LOW POWER LOW OFFSET VOLTAGE SINGLE COMPARATOR AS331

General Description

The AS331 consists of a single precision voltage comparator with a typical input offset voltage of 1.0mV and high voltage gain. It is 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 AS331 is available in standard SOT-23-5 package.

Features

- Wide Supply Voltage Range
  - Single Supply: 2V to 36V
  - Dual Supplies: ±1V to ±18V
- Low Supply Current at V_{CC}=5V: 0.4mA
- Low Input Bias Current: 25nA (Typical)
- Low Input Offset Current:5nA (Typical)
- Low Input Offset Voltage: 1mV (Typical)
- Input Common Mode Voltage Range Includes Ground
- Differential Input Voltage Range Equals to the Power Supply Voltage
- Low Output Saturation Voltage at 4mA: 200mV (Typical)
- Open Collector Output

Applications

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



SOT-23-5

Figure 1. Package Type of AS331

Pin Configuration

K Package
(SOT-23-5)

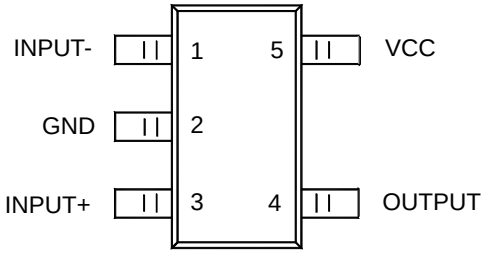


Figure 2. Pin Configuration of AS331 (Top View)

Functional Block Diagram

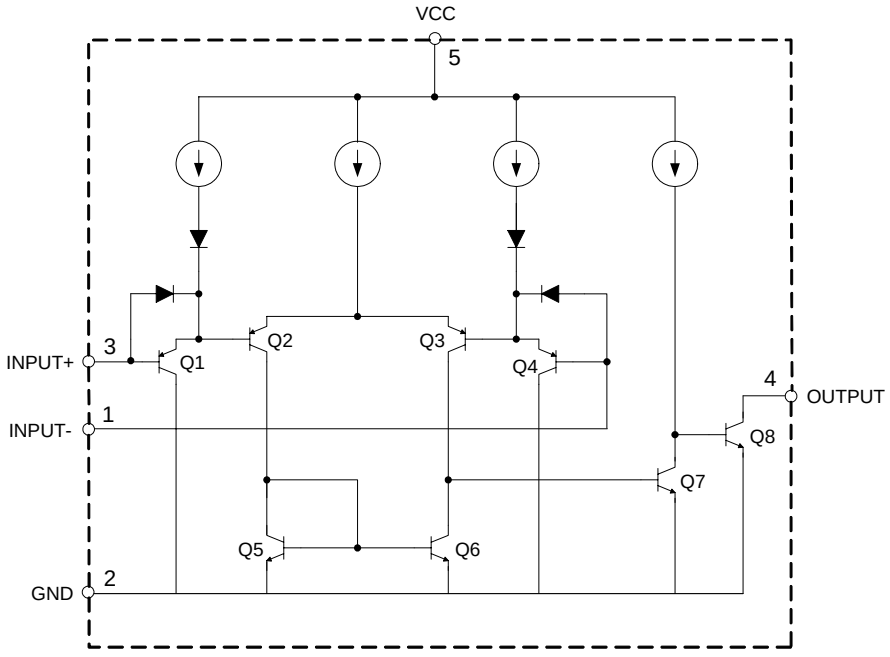
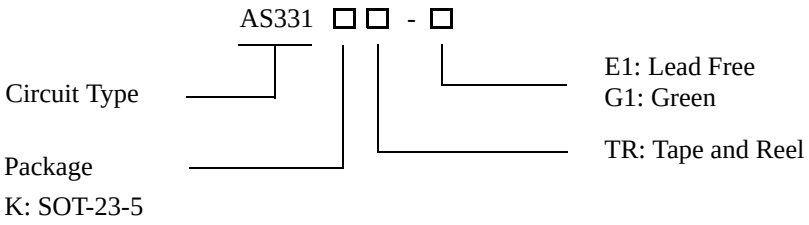


Figure 3. Functional Block Diagram of AS331

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
SOT-23-5	-40 to 85°C	AS331KTR-E1	AS331KTR-G1	EEA	GEA	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 package.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	40	V
Differential Input Voltage	V_{ID}	40	V
Input Voltage	V_{IN}	-0.3 to 40	V
Input Current (V_{IN}<-0.3V) (Note 2)	I_{IN}	50	mA
Output Short-circuit Current to Ground		Continuous	
Power Dissipation (T_A=25°C)	P_D	620	mW
Operating Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	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 -0.3V (at 25°C).

