

# MB393

## LOW POWER LOW OFFSET VOLTAGE DUAL COMPARATORS



CBC Microelectronics  
<http://www.cbcv.net>

### General Description

The MB393 consists of two independent precision voltage comparators with an offset voltage specification as low as 2.0 mV max for two comparators which 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.

Application areas include limit comparators, simple analog to digital converters; pulse, square wave and time delay generators; wide range VCO; MOS clock timers; multi vibrators and high voltage digital logic gates. The MB393 was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, the LM393 will directly interface with MOS logic where their low power drain is a distinct advantage over standard comparators.

The MB393 is available in standard DIP-8 and SOP-8 packages.

### Features

- Wide Power Supply Voltage:  
Single Supply: 3V to 36V  
Dual Supplies:  $\pm 1.5V$  to  $\pm 18V$
- Very low supply current drain (0.5 mA) — independent of supply voltage
- Low input biasing current: 25 nA
- Low input offset current:  $\pm 5$  nA
- Maximum offset voltage: 5 mV
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage: 200 mV at 4 mA  
Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems

### Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply
- DC-DC Module, PC Motherboard



Figure 1: Package Types of MB393

### Pin Configuration (DIP8 / SOP8)

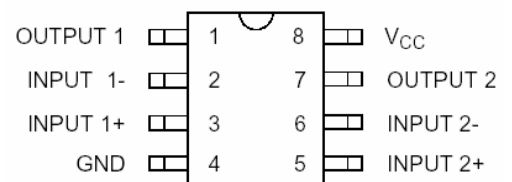
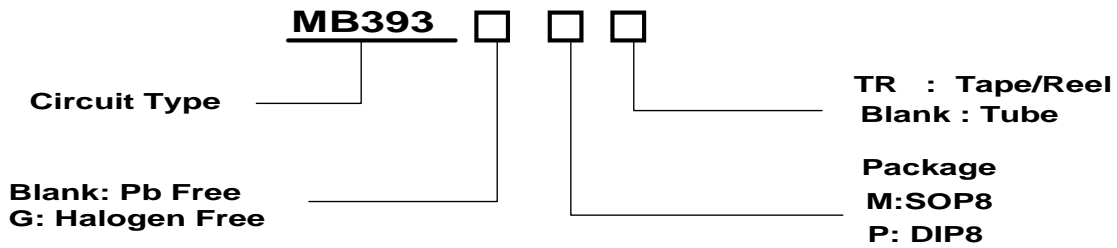


Figure 2: Pin Configuration of MB393 (Top View)

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## Ordering Information



Package	Part Number		Marking ID		Packing Type
	Pb-free	Halogen-Free	Pb-free	Halogen-Free	
SOP-8	MB393M	MB393GM	MB393M	MB393GM	Tube
	MB393MTR	MB393GMTR	MB393M	MB393GM	Tape & Reel
DIP-8	MB393P	MB393GP	MB393P	MB393GP	Tube

