



**MOTOROLA**  
Semiconductors

BOX 20912, PHOENIX, ARIZONA 85036

### 8192-BIT READ ONLY MEMORIES ROW SELECT CHARACTER GENERATORS

The MCM6570 is a mask-programmable 8192-bit horizontal-scan (row select) character generator. It contains 128 characters in a 7 x 9 matrix, and has the capability of shifting certain characters that normally extend below the baseline, such as j, y, g, p, and q. Circuitry is supplied internally to effectively lower the whole matrix for this type of character — a feature previously requiring external circuitry.

A seven-bit address code is used to select one of the 128 available characters. Each character is defined as a specific combination of logic "1"s and "0"s stored in a 7 x 9 matrix. When a specific four-bit binary row select code is applied, a word of seven parallel bits appears at the output. The rows can be sequentially selected, providing a nine-word sequence of seven parallel bits per word for each character selected by the address inputs. As the row select inputs are sequentially addressed, the devices will automatically place the 7 x 9 character in one of two pre-programmed positions on the 16-row matrix, with the positions defined by the four row select inputs. Rows that are not part of the character are automatically blanked.

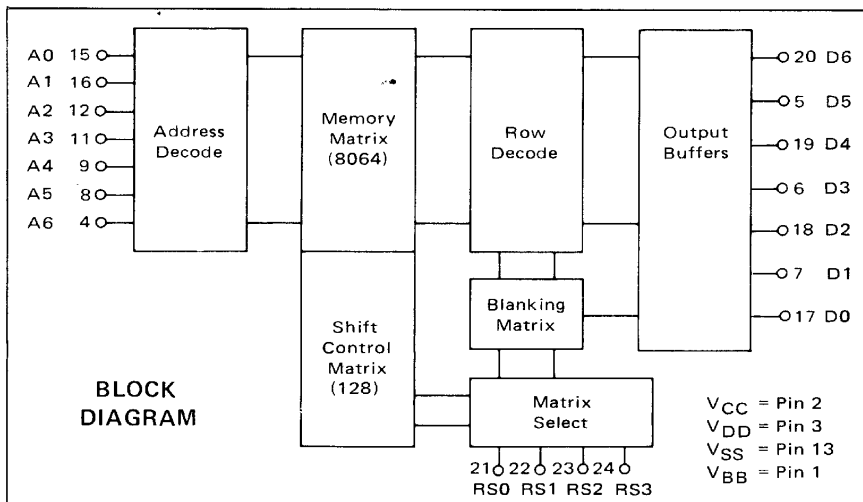
The MCM6571, MCM6571A, and MCM6572 thru MCM6579 are pre-programmed versions of the MCM6570. They contain various sets of characters to meet the requirements of diverse applications. The complete patterns of these devices are contained in this data sheet.

- Static Operation
- TTL Compatibility
- CMOS Compatibility (5 V)
- Shifted Character Capability (Except MCM6572, MCM6573)
- Maximum Access Time = 500 ns

#### ABSOLUTE MAXIMUM RATINGS (See Note 1, Voltages referenced to $V_{SS}$ )

Rating	Symbol	Value	Unit
Supply Voltages	$V_{CC}$	-0.3 to +6.0	Vdc
	$V_{DD}$	-0.3 to +15	
	$V_{BB}$	-10 to +0.3	
Data Input Voltage	$V_{in}$	-0.3 to +15	Vdc
Operating Temperature Range	$T_A$	0 to +70	$^{\circ}C$
Storage Temperature Range	$T_{stg}$	-55 to +125	$^{\circ}C$

NOTE 1: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to RECOMMENDED OPERATING CONDITIONS. Exposure to higher than recommended voltages for extended periods of time could affect device reliability.



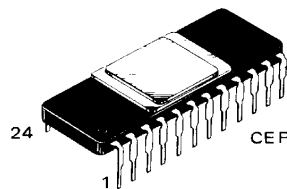
**MCM6570**  
**MCM6571**  
**MCM6571A**  
**MCM6572**  
**thru**  
**MCM6579**

**MOS**

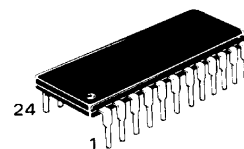
(N-CHANNEL, LOW THRESHOLD)

**8 K**  
**READ ONLY MEMORIES**

**HORIZONTAL-SCAN**  
**CHARACTER GENERATORS**  
**WITH SHIFTED CHARACTERS**



**L SUFFIX**  
CERAMIC PACKAGE  
CASE 684



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 709

#### PIN ASSIGNMENT

1	$V_{BB}$	RS3	24
2	$V_{CC}$	RS2	23
3	$V_{DD}$	RS1	22
4	A6	RS0	21
5	D5	D6	20
6	D3	D4	19
7	D1	D2	18
8	A5	D0	17
9	A4	A1	16
10	N.C.	A0	15
11	A3	N.C.	14
12	A2	$V_{SS}$	13

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high-impedance circuit.

