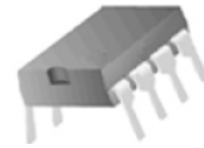


## Voltage Comparator

### General Description

- The TCI LM393 consist of two independent voltage comparator, designed specifically to operate from a single power supply over a wide voltage range.
- The LM393 is available in standard DIP-8, SOP-8 and TSSOP-8 packages.



DIP-8



SOP-8



TSSOP-8



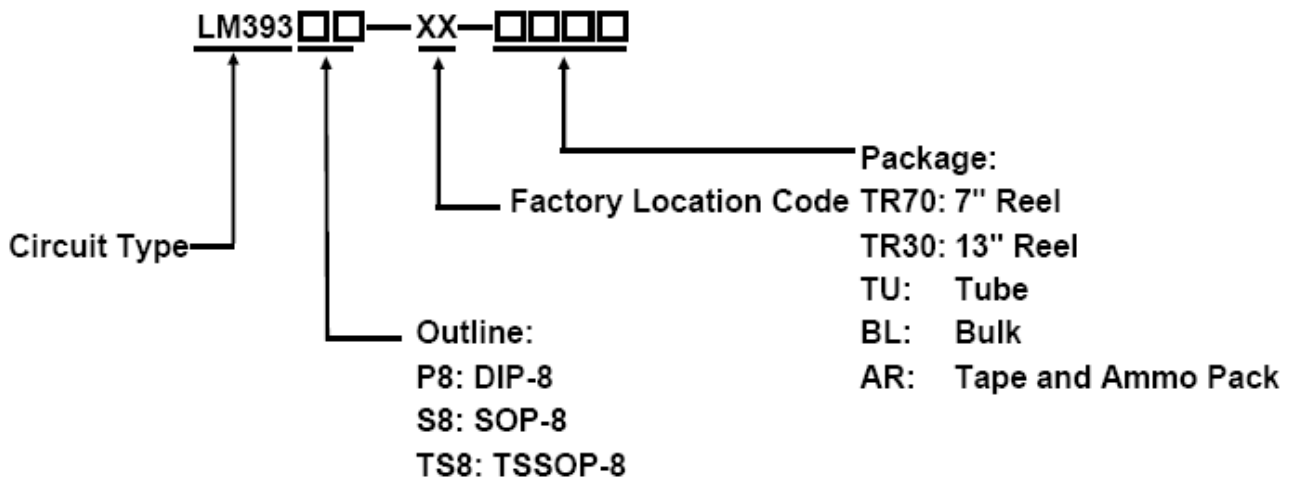
### Features

- Single or dual supply operation
- Wide operating supply range  
( $V_{CC}=2V \sim 36V$  or  $\pm 1 \sim \pm 18V$ )
- Input common-mode voltage includes ground
- Low supply current drain  $I_{CC}=0.8mA$  (Typical)
- Low input bias current  $I_{BIAS}=25nA$  (Typical)
- Output compatible with TTL, DTL, and CMOS logic system
- RoHS Compliance

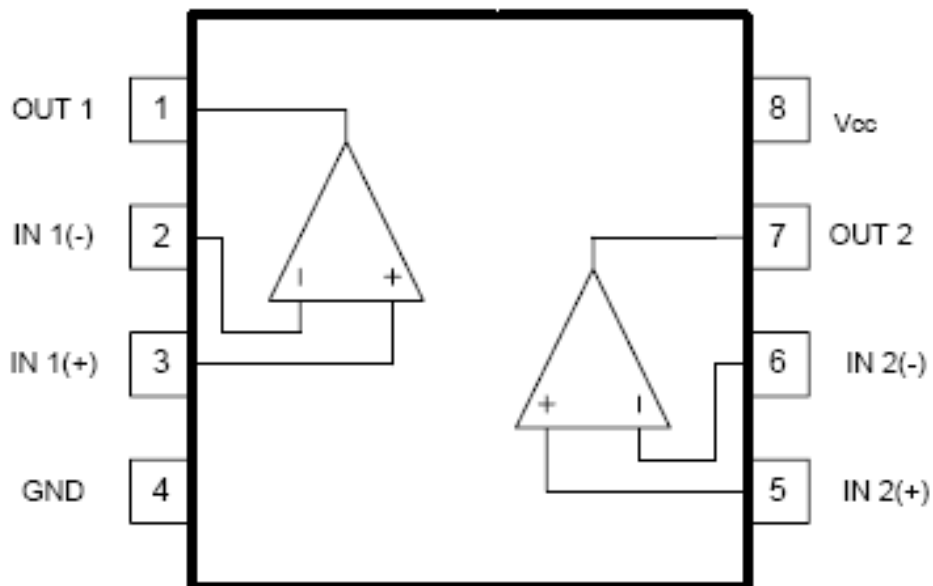
### Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply
- PC Motherboard
- Communication Equipment