## Typical Application

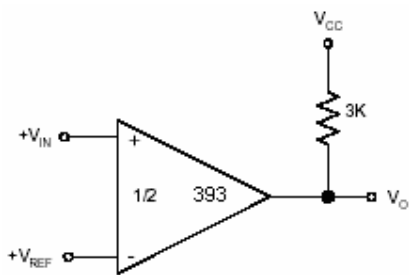


Figure 3: Basic Comparator

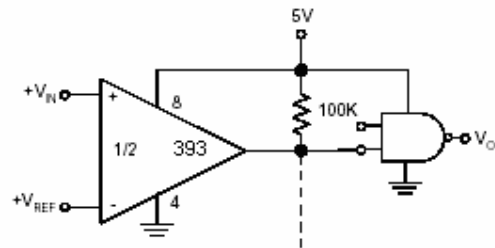


Figure 4: Driving CMOS

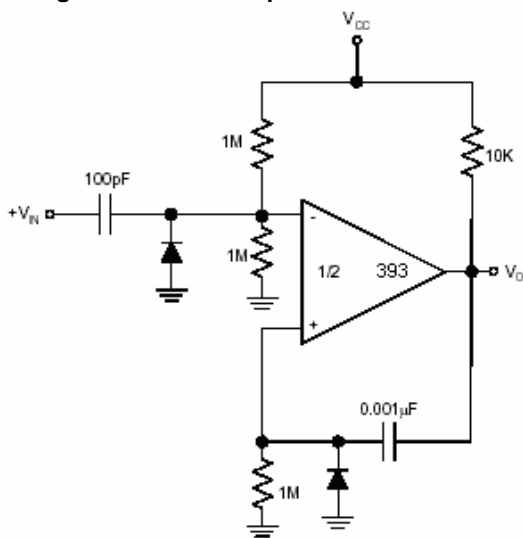


Figure 5: One Shot Multivibrator

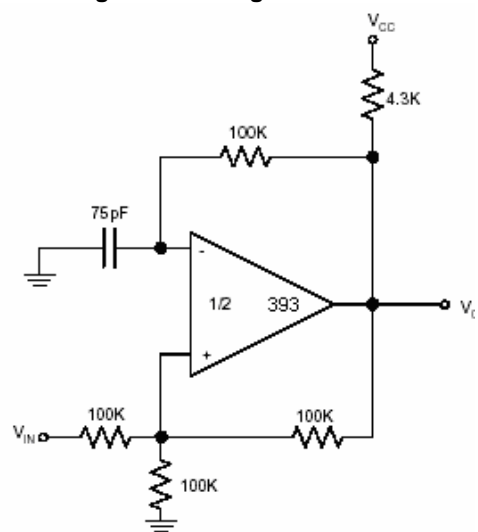


Figure 6: Squarewave Oscillator

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## Functional Block Diagram

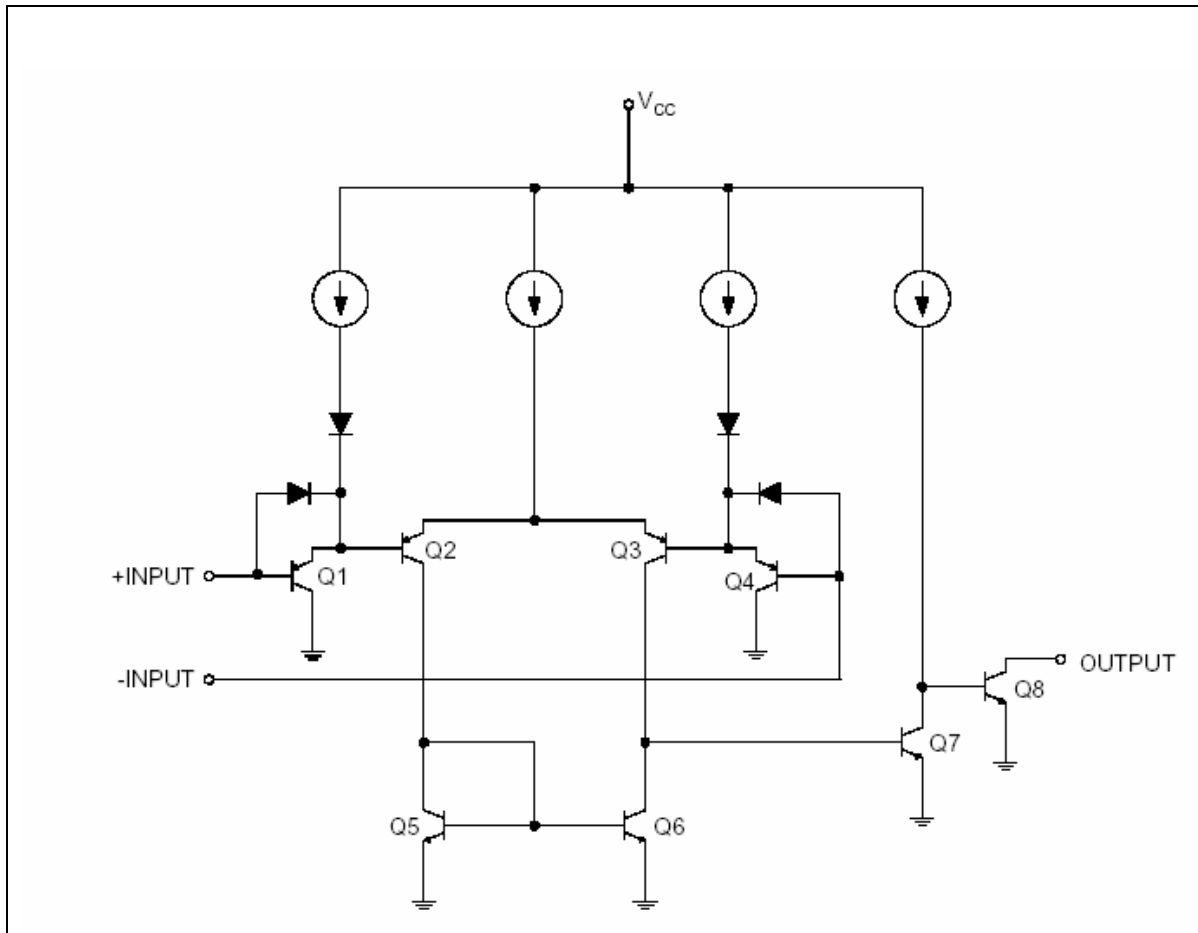


Figure 7: Functional Block Diagram of MB393 (Each Amplifier)

## Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Power Supply Voltage	V <sub>CC</sub>	40	V
Differential Input Voltage	V <sub>ID</sub>	40	V
Input Voltage	V <sub>IC</sub>	-0.3 to 40	V
Input Current (V <sub>IN</sub> < -0.3V)	I <sub>IN</sub>	50	mA
Power Dissipation	P <sub>D</sub>	DIP-8: 780	mW
		SOP-8: 550	mW
Storage Temperature Range	T <sub>stg</sub>	-55 to 150	
Lead Temperature (Soldering, 10 Seconds)		260	

Note1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

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## Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V <sub>CC</sub>	3	36	V
Ambient Operating Temperature	T <sub>A</sub>	-20	+85	

