Dual Differential Comparators

LR393D / LR2903D

DESCRIPTION

The LR393D/LR2903D consists of two voltage comparators with an offset voltage specification as low as 2.0mV max. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible, and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

SOP-8

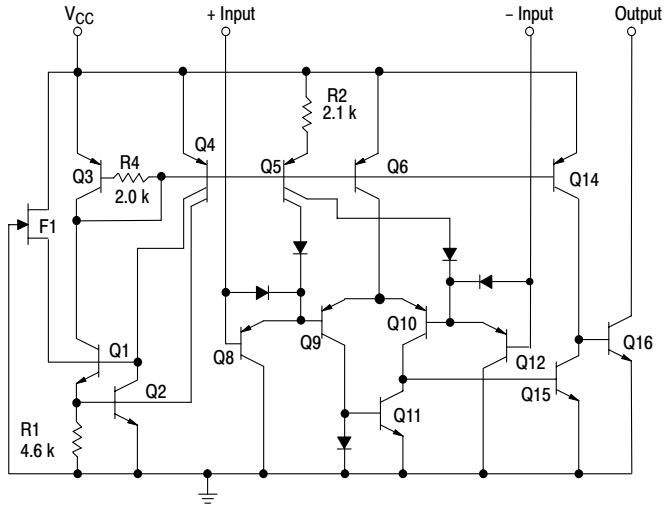
FEATURES

- Wide supply voltage range
- Low supply current drain independent of the supply voltage
- Low input biasing current
- Low input offset current
- Low input offset voltage
- Input common-mode voltage range includes GND
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage.
- Output voltage compatible with TTL, MOS and CMOS logic

ORDERING INFORMATION

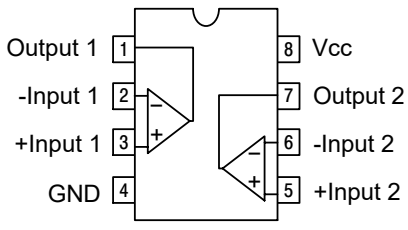
Device	Package
LR393D	SOP-8
LR2903D	SOP-8

BLOCK DIAGRAM



NOTE: Diagram shown is for 1 comparator

PIN CONFIGURATION



(Top View)

PIN DESCRIPTIONS

No.	Description	Symbol	No.	Description	Symbol
1	Output 1	OUT1	5	+Input2	IN2（+）
2	-Input1	IN1（-）	6	-Input2	IN2（-）
3	+Input1	IN1（+）	7	Output 2	OUT2
4	Ground	GND	8	Supply Voltage	Vcc

ABSOLUTE MAXIMUM RATINGS (Ta=25°C unless otherwise noted)

PARAMETER	Symbol	Value	Unit
Input voltage	V_{IN}	0.3 to 28.5	V
Operating Junction Temperature Range LR393D LR2903D	T_J	 -40 to +85 -40 to +125	°C

ELECTRICAL CHARACTERISTICS

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

PARAMETER	TEST CONDITIONS*			MIN	TYP	MAX	UNIT
V_{IO} Input offset voltage	Vcc=5V to 30V, $V_{IC}=V_{ICR}$ min, Vo=1.4V		25°C		2	5	mV
			Full range			9	
I_{IO} Input offset current	Vo=1.4V		25°C		5	50	nA
			Full range			150	
I_{IB} Input bias current	Vo=1.4V		25°C		-25	-250	nA
			Full range			-400	
V_{ICR} Common-mode input voltage range**			25°C	0 to Vcc-1.5			V
			Full range	0 to Vcc-2			
A_{VD} Large-signal differential voltage amplification	Vcc=15V, Vo=1.4V to 11.4V, $R_L \geq 15k\Omega$ to V_{CC}		25°C	50	200		V/mV
I_{OH} High-level output current	V_{OH}=5V, V_{ID}=1V,		25°C		0.1	50	nA
	V_{OH}=30V, V_{ID}=1V		Full range			1	μA
V_{OL} Low-level output voltage	I_{OL}=4mA, V_{ID}=-1V		25°C		150	400	mV
			Full range			700	
I_{OL} Low-level output current	V_{OL}=1.5V, V_{ID}=-1V		25°C	6			mA
I_{CC} Supply current	$R_L=\infty$	V_{CC}=5V	25°C		0.8	1	mA
		V_{CC}=30V	Full range			2.5	