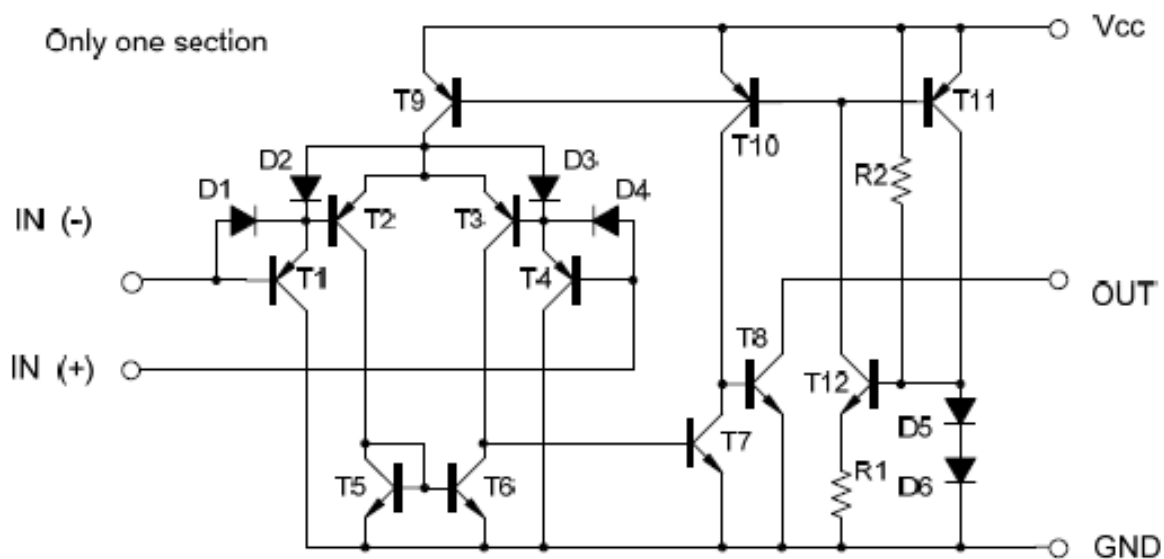
### Ordering Information



### Pin Configuration



### Block Diagram



# Voltage Comparator

## LM393

### Absolute Maximum Ratings

Symbol	Description	LM393	Unit
V <sub>CC</sub>	Supply Voltage	± 18 or 36	V
V <sub>I(DIFF)</sub>	Differential Input Voltage	36	V
V <sub>IN</sub>	Input Voltage	-0.3 ~ 36	V
P <sub>D</sub>	Power Dissipation	TSSOP-8	570
		SOP-8	660
		DIP-8	780
T <sub>J</sub>	Operating Junction Temperature	150	° C
T <sub>OPR</sub>	Operating Temperature Range	-40 ~ 85	° C
T <sub>STG</sub>	Storage Temperature Range	-65 ~ 150	° C

**Note:** Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### Electrical Characteristics

(V<sub>CC</sub>=5.0V, T<sub>A</sub>=25°C, all voltage referenced to GND unless otherwise specified)

