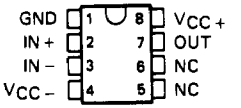
TYPES TL810M, TL810C
DIFFERENTIAL COMPARATORS

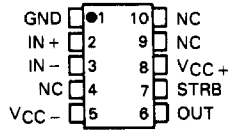
D993, MARCH 1971 – REVISED AUGUST 1983

- **Low Offset Characteristics**
- **High Differential Voltage Amplification**
- **Fast Response Times**
- **Output Compatible with Most TTL Circuits**

TL810M . . . JG PACKAGE
TL810C . . . JG OR P PACKAGE
(TOP VIEW)



TL810M . . . U PACKAGE
(TOP VIEW)



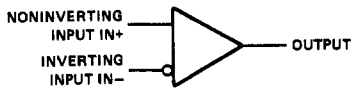
NC – No internal connection

description

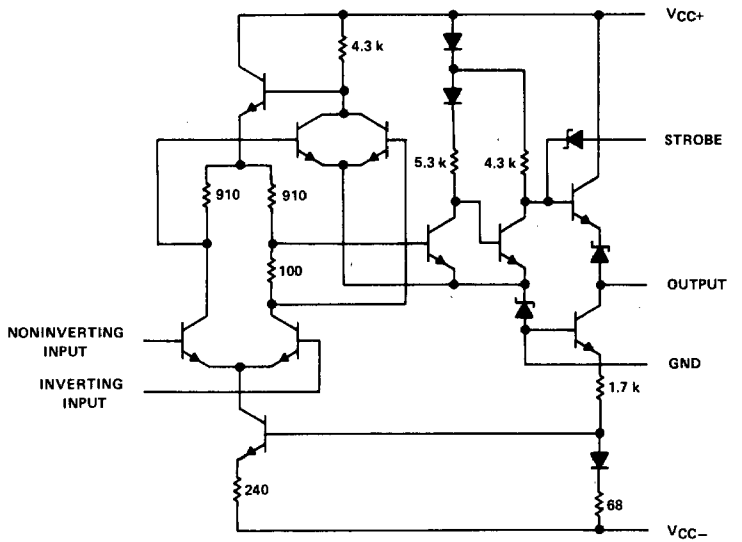
The TL810 is an improved version of the TL710 high-speed voltage comparator with an extra stage added to increase voltage amplification and accuracy. Typical amplification is 33,000. Component matching, inherent in monolithic integrated circuit fabrication techniques, produces a comparator with low-drift and low-offset characteristics. These circuits are particularly useful for applications requiring an amplitude discriminator, memory sense amplifier, or a high-speed limit detector.

The TL810M is characterized for operation over the full military temperature range of −55°C to 125°C; the TL810C is characterized for operation from 0°C to 70°C.

symbol



schematic



Resistor values shown are nominal in ohms.

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

Supply voltage V_{CC+} (see Note 1)	14 V
Supply voltage V_{CC-} (see Note 1)	−7 V
Differential input voltage (see Note 2)	±5 V
Input voltage (either input, see Note 1)	±7 V
Peak output current ($t_w \leq 1$ s)	10 mA
Continuous total power dissipation at (or below) 70°C free-air temperature (see Note 3)	300 mW
Operating free-air temperature range: TL810M Circuits	−55°C to 125°C
TL810C Circuits	0°C to 70°C
Storage temperature range	−65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG or U package	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: 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 TL810M above 70°C free-air temperature, refer to dissipation Derating Curves, Section 2. In the JG package, TL810M chips are alloy-mounted; TL810C chips are glass-mounted.

