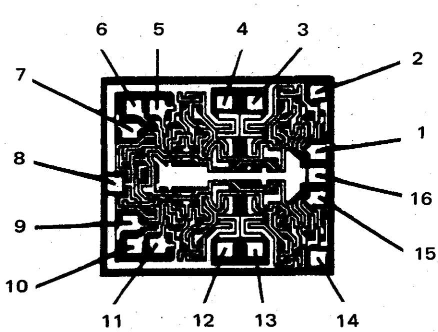


V_{CC} = 14
GND = 7

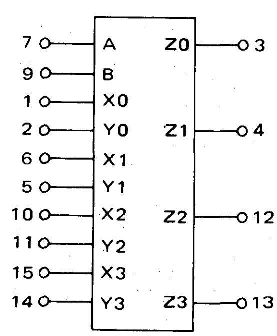
MCC7266/MCC8266
2-Input, 4-Bit Data Selector

MCC7267/MCC8267
2-Input, 4-Bit Data Selector (o.c.)

54 x 63
(79T)



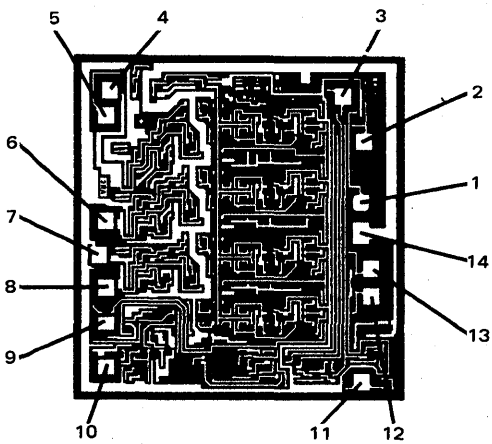
PIN CONNECTIONS



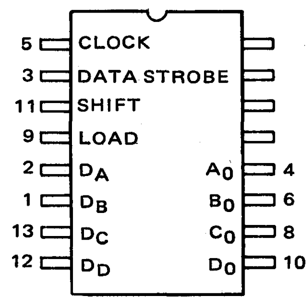
V_{CC} = Pin 16
Gnd = Pin 8

MCC7270/MCC8270
4-Bit Shift Register

89 x 92
(3RA)



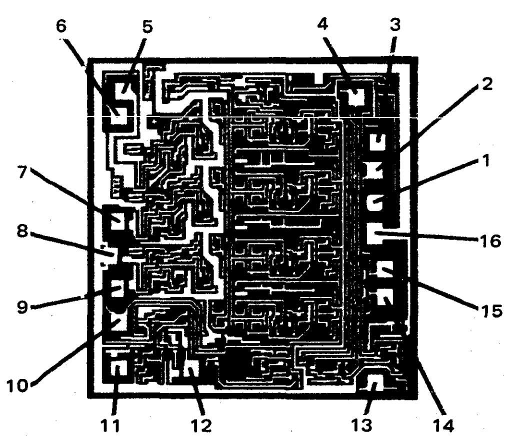
PIN CONNECTIONS



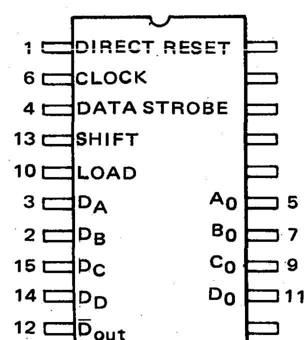
V_{CC} = 14
GND = 7

MCC7271/MCC8271
4-Bit Shift Register

89 x 92
(3RA)



PIN CONNECTIONS

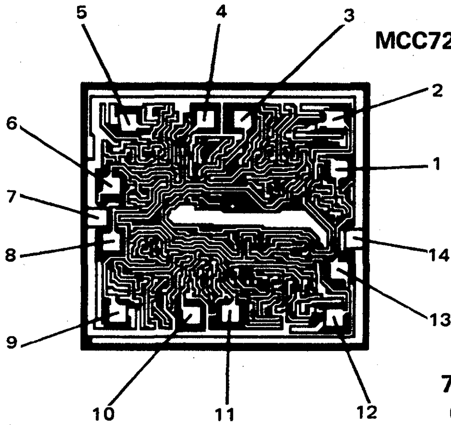


V_{CC} = 16
GND = 8

7

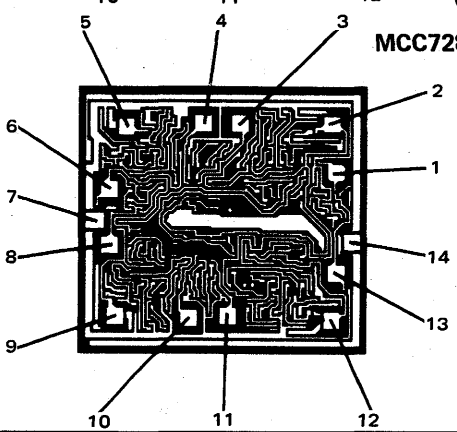
MCC7280/MCC8280
Presettable Decade Counter
MCC7281/MCC8281
Presettable Binary Counter

MCC7280/MCC8280



72 x 78
(5GD)

MCC7281/MCC8281



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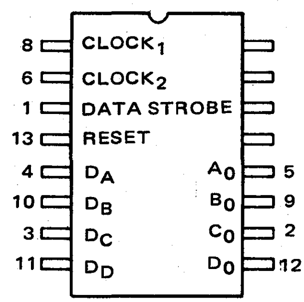
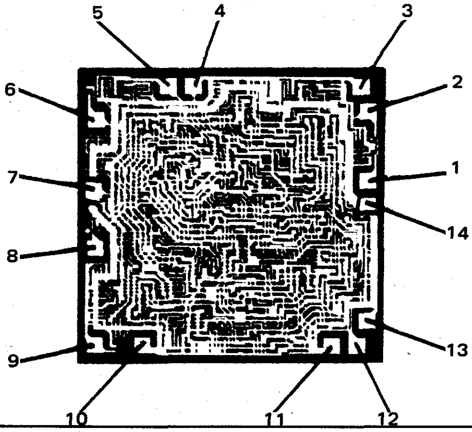


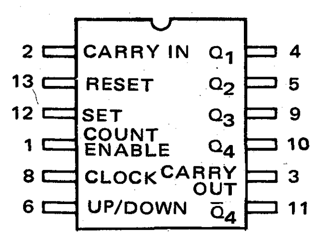
V_{CC} = 14
GND = 7

MCC7284/MCC8284
Binary Up/Down Counter
MCC7285/MCC8285
Decade Up/Down Counter

79 x 82
(51T)



