TYPES TL710M, TL710C
DIFFERENTIAL COMPARATORS

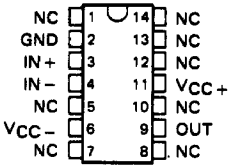
D2229, FEBRUARY 1971—REVISED AUGUST 1983

- **Fast Response Times**
- **Low Offset Characteristics**
- **Output Compatible with Most TTL Circuits**

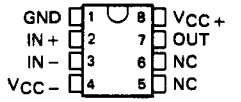
description

The TL710 is a monolithic high-speed comparator having differential inputs and a low-impedance output. Component matching, inherent in silicon integrated circuit fabrication techniques, produces a comparator with a low-drift and low-offset characteristics. These circuits are especially useful for applications requiring an amplitude discriminator, memory sense amplifier, or a high-speed voltage comparator. The TL710M is characterized for operation over the full military temperature range of −55°C to 125°C; the TL710C is characterized for operation from 0°C to 70°C.

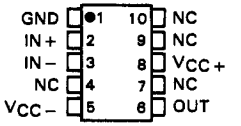
J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)

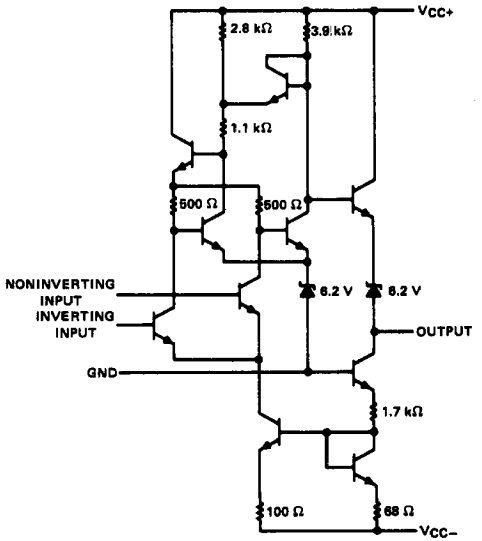


U FLAT PACKAGE
(TOP VIEW)



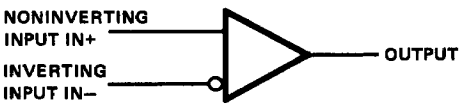
NC—No internal connection

schematic



Component values shown are nominal.

symbol



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		TL710M	TL710C	UNIT
Supply voltage V_{CC+} (see Note 1)		14	14	V
Supply voltage V_{CC-} (see Note 1)		−7	−7	V
Differential input voltage (see Note 2)		±5	±5	V
Input voltage (either input, see Note 1)		±7	±7	V
Peak output current ($t_w \leq 1$ s)		10	10	mA
Continuous total power dissipation at (or below) 70°C free-air temperature (see Note 3)		300	300	mW
Operating free-air temperature range		−55 to 125	0 to 70	°C
Storage temperature range		−65 to 150	−65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J, JG or U package	300	300	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	N or P package		260	°C

NOTES: 1. All voltage values, except differential voltages, are with respect to the network ground terminal.
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. For operation of the TL710M above 70°C free-air temperature, refer to Dissipation Derating Curves, Section 2. In the J and JG packages, TL710M chips are alloy-mounted; TL710C chips are glass-mounted.

electrical characteristics at specified free-air temperature, V_{CC+} = 12 V, V_{CC-} = −6 V

PARAMETER		TEST CONDITIONS†		TL710M			TL710C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$R_S \leq 200\ \Omega$, See Note 4	25°C		2	5		2	7.5	mV
			Full range			6			10	
α_{VIO}	Average temperature coefficient of input offset voltage	$R_S \leq 200\ \Omega$, See Note 4	Full range		5			7.5		μV/°C
I_{IO}	Input offset current	See Note 4	25°C		1	10		1	15	μA
			Full range			20			25	
I_{IB}	Input bias current	See Note 4	25°C		25	75		25	100	μA
			Full range			150			150	
V_{ICR}	Common-mode input voltage range	V_{CC-} = −7 V	25°C	±5			±5			V
V_{ID}	Differential input voltage range		25°C	±5			±5			V
A_{VD}	Large-signal differential voltage amplification	No load, See Note 4	25°C	750	1500		700	1500		V/V
			Full range	500			500			
V_{OH}	High-level output voltage	V_{ID} = 15 mV, I_{OH} = −0.5 mA	25°C	2.5	3.2	4	2.5	3.2	4	V
V_{OL}	Low-level output voltage	V_{ID} = −15 mV, I_{OL} = 0	25°C	−1	−0.5	0‡	−1	−0.5	0‡	V
I_{OL}	Low-level output current	V_{ID} = −15 mV, V_O = 0	25°C	1.6	2.5					mA
r_o	Output resistance	V_O = 1.4 V	25°C		200			200		Ω
CMRR	Common-mode rejection ratio	$R_S \leq 200\ \Omega$	25°C	70	90		65	90		dB
I_{CC+}	Supply current from V_{CC+}	V_{ID} = −5 V to 5 V (−10 mV for typ)	25°C		5.4	10.1		5.4		mA
I_{CC-}	Supply current from V_{CC-}		25°C		−3.8	−8.9		−3.8		mA
P_D	Total power dissipation	No load	25°C		88	175		88		mW

NOTE 4: These characteristics are verified by measurements at the following temperatures and output voltage levels: for TL710M, V_O = 1.8 V at T_A = −55°C, V_O = 1.4 V at T_A = 25°C, and V_O = 1 V at T_A = 125°C; for TL710C, V_O = 1.5 V at T_A = 0°C, V_O = 1.4 V at T_A = 25°C, and V_O = 1.2 V at T_A = 70°C. These output voltage levels were selected to approximate the logic threshold voltages of the types of digital logic circuits these comparators are intended to drive.