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electrical characteristics at specified free-air temperature, V_{CC+} = 12 V, V_{CC-} = −6 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		TL810M			TL810C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$R_S \leq 200\ \Omega$, See Note 4	25°C		0.6	2		1.6	3.5	mV
			Full range			3			4.5	
α_{VIO}	Average temperature coefficient of input offset voltage	R_S = 50 Ω, See Note 4	MIN to 25°C		3	10		3	20	μV/°C
			25°C to MAX		3	10		3	20	
I_{IO}	Input offset current	See Note 4	25°C		0.75	3		1.8	5	μA
			MIN		1.8	7			7.5	
			MAX		0.25	3			7.5	
α_{IIO}	Average temperature coefficient of input offset current	See Note 4	MIN to 25°C		15	75		24	100	nA/°C
			25°C to MAX		5	25		15	50	
I_{IB}	Input bias current	See Note 4	25°C		7	15		7	20	μA
			MIN		12	25		9	30	
V_{ICR}	Common-mode input voltage range	V_{CC-} = −7 V	Full range	±5			±5			V
A_{VD}	Large-signal differential voltage amplification	No load, V_O = 0 to 2.5 V	25°C	12.5	33		10	33		V/mV
			Full range	10			8			
V_{OH}	High-level output voltage	V_{ID} = 5 mV, I_{OH} = 0	Full range		4§	5		4§	5	V
		V_{ID} = 5 mV, I_{OH} = −5 mA	Full range	2.5	3.6§		2.5	3.6§		
V_{OL}	Low-level output voltage	V_{ID} = −5 mV, I_{OL} = 0	Full range	−1	−0.5§	0‡	−1	−0.5§	0‡	V
I_{OL}	Low-level output current	V_{ID} = −5 mV, V_O = 0	25°C	2	2.4		1.6	2.4		mA
			MIN	1	2.3		0.5	2.4		
			MAX	0.5	2.3		0.5	2.4		
r_o	Output resistance	V_O = 1.4 V	25°C		200			200		Ω
CMRR	Common-mode rejection ratio	$R_S \leq 200\Omega$	Full range	80	100§		70	100§		dB
I_{CC+}	Supply current from V_{CC+}	V_{ID} = −5 mV, No load	Full range		5.5§	9		5.5§	9	mA
I_{CC-}	Supply current from V_{CC-}		Full range		−3.5§	−7		−3.5§	−7	mA
P_D	Total power dissipation		Full range		90§	150		90§	150	mW

†Full range (MIN to MAX) for TL810M is −55°C to 125°C and for the TL810C 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.

§These typical values are at T_A = 25°C.

NOTE 4: These characteristics are verified by measurements at the following temperatures and output voltage levels: for TL810M, 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 TL810C, V_O = 1.5 V at T_A = 0°C, V_O = 1.4 V at 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.

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

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
Response time	R_L = ∞,	C_L = 5 pF,	See Note 5		30	80	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