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	2	36	V
Operating Ambient Temperature Range	T_A	-40	85	°C

Electrical Characteristics

V_{CC}=5V, GND=0V, T_A=25°C, unless otherwise specified. **Bold** typeface applies over T_A=-40 to 85°C (Note 3)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Input Offset Voltage	V_{OS}	V_{OUT}=1.4V, V_{CC}=5 to 30V			1	5	mV
						7.0	
Input Bias Current	I_B	I_{IN}+ or I_{IN}- with output in linear range, V_{CM}=0V			25	250	nA
						400	
Input Offset Current	I_{IO}	I_{IN}+-I_{IN}-, V_{CM}=0V			5	50	nA
						200	
Input Common Mode Voltage Range (Note 4)		V_{CC}=30V		0		V_{CC}-1.5	V
Supply Current	I_{CC}	$R_{L=\infty}$	V_{CC}=5V		0.4	1.0	mA
						2.0	
			V_{CC}=30V		0.5	1.7	
						3.0	
Voltage Gain	G_V	V_{CC}=15V, R_L≥15kΩ, V_{OUT}=1 to 11V		50	200		V/mV
Large Signal Response Time		V_{IN} =TTL Logic Swing, R_L=5.1kΩ			200		ns
Response Time		R_L=5.1kΩ			1.3		μs
Output Sink Current	I_{SINK}	V_{IN}-=1V, V_{IN}+=0V, V_{OUT}=1.5V		6.0	16		mA
Output Leakage Current	I_{LEAK}	V_{IN}-=0V, V_{IN}+=1V, V_{OUT}=5V			0.1		nA
		V_{IN}-=0V, V_{IN}+=1V, V_{OUT}=30V				**1**	μA
Saturation Voltage	V_{SAT}	V_{IN}-=1V, V_{IN}+=0V, I_{SINK}≤4mA			200	400	mV
						500	

Note 3: These specifications are limited to -40°C≤T_A≤85°C. Limits over 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°C). The upper end of the common mode voltage range is V_{CC}-1.5V (at 25°C), but either or both inputs can go to 18V without damages, independent of the magnitude of the V_{CC}.