### DC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted.)

#### RECOMMENDED DC OPERATING CONDITIONS (Referenced to $V_{SS}$ ).

Parameter	Symbol	Min	Nom	Max	Unit
Supply Voltage	$V_{DD}$	10.8	12	13.2	Vdc
	$V_{CC}$	4.75	5.0	5.25	Vdc
	$V_{SS}$	0	0	0	Vdc
	$V_{BB}$	-3.3	-3.0	-2.7	Vdc
Input Logic "1" Voltage (Driven by TTL) (Driven by Other Than TTL)	$V_{IH}^*$	3.0	—	$V_{CC}$	Vdc
		4.0	—	$V_{CC}$	Vdc
Input Logic "0" Voltage	$V_{IL}$	0	—	0.8	Vdc

\*A 4.0 V  $V_{IH}$  is required at the chip regardless of the type of driver used. However, internal MOS pullup devices on the chip can pull one TTL driver from 3.0 V to 4.0 V, without affecting access time. These pullup devices may not pull non-TTL drivers above 3.0 V.

#### DC CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Input Forward Current ( $V_{IL} = 0.4$ Vdc)	$I_{IL}$	—	—	-1.6	mAdc
Input Leakage Current ( $V_{IH} = 5.25$ Vdc, $V_{CC} = 4.75$ Vdc)	$I_{IH}$	—	—	100	$\mu$ Adc
Output Low Voltage (Blank) ( $I_{OL} = 1.6$ mAdc)	$V_{OL}$	0	—	0.4	Vdc
Output High Voltage (Dot) ( $I_{OH} = -40$ $\mu$ Adc)	$V_{OH}$	3.0	—	—	Vdc
Power Supply Current	$I_{DD}$	—	—	10	mAdc
	$I_{CC}$	—	—	125	mAdc
	$I_{BB}$	—	—	100	$\mu$ Adc
Power Dissipation	$P_D$	—	600	800	mW

#### CAPACITANCE (Periodically sampled rather than 100% tested)

Characteristic	Symbol	Min	Typ	Max	Unit
Input Capacitance ( $f = 1.0$ MHz)	$C_{in}$	—	4.0	7.0	pF
Output Capacitance ( $f = 1.0$ MHz)	$C_{out}$	—	4.0	7.0	pF

#### AC CHARACTERISTICS

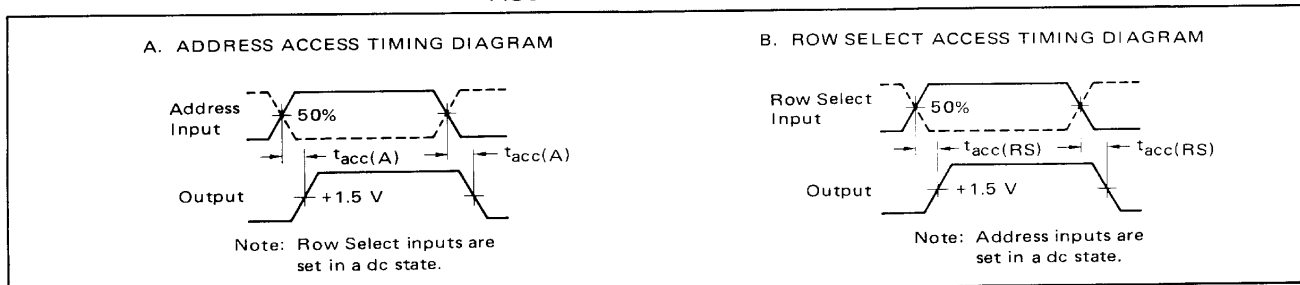
(Full operating voltage and temperature range unless otherwise noted.)

