

# Dual Operational Amplifier

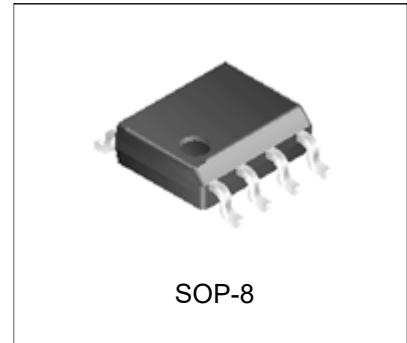
## LR393

### DESCRIPTION

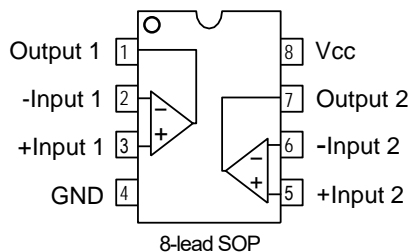
The LR393 consists of two independent voltage comparators designed specifically to operate from a single power supply over a wide voltage range.

### FEATURES

- \* Single or dual supply operation
- \* Wide operating supply range ( $V_{cc}=2V\sim 36V$  or  $\pm 1$  to  $\pm 18V$ )
- \* Input common-mode voltage includes ground
- \* Low supply current drain:  $I_{cc}=0.8mA$  (Typical)
- \* Low input bias current  $I_{bias}=65nA$  (Typical)
- \* Output compatible with TTL, DTL and CMOS logic system
- \* Available in SOP-8 package



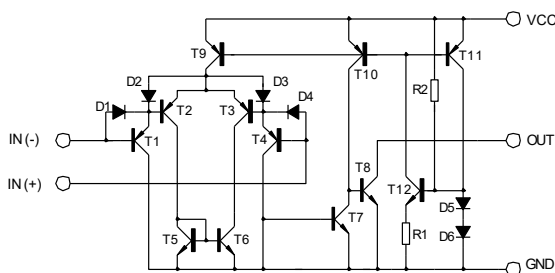
### PIN CONFIGURATION



### ORDERING INFORMATION

Device	Package
LR393D	SOP-8

### BLOCK DIAGRAM



NOTE: Diagram shown is for 1 comparator

**ABSOLUTE MAXIMUM RATINGS** (Ta=25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	Vcc	±18 OR 36	V
Differential input voltage	Vi(diff)	36	V
Input Voltage	VI	-0.3~36V	V
Power Dissipation	Pd	570	mW
Operating Temperature for LR393	Topr	0 to +70	°C
Storage Temperature	Tstg	-65 to +150	°C

**ELECTRICAL CHARACTERISTICS** (Ta=25°C )

(Vcc=5.0V, All voltage referenced to GND unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	Vio	V <sub>CM</sub> =0 to V <sub>cc</sub> -1.5 Vo(p)=1.4V, Rs=0		±1.0	±5.0	mV
Input offset current	Iio			±5	±50	nA
Input Bias current	Ib			65	250	nA
Input Common-mode voltage range	Vi(R)		0		V <sub>cc</sub> -1.5	V
Supply Current	Icc	R <sub>L</sub> =∞		0.6	1.0	mA
		R <sub>L</sub> =∞, V <sub>cc</sub> =30V		0.8	2.5	mA
Large signal Voltage Gain	Gv	V <sub>cc</sub> =15V, R <sub>L</sub> >15kΩ	50	200		V/mV
Large signal response time	tres	Vi=TTL logic wing Vref=1.4V, VRL=5V, RL=5.1kΩ		350		ns
Response time	tres	VRL=5V, RL=5.1kΩ		1400		ns
Output sink current	I <sub>sink</sub>	Vi(-)>1V, Vi(+)=0V, Vo(p)<1.5V	6	18		mA
Output saturation voltage	Vsat	Vi(-)>1V, Vi(+)=0V, I <sub>sink</sub> =4mA		160	400	mV
output leakage current	I <sub>leakage</sub>	Vi(+)=1V, Vi(-)=0, Vo(p)=5V		0.1		nA