## Electrical Characteristics

V<sub>CC</sub> = 5V, GND = 0V, T<sub>A</sub> = 25 unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	V <sub>IO</sub>	V <sub>O</sub> =1.4V, R <sub>S</sub> =0 V <sub>CC</sub> =5V to 30V		2	5	mV
Input Bias Current	I <sub>BIAS</sub>	I <sub>IN+</sub> or I <sub>IN-</sub> , V <sub>CM</sub> =0V		25	250	nA
Input Offset Current	I <sub>IO</sub>	I <sub>IN+</sub> - I <sub>IN-</sub> , V <sub>CM</sub> =0V		5	50	nA
Input Common Mode Voltage Range	V <sub>IR</sub>	V <sub>CC</sub> =30V	0		V <sub>CC</sub> -1.5	V
Supply Current	I <sub>CC</sub>	V <sub>CC</sub> =30V		0.7	1.7	mA
		V <sub>CC</sub> =5V		0.5	1.0	mA
Large Signal Voltage Gain	G <sub>V</sub>	V <sub>CC</sub> =15V, V <sub>O</sub> =1V to 11V R <sub>L</sub> ≥15KΩ	50	200		V/mV
Large Signal Response Time	t	V <sub>IN</sub> = TTL Logic Swing, V <sub>REF</sub> = 1.4V, V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1k		200		ns
Response Time		V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1K		1.3		us
Output Sink Current	I <sub>SINK</sub>	V <sub>+</sub> =0V, V <sub>-</sub> =1V, V <sub>O</sub> =1.5V	6	16		mA
Saturation Voltage	V <sub>SAT</sub>	V <sub>+</sub> =0V, V <sub>-</sub> =1V, I <sub>SINK</sub> ≤ 4mA		200	400	mV
Output Leakage Current	I <sub>LEAK</sub>	V <sub>+</sub> =1V, V <sub>-</sub> =0V, V <sub>O</sub> =1.5V		0.1		nA