PIN CONNECTIONS

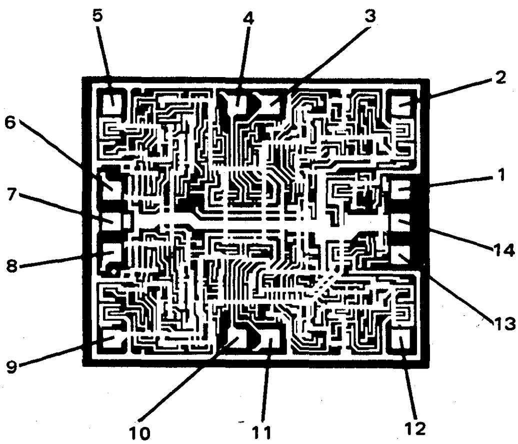


V_{CC} = 14
GND = 7

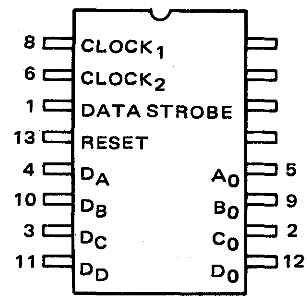
7

MCC7288/MCC8288
Divide by 12 Counter

92 x 78
(39N)



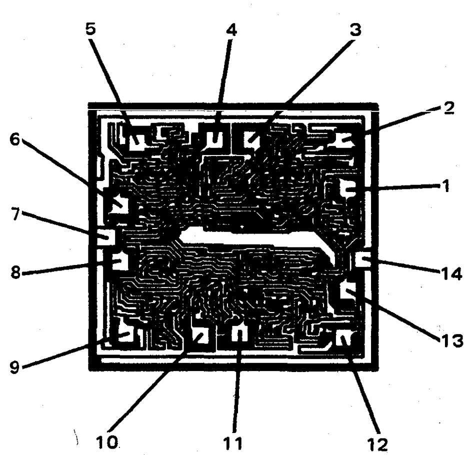
PIN CONNECTIONS



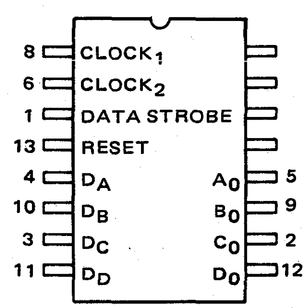
V_{CC} = 14
GND = 7

MCC7290/MCC8290
MCC7291/MCC8291
High Speed Presettable Decade Counter

72 x 78
(5GD)



PIN CONNECTIONS



V_{CC} = 14
GND = 7

MTTL – COMPLEX FUNCTIONS

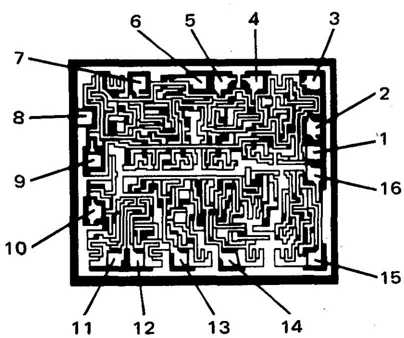
MCC8300 Series (0 to +75°C)
MCC9300 Series (–55 to +125°C)

These complex functions are designed for digital applications in the medium to high-speed range, with significant reduction in package count and increased logic per function over devices in the basic MTTL and MDTL families. They are direct replacements for F8300/9300 Series devices.

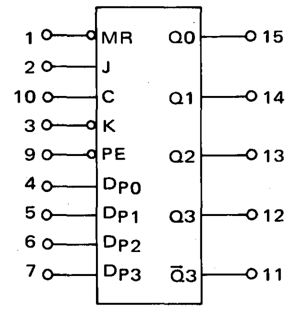
Type		Function	Wafer Mask Set #	Chip Size (Mils)
0 to 75°C	–55 to +125°C			
MCC8300	MCC9300	Universal 4-Bit Shift Register	99T	69x82
MCC8301	MCC9301	BCD-to-Decimal Decoder	77H	70x85
MCC8304	MCC9304	Dual Full Adder	10T	65x66
MCC8306	MCC9306	Preset. Decade Up/Down Counter	43P	84x125
MCC8307	MCC9307	BCD to Seven Segment Decoder	94M	73x73
MCC8308	MCC9308	Dual 4-Bit Latch	44P	74x98
MCC8309	MCC9309	Dual 4-Channel Data Selector	09T	64x65
MCC8310	MCC9310	Preset. Decade Counter	96R	75x102
MCC8311	MCC9311	One of 16 Decoder	11T	77x87
MCC8312	MCC9312	8-Channel Data Selector	21L	60x62
MCC8314	MCC9314	Quad Latch	69P	63x68
MCC8316	MCC9316	Presettable 4 Bit Binary Counter	96R	75x102
MCC8317	MCC9317	Seven Segment Decoder/Driver	12T	80x88
MCC8318	MCC9318	8-Input Priority Encoder	90P	68x70
MCC8322	MCC9322	Quad 2-Input Data Selector/Multiplexer	62V	52x57
MCC8324	MCC9324	5 Bit Comparator	8CM	65x66
MCC8328	MCC9328	Dual 8-Bit Shift Register	13M	70x88
MCC8601	MCC9601	Retriggerable Monostable Multivibrator	70K	48x54
MCC8602	MCC9602	Dual Retriggerable Resettable Monostable Multi.	41R	57x67

MCC8300/MCC9300
Universal 4-Bit Shift Register

69 x 82
(99T)



PIN CONNECTIONS

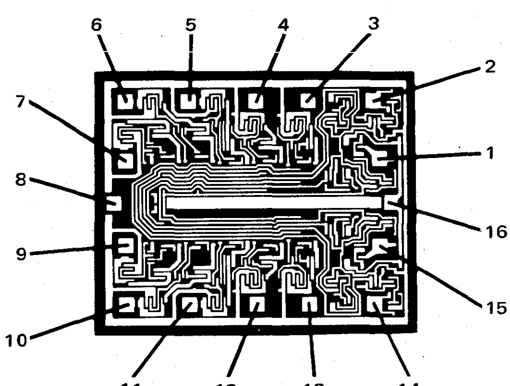


V_{CC} = Pin 16
Gnd = Pin 8

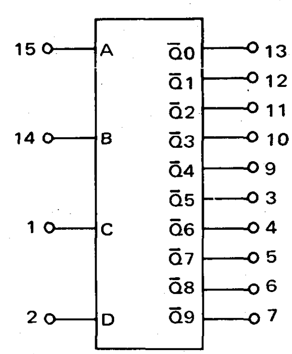
t_{pd} = 25 ns typ
P_D = 300 mW typ/pkg

MCC8301/MCC9301
BCD-to-Decimal Decoder

70 x 85
(77H)



PIN CONNECTIONS

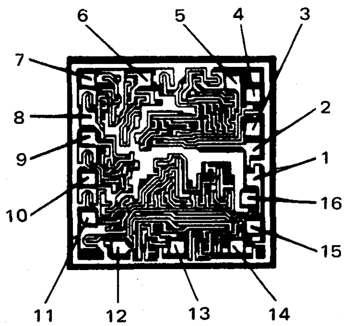


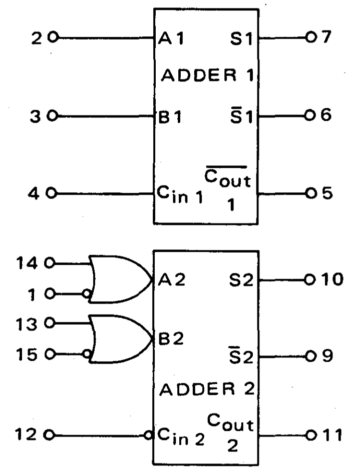
V_{CC} = Pin 16
Gnd = Pin 8

MCC8304/MCC9304
Dual Full Adder

PIN CONNECTIONS

65 x 66
(10T)