Symbol	Description	LM393			Unit	Conditions
		Min.	Typ.	Max.		
V <sub>I(OFF)</sub>	Input Offset Voltage	-	1.0	5.0	mV	V <sub>CM</sub> =0V to V <sub>CC</sub> -1.5V V <sub>O(P)</sub> =1.4V, R <sub>S</sub> =0Ω
V <sub>SAT</sub>	Output Saturation Voltage	-	160	400	mV	V <sub>I(-)</sub> >1V, V <sub>I(+)</sub> =0V, I <sub>SINK</sub> =4mA
V <sub>I(CM)</sub>	Input Common Mode Voltage	0	-	V <sub>CC</sub> -1.5	V	V <sub>CC</sub> =30V
G <sub>V</sub>	Large Signal Voltage Gain	50	200	-	V/mV	V <sub>CC</sub> =15V, R <sub>L</sub> ≥15KΩ
I <sub>CC</sub>	Power Supply Current	-	0.8	2.5	mA	R <sub>L</sub> =∞, V <sub>CC</sub> =30V
		-	0.6	1.0		R <sub>L</sub> =∞
I <sub>I(OFF)</sub>	Input Offset Current	-	5	50	nA	-
I <sub>I(BIAS)</sub>	Input Bias Current	-	65	250	nA	-
I <sub>O(SINK)</sub>	Output Sink Current	6	18	-	mA	V <sub>I(-)</sub> >1V, V <sub>I(+)</sub> =0V, V <sub>O(P)</sub> <1.5V
I <sub>O(LEAK)</sub>	Output Leakage Current	-	0.1	-	nA	V <sub>I(+)</sub> =1V, V <sub>I(-)</sub> =0V, V <sub>O(P)</sub> =5V
		-	-	1.0	μA	V <sub>I(+)</sub> =1V, V <sub>I(-)</sub> =0V, V <sub>O(P)</sub> =30V
t <sub>R</sub>	Large Signal Response Time	-	350	-	ns	V <sub>IN</sub> =TTL logic wing, V <sub>REF</sub> =1.4V, V <sub>RL</sub> =5V, R <sub>L</sub> =5.1KΩ
t <sub>R</sub>	Response Time	-	1400	-	ns	V <sub>RL</sub> =5V, R <sub>L</sub> =5.1KΩ

