

**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS****AS339/339A****General Description**

The AS339/339A consist of four independent precision voltage comparators with a typical offset voltage of 2.0mV and high gain. They are specifically designed to operate from a single power supply over wide range of voltages. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

The AS339/339A series are compatible with industry standard 339. AS339A has more stringent input offset voltage than AS339.

The AS339 is available in DIP-14, SOIC-14 and TSSOP-14 packages, AS339A is available in SOIC-14 package.

**Features**

- Wide Supply Voltage Range
  - Single Supply: 2.0V to 36V
  - Dual Supplies:  $\pm 1.0V$  to  $\pm 18V$
- Low Supply Current Drain: 0.9mA
- Low Input Bias Current: 25nA (Typical)
- Low Input Offset Current:  $\pm 5.0nA$  (Typical)
- Low Input Offset Voltage: 2.0mV (Typical)
- Input Common Mode Voltage Range Includes Ground
- Differential Input Voltage Range Equals to the Power Supply Voltage
- Low Output Saturation Voltage: 200mV at 4mA
- Open Collector Output

**Applications**

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



Figure 1. Package Types of AS339/339A



**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Pin Configuration**

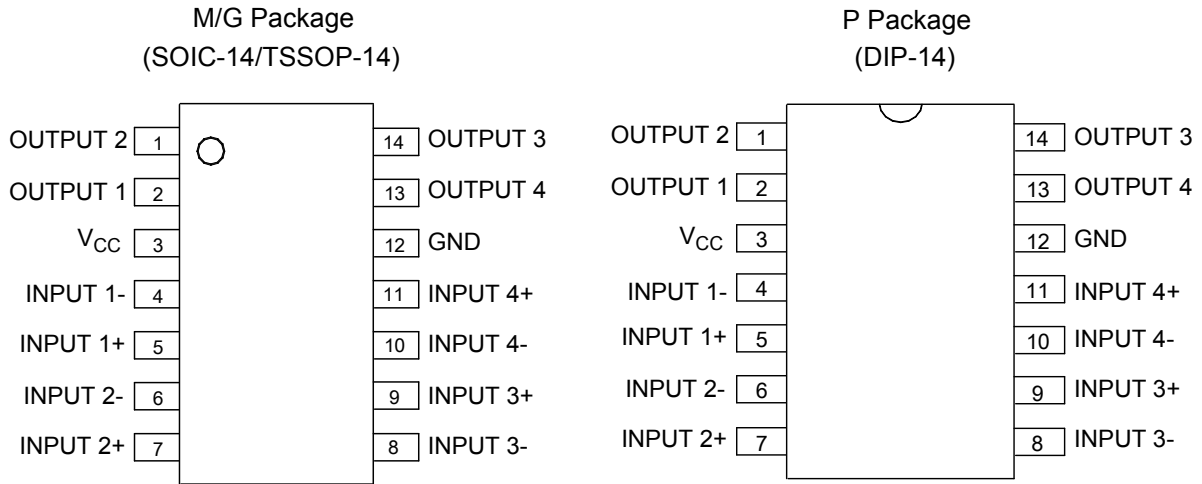


Figure 2. Pin Configuration of AS339/339A (Top View )