[All timing with  $t_r, t_f = 20$  ns; Load = 1 TTL Gate (MC7400 Series),  $C_L = 30$  pF]

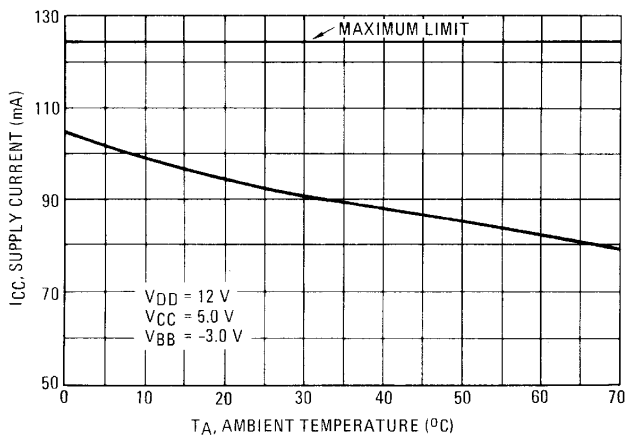
#### TIMING (Typical values measured at 25°C and nominal supplies)

Characteristic	Symbol	Min	Typ	Max	Unit
Address Access Time (See Figure 1A)	$t_{acc}(A)$	—	350	500	ns
Row Select Access Time (See Figure 1B)	$t_{acc}(RS)$	—	300	500	ns

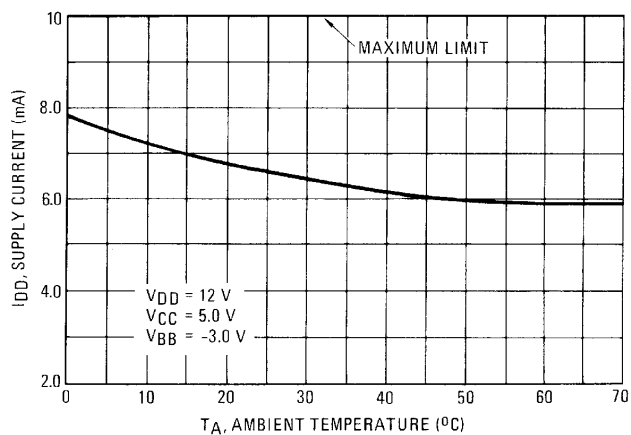
FIGURE 1 – TIMING DIAGRAMS



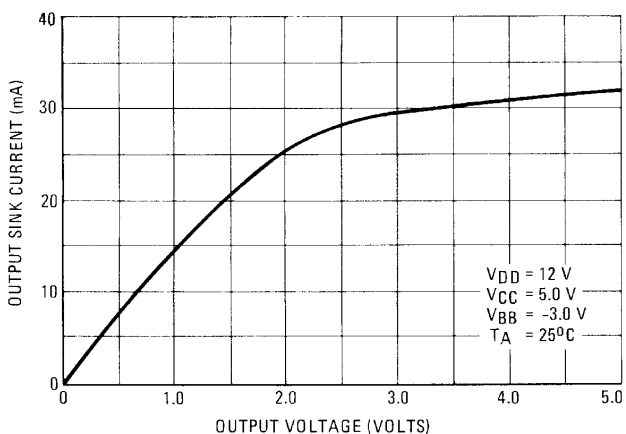
**FIGURE 2 –  $V_{CC}$  SUPPLY CURRENT versus TEMPERATURE**



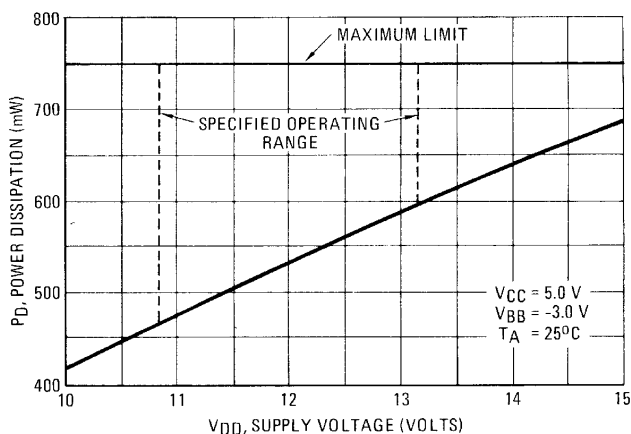
**FIGURE 3 –  $V_{DD}$  SUPPLY CURRENT versus TEMPERATURE**



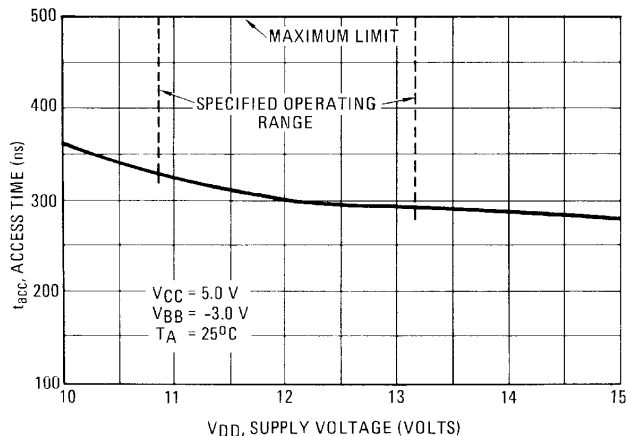
**FIGURE 4 – OUTPUT SINK CURRENT versus OUTPUT VOLTAGE**