Typical Performance Characteristics

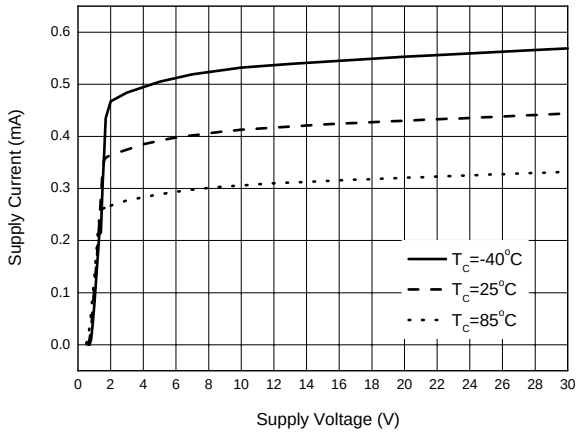


Figure 4. Supply Current vs. Supply Voltage

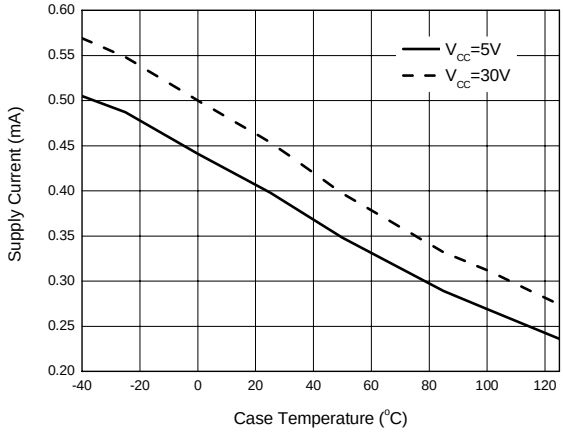


Figure 5. Supply Current vs. Case Temperature

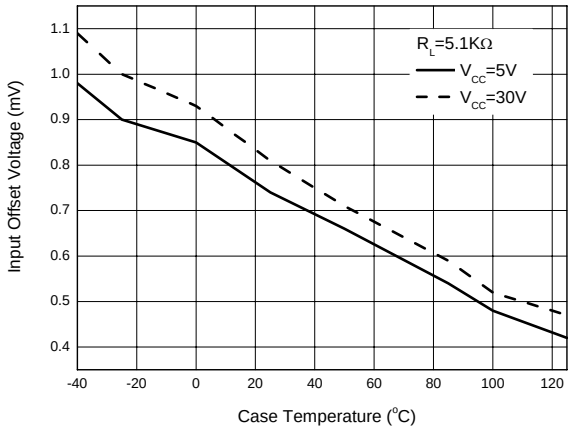


Figure 6. Input Offset Voltage vs. Case Temperature

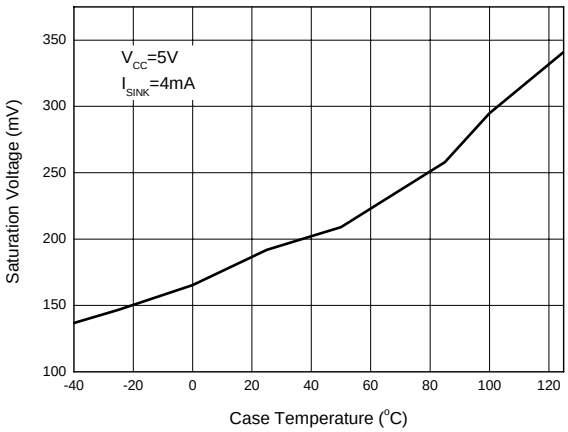


Figure 7. Saturation Voltage vs. Case Temperature

Typical Performance Characteristics (Continued)