**Functional Block Diagram**

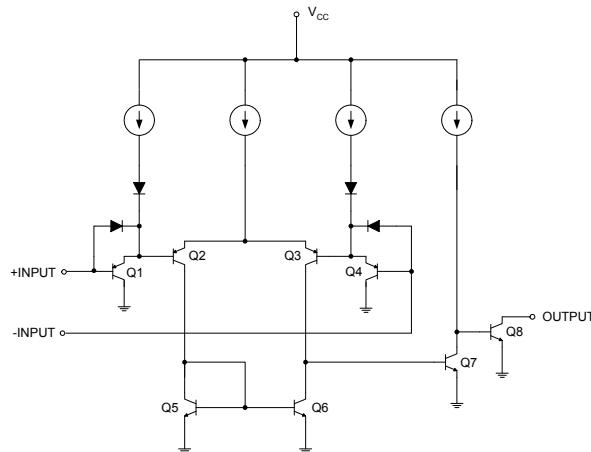
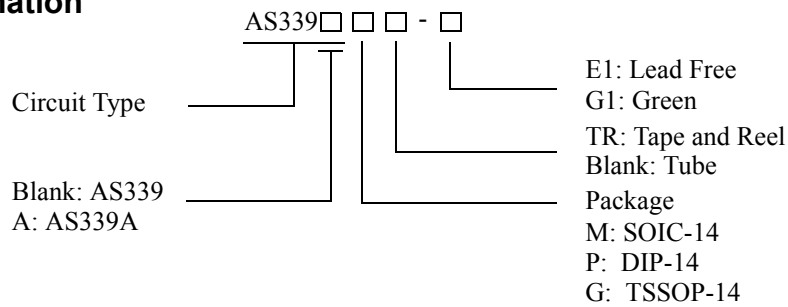


Figure 3. Functional Block Diagram of AS339/339A (Each comparator)

**Ordering Information**





**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Ordering Information (Continued)**

Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
SOIC-14	-40 to 85°C	AS339M-E1	AS339M-G1	AS339M-E1	AS339M-G1	Tube
		AS339MTR-E1	AS339MTR-G1	AS339M-E1	AS339M-G1	Tape & Reel
		AS339AM-E1	AS339AM-G1	AS339AM-E1	AS339AM-G1	Tube
		AS339AMTR-E1	AS339AMTR-G1	AS339AM-E1	AS339AM-G1	Tape & Reel
DIP-14		AS339P-E1	AS339P-G1	AS339P-E1	AS339P-G1	Tube
TSSOP-14		AS339GTR-E1	AS339GTR-G1	EGS339	GG339	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

**Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Supply Voltage	V <sub>CC</sub>	40	V
Differential Input Voltage	V <sub>ID</sub>	40	V
Input Voltage	V <sub>IN</sub>	-0.3 to 40	V
Input Current (V <sub>IN</sub> <-0.3V) (Note 2)	I <sub>IN</sub>	50	mA
Output Short-Circuit to Ground		Continuous	
Power Dissipation (T <sub>A</sub> =25°C)	P <sub>D</sub>	DIP-14	1050
		SOIC-14	890
		TSSOP-14	790
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-65 to 150	°C
Lead Temperature (Soldering, 10 Seconds)	T <sub>LEAD</sub>	260	°C

Note 1: 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.

Note 2: This input current will only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistors becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also lateral NPN parasitic transistor action on the IC chip. This transistor action can cause the output voltages of the comparators to go to the V+ voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative. This is not destructive and normal output states will re-establish when the input voltage, which was negative, again returns to a value greater than -0.3 V<sub>DC</sub> (at 25°C).



**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	$V_{CC}$	2	36	V
Operating Temperature Range	$T_A$	-40	85	$^{\circ}C$

**Electrical Characteristics**

Limits in standard typeface are for  $T_A=25^{\circ}C$ , **bold** typeface applies over  $T_A=-40^{\circ}C$  to  $85^{\circ}C$  (Note 3),  $V_{CC}=5V$ ,  $GND=0V$ , unless otherwise specified.

