

**LM139, LM239, LM339, LM139A
LM239A, LM339A, LM2901**
QUADRUPLE DIFFERENTIAL COMPARATORS

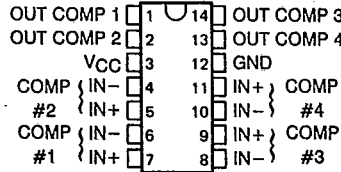
D1979, OCTOBER 1979—REVISED APRIL 1988

- Single Supply or Dual Supplies
- Wide Range of Supply Voltage ... 2 to 36 V
- Low Supply Current Drain Independent of Supply Voltage ... 0.8 mA Typ
- Low Input Bias Current ... 25 nA Typ
- Low Input Offset Current ... 3 nA Typ (LM139)
- Low Input Offset Voltage ... 2 mV Typ
- Common-Mode Input Voltage Range Includes Ground
- Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage ... ± 36 V
- Low Output Saturation Voltage
- Output Compatible with TTL, MOS, and CMOS

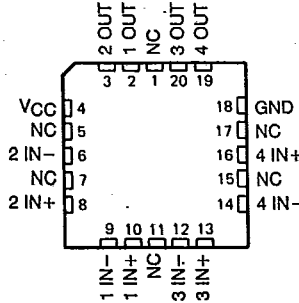
description

These devices consist of four independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies is also possible as long as the difference between the two supplies is 2 V to 36 V and pin 3 is at least 1.5 V more positive than the input common-mode voltage. Current drain is independent of the supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

LM139, LM139A ... J PACKAGE
ALL OTHERS ... D, J, OR N PACKAGE
(TOP VIEW) T-73-53

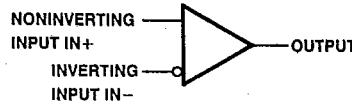


LM139, LM139A
FK CHIP CARRIER PACKAGE
(TOP VIEW)



NC—No internal connection

symbol (each comparator)



AVAILABLE OPTIONS

T _A	V _{IO} MAX at 25°C	PACKAGE			
		SMALL OUTLINE (D)	CERAMIC (FK)	CERAMIC DIP (J)	PLASTIC DIP (N)
0°C to 70°C	5 mV / 2 mV	LM339D / LM339AD	—	LM339J / LM339AJ	LM339N / LM339AN
-25°C to 85°C	5 mV / 2 mV	LM239D / LM239AD	—	LM239J / LM239AJ	LM239N / LM239AN
-40°C to 125°C	7 mV	LM2901D	—	LM2901J	LM2091N
-55°C to 125°C	5 mV / 2 mV	—	LM139FK / LM139AFK	LM139J / LM139AJ	—

The D package is available taped and reeled. Add the suffix R to the device type when ordering. (e.g., LM339DR)

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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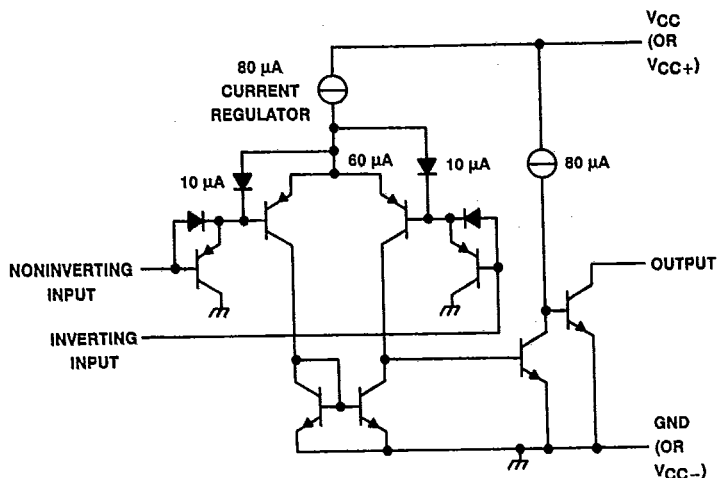
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Voltage Comparators

LM139, LM239, LM339, LM139A
LM239A, LM339A, LM2901
QUADRUPLE DIFFERENTIAL COMPARATORS

T-73-53

schematic (each comparator)



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Voltage Comparators

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

Supply voltage, V _{CC} (see Note 2)	36 V
Differential input voltage (see Note 3)	±36 V
Input voltage range (either input)	-0.3 V to 36 V
Output voltage	36 V
Output current	20 mA
Duration of output short-circuit to ground (see Note 4)	unlimited
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range:	
LM139	-55°C to 125°C
LM239, LM239A	-25°C to 85°C
LM339, LM339A	0°C to 70°C
LM2901	-40°C to 125°C
Storage temperature range	-65°C to 150°C
Case temperature for 60 seconds: FK package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package	260°C

- NOTES: 2. All voltage values, except differential voltages, are with respect to the network ground terminal.
3. Differential voltages are at the noninverting input terminal with respect to the inverting input.
4. Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.