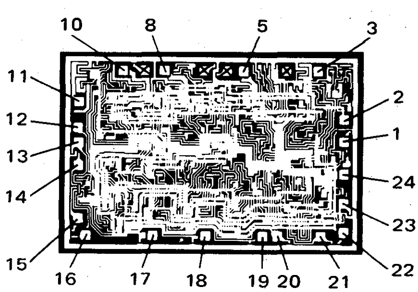


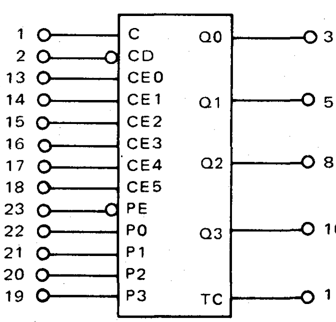
V_{CC} = Pin 16
Gnd = Pin 8

MCC8306/MCC9306
Presettable Decade Up/Down Counter

PIN CONNECTIONS

84 x 125
(43P)



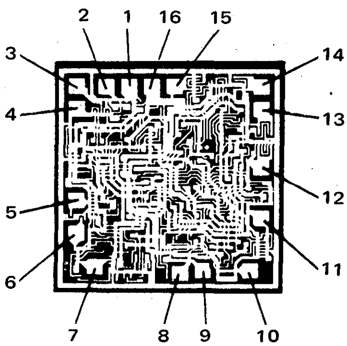


V_{CC} = Pin 24
Gnd = Pin 12

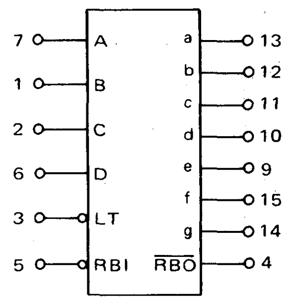
7

MCC8307/MCC9307
BCD to Seven Segment Decoder

73 x 73
(94M)



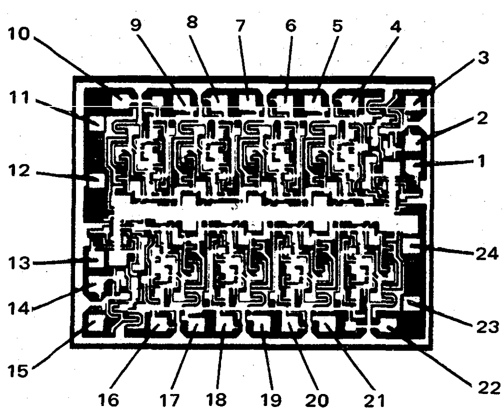
PIN CONNECTIONS



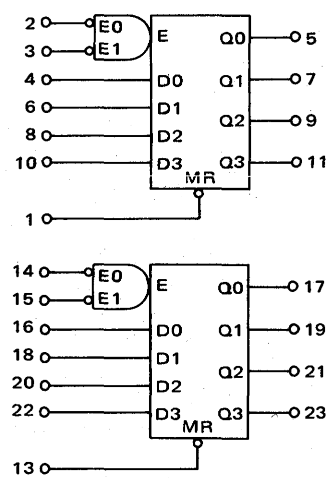
V_{CC} = Pin 16
Gnd = Pin 8

MCC8308/MCC9308
Dual 4-Bit Latch

74 x 98
(44P)



PIN CONNECTIONS

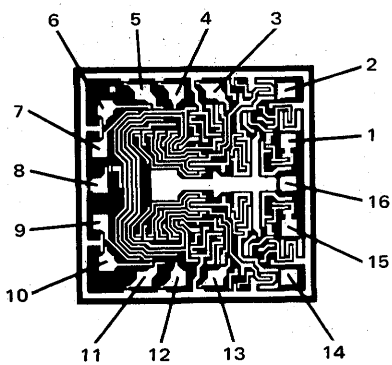


V_{CC} = Pin 24
Gnd = Pin 12

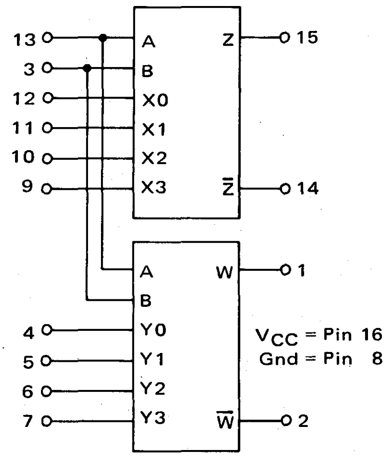
7

MCC8309/MCC9309
Dual 4-Channel Data Selector

64 x 65
(09T)



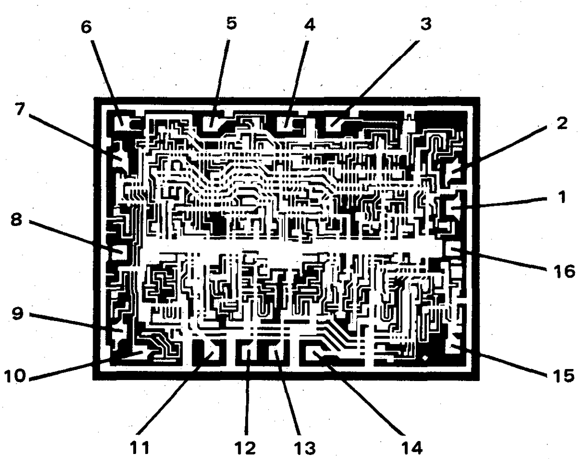
PIN CONNECTIONS



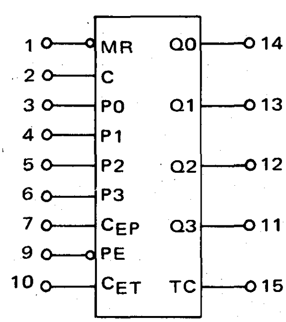
$Z = \overline{A}\,\overline{B}X0 + A\overline{B}X1 + \overline{A}BX2 + ABX3$
$\overline{Z} = \overline{A}\,\overline{B}\,\overline{X0} + A\overline{B}\,\overline{X1} + \overline{A}B\overline{X2} + AB\overline{X3}$
$W = \overline{A}\,\overline{B}Y0 + A\overline{B}Y1 + \overline{A}BY2 + ABY3$
$\overline{W} = \overline{A}\,\overline{B}\,\overline{Y0} + A\overline{B}\,\overline{Y1} + \overline{A}B\overline{Y2} + AB\overline{Y3}$

MCC8310/MCC9310
Presettable Decade Counter

75 x 102
(96R)