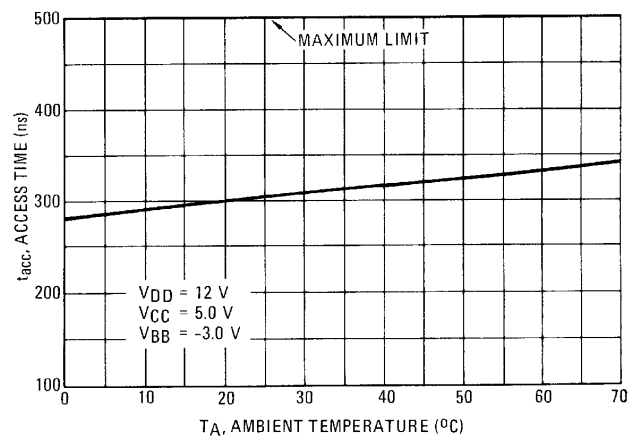
**FIGURE 5 – POWER DISSIPATION versus  $V_{DD}$  SUPPLY VOLTAGE**



**FIGURE 6 – ACCESS TIME versus  $V_{DD}$  SUPPLY VOLTAGE**



**FIGURE 7 – ACCESS TIME versus TEMPERATURE**



**MEMORY OPERATION (Using Positive Logic)**

Most positive level = 1, most negative level = 0

**Address**

To select one of the 128 characters, apply the appropriate binary code to the Address inputs (A0 thru A6).

**Row Select**

To select one of the rows of the addressed character to appear at the seven output lines, apply the appropriate binary code to the Row Select inputs (RS1 thru RS4).

**Shifted Characters**

These devices have the capability of displaying characters that descend below the bottom line (such as lower case letters j, y, g, p, and q). Internal circuitry effectively drops the whole matrix for this type of character. Any character can be programmed to occupy either of the two positions in a 7 x 16 matrix. (Shifted characters are not available on MCM6572 or MCM6573.)

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**Output**

For these devices, an output dot is defined as a logic "1" level, and an output blank is defined as a logic "0" level.