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREE-AIR TEMPERATURE

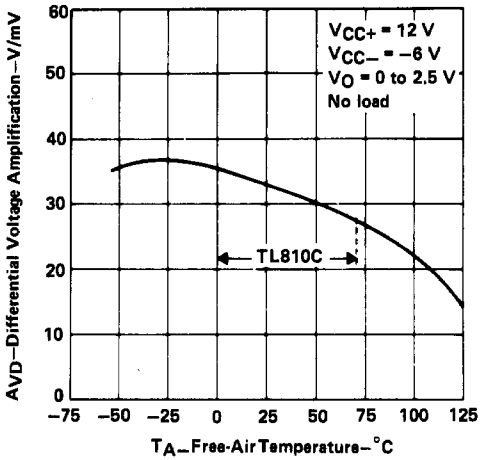

FIGURE 1

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs SUPPLY VOLTAGE

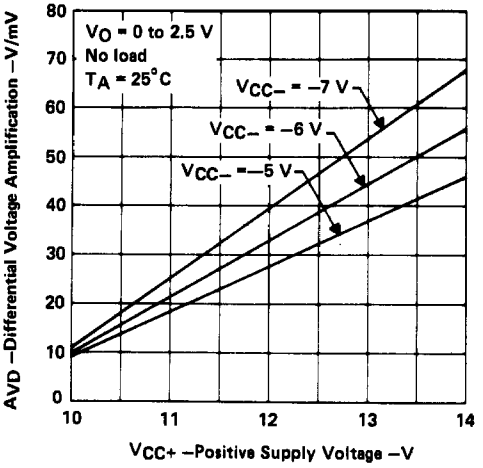

FIGURE 2

OUTPUT VOLTAGE LEVELS vs FREE-AIR TEMPERATURE

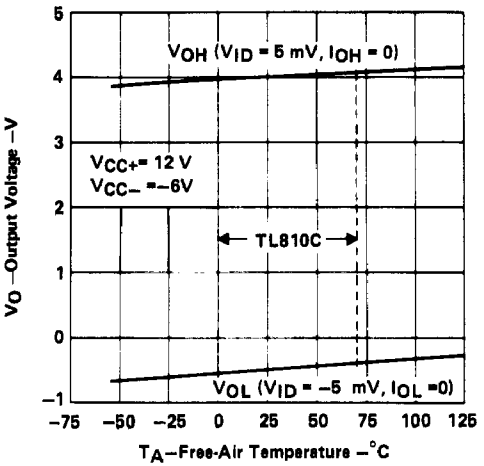

FIGURE 3

LOW-LEVEL OUTPUT CURRENT vs FREE-AIR TEMPERATURE

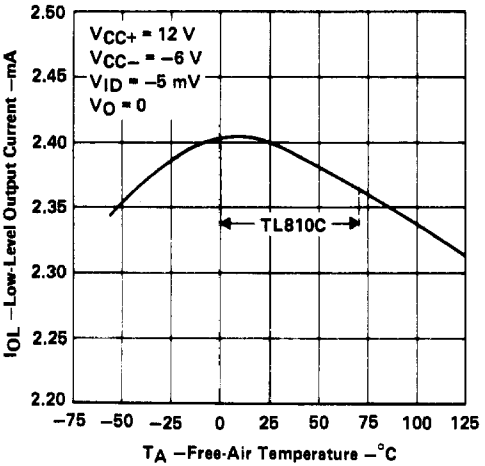

FIGURE 4

4 Voltage Comparators

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TYPICAL CHARACTERISTICS

TL810M

VOLTAGE TRANSFER CHARACTERISTICS

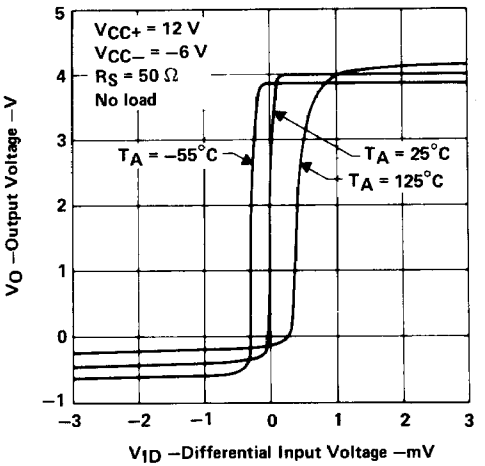

FIGURE 5

TL810C

VOLTAGE TRANSFER CHARACTERISTICS

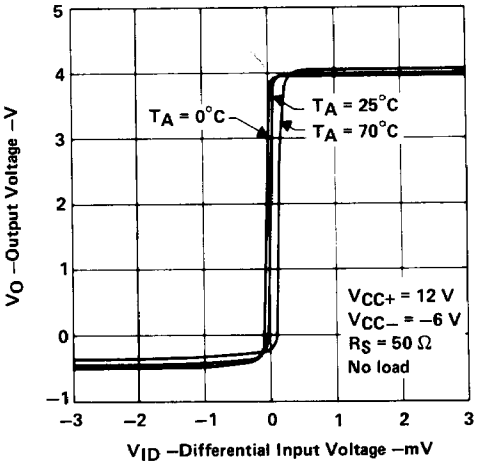