†Full range for TL710M is −55°C to 125°C and for TL710C is 0°C to 70°C.

‡The algebraic convention where the most-positive (least-negative) limit is designated as maximum is used in this data sheet for logic levels only, e.g., when 0 V is the maximum, the minimum limit is a more-negative voltage.

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switching characteristics, V_{CC+} = 12 V, V_{CC-} = −6 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	TL710M	TL710C	UNIT
		TYP	TYP	
Response time	No load, See Note 5	40	40	ns

NOTE 5: The response time specified is for a 100-mV input step with 5-mV overdrive and is the interval between the input step function and the instant when the output crosses 1.4 V.

TYPICAL CHARACTERISTICS

TL710M
VOLTAGE TRANSFER CHARACTERISTICS

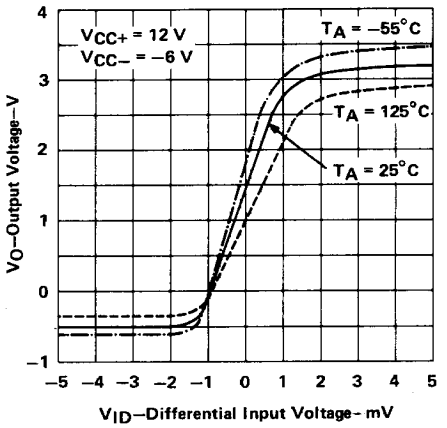

FIGURE 1

TL710C
VOLTAGE TRANSFER CHARACTERISTICS

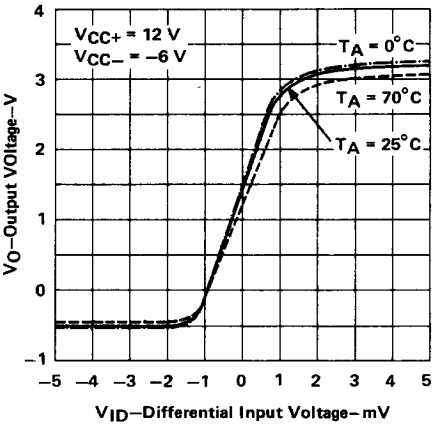

FIGURE 2

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

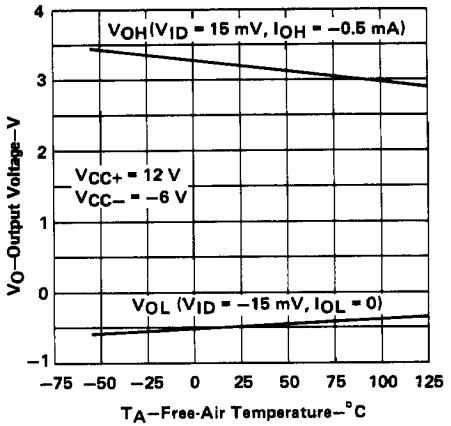

FIGURE 3

TOTAL POWER DISSIPATION
vs
FREE-AIR TEMPERATURE

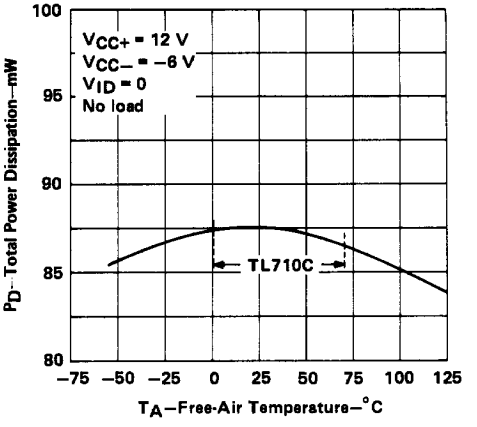

FIGURE 4

OUTPUT RESPONSE FOR VARIOUS
INPUT OVERDRIVES

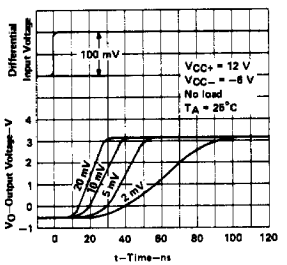

FIGURE 5

OUTPUT RESPONSE FOR VARIOUS
INPUT OVERDRIVES

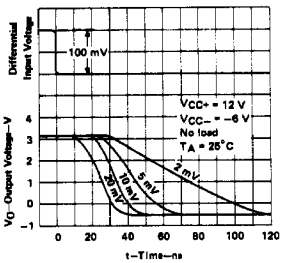

FIGURE 6

COMMON-MODE PULSE RESPONSE
vs
ELAPSED TIME

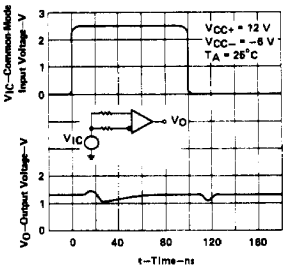

FIGURE 7

4 Voltage Comparators

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