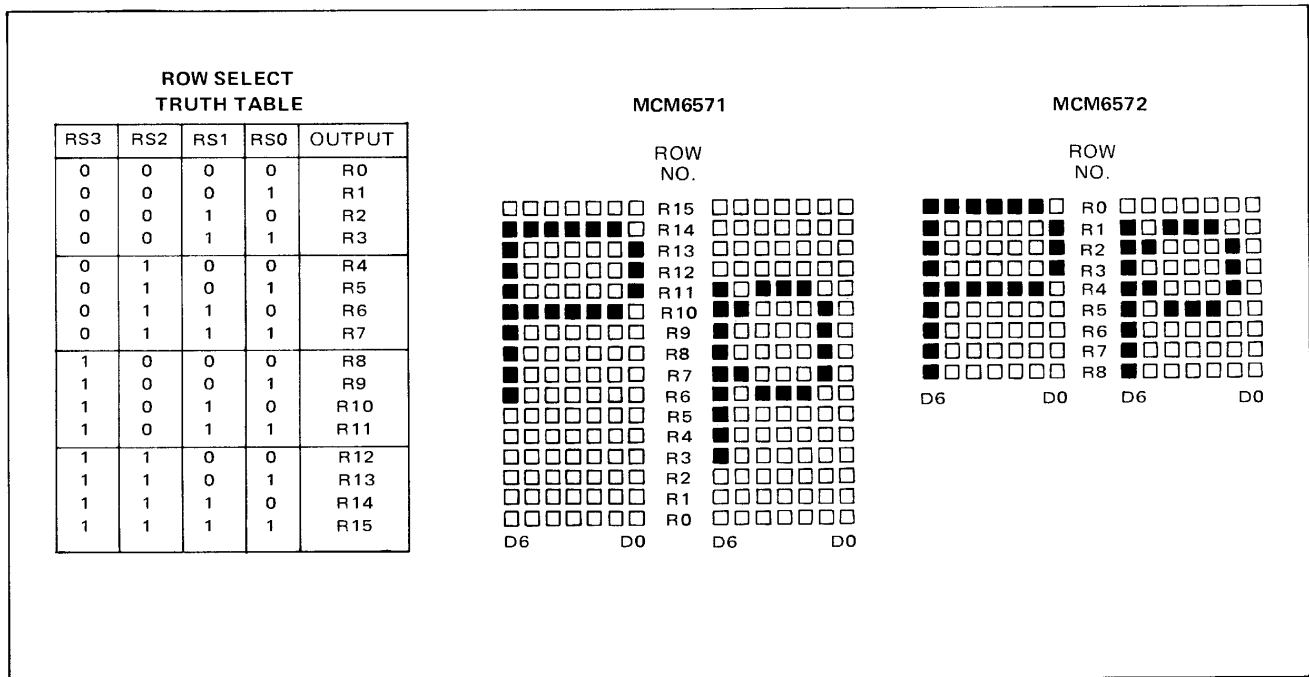
**DISPLAY FORMAT**

Figure 8 shows the relationship between the logic levels at the row select inputs and the character row at the outputs. The MCM6570 allows the user to locate the basic 7 x 9 font anywhere in the 7 x 16 array. In addition, a shifted font can be placed anywhere in the same 7 x 16 array. For example, the basic MCM6571 font is established in rows R14 thru R6. All other rows are automatically blanked. The shifted font is established in rows R11 thru R3, with all other rows blanked. Thus, while any one character is contained in a 7 x 9 array, the MCM6571 requires a 7 x 12 array on the CRT screen to contain both normal and descending characters. Other

uses of the shift option may require as much as the full 7 x 16 array, or as little as the basic 7 x 9 array (when no shifting occurs, as in the MCM6572).

The MCM6570 can be programmed to be scanned either from bottom to top or from top to bottom. This is achieved through the option of assigning row numbers in ascending or descending count, as long as both the basic font and the shifted font are the same. For example, an up counter will scan the MCM6571 from bottom to top, whereas an up counter will scan the MCM6571A from top to bottom (see Figures 14 and 15 for row designation).

FIGURE 8 — ROW SELECT INPUT CODE AND SAMPLE CHARACTERS FOR MCM6571 AND MCM6572



**CUSTOM PROGRAMMING FOR MCM6570**

By the programming of a single photomask, the customer may specify the content of the MCM6570. Encoding of the photomask is done with the aid of a computer to provide quick, efficient implementation of the custom bit pattern while reducing the cost of implementation.

Information for the custom memory content may be sent to Motorola in the following forms, in order of preference:\*

1. Hexadecimal coding using IBM Punch Cards (Figures 10 and 11).
2. Hexadecimal coding using ASCII Paper Tape Punch (Figure 12).

Programming of the MCM6570 can be achieved by using the following sequence:

1. Create the 128 characters in a 7 x 9 font using the format shown in Figure 9. Note that information at output D6 appears in column one, D5 in column two, thru D0 information in column seven. The dots filled in and programmed as a logic "1" will appear at the outputs as V<sub>OH</sub>; the dots left blank will be at V<sub>OL</sub>. (Blank formats appear at the end of this data sheet for your

convenience; they are not to be submitted to Motorola, however.)

2. Indicate which characters are shifted by filling in the extra square (dot) in the top row, at the left (column S).

3. Convert the characters to hexadecimal coding treating dots as ones and blanks as zeros, and enter this information in the blocks to the right of the character font format. High order bits are at the left, in columns S and D3. For the bottom eight rows, the bit in column S must be zero, so these locations have been omitted. For the top row, the bit in column S will be zero for an unshifted character, and one for a shifted character.

4. Transfer the hexadecimal figures either to punched cards (Figure 10) or to paper tape (Figure 12).

5. Assign row numbers to the unshifted font. These must be nine sequential numbers (values 0 thru 15) assigned consecutively to the rows. The shifted font is similarly placed in any position in the 16 rows.

6. Provide, in writing, the information indicated in Figure 13 (a copy of Figure 13 may be used for this purpose). Submit this information to Motorola together with the punched cards or paper tape.