## TYPICAL PERFORMANCE CHARACTERISTICS

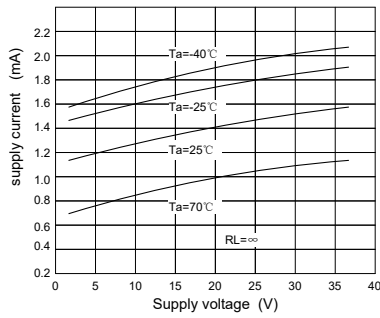


Figure 1. supply current vs supply voltage

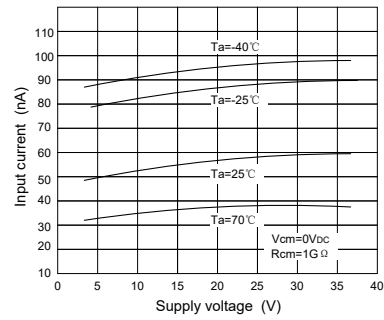


Figure 2. Input Current vs Supply Voltage

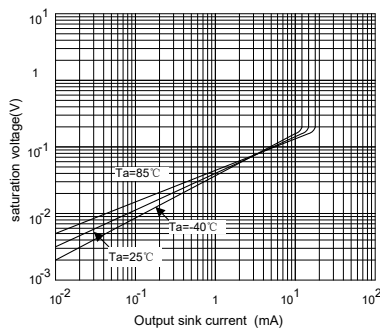


Figure 3. Output Saturation Voltage vs Sink Current

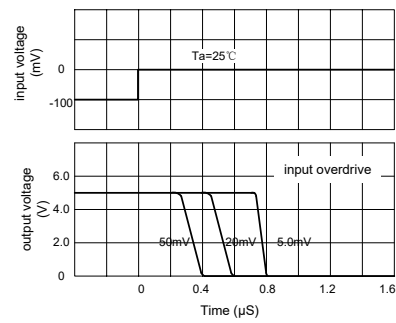


Figure 4. Response Time for Various Input Overdrive-Negative Transition

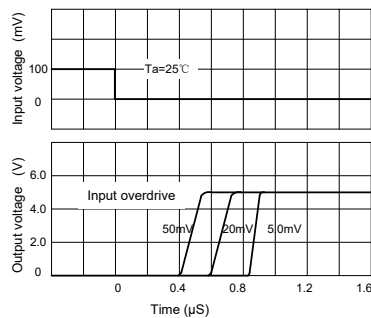
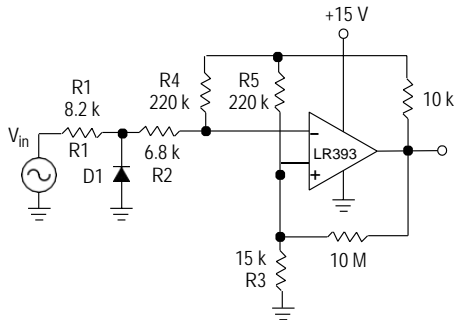


Figure 5. Response Time for Various Input Overdrive-Positive Transition

**TYPICAL APPLICATION**

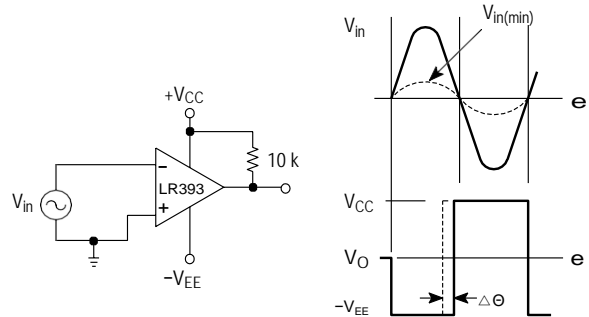


D1 prevents input from going negative by more than 0.6 V.

$$R1 + R2 = R3$$

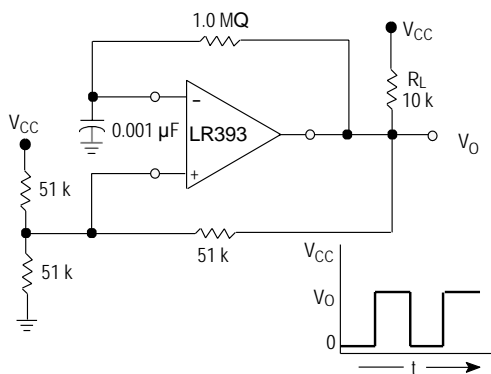
$$R3 \leq \frac{R5}{10} \text{ for small error in zero crossing.}$$