Parameter	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$V_O=1.4V$ , $R_S=0\Omega$ , $V_{CC}$ from 5V to 30V	AS339	2	5	mV
			<b>7</b>		
		AS339A	2	3	
			<b>5</b>		
Input Bias Current	$I_{IN+}$ or $I_{IN-}$ with output in Linear Range, $V_{CM}=0V$		25	250	nA
				<b>400</b>	
Input Offset Current	$I_{IN+} - I_{IN-}$ , $V_{CM}=0V$		5.0	50	nA
				<b>200</b>	
Input Common Mode Voltage Range (Note 4)	$V_{CC}=30V$	0		$V_{CC}-1.5$	V
Supply Current	$R_L=\infty$	$V_{CC}=5V$	0.9	2.0	mA
			<b>3.0</b>		
		$V_{CC}=30V$	1.2	2.5	
			<b>3.5</b>		
Voltage Gain	$R_L \geq 15k\Omega$ , $V_{CC}=15V$ , $V_O=1V$ to 11V	50	200		V/mV
Large Signal Response Time	$V_{IN}=\text{TTL Logic Swing}$ , $V_{REF}=1.4V$ , $V_{RL}=5V$ , $R_L=5.1k\Omega$		200		ns
Response Time	$V_{RL}=5V$ , $R_L=5.1k\Omega$		1.3		$\mu s$
Output Sink Current	$V_{IN-}=1V$ , $V_{IN+}=0$ , $V_O=1.5V$	6.0	16		mA
Output Leakage Current	$V_{IN-}=0V$ , $V_{IN+}=1V$ , $V_O=5V$		0.1		nA
	$V_{IN-}=0V$ , $V_{IN+}=1V$ , $V_O=30V$			<b>1</b>	$\mu A$
Saturation Voltage	$V_{IN-}=1V$ , $V_{IN+}=0$ , $I_{SINK} \leq 4mA$		200	400	mV
				<b>500</b>	
Thermal Resistance (Junction to Case)	SOIC-14		51.93		$^{\circ}C/W$
	DIP-14		35.00		

Note 3: Limits over the full temperature are guaranteed by design, but not tested in production.

Note 4: The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at  $25^{\circ}C$ ). The upper end of the common-mode voltage range is  $V_{CC}-1.5V$  (at  $25^{\circ}C$ ), but either or both inputs can go to +36V without damages, independent of the magnitude of the  $V_{CC}$ .



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**Typical Performance Characteristics**

