

MOTOROLA

SEMICONDUCTOR  
TECHNICAL DATA

ADVANCE INFORMATION

QUAD SINGLE SUPPLY COMPARATORS

These comparators are designed for use in level detection, low level sensing and memory applications in Consumer Automotive and Industrial electronic applications.

- Single or Split Supply Operation
- Low Input Bias Current — 25 nA (Typ)
- Low Input Offset Current — ±5.0 nA (Typ)
- Low Input Offset Voltage — ±2.0 mV (Typ)
- Input Common-Mode Voltage Range to Ground
- Low Output Saturation Voltage — 130 mV (Typ) @ 4.0 mA
- TTL and CMOS Compatible

MAXIMUM RATINGS (TA = 25°C Unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltages Single Supply	V <sub>CC</sub>	36	Vdc
Split Supplies	V <sub>CC</sub> -V <sub>EE</sub>	±8	
Input Differential Voltage Range	V <sub>IDR</sub>	V <sub>CC</sub>	Vdc
Input Common Mode Voltage Range	V <sub>ICR</sub>	-0.3 to 36	Vdc
Output Short Circuit Duration	t <sub>s</sub>	Continuous	Sec
Power Dissipation, Plastic DIP	P <sub>D</sub>	1.0	W
Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-65 to +150	°C

ORDERING INFORMATION

Device	Package	Temperature Range
LMT339N LMT339D	8 Pin Plastic DIP SO-8	0°C to 70°C
LMT2901N LMT2901D	8 Pin Plastic DIP SO-8	-40°C to 105°C

**CAUTION:** These devices do not have internal ESD protection circuitry and are rated as CLASS 1 devices per the ESD test method in Mil-Std-883D. They should be handled using standard ESD prevention methods to avoid damage to the device.

LMT339, LMT2901

QUAD COMPARATORS

SILICON MONOLITHIC  
INTEGRATED CIRCUIT

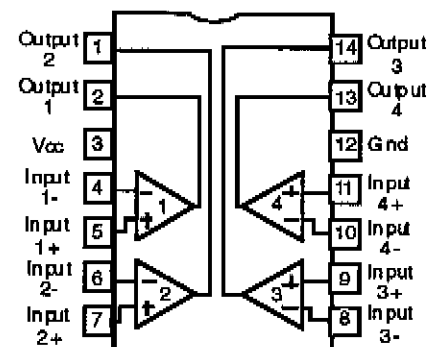


N SUFFIX  
PLASTIC PACKAGE  
CASE 646



D SUFFIX  
PLASTIC PACKAGE  
CASE 751 A  
SO-14

PIN CONNECTIONS



**ELECTRICAL CHARACTERISTICS** ( $V_{CC}=+5.0V$ ,  $V_{EE}=\text{Ground}$ ,  $T_A=25^\circ\text{C}$  unless otherwise noted)

CHARACTERISTICS	SYMBOL	LMT339			LMT2901			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage (Note 4)	$V_{IO}$	—	$\pm 2.0$	$\pm 5.0$	—	$\pm 2.0$	$\pm 7.0$	mVdc
Input Offset Current (Note 4)	$I_{IO}$	—	$\pm 5.0$	$\pm 50$	—	$\pm 5.0$	$\pm 50$	nA
Input Bias Current (Note 4, 5) (Output in Linear Range)	$I_{IB}$	—	25	250	—	25	250	nA
Input Common-Mode Voltage Range	$V_{ICR}$	0	—	$V_{CC}-1.5$	0	—	$V_{CC}-1.5$	V
Voltage Gain $R_L \geq 15\text{ k}\Omega$ , $V_{CC}=15\text{ Vdc}$	$A_V$	—	200	—	25	100	—	V/mV
Large Signal Response Time $V_I = \text{TTL Logic Swing}$ , $V_{ref}=1.4\text{ Vdc}$ , $V_{RL}=5.0\text{ Vdc}$ , $R_L=5.1\text{ k}\Omega$	—	—	300	—	—	300	—	ns
Response Time (Note 6) $V_{RL}=5.0\text{ Vdc}$ , $R_L=5.1\text{ k}\Omega$	—	—	1.3	—	—	1.3	—	$\mu\text{s}$
Output Sink Current $V_I (-) \geq +1.0\text{ Vdc}$ , $V_I (+)=0$ , $V_O \leq 1.5\text{ Vdc}$	$I_{sink}$	6.0	16	—	6.0	16	—	mA
Saturation Voltage $V_I (-) \geq +1.0\text{ Vdc}$ , $V_I (+)=0$ , $I_{sink} \leq 4.0\text{ mA}$	$V_{sat}$	—	200	400	—	200	400	mV
Output Leakage Current $V_I (+) \geq +1.0\text{ Vdc}$ , $V_I (-)=0$ , $V_O = +5.0\text{ Vdc}$	$I_{OL}$	—	0.1	—	—	0.1	—	nA
Supply Current $R_L = \infty$ (For All Comparators)	$I_{CC}$	—	0.8	2.0	—	0.8	2.0	mA