**Figure 6. Zero Crossing Detector (Single Supply)**

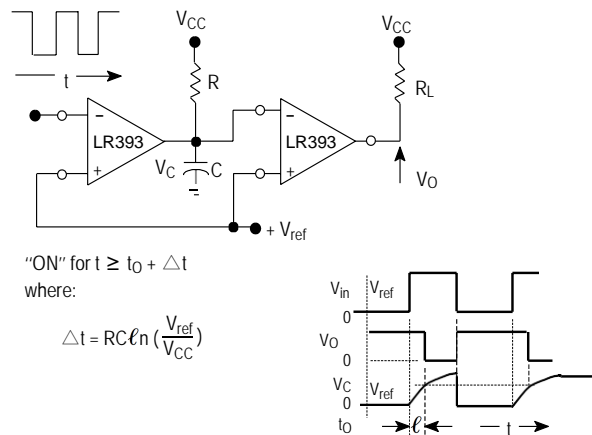


$$V_{in(min)} = 0.4 \text{ V peak for } 1\% \text{ phase distortion } (\Delta\Theta).$$

**Figure 7. Zero Crossing Detector (Split Supply)**



**Figure 8. Free-Running Square-Wave Oscillator**

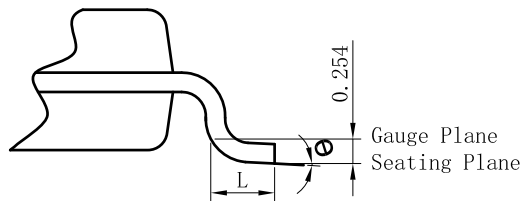
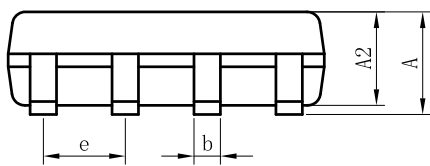
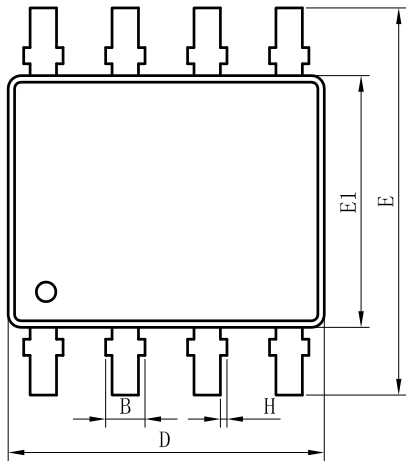


**Figure 9. Time Delay Generator**

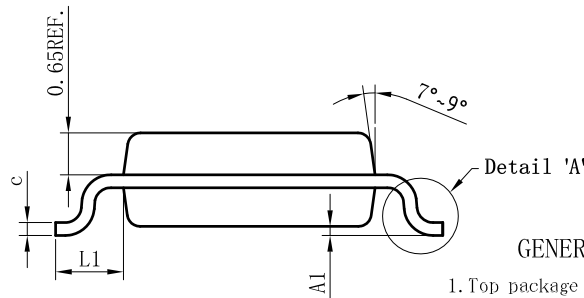
**MECHANICAL DIMENSIONS**

**SOP-8**

Unit: mm



Detail 'A'



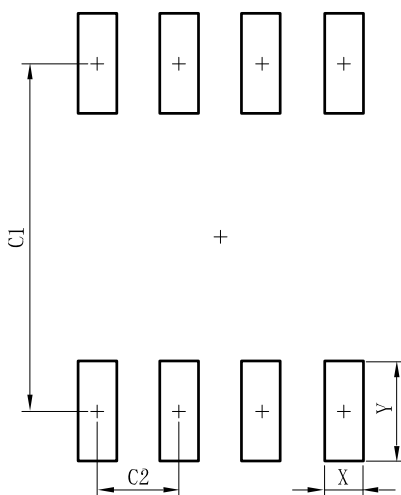
Detail 'A'

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**

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