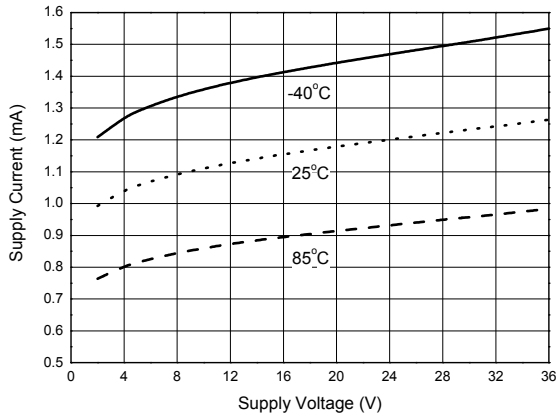


Figure 4. Supply Voltage vs. Supply Current

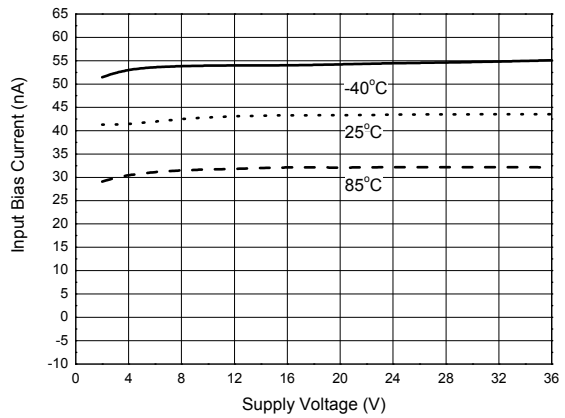


Figure 5. Supply Voltage vs. Input Bias Current

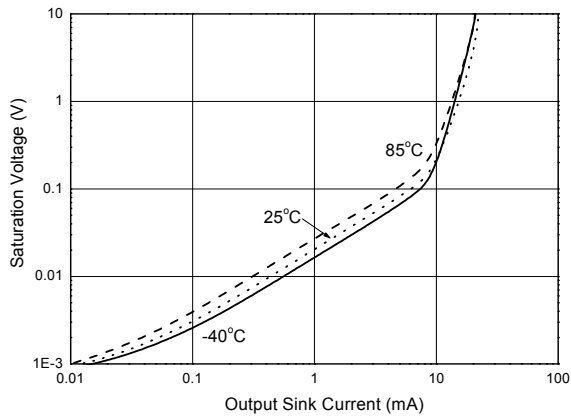


Figure 6. Output Sink Current vs. Saturation Voltage

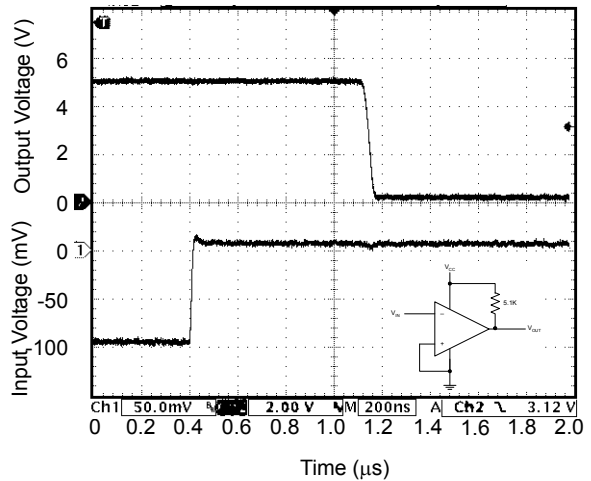


Figure 7. Response Time for 5mV Input Overdrive - Negative Transition