FIGURE 9 – CHARACTER FORMAT

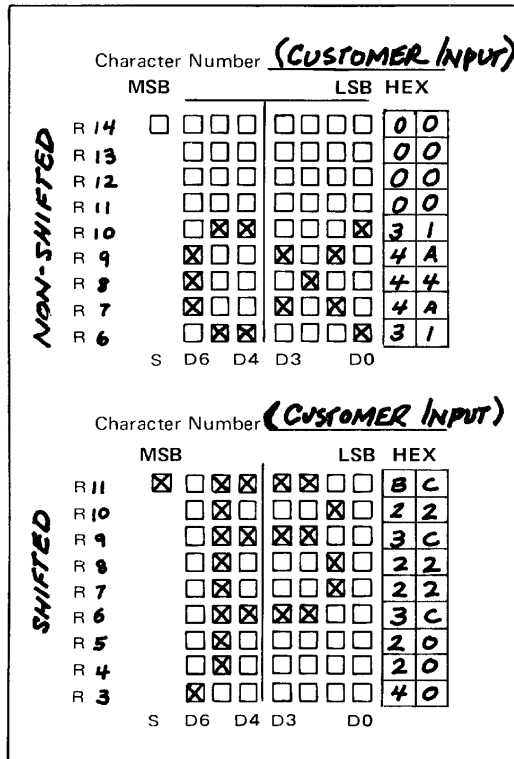
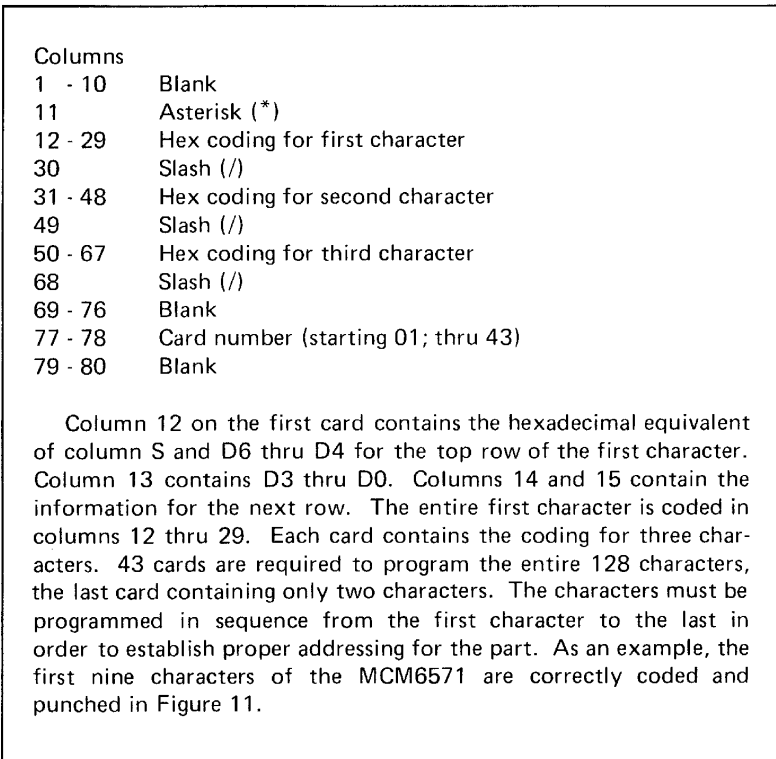


FIGURE 10 – CARD PUNCH FORMAT



\*Note: Motorola can accept magnetic tape and truth table formats. For further information contact your local Motorola sales representative.





FIGURE 14 – MCM6571 PATTERN

A3 . A0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0
000																
001																
010																
011																
100																
101																
110																
111																

▣ = Shifted character. The character is shifted three rows to R11 at the top of the font and R3 at the bottom.

FIGURE 15 – MCM6571A PATTERN

A3 . A0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0
000																
001																
010																
011																
100																
101																
110																
111																

▣ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.



FIGURE 16 – MCM6572 PATTERN\*\*

A3 . A0		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4		D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0
000	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
001	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
010	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
011	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
100	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
101	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
110	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
111	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111

\*\* Shifted characters are not used.

FIGURE 17 – MCM6573 PATTERN\*\*

A3 . A0		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4		D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0
000	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
001	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
010	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
011	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
100	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
101	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
110	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
111	RO RB	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111

\*\* Shifted characters are not used.





FIGURE 18 – MCM6574 PATTERN

A3 . A0		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4		D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0
000	RO																
	RB																
001	RO																
	RB																
010	RO																
	RB																
011	RO																
	RB																
100	RO																
	RB																
101	RO																
	RB																
110	RO																
	RB																
111	RO																
	RB																

▀ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

FIGURE 19 – MCM6575 PATTERN

A3 . A0		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4		D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0	D6 . D0
000	RO																
	RB																
001	RO																
	RB																
010	RO																
	RB																
011	RO																
	RB																
100	RO																
	RB																
101	RO																
	RB																
110	RO																
	RB																
111	RO																
	RB																

▀ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.





FIGURE 22 – MCM6578 PATTERN

A3 . A0		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4		D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0
000	RD																
	RB																
001	RD																
	RB																
010	RD																
	RB																
011	RD																
	RB																
100	RD																
	RB																
101	RD																
	RB																
110	RD																
	RB																
111	RD																
	RB																

▼ Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

FIGURE 23 – MCM6579 PATTERN

A3 . A0		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
A6 . A4		D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0	D6 D0
000	RD																
	RB																
001	RD																
	RB																
010	RD																
	RB																
011	RD																
	RB																
100	RD																
	RB																
101	RD																
	RB																
110	RD																
	RB																
111	RD																
	RB																

▼ Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.