### Typical Characteristics Curves

Fig.1- Supply Current

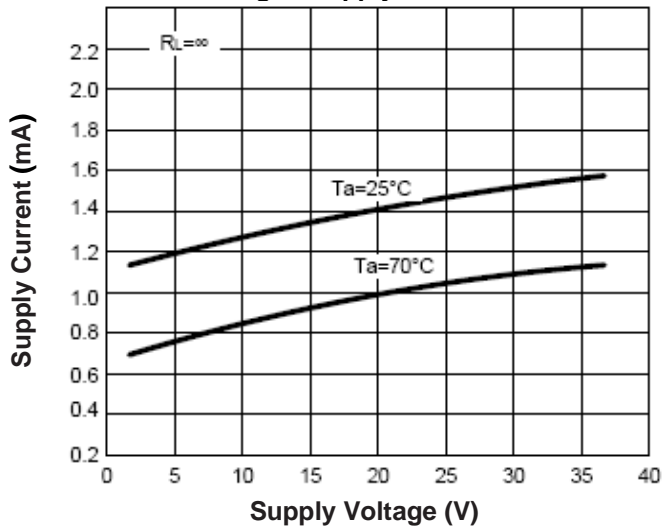


Fig.2- Input Current

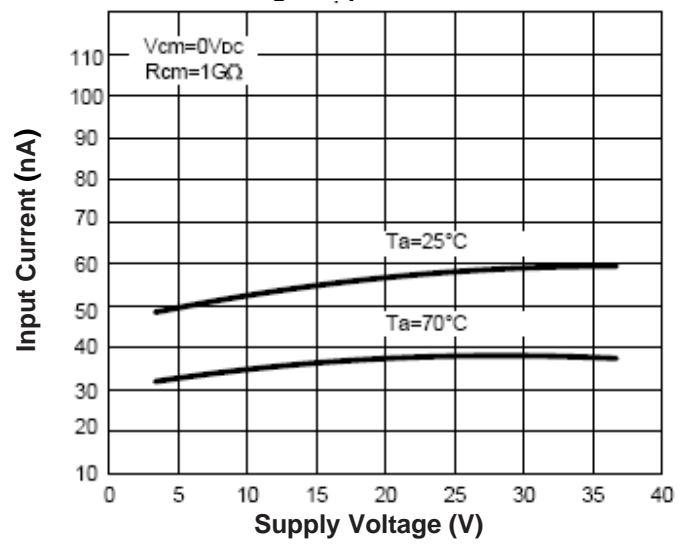


Fig.3- Output Saturation Voltage

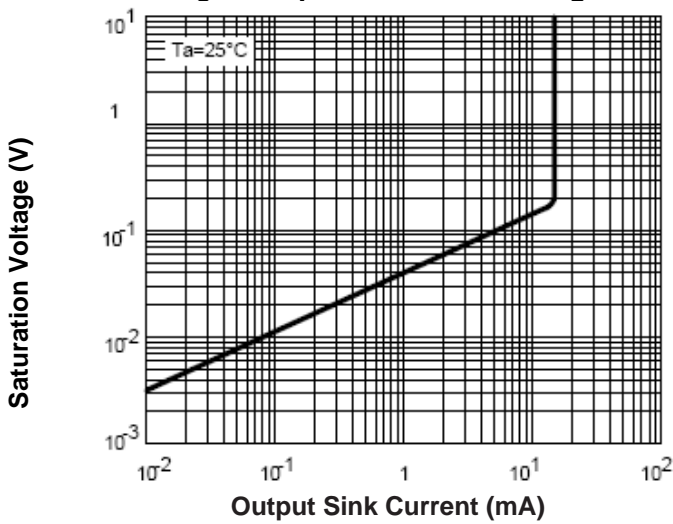
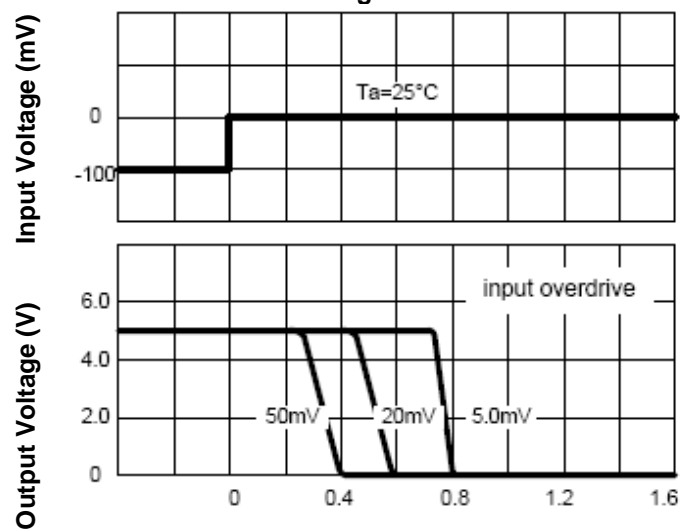


Fig.4- Response Time for Various Input Overdrive Negative Transition



# Voltage Comparator

## LM393

### Typical Characteristics Curves (Continued)

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

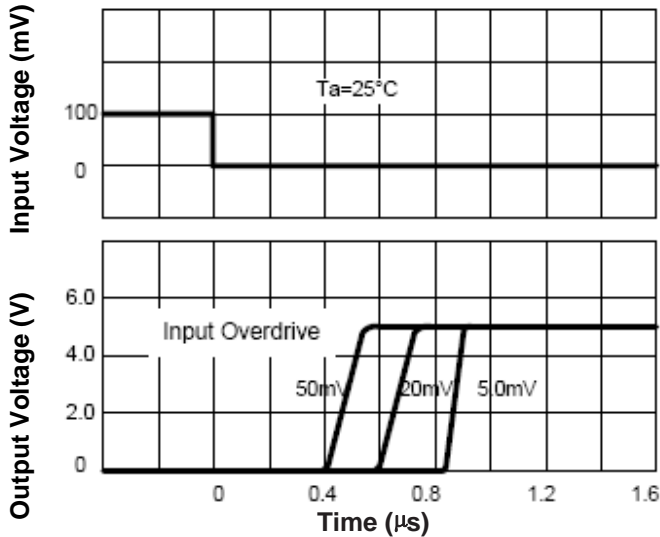


Fig.6- Voltage Follower Pulse Response

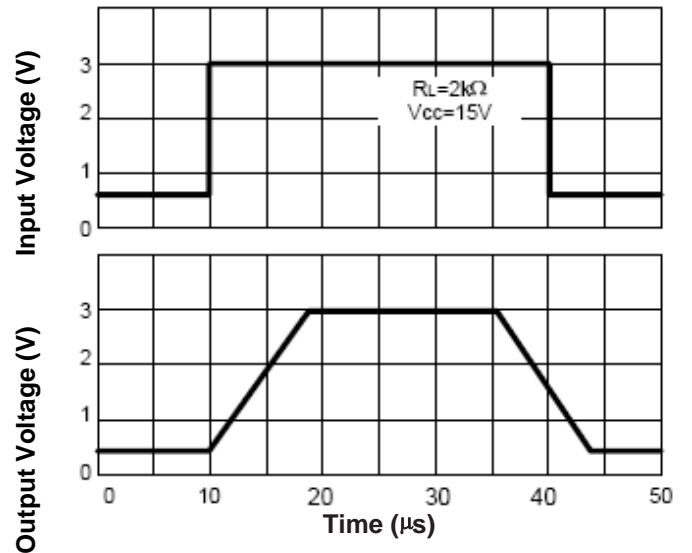


Fig.7- Voltage Follower Pulse Response (small signal)