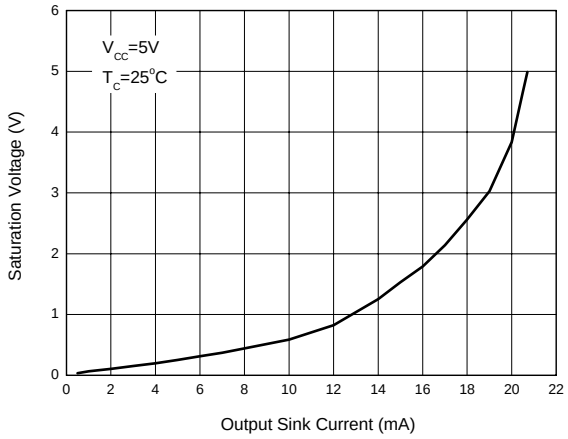


Figure 8. Saturation Voltage vs. Output Sink Current

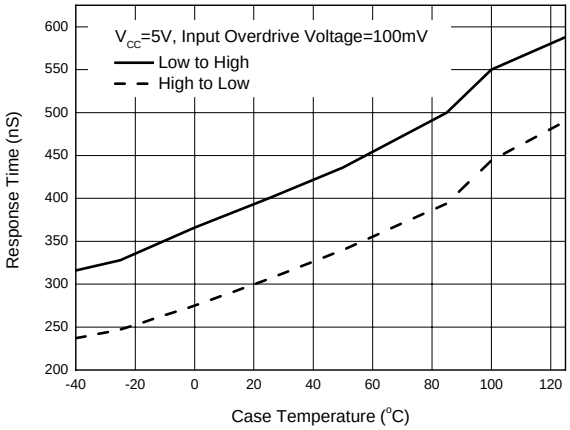


Figure 9. Response Time vs. Case Temperature

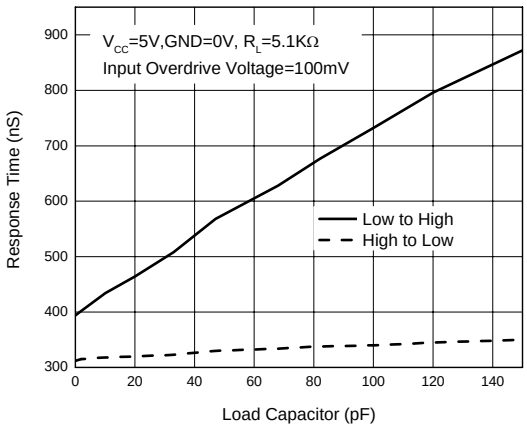


Figure 10. Response Time vs. Load Capacitor

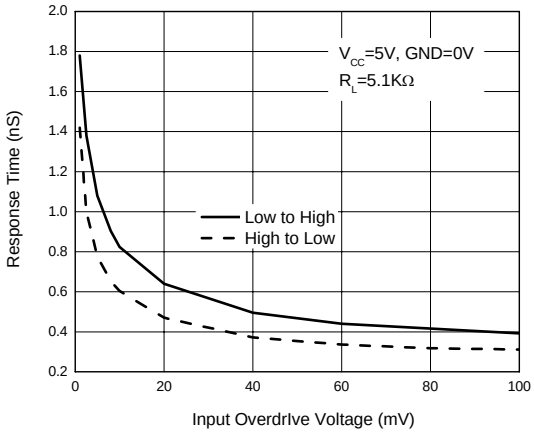


Figure 11. Response Time vs. Input Overdrive Voltage

Typical Performance Characteristics (Continued)

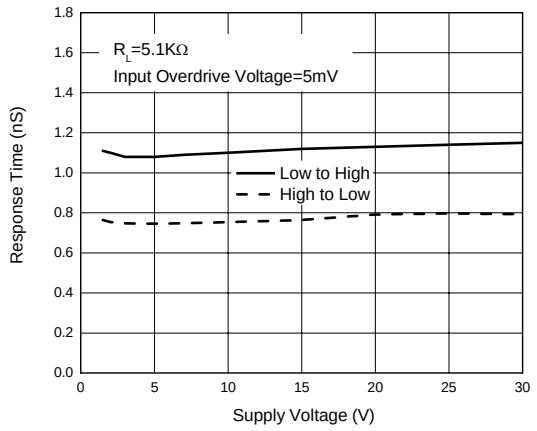


Figure 12. Response Time vs. Supply Voltage

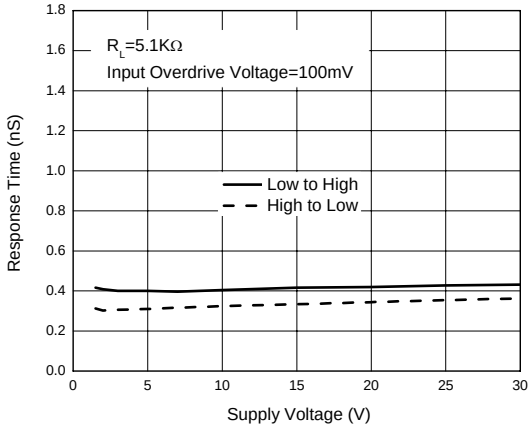


Figure 13. Response Time vs. Supply Voltage

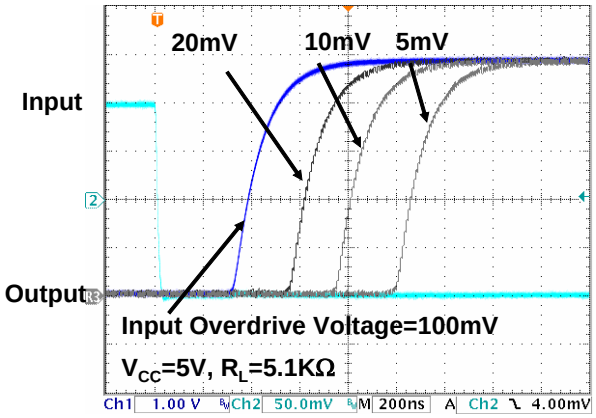


Figure 14. Response Time for Positive Transition

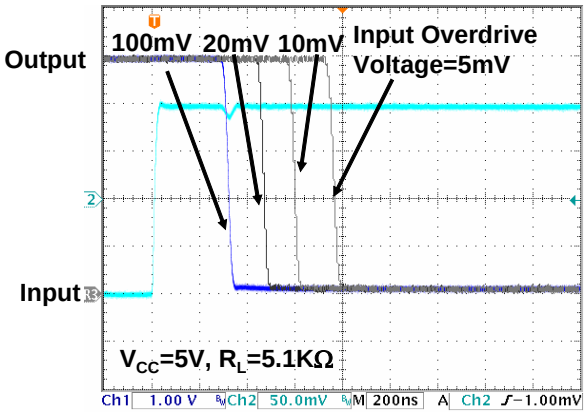


Figure 15. Response Time for Negative Transition

Typical Performance Characteristics (Continued)