PIN CONNECTIONS

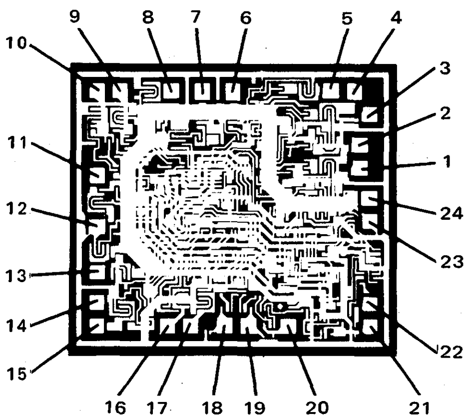


V_{CC} = Pin 16
Gnd = Pin 8

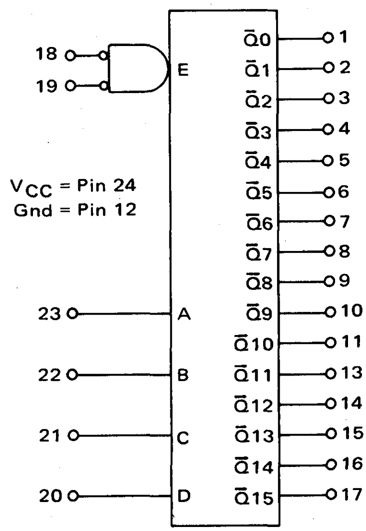
7

MCC8311/MCC9311
One of 16 Decoder

77 x 87
(11T)



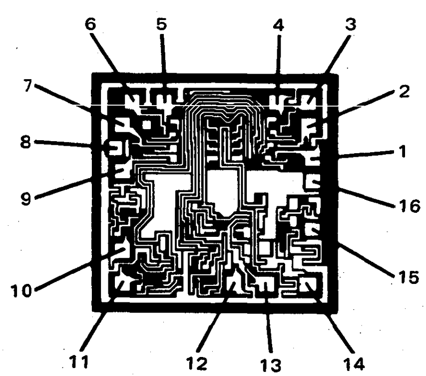
PIN CONNECTIONS

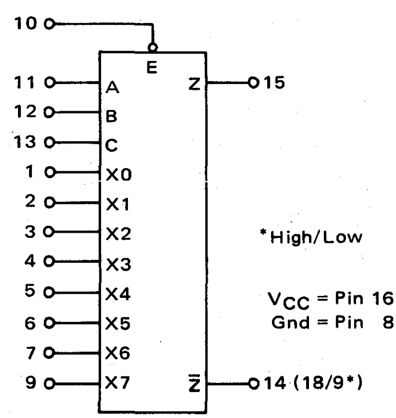


MCC8312/MCC9312
8-Channel Data Selector

PIN CONNECTIONS

60 x 62
(21L)



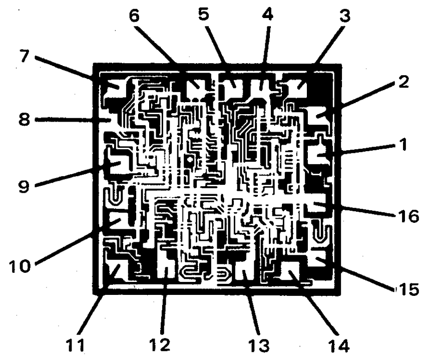


$$Z = E \bullet (\bar{A}\bar{B}\bar{C}X0 + A\bar{B}\bar{C}X1 + \bar{A}B\bar{C}X2 + AB\bar{C}X3 + \bar{A}\bar{B}CX4 + A\bar{B}CX5 + \bar{A}BCX6 + ABCX7)$$

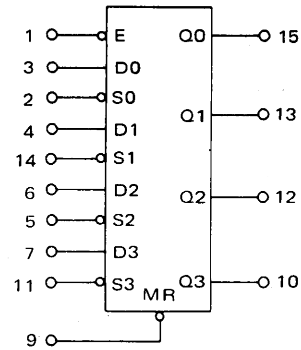
$$\bar{Z} = E \bullet (\bar{A}\bar{B}\bar{C}\overline{X0} + A\bar{B}\bar{C}\overline{X1} + \bar{A}B\bar{C}\overline{X2} + AB\bar{C}\overline{X3} + \bar{A}\bar{B}C\overline{X4} + A\bar{B}C\overline{X5} + \bar{A}BC\overline{X6} + ABC\overline{X7})$$

MCC8314/MCC9314
Quad Latch

63 x 68
(69P)



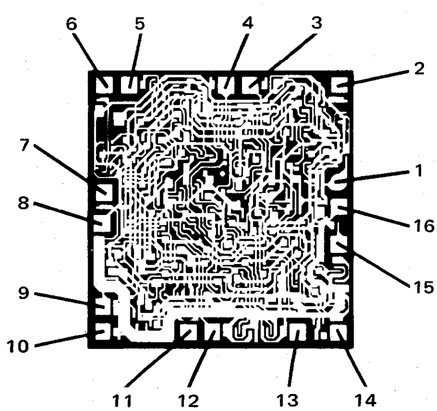
PIN CONNECTIONS



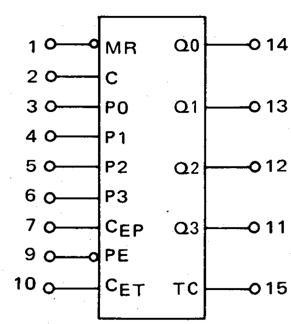
V_{CC} = Pin 16
Gnd = Pin 8

MCC8316/MCC9316
Presettable 4 Bit Binary Counter

75 x 102
(96R)



PIN CONNECTIONS



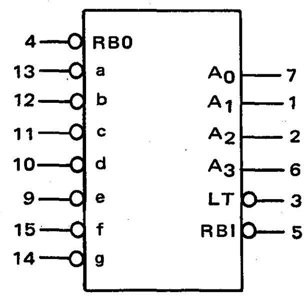
V_{CC} = Pin 16
Gnd = Pin 8

MCC8317/MCC9317
Seven Segment Decoder/Driver

80 x 88
(12T)

CONSULT FACTORY

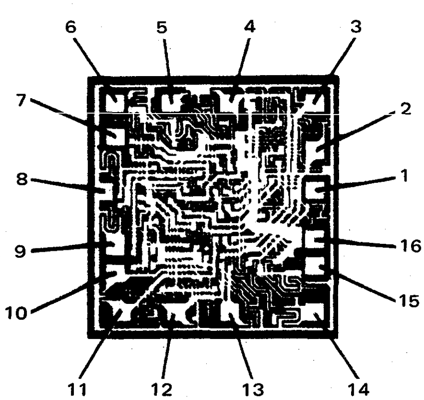
PIN CONNECTIONS



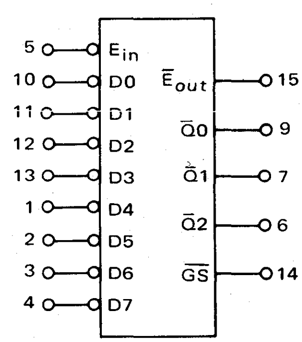
V_{CC} = Pin 16
GND = Pin 8

MCC8318/MCC9318
8-Input Priority Encoder

68 x 70
(90P)



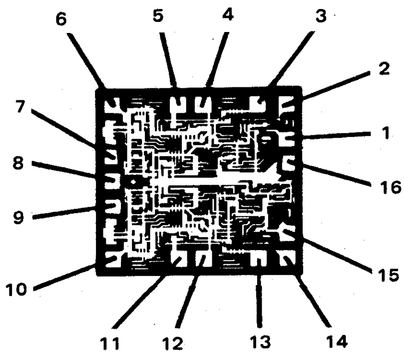
PIN CONNECTIONS



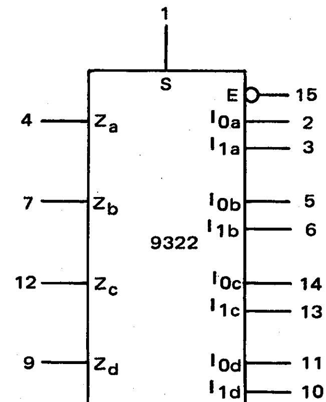
V_{CC} = Pin 16
Gnd = Pin 8

MCC8322/MCC9322
Quad 2-Input Data Selector/Multiplexer

52 x 57
(62V)