FIGURE 6

INPUT BIAS CURRENT
vs
FREE-AIR TEMPERATURE

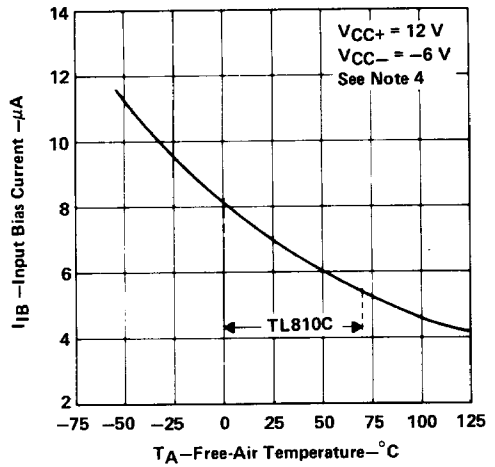

FIGURE 7

COMMON-MODE REJECTION RATIO
vs
FREE-AIR TEMPERATURE

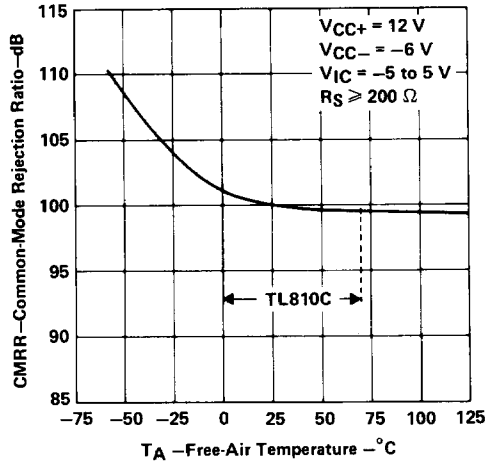

FIGURE 8

NOTE 4: These characteristics are verified by measurements at the following temperatures and output voltage levels: for TL810M, 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 TL810C, V_O = 1.5 V at T_A = 0°C, V_O = 1.4 V at 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.

TYPICAL CHARACTERISTICS

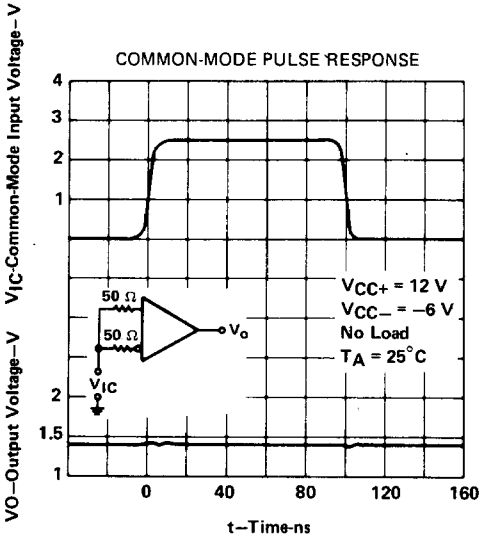

FIGURE 9

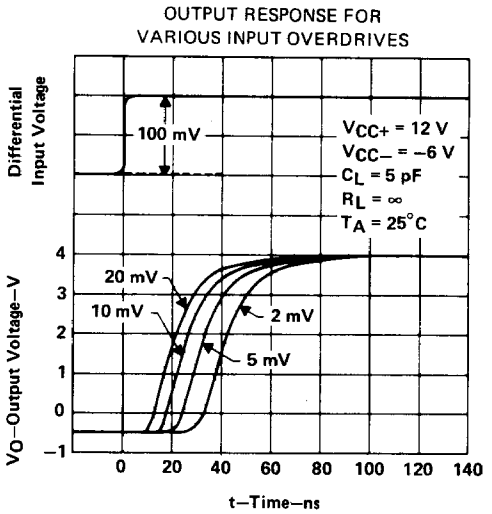

FIGURE 10

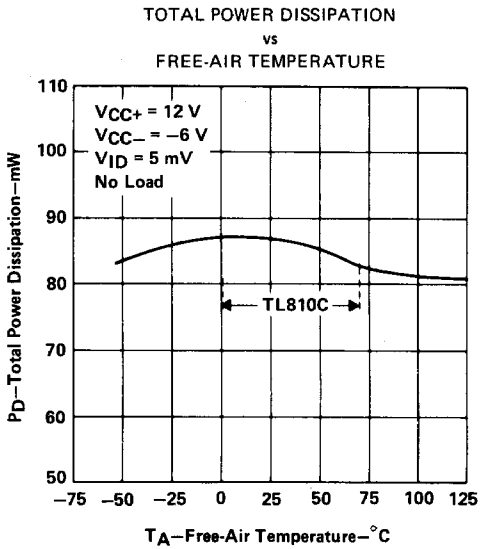

FIGURE 11

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