**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Typical Performance Characteristics (Continued)**

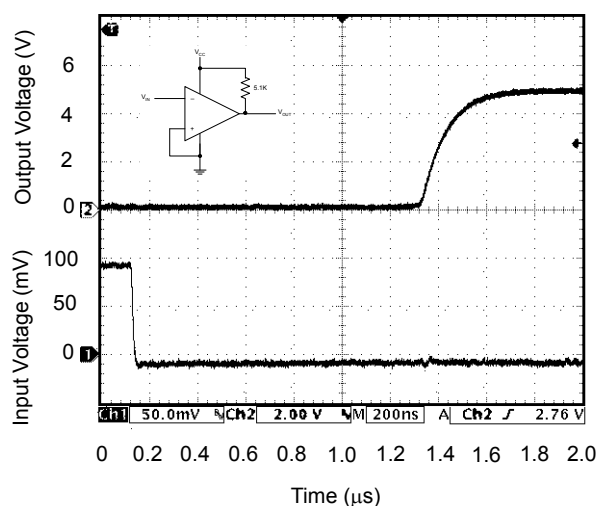


Figure 8. Response Time for 5mV Input Overdrive - Positive Transition

**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Typical Applications**

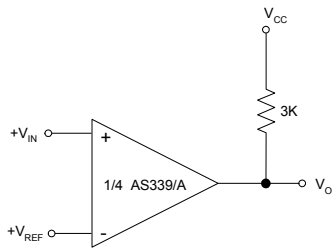


Figure 9. Basic Comparator

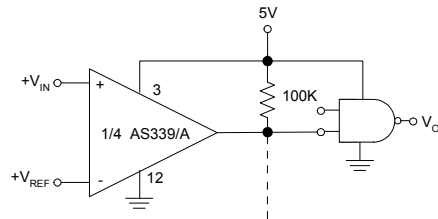


Figure 10. Driving CMOS