*Full range (MIN to MAX) for the LR393D is -40℃ to +85℃, and full range (MIN to MAX) for the LR2903D is -40℃ to +125℃. All characteristics are measured with zero common-mode input voltage unless otherwise specified.

**The voltage at either input or common-mode should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is Vcc-1.5V, but either or both inputs can go to 30V without damage.

SWITCHING CHARACTERISTICS (Vcc=5V, Ta=25°C)

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Response time	R_L connected to 5V through 5.1kΩ,	100-mV input step with 5-mV overdrive		1.3		μs
	C_L=15pF* (See Note 1)	TTL-level input step		0.3		

NOTE 1. C_L includes probe and jig capacitance.
The response time specified is the interval between the input step function and the instant, when the output crosses 1.4V.

TYPICAL PERFORMANCE CHARACTERISTICS

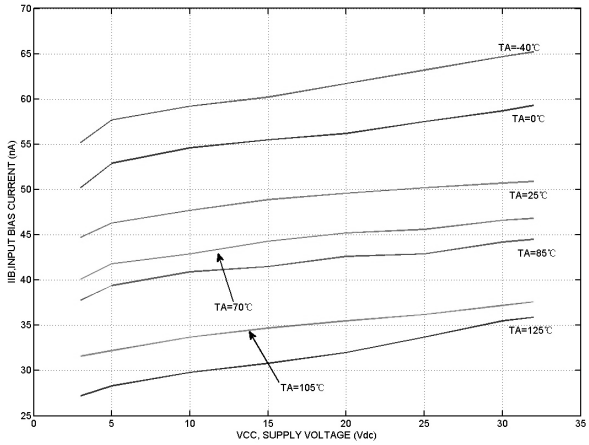


Figure 1. Input Bias Current vs Power Supply Voltage

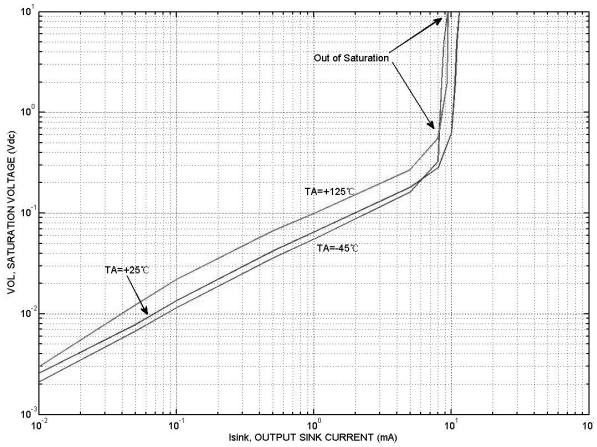


Figure 2. Output Saturation Voltage vs Output Sink Current

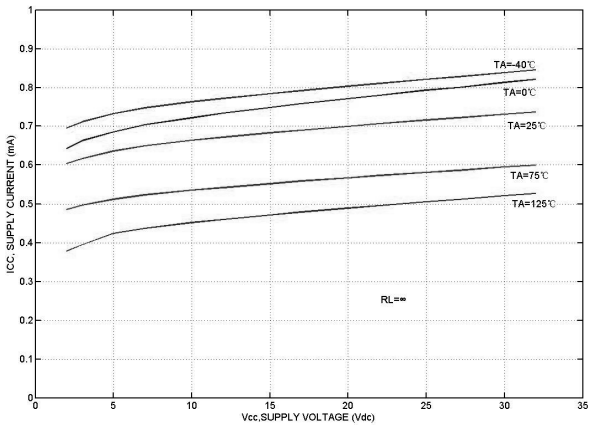
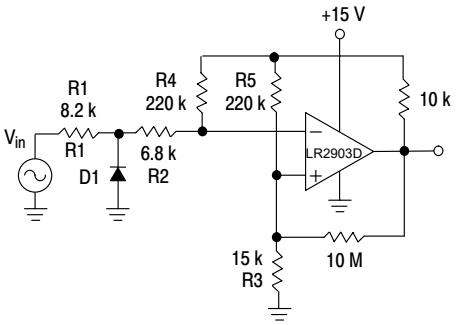


Figure 3. Power Supply Current vs Power Supply Voltage

TYPICAL APPLICATION CIRCUITS

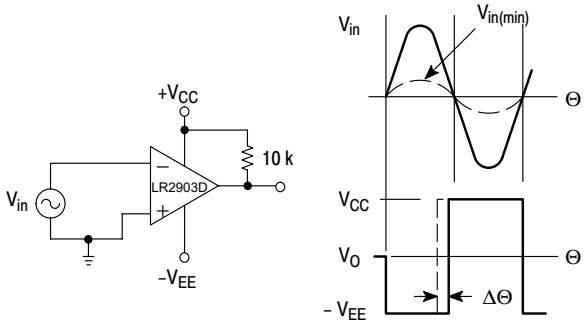


D1 prevents input from going negative by more than 0.6 V.

$R1 + R2 = R3$

$R3 \leq \frac{R5}{10}$ for small error in zero crossing.

Figure 4. Zero Crossing Detector (Single Supply)



$V_{in(min)} \approx 0.4$ V peak for 1% phase distortion ($\Delta\Theta$).

Figure 5. Zero Crossing Detector (Split Supply)

