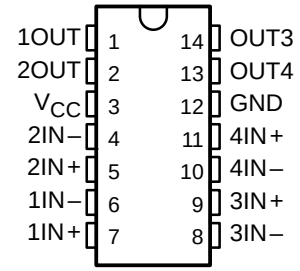
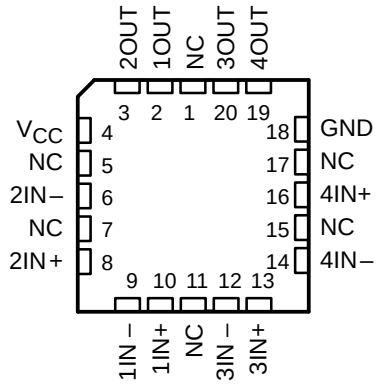
- **Single Supply or Dual Supplies**
- **Wide Range of Supply Voltage 2 V to 36 V**
- **Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ**
- **Low Input Bias Current . . . 25 nA Typ**
- **Low Input Offset Current . . . 3 nA Typ (LM139)**
- **Low Input Offset Voltage . . . 2 mV 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**

D, DB, J, N, OR PW PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)



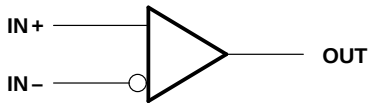
NC – No internal connection

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 V_{CC} 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 wire-AND relationships.

The LM139 and LM139A are characterized for operation from –55°C to 125°C. The LM239 and LM239A are characterized for operation from –25°C to 125°C. The LM339 and LM339A are characterized for operation from 0°C to 70°C. The LM2901 and LM2901Q are characterized for operation from –40°C to 125°C.

symbol (each comparator)



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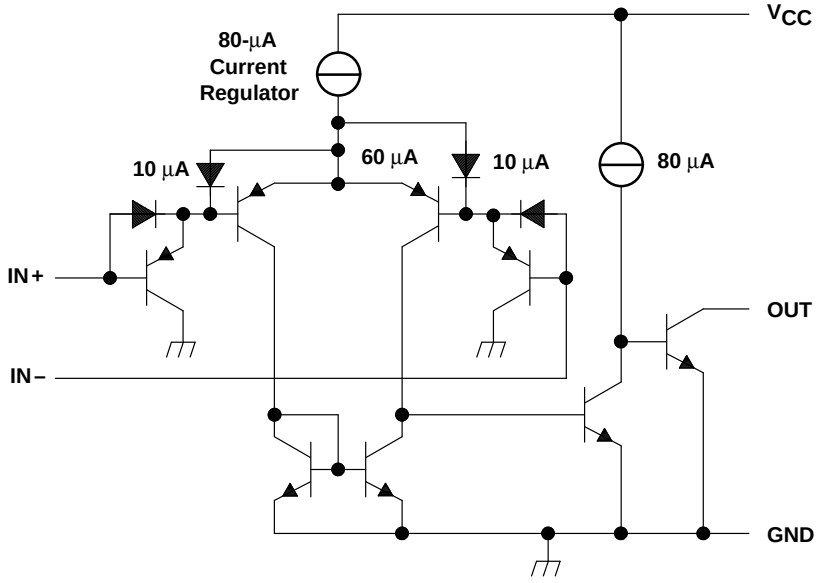
AVAILABLE OPTIONS

T_A	V_{IO}max at 25°C	PACKAGED DEVICES						CHIP FORM (Y)§
		SMALL OUTLINE (D)†	SSOP (DB)‡	CHIP CARRIER (FK)	CERAMIC DIP (J)	PLASTIC DIP (N)	TSSOP (PW)‡	
0°C to 70°C	5 mV 2 mV	LM339D LM339AD	LM339DBLE —	—	—	LM339N LM339AN	LM339PWLE —	LM339Y
−25°C to 85°C	5 mV 2 mV	LM239D LM239AD	—	—	—	LM239N LM239AN	—	—
−40°C to 125°C	7 mV	LM2901D LM2901QD	LM2901DBLE —	—	—	LM2901QN	LM2901PWLE —	—
−55°C to 125°C	5 mV 2 mV	LM139D LM139AD	—	LM139AFK	LM139J LM139AJ	LM139N LM139AN	—	—

† The D package is available taped and reeled. Add the suffix R to the device type (e.g., LM339DR).
‡ The DB and PW packages are only available left-end taped and reeled.
§ Chips are tested at 25°C (see electrical characteristics).

schematic (each comparator)