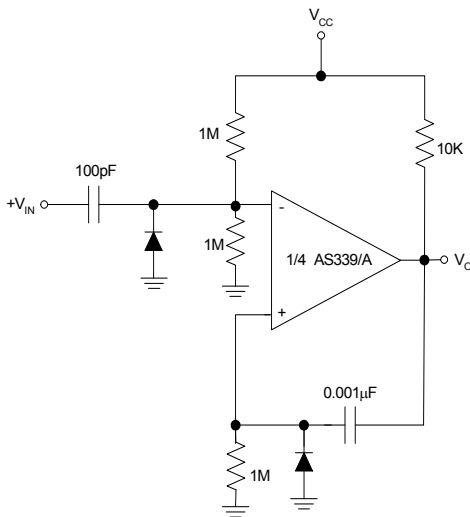


Figure 11. One Shot Multivibrator

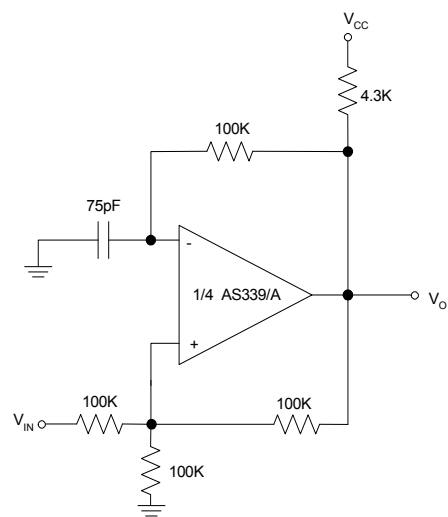


Figure 12. Squarewave Oscillator

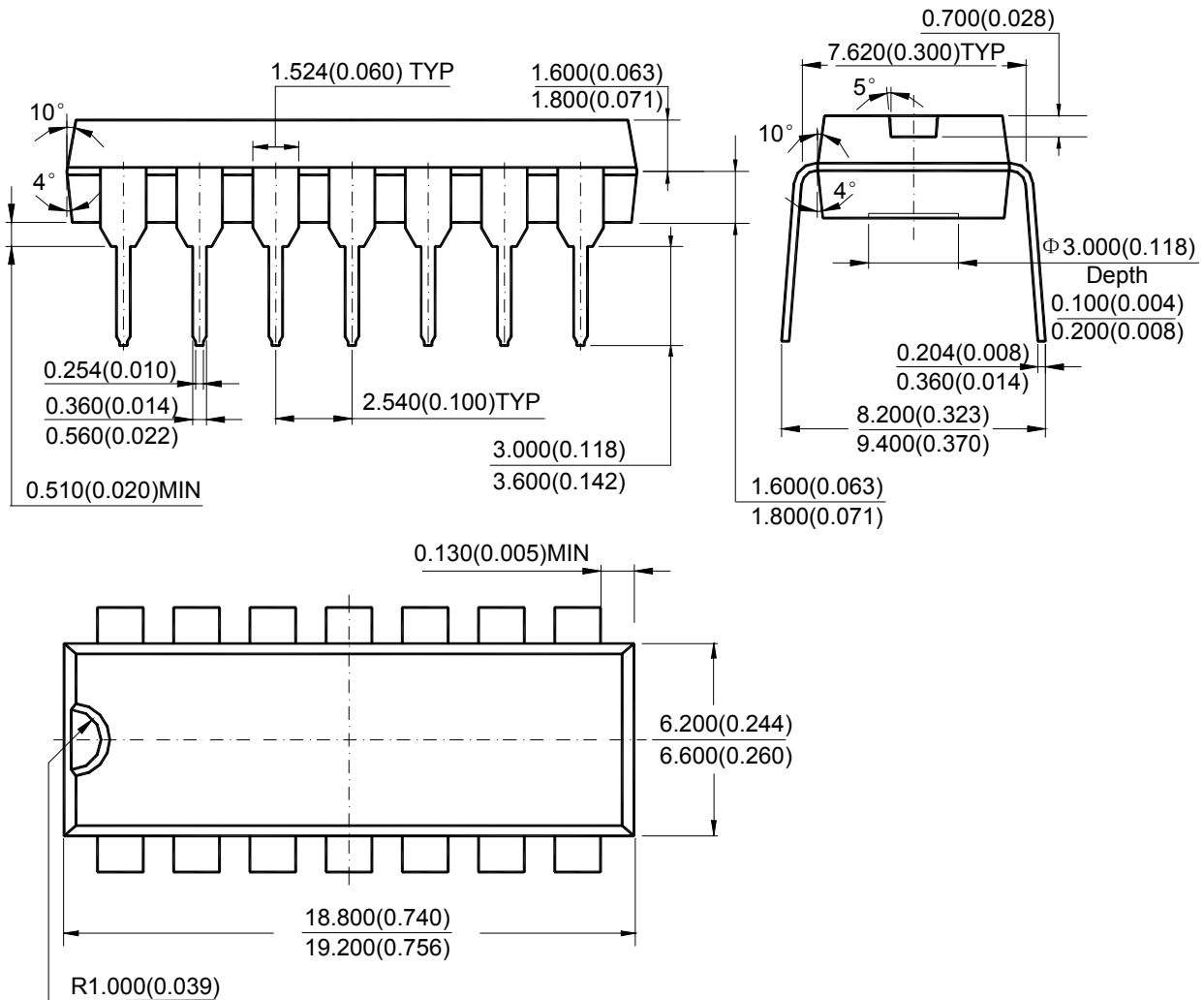


**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Mechanical Dimensions**

**DIP-14**

**Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.



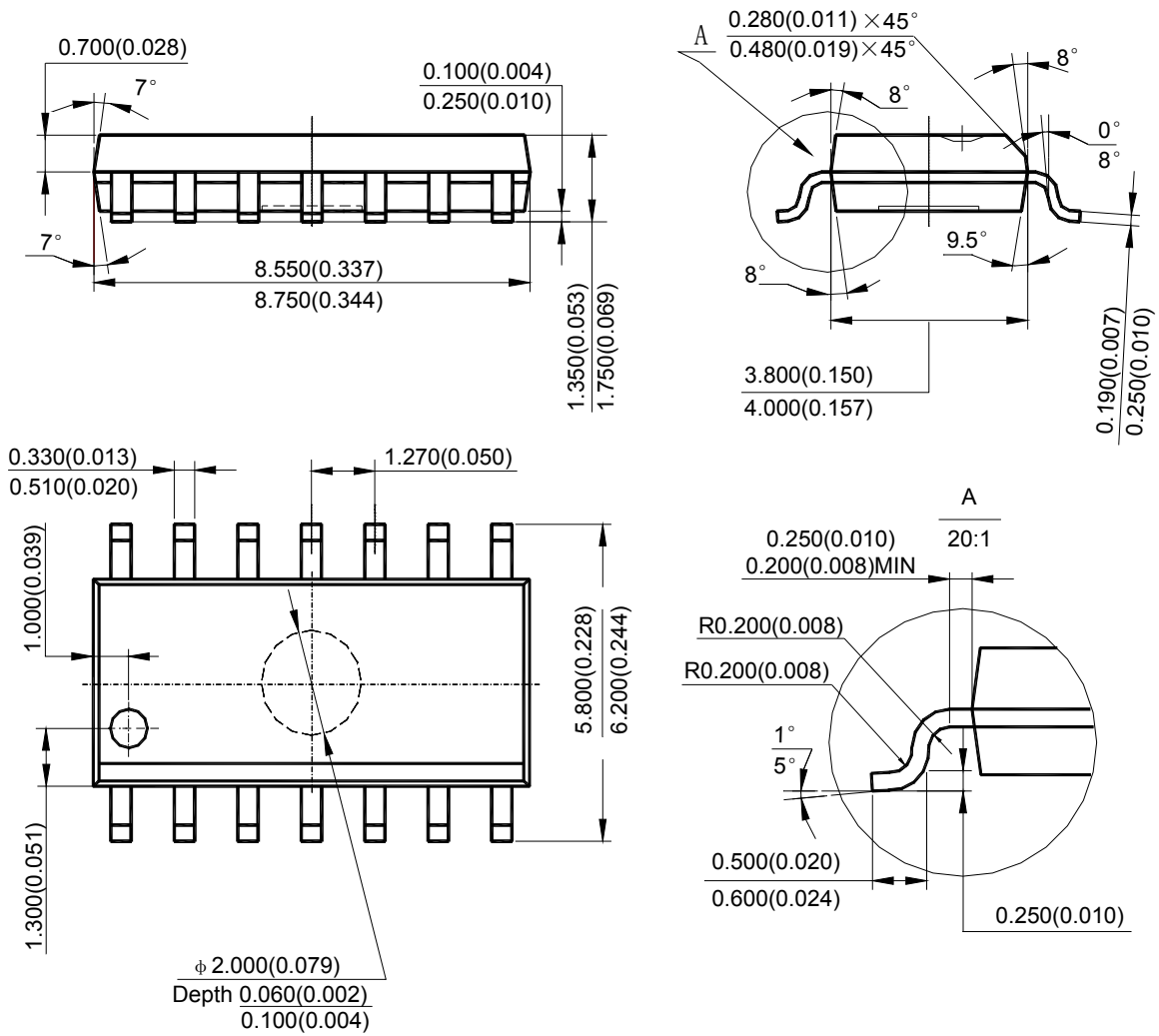