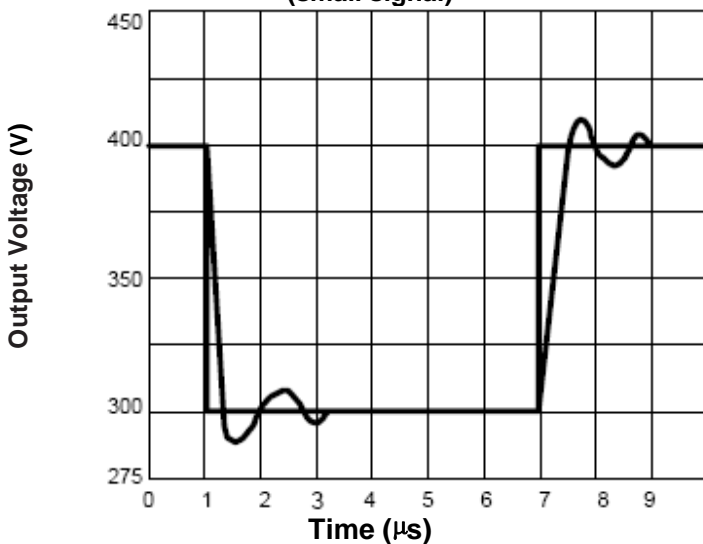
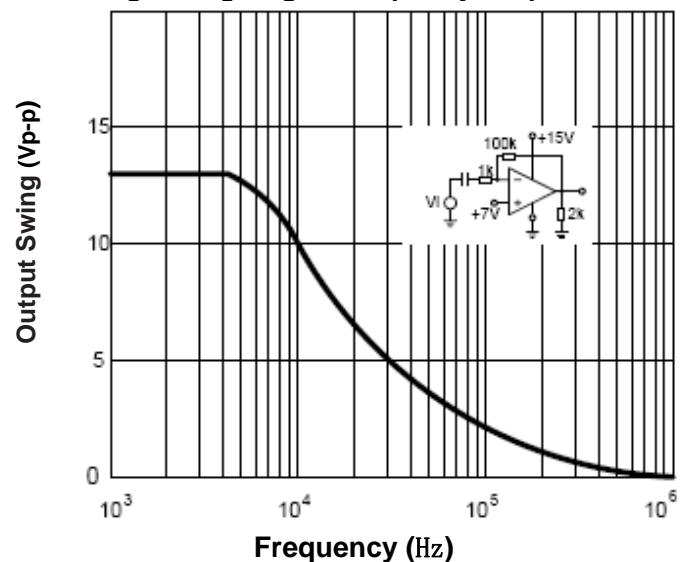