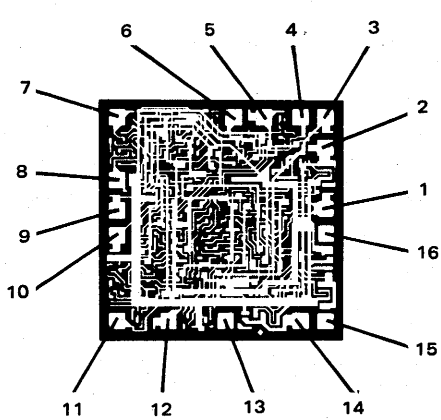
PIN CONNECTIONS



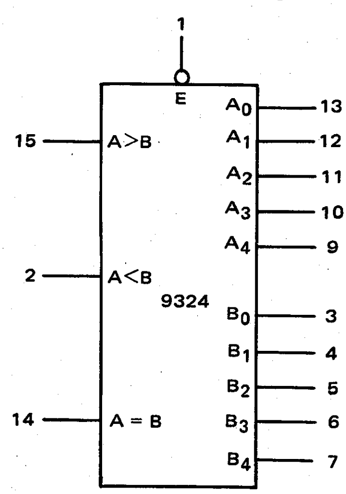
V_{CC} = Pin 16
GND = Pin 8

MCC8324/MCC9324
5 Bit Comparator

65 x 66
(8CM)



PIN CONNECTIONS

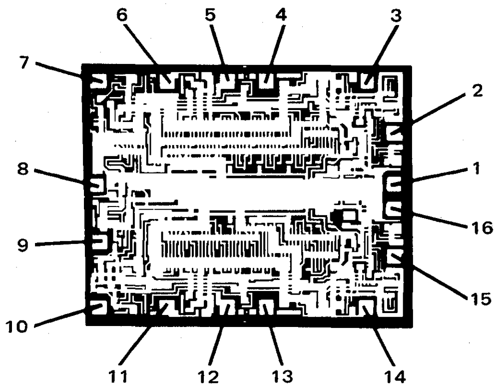


V_{CC} = Pin 16
GND = Pin 8

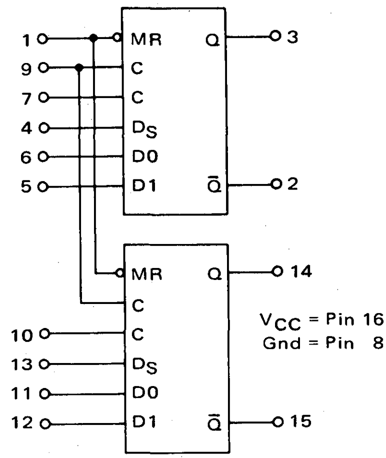
7

MCC8328/MCC9328
Dual 8-Bit Shift Register

70 x 88
(13M)

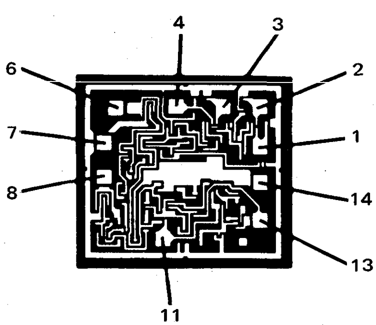


PIN CONNECTIONS

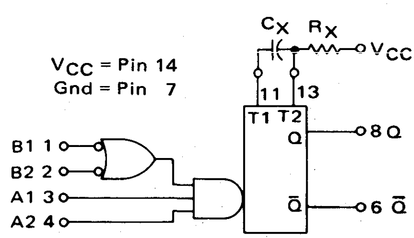


MCC8601/MCC9601
Retriggerable Monostable Multivibrator

48 x 54
(70K)

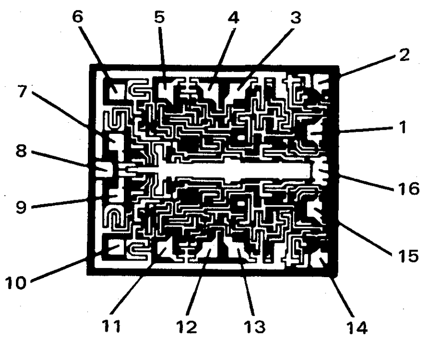


PIN CONNECTIONS

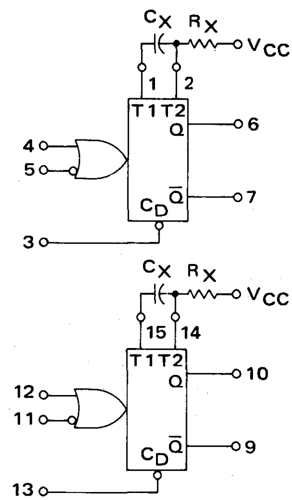


MCC8602/MCC9602
Dual Retriggerable Resettable Monostable Multivibrator

57 x 67
(41R)



PIN CONNECTIONS



V_{CC} = Pin 16
Gnd = Pin 8

7

7

CHAPTER 8
CMOS Integrated Circuits

McMOS geometry photos were not available when this book was being compiled. However, all McMOS devices listed on the following pages are available in chip form. For detailed information, contact:

CMOS Marketing
Motorola Semiconductor Products Inc.
3501 Ed Bluestein Blvd.
Austin, Texas 78721
(512) 928-2600