**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Mechanical Dimensions (Continued)**

**SOIC-14**

**Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.

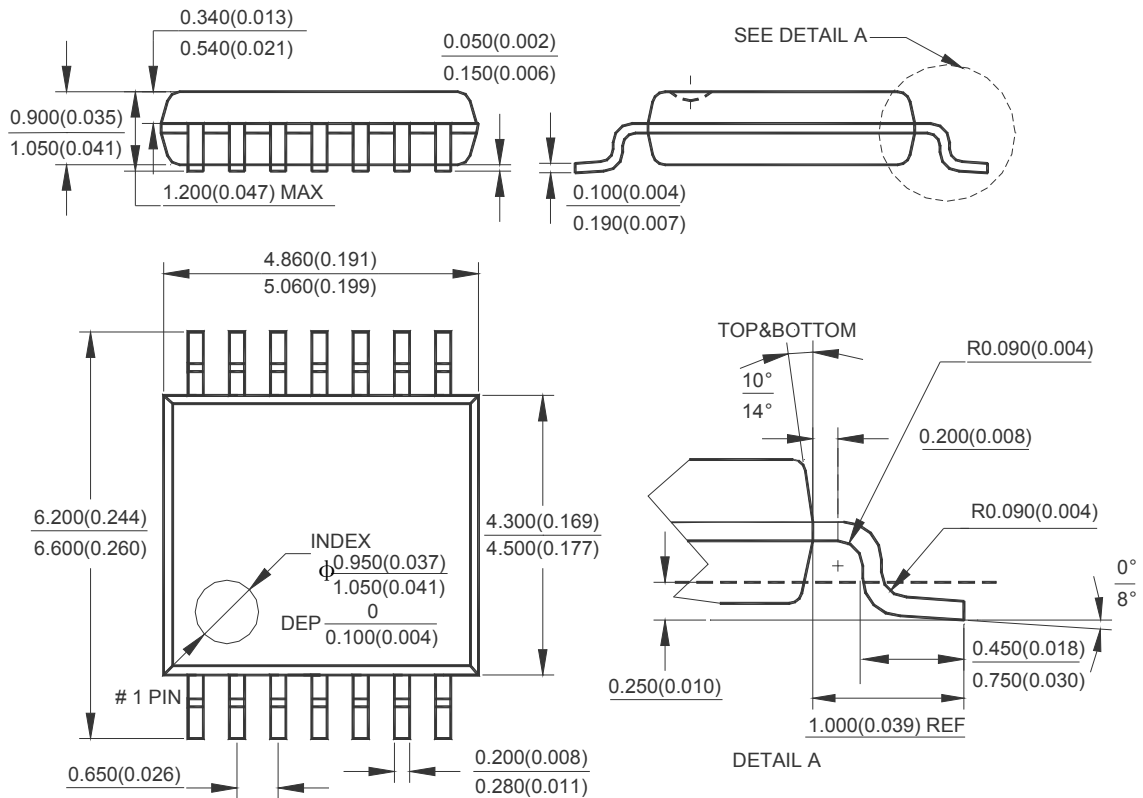


**LOW POWER LOW OFFSET VOLTAGE QUAD COMPARATORS AS339/339A**

**Mechanical Dimensions (Continued)**

**TSSOP-14**

**Unit: mm(inch)**



Note: Eject hole, oriented hole and mold mark is optional.



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