## Typical Performance Characteristics

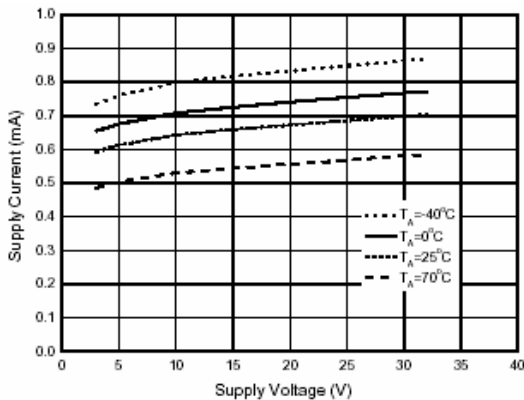


Figure 8: Supply Voltage vs. Supply Current

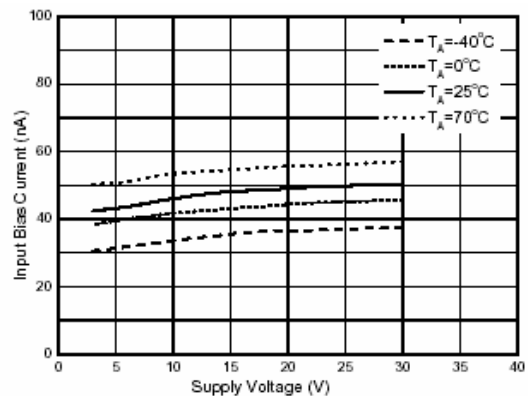


Figure 9: Supply Voltage vs. Input Bias Current

Typical Performance Characteristics (Continued)

