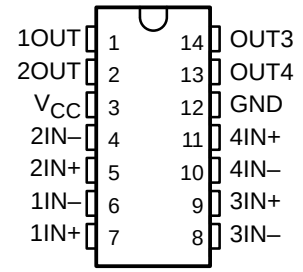
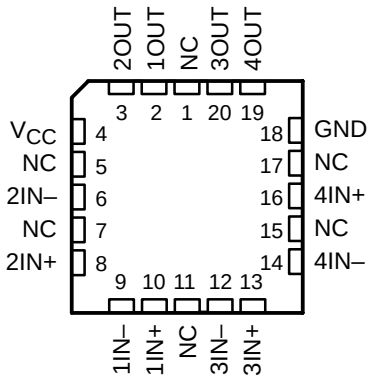
- **Single Supply or Dual Supplies**
- **Wide Range of Supply Voltage . . . 2 V to 36 V**
- **Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ**
- **Low Input Bias Current . . . 25 nA Typ**
- **Low Input Offset Current . . . 3 nA Typ (LM139)**
- **Low Input Offset Voltage . . . 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**
- **Package Options Include Plastic Small-Outline (D, NS), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Dual Flatpack (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs**

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



FK PACKAGE
(TOP VIEW)



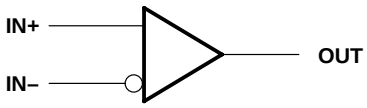
NC – No internal connection

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 also is 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 wired-AND relationships.

The LM139 and LM139A are characterized for operation over the full military temperature range of –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 is characterized for operation from –40°C to 125°C.

symbol (each comparator)



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PRODUCTION DATA information is 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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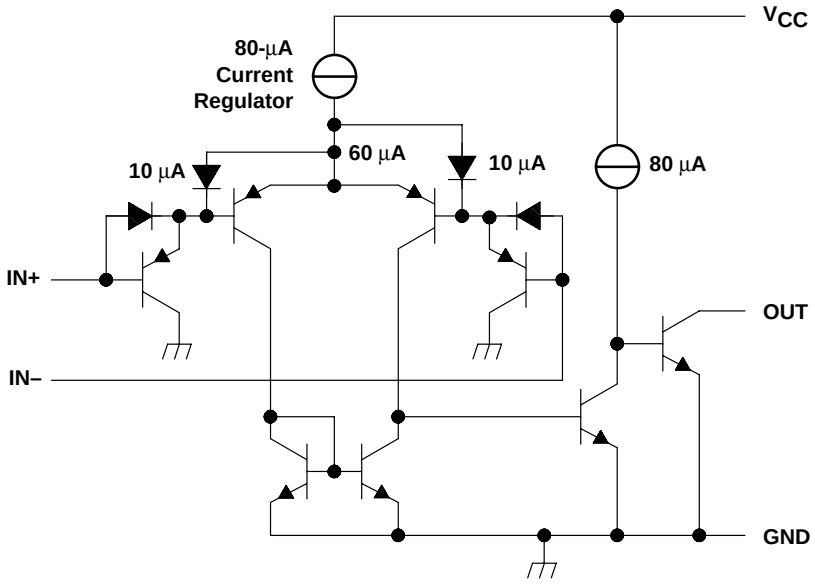
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

AVAILABLE OPTIONS

T_A	V_{IO}(max) at 25°C	PACKAGED DEVICES						
		PLASTIC SOIC (D, NS)	PLASTIC SSOP (DB)	CERAMIC CHIP CARRIER (FK)	CERAMIC DIP (J)	PLASTIC DIP (N)	PLASTIC TSSOP (PW)	CERAMIC DUAL FLATPACK (W)
0°C to 70°C	5 mV 5 mV 2 mV 2 mV	LM339D LM339NS LM339AD LM339ANS	LM339DBR — — —	—	—	LM339N — LM339AN —	LM339PWR — — —	—
–25°C to 85°C	5 mV 2 mV	LM239D LM239AD	—	—	—	LM239N LM239AN	—	—
–40°C to 125°C	7 mV 7 mV	LM2901D LM2901NS	LM2901DBR	—	—	LM2901N	LM2901PWR	—
–55°C to 125°C	5 mV 2 mV	LM139D LM139AD	—	LM139FK LM139AFK	LM139J LM139AJ	—	—	LM139W LM139AW

The D and NS packages are available taped and reeled. Add the suffix R to the device type (e.g., LM339DR). The DB and PW packages are only available taped and reeled.

schematic (each comparator)



All current values shown are nominal.