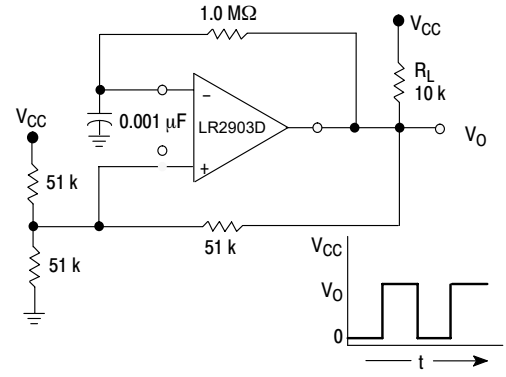


Figure 6. Free−Running Square−Wave Oscillator

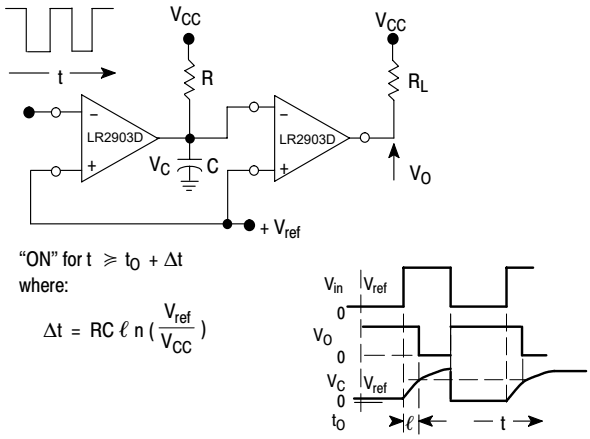
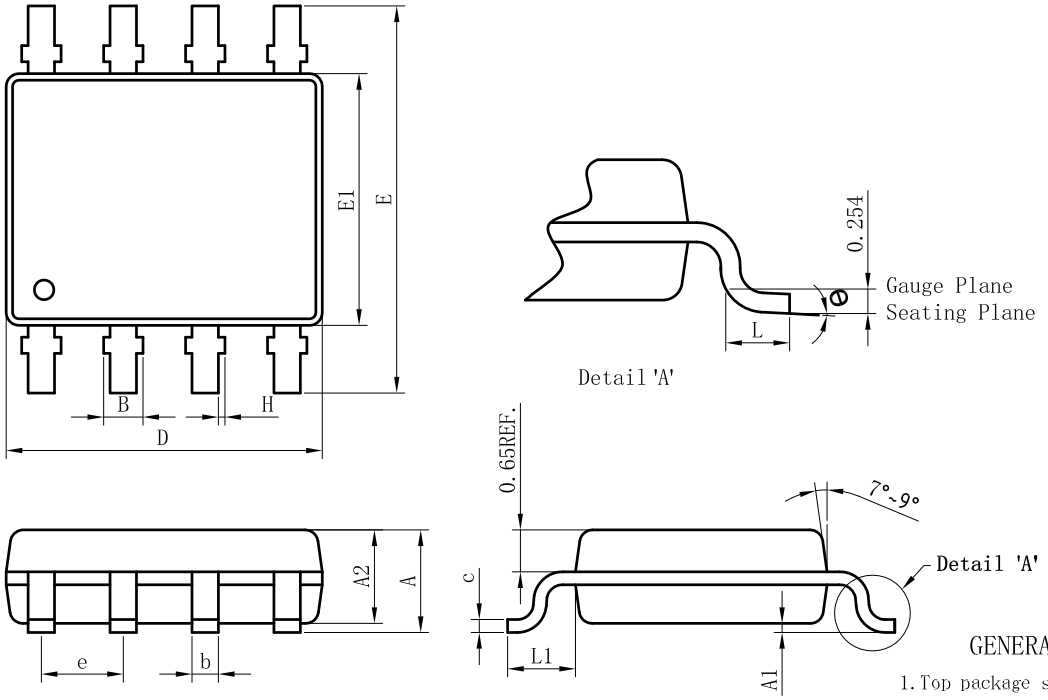


Figure 7. Time Delay Generator

MECHANICAL DIMENSIONS

SOP-8 **Unit: mm**

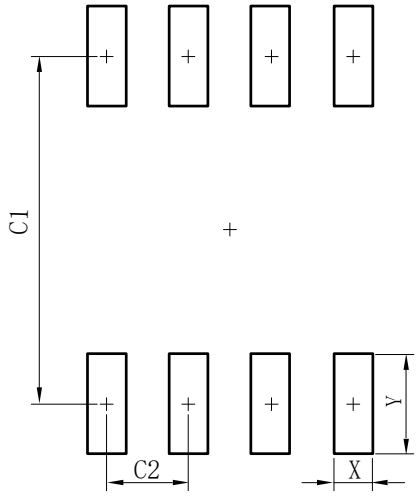


SOP-8			
DIM	MIN	NOR	MAX
A	–	–	1.75
A1	0.10	0.15	0.20
A2	1.35	1.45	1.55
b	0.33	0.42	0.51
c	0.15	0.22	0.29
D	4.77	4.90	5.03
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.46	0.66	0.86
L1	0.85	1.05	1.25
θ	0°	5°	8°
B	–	–	0.55
H	0	0.05	0.10
All Dimensions in mm			

GENERAL NOTES

1. Top package surface finish Ra0.4±0.2um
2. Bottom package surface finish Ra0.7±0.2um
3. Side package surface finish Ra0.4±0.2um
4. Package Body Sizes Exclude Mold Flash, Protrusion Or Gate Burrs. Mold Flash, Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side.
5. Dimension "b" Does Not Include Dambar Protrusion.

SUGGESTED PAD LAYOUT



SOP-8	
DIM	(mm)
X	0.60
Y	1.55
C1	5.40
C2	1.27

DISCLAIMER

- Curve guarantee in the specification. The curve of test items with electric parameter is used as quality guarantee. The curve of test items without electric parameter is used as reference only.

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