McMOS INTEGRATED CIRCUITS

Part Number	Function	Suffix*	Pins	Second Sourced
MC14000	Dual 3-Input NOR Gate plus Inverter	AL,CL,CP	14	✓
MC14001	Quad 2-Input NOR Gate	AL,CL,CP	14	✓
MC14001B	Quad 2-Input NOR Gate	AL,CL,CP	14	✓
MC14002	Dual 4-Input NOR Gate	AL,CL,CP	14	✓
MC14002B	Dual 4-Input NOR Gate	AL,CL,CP	14	✓
MC14006B	18-Bit Static Shift Register	AL,CL,CP	14	✓
MC14007B	Dual Complementary Pair plus Inverter	AL,CL,CP	14	✓
MC14008B	4-Bit Full Adder	AL,CL,CP	16	✓
MC14011	Quad 2-Input NAND Gate	AL,CL,CP	14	✓
MC14011B	Quad 2-Input NAND Gate	AL,CL,CP	14	✓
MC14012	Dual 4-Input NAND Gate	AL,CL,CP	14	✓
MC14012B	Dual 4-Input NAND Gate	AL,CL,CP	14	✓
MC14013B	Dual D Flip-Flop	AL,CL,CP	14	✓
MC14014B	8-Bit Static Shift Register	AL,CL,CP	16	✓
MC14015B	Dual 4-Bit Static Shift Register	AL,CL,CP	16	✓
MC14016B	Quad Analog Switch/Quad Multiplexer	AL,CL,CP	14	✓
MC14017B	Decade Counter/Divider	AL,CL,CP	16	✓
MC14018B	Presettable Divide-by-N Counter	AL,CL,CP	16	✓
MC14020B	14-Bit Binary Counter	AL,CL,CP	16	✓
MC14021B	8-Bit Static Shift Register	AL,CL,CP	16	✓
MC14022B	Octal Counter/Divider	AL,CL,CP	16	✓
MC14023	Triple 3-Input NAND Gate	AL,CL,CP	14	✓
MC14023B	Triple 3-Input NAND Gate	AL,CL,CP	14	✓
MC14024B	Seven Stage Ripple Counter	AL,CL,CP	14	✓
MC14025	Triple 3-Input NOR Gate	AL,CL,CP	14	✓
MC14025B	Triple 3-Input NOR Gate	AL,CL,CP	14	✓
MC14027B	Dual J-K Flip-Flop	AL,CL,CP	16	✓
MC14028B	BCD-to-Decimal Decoder	AL,CL,CP	16	✓
MC14032B	Triple Serial Adder (Positive Logic)	AL,CL,CP	16	✓
MC14034B	8-Bit Universal Bus Register	AL,CL,CP	24	✓
MC14035B	4-Bit Shift Register	AL,CL,CP	16	✓
MC14038B	Triple Serial Adder (Negative Logic)	AL,CL,CP	16	✓
MC14040B	12-Bit Binary Counter	AL,CL,CP	16	✓
MC14042B	Quad Latch	AL,CL,CP	16	✓
MC14043B	Quad NOR R-S Latch	AL,CL,CP	16	✓
MC14044B	Quad NAND R-S Latch	AL,CL,CP	16	✓
MC14046B	Phase-Locked Loop	AL,CL,CP	16	✓
MC14049B	Hex Inverter/Buffer	AL,CL,CP	16	✓
MC14050B	Hex Buffer	AL,CL,CP	16	✓
MC14051B	8-Channel Analog Multiplexer	AL,CL,CP	16	✓

*Add suffix to part number on all orders. For chips, use MCC prefix, and delete package designator from suffix.

AL	3 to 18 V, −55 to +125°C, ceramic package
CL	3 to 18 V, −40 to +85°C, ceramic package
CP	3 to 18 V, −40 to +85°C, plastic package
L	Limited voltage range, limited temperature range, ceramic package
P	Limited voltage range, limited temperature range, plastic package
EFL	3 to 18 V, −55 to +125°C, ceramic package
FL	3 to 18 V, −40 to +85°C, ceramic package
FP	3 to 18 V, −40 to +85°C, plastic package
EVL	3 to 6 V, −55 to +125°C, ceramic package
VL	3 to 6 V, −40 to +85°C, ceramic package
VP	3 to 6 V, −40 to +85°C, plastic package
Z	Limited voltage range, limited temperature range, leadless ceramic package

McMOS INTEGRATED CIRCUITS (continued)

Part Number	Function	Suffix*	Pins	Second Sourced
MC14052B	Dual 4-Channel Analog Multiplexer	AL,CL,CP	16	✓
MC14053B	Triple 2-Channel Analog Multiplexer	AL,CL,CP	16	✓
MC14066B	Quad Analog Switch	AL,CL,CP	14	✓
MC14068B	8-Input NAND Gate	AL,CL,CP	14	✓
MC14069B	Hex Inverter	AL,CL,CP	14	✓
MC14070B	Quad Exclusive OR Gate	AL,CL,CP	14	✓
MC14071	Quad 2-Input OR Gate	AL,CL,CP	14	✓
MC14071B	Quad 2-Input OR Gate	AL,CL,CP	14	✓
MC14072B	Dual 4-Input OR Gate	AL,CL,CP	14	✓
MC14073B	Triple 3-Input AND Gate	AL,CL,CP	14	✓
MC14075B	Triple 3-Input OR Gate	AL,CL,CP	14	✓
MC14076B	Quad D-Type Register	AL,CL,CP	16	✓
MC14077B	Quad Exclusive NOR Gate	AL,CL,CP	14	✓
MC14078B	8-Input NOR Gate	AL,CL,CP	14	✓
MC14081	Quad 2-Input AND Gate	AL,CL,CP	14	✓
MC14081B	Quad 2-Input AND Gate	AL,CL,CP	14	✓
MC14082B	Dual 4-Input AND Gate	AL,CL,CP	14	✓
MC14093B	Quad 2-Input NAND Schmitt Trigger	AL,CL,CP	14	✓
MC14160B	Decade Counter (Asynchronous Clear)	AL,CL,CP	16	✓
MC14161B	Binary Counter (Asynchronous Clear)	AL,CL,CP	16	✓
MC14162B	Decade Counter (Synchronous Clear)	AL,CL,CP	16	✓
MC14163B	Binary Counter (Synchronous Clear)	AL,CL,CP	16	✓
MC14174B	Hex D Flip-Flop	AL,CL,CP	16	✓
MC14175B	Quad D Flip-Flop	AL,CL,CP	16	✓
MC14194B	4-Bit Universal Shift Register	AL,CL,CP	16	✓
MC14408	Binary-to-Phone Pulse Converter	L,P	16	
MC14409	Binary-to-Phone Pulse Converter	L,P	16	
MC14410	2-of-8 Tone Encoder	L,P	16	
MC14411	Bit-Rate Frequency Generator	L,P	24	
MC14412	Universal Low-Speed Modem	FL,VL	16	
MC14415	Quad Precision Timer/Driver	EFL,FL,FP, EVL,VL,VP	16	
MC14419	2-of-8 Keypad-to-Binary Encoder	L,P	16	
MC14422	Remote Control Transmitter	P	16	
MC14431	12-Bit A/D Converter	L,P	24	
MC14433	3½ Digit A/D Converter	L,P	24	
MC14435	3½ Digit A/D Logic Subsystem	EFL,FL,FP, EVL,VL,VP	16	
MC14440	LCD Watch/Clock Circuit	L,Z	40,36	
MC14450	Oscillator 2^{16} Divider/Buffer	L,P	6	
MC14451	Oscillator/Divider/Buffer	L,P	16	
MC14452	Digitally Trimmed Frequency Divider	P	14	
MC14490	Hex Contact Bounce Eliminator	EFL,FL,FP, EVL,VL,VP	16	
MC14501	Triple Gate	AL,CL,CP	16	
MC14502B	Strobed Hex Inverter/Buffer	AL,CL,CP	16	✓
MC14503B	Hex 3-State Buffer	AL,CL,CP	16	✓
MCM14505	64 x 1-Bit Static RAM	AL,CL,CP	14	
MC14506B	Dual Expandable AOI Gate	AL,CL,CP	16	
MC14507	Quad Exclusive OR Gate	AL,CL,CP	14	✓
MC14508B	Dual 4-Bit Latch	AL,CL,CP	24	✓
MC14510B	BCD Up/Down Counter	AL,CL,CP	16	✓
MC14511B	BCD-to-7 Segment Latch/Decoder/Driver	AL,CL,CP	16	✓

*Suffixes defined on page 8-2.