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
Package thermal impedance, θ_{JA} (see Note 4): D package . . . . . 86°C/W
DB package . . . . . 96°C/W
N package . . . . . 80°C/W
NS package . . . . . 76°C/W
PW package . . . . . 113°C/W
Continuous total dissipation . . . . . See Dissipation Rating Table
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
Storage temperature range, T_{stg} . . . . . –65°C to 150°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.
4. The package thermal impedance is calculated in accordance with JESD 51-7.

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
FK	900 mW	11 mW/°C	68°C	880 mW	715 mW	275 mW
J	900 mW	11 mW/°C	68°C	880 mW	715 mW	275 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, $V_{IC} = V_{ICR}$(min), V_O = 1.4 V		25°C		2	5		1	2	mV
				Full range			9			4	
I_{IO}	Input offset current	V_O = 1.4 V		25°C		3	25		3	25	nA
				Full range			100			100	
I_{IB}	Input bias current	V_O = 1.4 V		25°C		–25	–100		–25	–100	nA
				Full range			–300			–300	
V_{ICR}	Common-mode input-voltage range			25°C	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			
A_{VD}	Large-signal differential-voltage amplification	$V_{CC}\pm$ = ±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	Full range			1			1	µA
V_{OL}	Low-level output voltage	V_{ID} = –1 V,	I_{OL} = 4 mA	25°C		150	400		150	400	mV
				Full range			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.
‡ Full range (MIN to MAX) for LM139 and LM139A is –55°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		LM139 LM139A			UNIT
			MIN	TYP	MAX	
Response time	R_L connected to 5 V through 5.1 kΩ, C_L = 15 pF§, See Note 5	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 5: 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			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		25°C		2	5		1	3	mV
				Full range			9			4	
I_{IO}	Input offset current	V_O = 1.4 V		25°C		5	50		5	50	nA
				Full range			150			150	
I_{IB}	Input bias current	V_O = 1.4 V		25°C		–25	–250		–25	–250	nA
				Full range			–400			–400	
V_{ICR}	Common-mode input-voltage range			25°C	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			
A_{VD}	Large-signal differential-voltage amplification	V_{CC} = 15 V, V_O = 1.4 V to 11.4 V, $R_L \geq 15\ k\Omega$ to V_{CC}		25°C	50	200		50	200		V/mV
I_{OH}	High-level output current	V_{ID}= 1 V	V_{OH} = 5 V	25°C		0.1	50		0.1	50	nA
			V_{OH} = 30 V	Full range			1			1	µA
V_{OL}	Low-level output voltage	V_{ID} = –1 V,	I_{OL} = 4 mA	25°C		150	400		150	400	mV
				Full range			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.
‡ 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. 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			UNIT
			MIN	TYP	MAX	
Response time	R_L connected to 5 V through 5.1 kΩ, C_L = 15 pF§, See Note 5	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 5: 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‡	LM2901			UNIT
					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	7	mV
				Full range			15	
I_{IO}	Input offset current	V_O = 1.4 V		25°C		5	50	nA
				Full range			200	
I_{IB}	Input bias current	V_O = 1.4 V		25°C		–25	–250	nA
				Full range			–500	
V_{ICR}	Common-mode input-voltage range			25°C	0 to V_{CC}–1.5			V
				Full range	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, $R_L \geq 15\ k\Omega$ to V_{CC}		25°C	25	100		V/mV
I_{OH}	High-level output current	V_{ID}= 1 V	V_{OH} = 5 V	25°C		0.1	50	nA
			V_{OH} = 30 V	Full range			1	µA
V_{OL}	Low-level output voltage	V_{ID} = –1 V,	I_{OL} = 4 mA	25°C		150	500	mV
				Full range			700	
I_{OL}	Low-level output current	V_{ID} = –1 V,	V_{OL} = 1.5 V	25°C	6	16		mA
I_{CC}	Supply current (four comparators)	V_O = 2.5 V,	No load	25°C		0.8	2	mA
		V_{CC} = 30 V, No load	V_O = 2.5 V,			1	2.5	

† All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
‡ Full range (MIN to MAX) 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		LM2901			UNIT
			MIN	TYP	MAX	
Response time	R_L connected to 5 V through 5.1 kΩ, C_L = 15 pF§, See Note 5	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 5: 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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