APPLICATIONS INFORMATION

One important application for the MCM6570-79 is in CRT display systems (Figure 24). A set of buffer shift registers or random access memories applies a 7-bit character code to the input of the character generator, which then supplies one row of the character according to the count at the four row select inputs. As each row is available, it is put into the TTL MC7495 shift registers. The parallel information in these shift registers is clocked serially out to the Z-axis where it modulates the raster to form the character.

The MCM6570-79 require three power supplies: -3.0 volts, +5.0 volts, and +12 volts. The character generator requires only small currents from the -3.0 volt and +12 volt supplies, such that charge pump techniques using +5.0 volts can be used.

Figure 25 shows a supply circuit that will generate the required -3.0 volts for  $V_{BB}$ . The +12-volt supply of

Figure 26 will supply the 6.0 mA that is typically required. Increased current capability is possible by modifying the circuits. Use of these small, low-cost supplies makes a single +5.0-volt system possible.

When powering this device from laboratory or system power supplies, it is important that the Absolute Maximum Ratings not be exceeded or device failure can result. Some power supplies exhibit spikes or "glitches" on their outputs when the ac power is switched on and off. For example, the bench power supply programmed to deliver +12 volts may have large transients below ground when the ac power is switched on and off. If this possibility exists, it is suggested that the user switch the dc side of the power supply or protect the device power pins (+12, +5.0, and -3.0 volt) against reverse biasing with clamp diodes. A hot carrier diode such as the MBD501 is suggested for this purpose.