McMOS INTEGRATED CIRCUITS (continued)

Part Number	Function	Suffix*	Pins	Second Sourced
MC14512	8-Channel Data Selector	AL,CL,CP	16	✓
MC14514B	4-Bit Latch/4-to-16 Line Decoder (High)	AL,CL,CP	24	✓
MC14515B	4-Bit Latch/4-to-16 Line Decoder (Low)	AL,CL,CP	24	✓
MC14516B	Binary Up/Down Counter	AL,CL,CP	16	✓
MC14517B	Dual 64-Bit Static Shift Register	AL,CL,CP	16	✓
MC14518B	Dual BCD Up Counter	AL,CL,CP	16	✓
MC14519B	4-Bit AND/OR Selector	AL,CL,CP	16	✓
MC14520B	Dual Binary Up Counter	AL,CL,CP	16	✓
MC14521B	24-Stage Frequency Divider	AL,CL,CP	16	
MC14522B	Programmable BCD Divide-by-N Counter	AL,CL,CP	16	✓
MCM14524	256 x 4-Bit Read Only Memory	AL,CL,CP	16	
MC14526B	Programmable Binary Divide-by-N Counter	AL,CL,CP	16	✓
MC14527B	BCD Rate Multiplier	AL,CL,CP	16	✓
MC14528B	Dual Monostable Multivibrator	AL,CL,CP	16	✓
MC14529B	Dual 4-Channel Analog Data Selector	AL,CL,CP	16	✓
MC14530B	Dual 5-Input Majority Logic Gate	AL,CL,CP	16	
MC14531B	12-Bit Parity Tree	AL,CL,CP	16	✓
MC14532B	8-Bit Priority Encoder	AL,CL,CP	16	✓
MC14534B	Real Time 5-Decade Counter	AL,CL,CP	24	
MC14536B	Programmable Timer	AL,CL,CP	16	
MCM14537	256 x 1-Bit Static RAM	AL,CL	16	
MC14538B	Dual Precision Monostable Multivibrator	AL,CL,CP	16	
MC14539B	Dual 4-Channel Data Selector/Multiplexer	AL,CL,CP	16	
MC14541B	Programmable Oscillator-Timer	AL,CL,CP	14	
MC14543B	BCD-to-7 Segment Latch/Decoder/Driver	AL,CL,CP	16	✓
MC14549B	Successive Approximation Register	AL,CL,CP	16	
MCM14552	64 x 4-Bit Static RAM	AL,CL,CP	24	
MC14553B	3-Digit BCD Counter	AL,CL,CP	16	
MC14554B	2 x 2-Bit Parallel Binary Multiplier	AL,CL,CP	16	
MC14555B	Dual Binary to 1-of-4 Decoder	AL,CL,CP	16	✓
MC14556B	Dual Binary to 1-of-4 Decoder (Inverting)	AL,CL,CP	16	✓
MC14557B	1-to-64-Bit Variable Length Shift Register	AL,CL,CP	16	
MC14558B	BCD-to-7 Segment Decoder	AL,CL,CP	16	
MC14559B	Successive Approximation Register	AL,CL,CP	16	
MC14560B	NBCD Adder	AL,CL,CP	16	
MC14561B	9's Complementer	AL,CL,CP	14	
MC14562B	128-Bit Static Shift Register	AL,CL,CP	14	
MC14566B	Industrial Time Base Generator	AL,CL,CP	16	
MC14568B	Phase Comparator/Programmable Counter	AL,CL,CP	16	
MC14569B	Dual Programmable BCD/Binary Counter	AL,CL,CP	16	
MC14572	Hex Gate	AL,CL,CP	16	
MC14580B	4 x 4 Multiport Register	AL,CL,CP	24	✓
MC14581B	4-Bit Arithmetic Logic Unit	AL,CL,CP	24	✓
MC14582B	Look-Ahead Carry Block	AL,CL,CP	16	✓
MC14583B	Dual Schmitt Trigger	AL,CL,CP	16	
MC14584B	Hex Schmitt Trigger	AL,CL,CP	14	
MC14585B	4-Bit Magnitude Comparator	AL,CL,CP	16	✓
MCM14505	64-Bit Static Random Access Memory	AL,CL,CP	14	
MCM14524	1024-Bit Read Only Memory	AL,CL,CP	16	
MCM14537	256-Bit Static Random Access Memory	AL,CL	16	
MCM14552	256-Bit Static Random Access Memory	AL,CL,CP	24	

NMOS Devices Designed to work with the MC14422 CMOS device:

MC6525	Remote Control Receiver	P	28	
MC6526	Remote Control Receiver	P	28	

*Suffixes defined on page 8-2.

APPENDIX A
Standard Visual Inspection

The following specifications and documents provide the visual inspection criteria for Motorola chip devices:

STANDARD SPECIFICATIONS

MIL-STD-750	Test Methods for Semiconductor Devices (Method 2073)
MIL-STD-883	Test Methods and Procdures for Microelectronics (Method 2010)

MOTOROLA SPECIFICATIONS

12M53030J	Visual Inspection of Integrated Circuits
12M53449J	Standard Hi-Rel Internal Visual Inspection Criteria
12M54725F	Visual Inspection of Silicon Packaged Chips
12M54977F	Zener Diode Dice Visual
12M55254L	Visual Inspection of Silicon Wafers (for Wafers and Chips)
12M55367J	Internal Inspection Criteria for Microelectronics equivalent to MIL-STD-883 Class B
12MRB00104A	Visual Inspection of Silicon Vial Packaged Chips
12MRB01715A	Visual Inspection of Silicon Flip-Chip Packaged Chips
12MRB03061A	Silicon Power Transistor Chip Inspection
12MRB03265A	Visual Inspection of Silicon Wafers Prior to Bump Processing
12MRB04044A	Shear Test for Flip-Chips

Copies of the military standards can be obtained by writing the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Copies of the Motorola specifications should be ordered from your Motorola Sales Office.

The following visual inspection criteria used by Motorola are **not** included in the documents listed.

POWER TRANSISTORS

Visual inspection is performed per MIL-STD-883, Method 2010, Level B, with the following addition:

Metallization Bridging. A chip shall be rejected if bridged metallization reduces the distance between two metallization strips to less than 75% of the design separation.

Excess Die. A chip shall be rejected if a portion of an adjacent die with metallization is still attached.

SMALL-SIGNAL RF TRANSISTORS

Visual inspection is performed per MIL-STD-883, Method 2010, Level A or B (customer must specify which level) with the following additions and clarifications:

Additions

Excess Die. A chip shall be rejected if a portion of an adjacent chip with metallization is still attached.

Scribe Line Limit. A chip shall be rejected if a scribe line is not contained within the scribe grid.

Chip-Out. A chip shall be rejected if at least 2/3 of each edge is not intact. (This applies only if the entire thickness of the chip is missing.)

Metal Splinters. A chip shall be rejected if it contains metal splinters long enough to bridge any two metallized areas.

Clarifications

Cracks and Chips.

NPN Transistors: A die shall be rejected when there is less than 0.1 mil of passivation visible between the crack or chip and the operating metallization or collector-base junction and the edge of the die.

PNP Transistors: A die shall be rejected when a crack or chip extends within 0.1 mil of the inside diffusion line of the annular ring (guard ring).