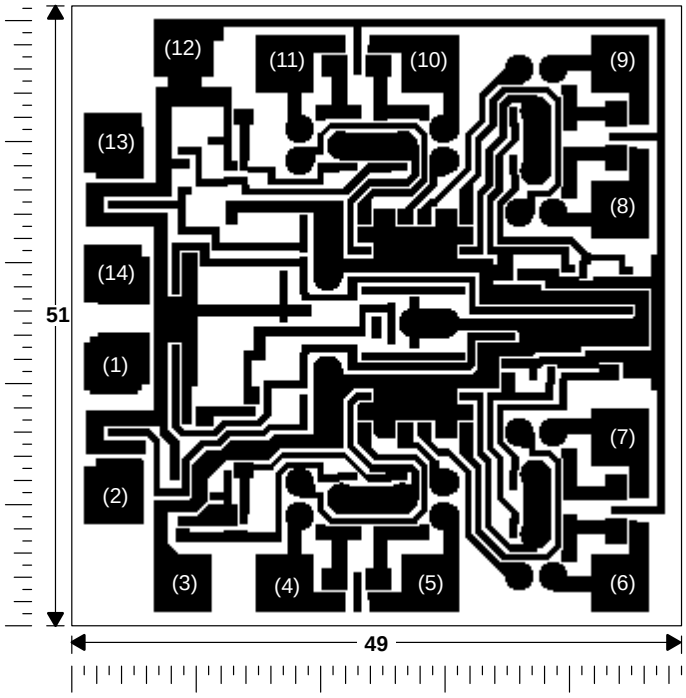


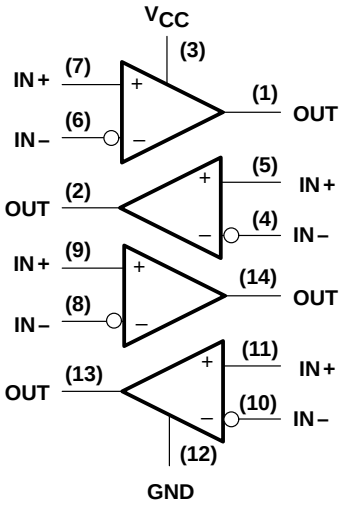
All current values shown are nominal.

LM339Y chip information

This chip, when properly assembled, displays characteristics similar to the LM339. Thermal compression or ultrasonic bonding can be used on the doped-aluminum bonding pads. Chips can be mounted with conductive epoxy or a gold-silicon preform.

BONDING PAD ASSIGNMENTS





CHIP THICKNESS: 15 TYPICAL

BONDING PADS: 4 × 4 MINIMUM

$T_J$max = 150°C

TOLERANCES ARE ±10%.

ALL DIMENSIONS ARE IN MILS.

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

Supply voltage, V_{CC} (see Note 1) . . . . . 36 V
Differential input voltage, V_{ID} (see Note 2) . . . . . ±36 V
Input voltage range, V_I (either input) . . . . . –0.3 V to 36 V
Output voltage, V_O . . . . . 36 V
Output current, I_O . . . . . 20 mA
Duration of output short circuit to ground (see Note 3) . . . . . unlimited
Continuous total dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A: LM139, LM139A . . . . . –55°C to 125°C
LM239, LM239A . . . . . –25°C to 85°C
LM339, LM339A . . . . . 0°C to 70°C
LM2901, LM2901Q . . . . . –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 10 seconds: D, DB, N, or PW package . . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package . . . . . 300°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values, except differential voltages, are with respect to network ground.
2. Differential voltages are at IN+ with respect to IN–.
3. Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ 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	—
DB	775 mW	6.2 mW/°C	25°C	496 mW	403 mW	155 mW
FK	900 mW	11.0 mW/°C	68°C	880 mW	715 mW	275 mW
J	900 mW	11.0 mW/°C	68°C	880 mW	715 mW	275 mW
N	900 mW	9.2 mW/°C	52°C	736 mW	598 mW	—
PW	700 mW	5.6 mW/°C	25°C	448 mW	364 mW	140 mW

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

PARAMETER		TEST CONDITIONS		T_A†	LM139			LM139A			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{CC} = 5 V to 30 V, V_O = 1.4 V	$V_{IC} = V_{ICR}$min,	25°C		2	5		1	2	mV
				−55°C to 125°C			9			4	
I_{IO}	Input offset current	V_O = 1.4 V		25°C		3	25		3	25	nA
				−55°C to 125°C			100			100	
I_{IB}	Input bias current	V_O = 1.4 V		25°C		−25	−100		−25	−100	nA
				−55°C to 125°C			−300			−300	
V_{ICR}	Common-mode input voltage range			25°C	0 to V_{CC}−1.5			0 to V_{CC}−1.5			V
				−55°C to 125°C	0 to V_{CC}−2			0 to V_{CC}−2			
A_{VD}	Large-signal differential voltage amplification	V_{CC}± = ± 7.5 V,	V_O = −5 V to 5 V	25°C		200		50	200		V/mV
I_{OH}	High-level output current	V_{ID} = 1 V	V_{OH} = 5 V	25°C		0.1			0.1		nA
			V_{OH} = 30 V	−55°C to 125°C			1			1	µA
V_{OL}	Low-level output voltage	V_{ID} = −1 V,	I_{OL} = 4 mA	25°C		150	400		150	400	mV
				−55°C to 125°C			700			700	
I_{OL}	Low-level output current	V_{ID} = −1 V,	V_{OL} = 1.5 V	25°C	6	16		6	16		mA
I_{CC}	Supply current (four comparators)	V_O = 2.5 V,	No load	25°C		0.8	2		0.8	2	mA