**PERFORMANCE CHARACTERISTICS** ( $V_{CC}=+5.0V$ ,  $V_{EE}=\text{Ground}$ ,  $T_A=T_{LOW}$  to  $T_{HIGH}$ )

CHARACTERISTICS	SYMBOL	LMT339			LMT2901			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$V_{IO}$	—	—	$\pm 9.0$	—	—	$\pm 15$	mVdc
Input Offset Current	$I_{IO}$	—	—	$\pm 150$	—	—	$\pm 200$	nA
Input Bias Current (Note 5) (Output in Linear Range)	$I_{IB}$	—	25	400	—	25	500	nA
Input Common-Mode Voltage Range	$V_{ICR}$	0	—	$V_{CC}-2.0$	0	—	$V_{CC}-2.0$	V
Saturation Voltage $V_I (-) \geq +1.0\text{ Vdc}$ , $V_I (+)=0$ , $I_{sink} \leq 4.0\text{ mA}$	$V_{sat}$	—	—	700	—	—	700	mV
Output Leakage Current $V_I (+) \geq +1.0\text{ Vdc}$ , $V_I (-)=0$ , $V_O = 30\text{ Vdc}$	$I_{OL}$	—	—	1.0	—	—	1.0	$\mu\text{A}$
Differential Input Voltage All $V_I \geq 0\text{ Vdc}$	$V_{ID}$	—	—	$V_{CC}$	—	—	$V_{CC}$	mA

**NOTES:**

- $T_{LOW} = 0^\circ\text{C}$ ,  $T_{HIGH} = +70^\circ\text{C}$  (for LMT339)  
 $T_{LOW} = -40^\circ\text{C}$ ,  $T_{HIGH} = +105^\circ\text{C}$  (for LMT2901)
- The maximum output current may be as high as 20 mA, independent of the magnitude of  $V_{CC}$ . Output short circuits to  $V_{CC}$  can cause excessive heating and eventual destruction.
- This magnitude of input current will only occur if the leaks are driven more negative than ground or the negative supply voltage. This is due to the PNP collector-base junction becoming forward biased, acting as an input clamp diode. There is also a lateral PNP parasitic transistor action which can cause the output voltage of the comparators to go to the  $V_{CC}$  voltage level (or ground if overdrive is large) during the time that an input is driven negative. This will not destroy the device when limited to the max rating and normal output states will recover when the inputs become  $\geq$  ground or negative supply.
- At the output switch point,  $V_O \approx 1.4\text{ Vdc}$ ,  $R_{SS} \leq 100\ \Omega$ ,  $5.0\text{ Vdc} \leq V_{CC} \leq 30\text{ Vdc}$ , with the inputs over the full common-mode range (0 Vdc to  $V_{CC} - 1.5\text{ Vdc}$ ).
- The bias current flows out of the inputs due to the PNP input stage. This current is virtually constant, independent of the output state.
- The response time specified is for a 100 mV input step with 5.0 mV overdrive. For larger signals, 300 ns is typical.

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