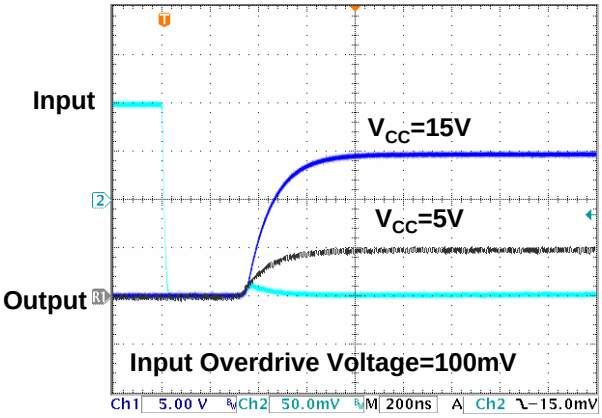


Figure 16. Response Time for Positive Transition

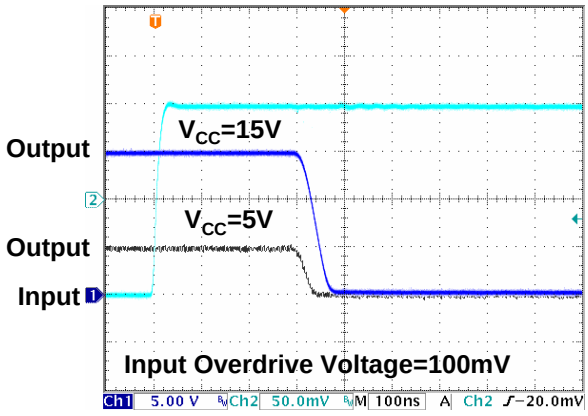


Figure 17. Response Time for Negative Transition

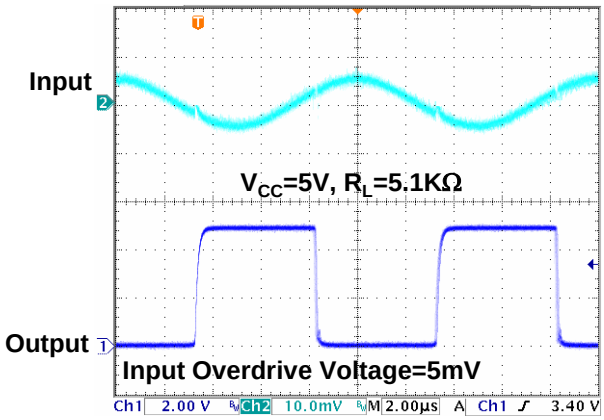


Figure 18. 100kHz Response

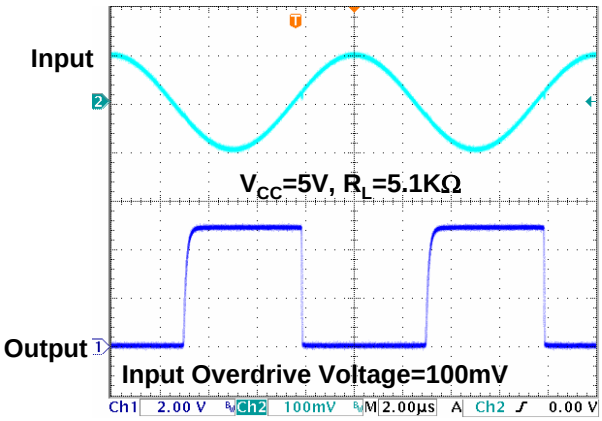


Figure 19. 100kHz Response

Typical Performance Characteristics (Continued)