Fig.8- Large Signal Frequency Response



### Typical Characteristics Curves (Continued)

Fig.9- Output Characteristics Current Sourcing

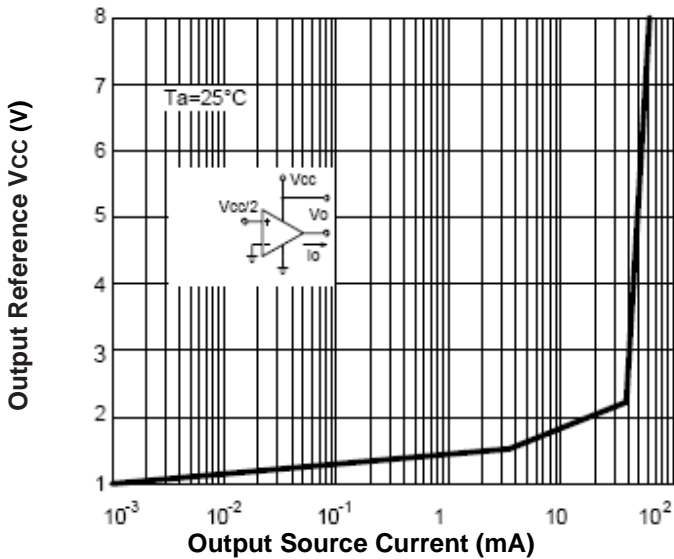


Fig.10- Output Characteristics Current Sinking

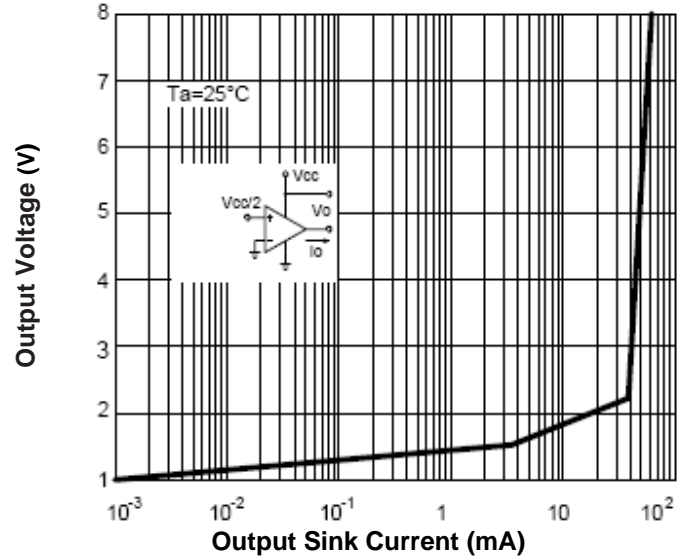
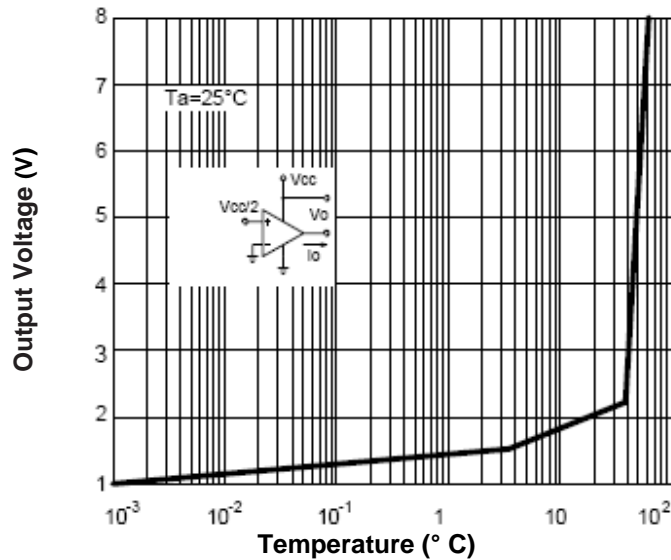