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

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS		LM139, LM139A			UNIT
			MIN	TYP	MAX	
Response time	R_L connected to 5 V through 5.1 kΩ, C_L = 15 pF,‡ See Note 4	100-mV input step with 5-mV overdrive		1.3		µs
		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.

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

PARAMETER		TEST CONDITIONS		T_A†	LM239, LM339			LM239A, LM339A			LM2901, LM2901Q			UNIT
					MIN	TYP	MAX	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		25°C		2	5		1	3		2	7	mV
				Full range			9			4			15	
I_{IO}	Input offset current	V_O = 1.4 V		25°C		5	50		5	50		5	50	nA
				Full range			150			150			200	
I_{IB}	Input bias current	V_O = 1.4 V		25°C		−25	−250		−25	−250		−25	−250	nA
				Full range			−400			−400			−500	
V_{ICR}	Common-mode input voltage range			25°C	0 to V_{CC}−1.5			0 to V_{CC}−1.5			0 to V_{CC}−1.5			V
				Full range	0 to V_{CC}−2			0 to V_{CC}−2			0 to V_{CC}−2			
A_{VD}	Large-signal differential voltage amplification	V_{CC} = 15 V, V_O = 1.4 V to 11.4 V, $R_L \geq 15$ kΩ to V_{CC}		25°C	50	200		50	200		25	100		V/mV
I_{OH}	High-level output current	V_{ID} = 1 V	V_{OH} = 5 V	25°C		0.1	50		0.1	50		0.1	50	nA
			V_{OH} = 30 V	Full range			1			1			1	µA
V_{OL}	Low-level output voltage	V_{ID} = −1 V, I_{OL} = 4 mA		25°C		150	400		150	400		150	500	mV
				Full range			700			700			700	
I_{OL}	Low-level output current	V_{ID} = −1 V, V_{OL} = 1.5 V		25°C	6	16		6	16		6	16		mA
I_{CC}	Supply current (four comparators)	V_O = 2.5 V, No load		25°C		0.8	2		0.8	2		0.8	2	mA
		V_{CC} = 30 V, V_O = 2.5 V, No load										1	2.5	

† 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 V, T_A = 25°C

PARAMETER	TEST CONDITIONS		LM239, LM239A LM339, LM339A LM2901, LM2901Q		UNIT
			MIN	TYP MAX	
Response time	R_L connected to 5 V through 5.1 kΩ, C_L = 15 pF,‡ See Note 4	100-mV input step with 5-mV overdrive		1.3	µs
		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.

electrical characteristics at V_{CC} = 5 V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		LM339Y			UNIT
				MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_{CC} = 5 V to 30 V, V_O = 1.4 V	V_{IC} = V_{ICR}min,		2	5	mV
I_{IO}	Input offset current	V_O = 1.4 V			5	50	nA
I_{IB}	Input bias current	V_O = 1.4 V			–25	–250	nA
V_{ICR}	Common-mode input voltage range			0 to V_{CC}–1.5			V
A_{VD}	Large-signal differential voltage amplification	V_{CC} = 15 V, $R_L \geq 15\ k\Omega$ to V_{CC}	V_O = 1.4 V to 11.4 V,	25	100		V/mV
I_{OH}	High-level output current	V_{ID} = 1 V,	V_{OH} = 5 V		0.1	50	nA
V_{OL}	Low-level output voltage	V_{ID} = –1 V,	I_{OL} = 4 mA		150	400	mV
I_{OL}	Low-level output current	V_{ID} = –1 V,	V_{OL} = 1.5 V	6	16		mA
I_{CC}	Supply current (four comparators)	V_O = 2.5 V,	No load		0.8	2	mA
		V_O = 30 V, No load	V_O = 15 V,		1	2.5	

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

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS		LM339Y			UNIT
			MIN	TYP	MAX	
Response time	R_L connected to 5 V through 5.1 kΩ, C_L = 15 pF,‡ See Note 4	100-mV input step with 5-mV overdrive		1.3		µs
		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.

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