FIGURE 24 - CRT DISPLAY APPLICATION USING MCM6571

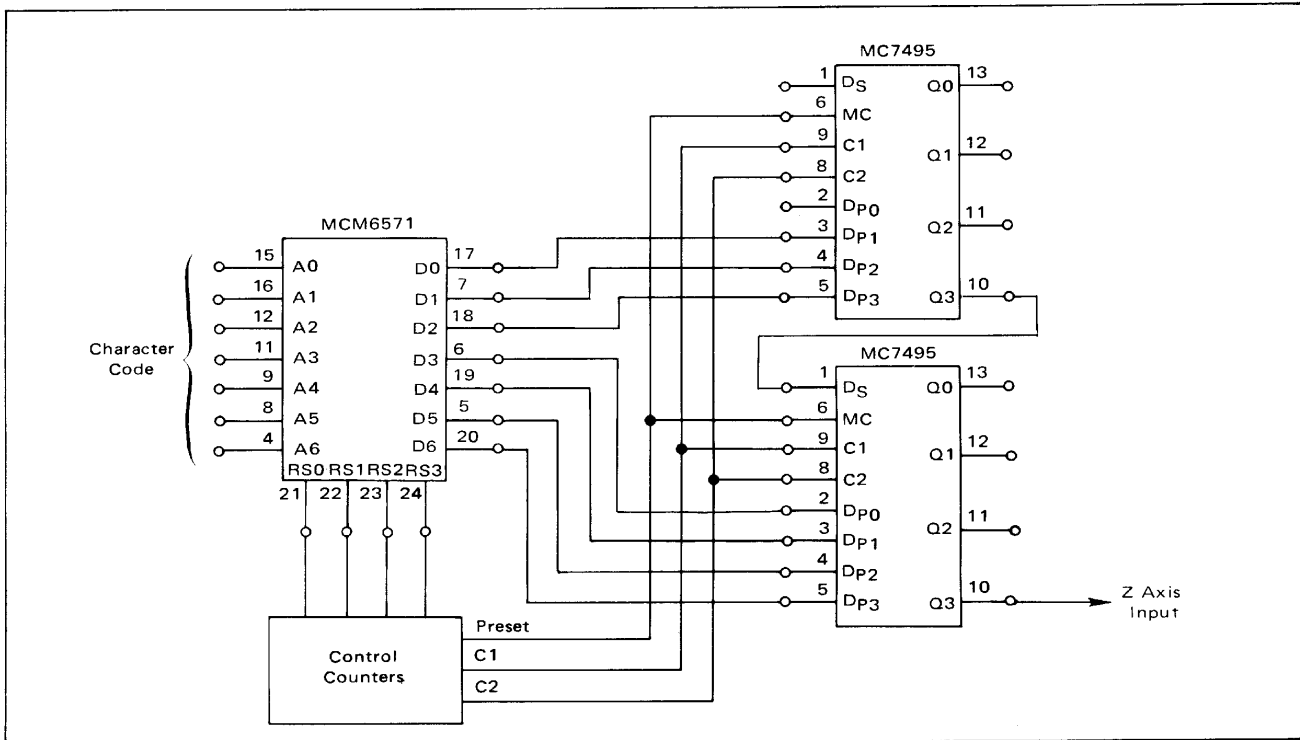


FIGURE 25 – SUBSTRATE BIAS CHARGE PUMP SUPPLY

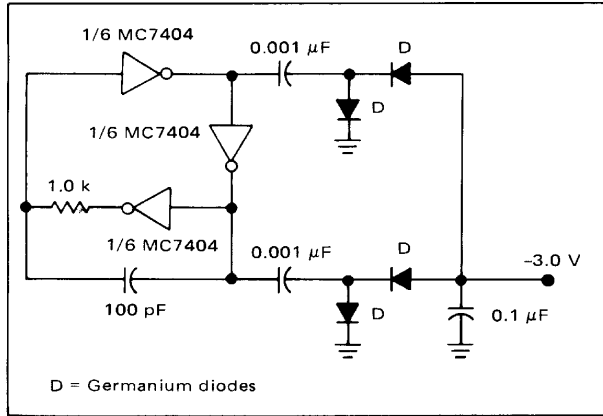
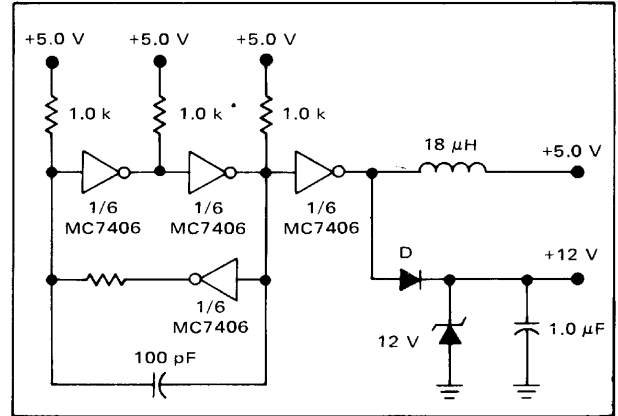


FIGURE 26 – GATE VOLTAGE CHARGE PUMP SUPPLY



PACKAGE DIMENSIONS

CASE 684-04

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	29.34	30.86	1.155	1.215
B	12.70	14.22	0.500	0.560
C	3.05	3.94	0.120	0.155
D	0.38	0.51	0.015	0.020
F	0.89	1.40	0.035	0.055
G	2.54 BSC		0.100 BSC	
H	0.89	1.40	0.035	0.055
J	0.20	0.30	0.008	0.012
K	2.92	3.68	0.115	0.145
L	14.86	15.87	0.585	0.625
M	15°		15°	
N	0.51	1.14	0.020	0.045

NOTES:  
 1. LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE WITH MAXIMUM MATERIAL CONDITION.  
 2. LEAD NO. 1 CUT FOR IDENTIFICATION, OR BUMP ON TOP.  
 3. DIM "L" TO INSIDE OF LEADS. (MEASURED 0.51 mm (0.020) BELOW PKG BASE)

CASE 709-01

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	31.37	32.13	1.235	1.265
B	13.72	14.22	0.540	0.560
C	4.57	5.08	0.180	0.200
D	0.36	0.51	0.014	0.020
F	1.02	1.52	0.040	0.060
G	2.41	2.67	0.095	0.105
H	1.78	2.03	0.070	0.080
J	0.20	0.30	0.008	0.012
K	3.05	3.56	0.120	0.140
L	14.73	15.24	0.580	0.600
M	0°		0°	
N	0.51	1.02	0.020	0.040

NOTES:  
 1. LEADS, TRUE POSITIONED WITHIN 0.25 mm (0.010) DIA AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION. (DIM "D")  
 2. DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.

Circuit diagrams utilizing Motorola products are included as a means of illustrating typical semiconductor applications; consequently, complete information sufficient for construction purposes is not necessarily given. The information has been carefully checked and

is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies. Furthermore, such information does not convey to the purchaser of the semiconductor devices described any license under the patent rights of Motorola Inc. or others.



The formats below are given for your convenience in preparing character information for MCM6570 programming. THESE FORMATS ARE NOT TO BE USED TO TRANSMIT THE INFORMATION TO MOTOROLA. Refer to the Custom Programming instructions for detailed procedures.

Character Number \_\_\_\_\_

	MSB				LSB				HEX
R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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