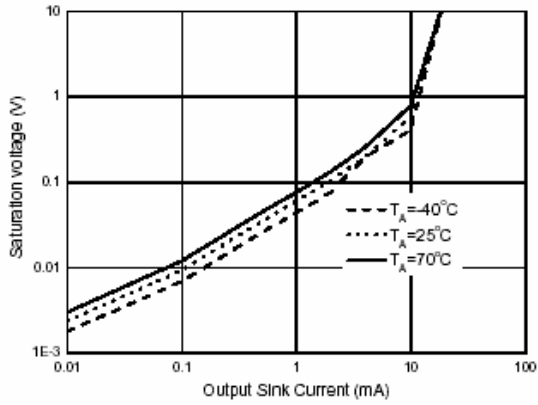


Figure 10: Output Sink Current vs. Saturation Voltage

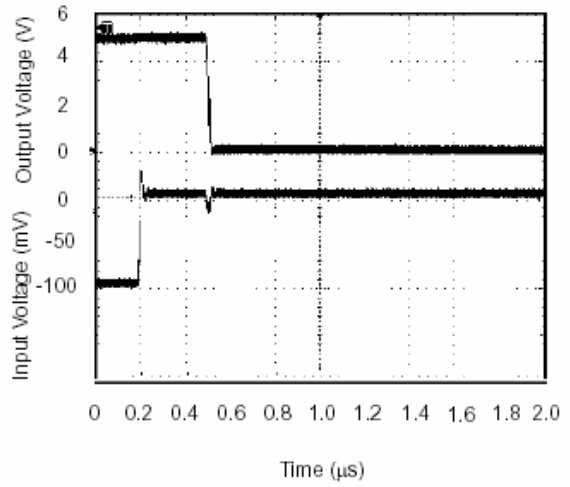


Figure 11: Response Time for 5mV Input Overdrive-Negative Transition

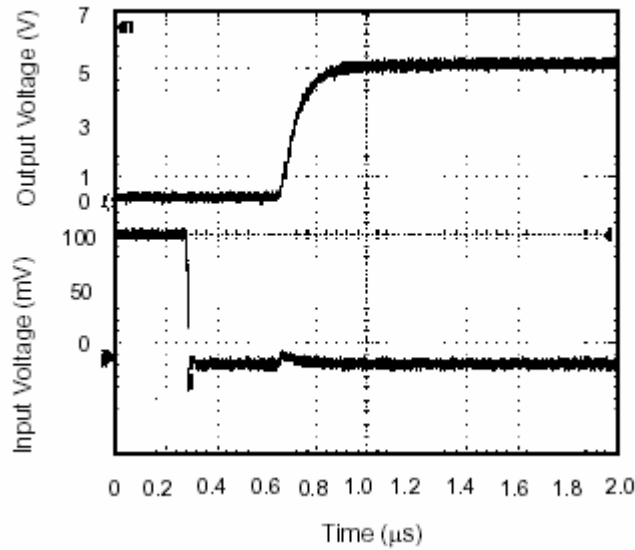


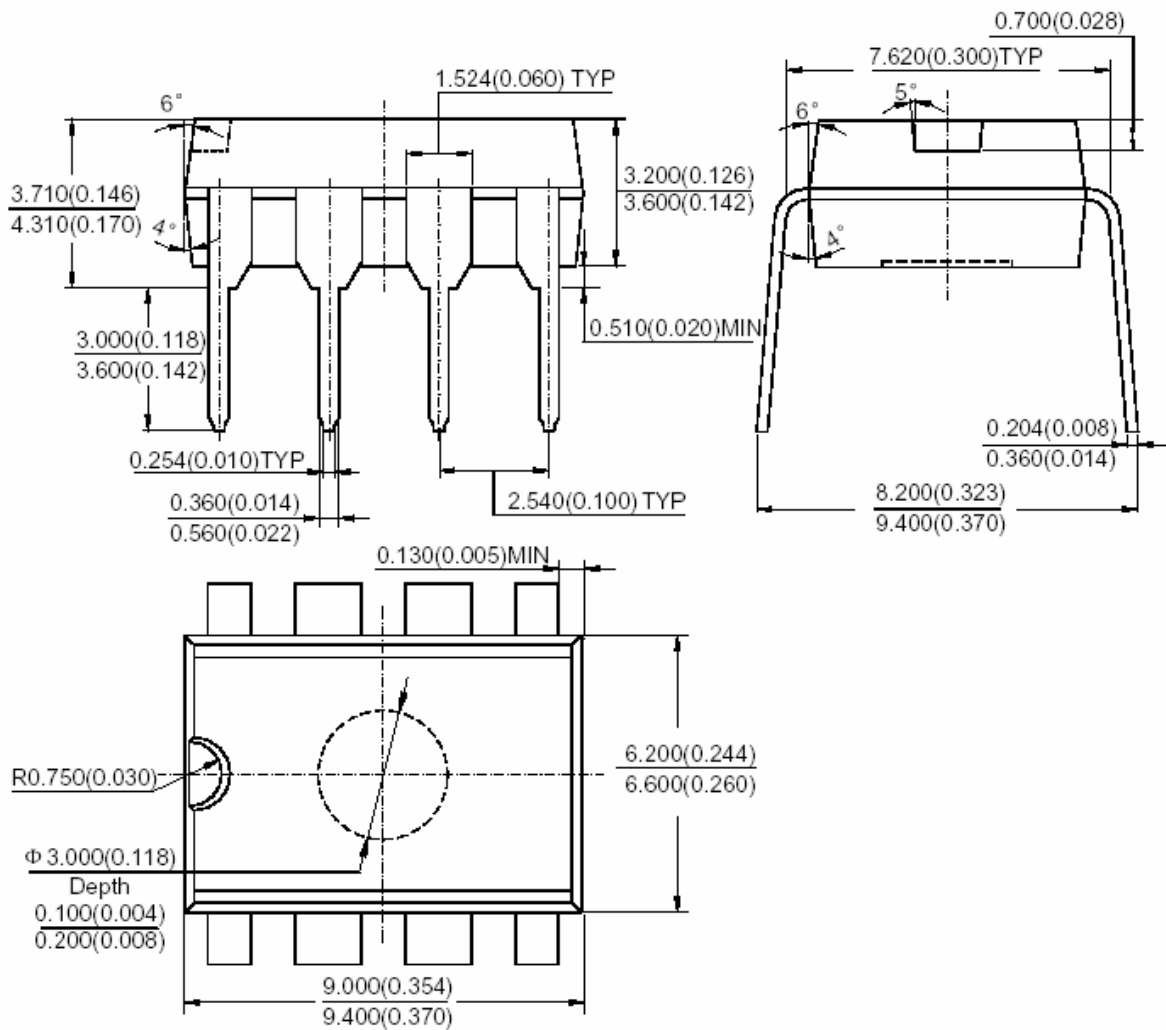
Figure 12: Response Time for 5mV Input Overdrive-Positive Transition