Scratch Metallization. The scratch criteria does not apply to the metallized annular ring.

DIODES

Visual inspection is performed per MIL-STD-750, Method 2073, with the following additions:

Missing Metallization. A chip shall be rejected when the device has more than 10% missing metal in the window area.

Excess die. A chip shall be rejected if any portion of an adjacent chip with metallization is still attached.

APPENDIX B
Die and Wire Bonding

Some considerations in bonding Motorola die to a substrate and attaching connecting wires to the top bonding pads are presented here. If additional or more detailed information is desired, manufacturers of die and wire bonding equipment and materials should be consulted.

DIE BONDING

Three major categories of die bonding may be used with Motorola conventional chips:

1. Eutectic braze (hard solder)
2. Soft solder
3. Epoxy

Eutectic braze is the predominate die bonding technique in use today for small-signal devices; however, the trend is toward epoxy bonding, especially in multi-chip hybrid circuits. Soft solders are popular for the assembly of low-cost devices.

Die bond quality is a function of the number of voids in the bond area. As the void area approaches 20% of the total area, thermal resistance noticeably increases, causing a reduction in the power handling ability of the chip.

Eutectic Braze. The eutectic braze or hard solder includes gold-silicon, gold-germanium, and gold-tin. The best material to use is determined by the backing material of the chip as indicated in Table 1. To improve wetting, thereby reducing voids, chips should be "scrubbed" on a pre-heated mounting surface. A preform is also helpful in reducing voids and is recommended when bonding large die.

Large power die (over 20,000 square mils) are difficult to bond using eutectic braze because of the different thermal coefficients of expansion of silicon and package materials and the high temperature required. To avoid cracking the die, a "moly" insert is used in the die bond for stress relief or a soft solder bond is used.

Soft Solder. Soft solders include lead-indium-gold and lead-tin. They are useful for low-cost assembly of power circuits, where temperature cycling is not extreme. Use of preforms is recommended but scrubbing is normally not necessary.

Epoxy. Epoxies may be used with chips having any metallization. Both conductive epoxies (gold-filled and silver-filled) and electrically insulating epoxies are now available. They are solvent free and cure in 20 to 45 minutes at temperatures under 150°C (typically 100-120°C). The cured epoxies readily withstand subsequent wire bonding at temperatures up to 400°C.

Comparison of Die Bonding Techniques. Each technique generally has specific advantages and limitations in terms of chip power dissipation and electrical degradation. A decrease in power dissipation capability of the chip occurs as the thermal resistance of the die bond is increased. The gold-silicon bond exhibits the lowest thermal resistance. In order of increasing loss, the techniques are gold-silicon, gold-germanium, gold-tin, the soft solders, and epoxy. The epoxies have significantly higher thermal resistance than the others.

Electrical degradation of the chip may result from the temperature required to secure the bond. Gold-silicon requires a bonding temperature of over 380°C, the highest of all bonding techniques, while the epoxies have a cure temperature of less than 150°C.

Surface cleanliness is of primary importance if degradation (usually in the form of a loss in h_{FE} at low currents) is to be avoided. Consequently, care must be taken in handling to avoid contamination, particularly if the chips are not passivated.

WIRE BONDING

Wire bonding may be conveniently classified into two types: thermocompression and ultrasonic. Both types may be used with Motorola chips, with either gold or aluminum wire. However, less trouble with voids (caused by the formation of intermetallic compounds on the chip surface) occurs if the wire material is similar to that of the chip top metallization. Similarly, it is desirable that the post of terminal material be the same as the wire. Intermetallic contamination can form at temperatures above 150°C and is aggravated by temperature cycling.

Thermocompression Bonds have been in use by the industry for a long time. Two types are in use today: ball and stitch. Comparisons between the types are shown in Table 2.

Ultrasonic Bonding is a more critical process than thermocompression bonding. Because there is no clear understanding of how the ultrasonic energy and its rate of transmission are related to making a satisfactory wire bond, the fabrication procedures must be empirically determined to make reliable wire bonds. Since bonding may be done at low temperatures, the formation of intermetallic contamination is greatly reduced during the bonding process.

The ultrasonic process, is normally used with a wedge tool which is lowered and raised by pivoting, has three limitations that become particularly acute in hybrid circuits:

1. The bond surfaces must be uniformly rigid.
2. The height of the die and terminal bonding surfaces cannot vary greatly form device to device.
3. The device must be rotated to align the two bonding sites with the wire*.

*Such rotation is inconvenient and it can contribute to operator error in devices with complex bonding pad location patterns.

The first requirement relates to the need to couple the ultrasonic energy into the bonding area. The other two requirements are relaxed if ultrasonic ball-stitch bonding with gold wire is used; since the tool moves vertically to and from the bonding surface, there is no need to align the two bonding sites to avoid the wire in moving from the first to the second bonding site.

Consequently, gold-wire ultrasonic bonding is finding more use in hybrid circuits.

Bonding Compatibility. Care must be exercised in assembling hybrid circuits to avoid weakening or destroying the die bond during wire bond. In general, a high temperature process should not follow a low temperature process, epoxy bonding excepted.

REFERENCE:

Harry A. Schafft, Testing and Fabrication of Wire Bond Electrical Connections — A Comprehensive Study, National Bureau of Standards Technical Note 726, Washington, D.C., September, 1972.

TABLE 1 — Data for Die Bonding

Device Class	Back Metal	Technique	Material	Eutectic Temp. °C	Scrub	Preform
Most IC's	Au	Eutectic Braze	AuSi	380	Optional*	Not Used
Power	Au	Eutectic Braze	AuSi	380	Recommended	Not Used
	CrAg	Soft Solder	PbinAg 92.5-2.5-5.0	310	Optional	Recommended
Small-Signal	Au	Eutectic Braze	AuSi	380	Optional*	Not Used
Zeners	Au	Eutectic Braze	AuSi	380	Recommended	Not Used
	CrAgAu	Hard Solder	AuGe	360	Recommended	Optional
Thyristors	CrCuAu	Soft Solder	PbSn (95-5)	305	Optional	Recommended
Rectifiers	NiAu	Soft Solder	PbSn (95-5)	305	Optional	Recommended
Shottky Barrier Rectifiers	CrAg	Soft Solder	PbSn (95-5)	305	Optional	Recommended

Bonding temperature should generally be at least 20°C above eutectic temperature.
Inert atmosphere (N_2 or N_2H_2) is recommended.
*Scrubbing is recommended on chips greater than 1000 square mils.

TABLE 2 — Comparison of Thermocompression Bonds

Feature	Ball	Stitch
Bonding Pad Area	Large — approximately 4 times wire diameter.	Small — oblong (2x4 mils for 1 mil wire)
Strength	Limited by the tensile strength of the wire just above the ball which has been fully annealed during flame-off.	Wire is deformed at the bond so that a significant reduction occurs in the wire cross-section adjacent to the bond.
Alignment for second bonding site	Not required	Bonding sites must be aligned with the direction of the wire feed and the bond-machine to avoid twisting the wire adjacent to the bonds.

NOTE: Since both ball and stitch bonds are made with a capillary tool , both may be performed on the same equipment. It is common to ball bond to the chip and stitch bond to the post or terminal.