Fig.11- Current Limiting



### Typical Applications

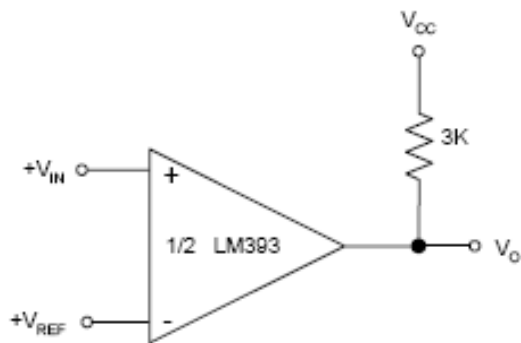


Fig.12-Basic Comparator

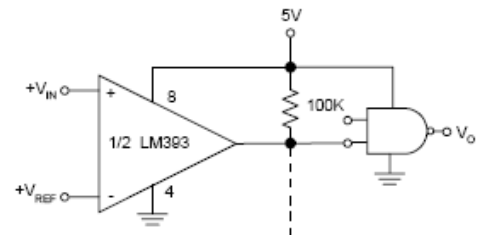


Fig.13-Driving CMOS

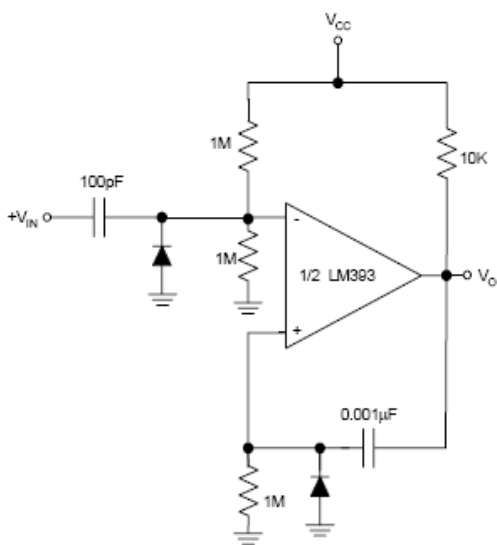


Fig.14-One Shot Multivibrator

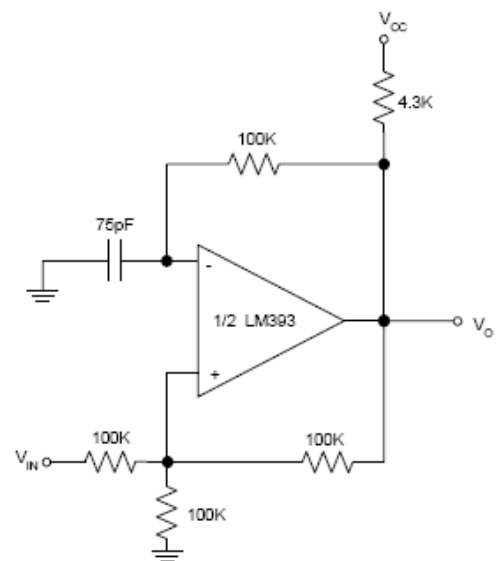
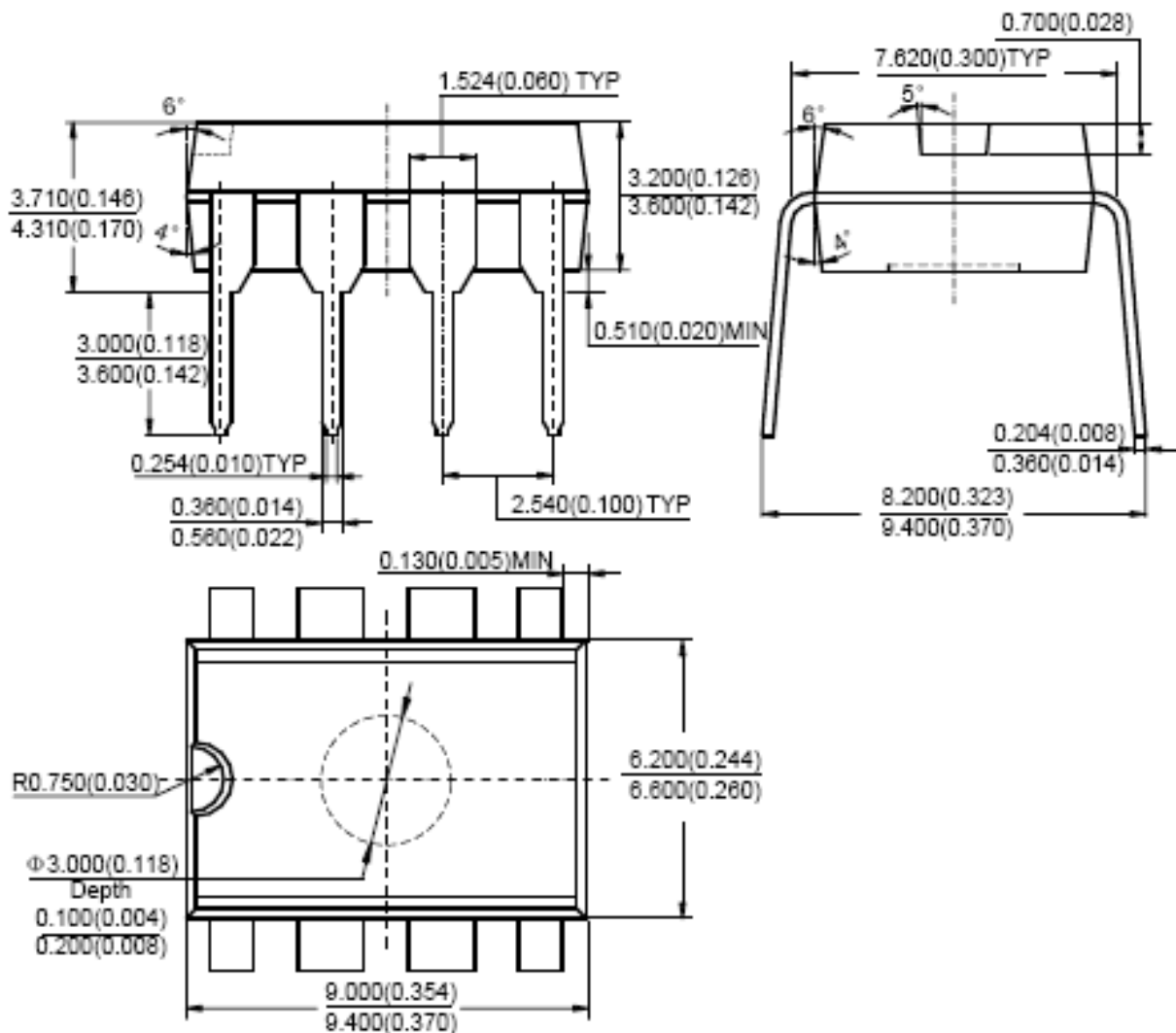