DISSIPATION RATING TABLE

PACKAGE	T _A ≤ 25°C POWER RATING	DERATING FACTOR	DERATE ABOVE T _A	T _A = 70°C POWER RATING	T _A = 85°C POWER RATING	T _A = 125°C POWER RATING
D	900 mW	7.6 mW/°C	31°C	608 mW	494 mW	—
FK	900 mW	11.0 mW/°C	68°C	880 mW	715 mW	275 mW
J (LM139, LM139A)	900 mW	11.0 mW/°C	68°C	880 mW	715 mW	275 mW
J (All others)	900 mW	8.2 mW/°C	40°C	656 mW	533 mW	—
N	900 mW	9.2 mW/°C	52°C	736 mW	598 mW	—

LM139, LM139A
QUADRUPLE DIFFERENTIAL COMPARATORS

T-73-53

electrical characteristics at specified free-air temperature, VCC = 5 V (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	LM139			LM139A			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
V _{IO} Input offset voltage	V _{CC} = 5 V to 30 V, V _{IC} = V _{ICR} min, V _O = 1.4 V		2	5		1	2	mV
I _{IO} Input offset current	V _O = 1.4 V		3	25		3	25	nA
I _{IB} Input bias current	V _O = 1.4 V		-25	-100		-25	-100	nA
V _{ICR} Common-mode input voltage range			0 to	-300		0 to	-300	V
			V _{CC} -1.5			V _{CC} -1.5		
			0 to			0 to		
			V _{CC} -2			V _{CC} -2		
AVD Large-signal differential voltage amplification	V _{CC} ± = ±7.5 V, V _O = -5 V to 5 V		200			50	200	V/mV
I _{OH} High-level output current	V _{ID} = 1 V		0.1			0.1		nA
	V _{OH} = 5 V							
	V _{OH} = 30 V							
V _{OL} Low-level output voltage	V _{ID} = -1 V, I _{OL} = 4 mA		150	400		150	400	mV
I _{OL} Low-level output current	V _{ID} = -1 V, V _{OL} = 1.5 V		6	16		6	16	mA
I _{CC} Supply current (four comparators)	V _O = 2.5 V, No load		0.8	2		0.8	2	mA

† All characteristics are measured with zero common-mode input voltage unless otherwise specified.

switching characteristics, VCC = 5 V, TA = 25°C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
	TTL-level input step		0.3		

‡ C_L includes probe and jig capacitance.

NOTE 4: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.



LM239, LM339, LM239A, LM339A, LM2901
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Voltage Comparators

electrical characteristics at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	LM239, LM339			LM239A, LM339A			LM2901			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V _{IO} Input offset voltage	25°C	2	5	2	1	2	2	2	7	mV	
	Full range	5	9	4	5	50	5	50	15		
I _{IO} Input offset current	25°C	5	50	50	5	50	150	200	200	nA	
	Full range	-25	-250	-250	-25	-250	-250	-25	-250		
I _{IB} Input bias current	25°C	-400	-400	-400	-400	-400	-400	-400	-500	nA	
	Full range	0 to -400	0 to -400	0 to -400	0 to -400	0 to -400	0 to -400	0 to -400	0 to -500		
V _{ICR} Common-mode input voltage range	25°C	V _{CC} -1.5	V _{CC} -1.5	V _{CC} -1.5	V _{CC} -1.5	V _{CC} -1.5	V _{CC} -1.5	V _{CC} -1.5	V _{CC} -1.5	V	
	Full range	0 to V _{CC} -2	0 to V _{CC} -2	0 to V _{CC} -2	0 to V _{CC} -2	0 to V _{CC} -2	0 to V _{CC} -2	0 to V _{CC} -2	0 to V _{CC} -2		
A _{VD} Large-signal differential voltage amplification	25°C	50	200	200	50	200	200	100	100	V/mV	
	Full range	0.1	50	50	0.1	50	50	0.1	50		
I _{OH} High-level output current	25°C	1	1	1	1	1	1	1	1	mA	
	Full range	150	400	400	150	400	400	150	500		
V _{OL} Low-level output voltage	25°C	700	700	700	700	700	700	700	700	mV	
	Full range	6	16	16	6	16	16	6	16		
I _{OL} Low-level output current	25°C	0.8	2	2	0.8	2	2	0.8	2	mA	
	Full range	6	16	16	6	16	16	6	16		
I _{CC} Supply current (four comparators)	25°C	10	10	10	10	10	10	10	10	mA	
	Full range	10	10	10	10	10	10	10	10		

† Full range (MIN to MAX) for LM239 and LM239A is -25°C to 85°C, for LM339 and LM339A is 0°C to 70°C, and for LM2901 is -40°C to 125°C. All characteristics are measured with zero common-mode input voltage unless otherwise specified.

switching characteristics, $V_{CC} = 5\text{ V}$, $I_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT

‡ C_L includes probe and jig capacitance.
 NOTE 5: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