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## Mechanical Dimensions

DIP-8

Unit: mm(inch)

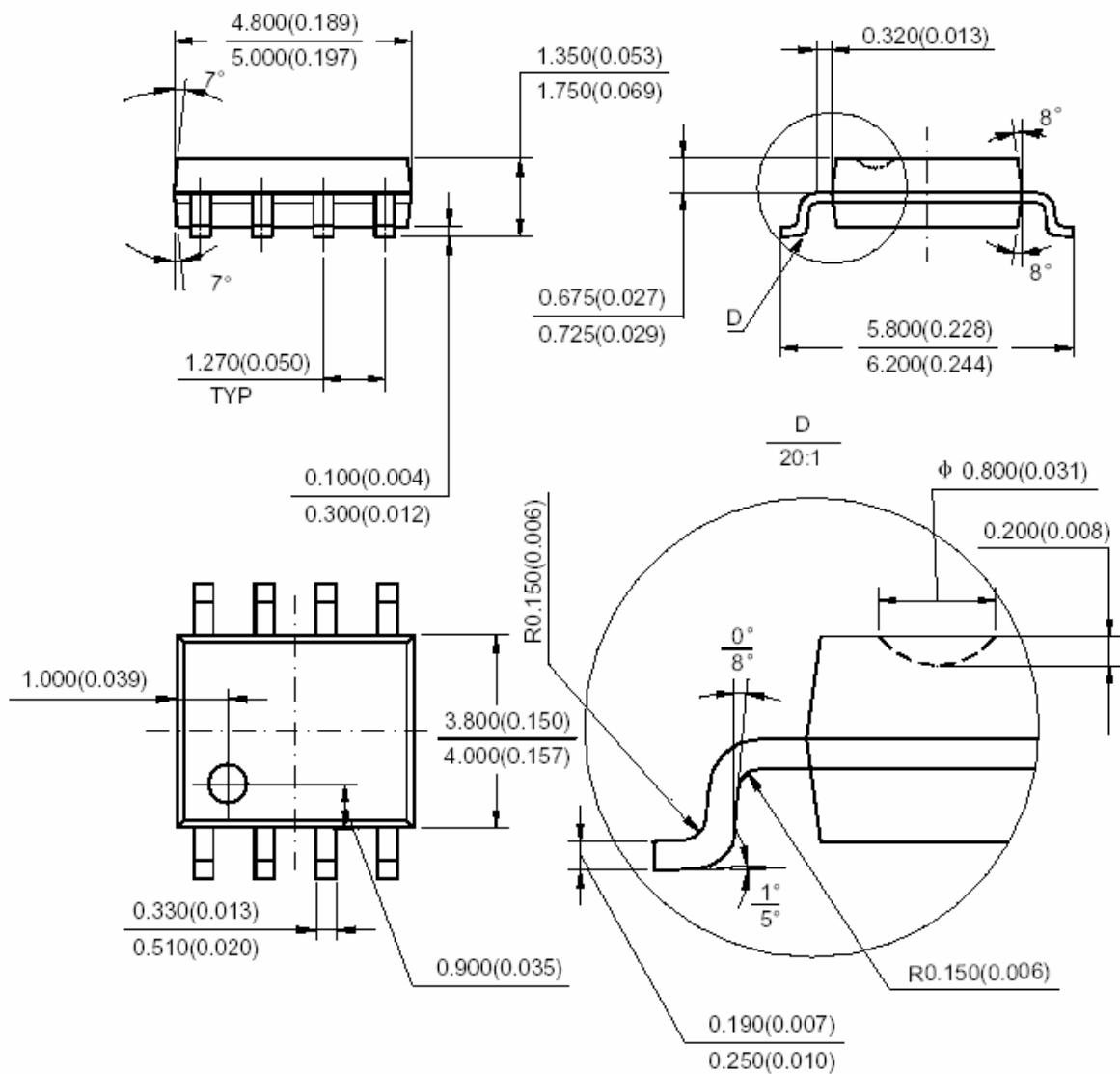


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## Mechanical Dimensions (Continued)

SOP-8

Unit: mm(inch)



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