Fig.15-Squarewave Oscillator

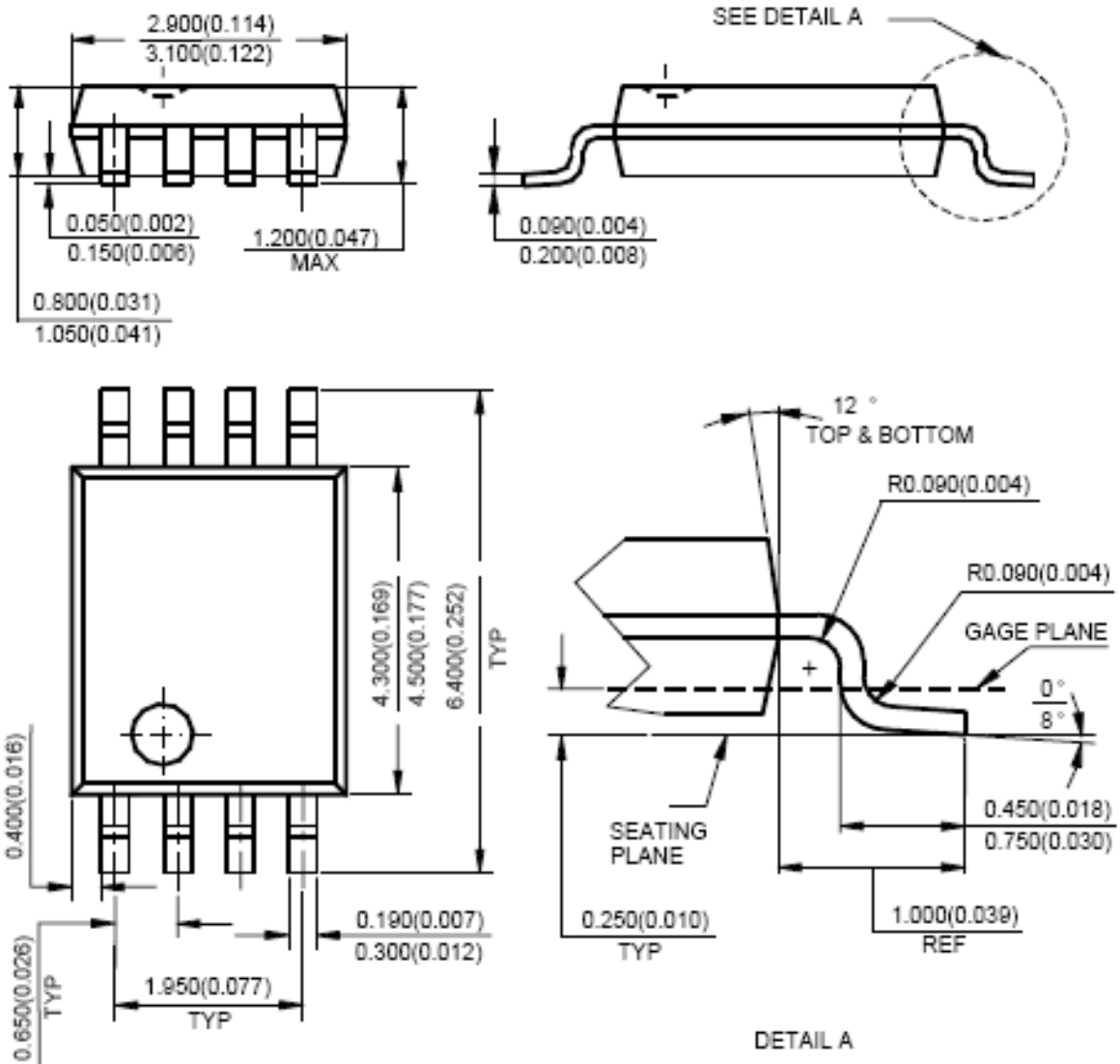
### Dimensions in mm (inches)



DIP-8







TSSOP-8

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