

# MOTOROLA SEMICONDUCTOR TECHNICAL DATA

## ADVANCE INFORMATION

### DUAL SINGLE SUPPLY COMPARATORS

The LMT393 family of comparators are dual independent voltage comparators capable of single or split-supply operation. These devices are designed to permit a common mode range-to-ground level with single-supply operation. Input offset voltage specifications as low as 5.0 mV make this device an excellent selection for many applications in consumer automotive, and industrial electronics.

- Wide Single-Supply Range — 2.0 Vdc to 36 Vdc
- Split-Supply Range —  $\pm 1.0$  Vdc to  $\pm 18$  Vdc
- Very Low Current Drain Independent of Supply Voltage — 0.4 mA
- Low Input Bias Current — 25 nA (Typ)
- Low Input Offset Current —  $\pm 5.0$  nA (Typ)
- Low Input Offset Voltage —  $\pm 5.0$  mV (Max)
- Input Common-Mode Voltage Range to Ground
- Differential Input Voltage Range Equal to Power Supply Voltage
- Output Voltage Compatible with DTL, ECL, TTL, MOS and CMOS Logic Levels

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

Rating	Symbol	Value	Unit
Power Supply Voltages Single Supply Split Supplies	V <sub>CC</sub> V <sub>CC</sub> , V <sub>EE</sub>	36 $\pm 18$	Vdc
Input Differential Voltage Range	V <sub>IDR</sub>	$\pm 36$	Vdc
Input Common Mode Voltage Range	V <sub>ICR</sub>	-0.3 to V <sub>CC</sub>	Vdc
Output Short Circuit Duration	t <sub>S</sub>	Continuous	Sec
Output Sink Current	I <sub>SINK</sub>	20	mA
Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-65 to +150	°C
Power Dissipation, Plastic DIP	P <sub>D</sub>	500	mW

#### ORDERING INFORMATION

Device	Package	Temperature Range
LMT393N LMT393D	8 Pin Plastic DIP SO-8	0°C to 70°C
LMT2903N LMT2903D	8 Pin Plastic DIP SO-8	-40°C to 105°C

## LMT393, LMT2903

### DUAL COMPARATORS

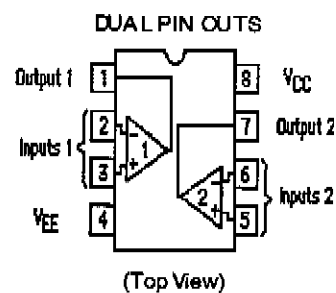
SILICON MONOLITHIC  
INTEGRATED CIRCUIT



**N SUFFIX**  
PLASTIC PACKAGE  
CASE 626



**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751-02  
SO-8



**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.

MacRev 3.0

**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = +5.0V_{dc}$ ;  $*T_{low} \leq T_A \leq T_{high}$  unless otherwise noted)

CHARACTERISTICS	SYMBOL	LMT393			LMT2903			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage (1) $T_A = 25^\circ C$ $T_{low} \leq T_A \leq T_{high}$	$V_{IO}$	—	$\pm 2.0$	$\pm 5.0$	—	$\pm 2.0$	$\pm 7.0$	mV
		—	—	9.0	—	—	15	
Input Offset Current $T_A = 25^\circ C$ $T_{low} \leq T_A \leq T_{high}$	$I_{IO}$	—	$\pm 5.0$	$\pm 50$	—	$\pm 5.0$	$\pm 50$	nA
		—	—	$\pm 150$	—	$\pm 50$	$\pm 200$	
Input Bias Current (2) $T_A = 25^\circ C$ $T_{low} \leq T_A \leq T_{high}$	$I_{IB}$	—	25	250	—	25	250	nA
		—	—	400	—	200	500	
Input Common-Mode Voltage Range (2) $T_A = 25^\circ C$ $T_{low} \leq T_A \leq T_{high}$	$V_{ICR}$	0	—	$[V_{CC}]$	0	—	$[V_{CC}]$	Volts
		0	—	-1.5	0	—	-1.5	
				-2.0			-2.0	
Voltage Gain $R_L \geq 15 k\Omega$ , $V_{CC} = 15 V_{dc}$ $T_A = 25^\circ C$	$A_{VOL}$	50	200	—	25	200	—	V/mV
Large Signal Response Time $V_{in} = \text{TTL Logic Swing}$ , $V_{ref} = 1.4 V_{dc}$ $V_{RL} = 5.0 V_{dc}$ , $R_L = 5.1 k\Omega$ , $T_A = 25^\circ C$	—	—	300	—	—	300	—	ns
Response Time (3) $V_{RL} = 5.0 V_{dc}$ , $R_L = 5.1 k\Omega$ , $T_A = 25^\circ C$	$t_{TLH}$	—	1.3	—	—	1.5	—	$\mu s$
Input Differential Range (4) All $V_{in} \geq \text{Gnd}$ or $V^-$ Supply (if used)	$V_{ID}$	—	—	$V_{CC}$	—	—	$V_{CC}$	V
Output Sink Current $V_{in-} \geq 1.0 V_{dc}$ , $V_{in+} = 0 V_{dc}$ , $V_O \leq 1.5 V_{dc}$ , $T_A = 25^\circ C$	$I_{sink}$	6.0	16	—	6.0	16	—	mA
Output Saturation Voltage $V_{in-} \geq 1.0V_{dc}$ , $V_{in+} = 0$ , $I_{sink} \leq 4.0 \text{ mA}$ , $T_A = 25^\circ C$ $T_{low} \leq T_A \leq T_{high}$	$V_{OL}$	—	200	400	—	200	400	mV
		—	—	700	—	—	700	
Output Leakage Current $V_{in-} = 0 V$ , $V_{in+} \geq 1.0 V_{dc}$ , $V_O = 5.0 V_{dc}$ , $T_A = 25^\circ C$ $V_{in-} = 0 V$ , $V_{in+} \geq 1.0 V_{dc}$ , $V_O = 30 V_{dc}$ , $T_{low} \leq T_A \leq T_{high}$	$I_{OL}$	—	0.1	—	—	0.1	—	nA
		—	—	1000	—	—	1000	
Supply Current $R_L = \infty$ Both Comparators $T_A = 25^\circ C$ $R_L = \infty$ Both Comparators, $V_{CC} = 30 V$	$I_{CC}$	—	0.8	1.0	—	0.8	1.0	mA
		—	—	2.5	—	—	2.5	

\* LMT393 —  $T_{LOW} = 0^\circ C$ ,  $T_{HIGH} = +70^\circ C$ LMT2903 —  $T_{LOW} = -40^\circ C$ ,  $T_{HIGH} = +105^\circ C$ 

## NOTES:

- At output switch point,  $V_O = 1.4 V_{dc}$ ,  $R_S = 0\Omega$  with  $V_{CC}$  from 5.0 Vdc to 30 Vdc, and over the full input common-mode range (0 volts to  $V_{CC} = -1.5$  volts)
- Due to the PNP transistor inputs, bias current will flow out of the inputs, this current is essentially constant independent of the output state, therefore, no loading changes will exist on the input lines.
- Response time is specified with a 100 mV step and 5.0 mV of overdrive. With larger magnitudes of overdrive faster response times are obtained.
- The comparator will exhibit proper output state if one of the inputs become greater than  $V_{CC}$ , the other input must remain within the common mode range. The low input state must not be less than -0.3 volts of ground or minus supply.

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