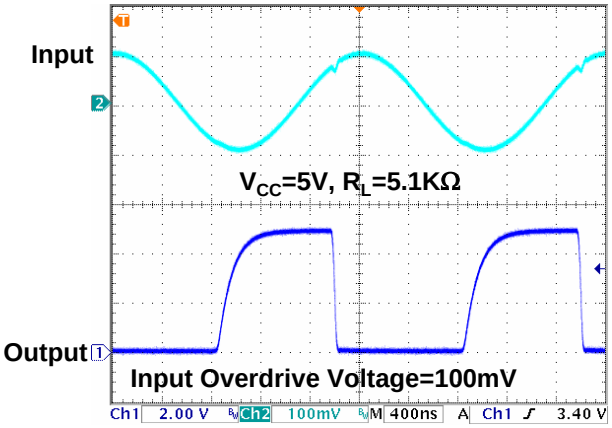


Figure 20. 500kHz Response

Typical Application

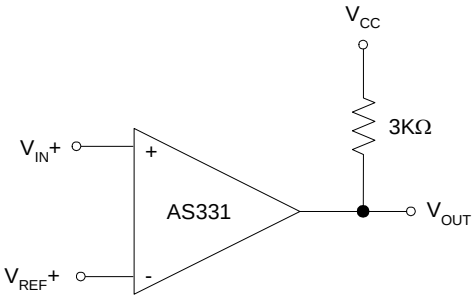


Figure 21. Basic Comparator

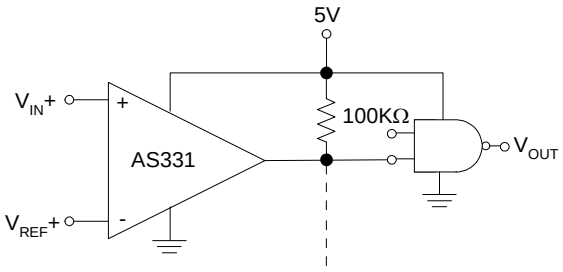


Figure 22. Driving CMOS

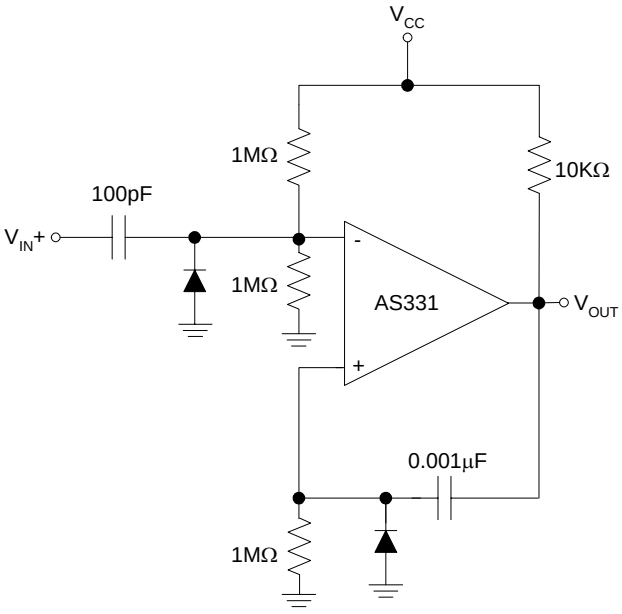


Figure 23. One Shot Multivibrator

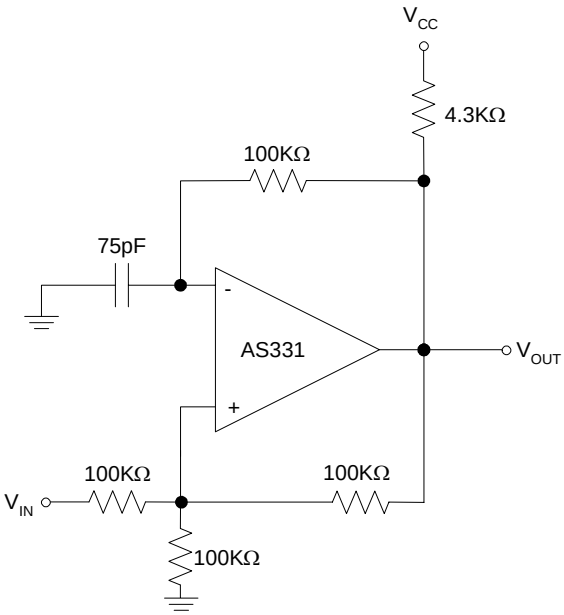
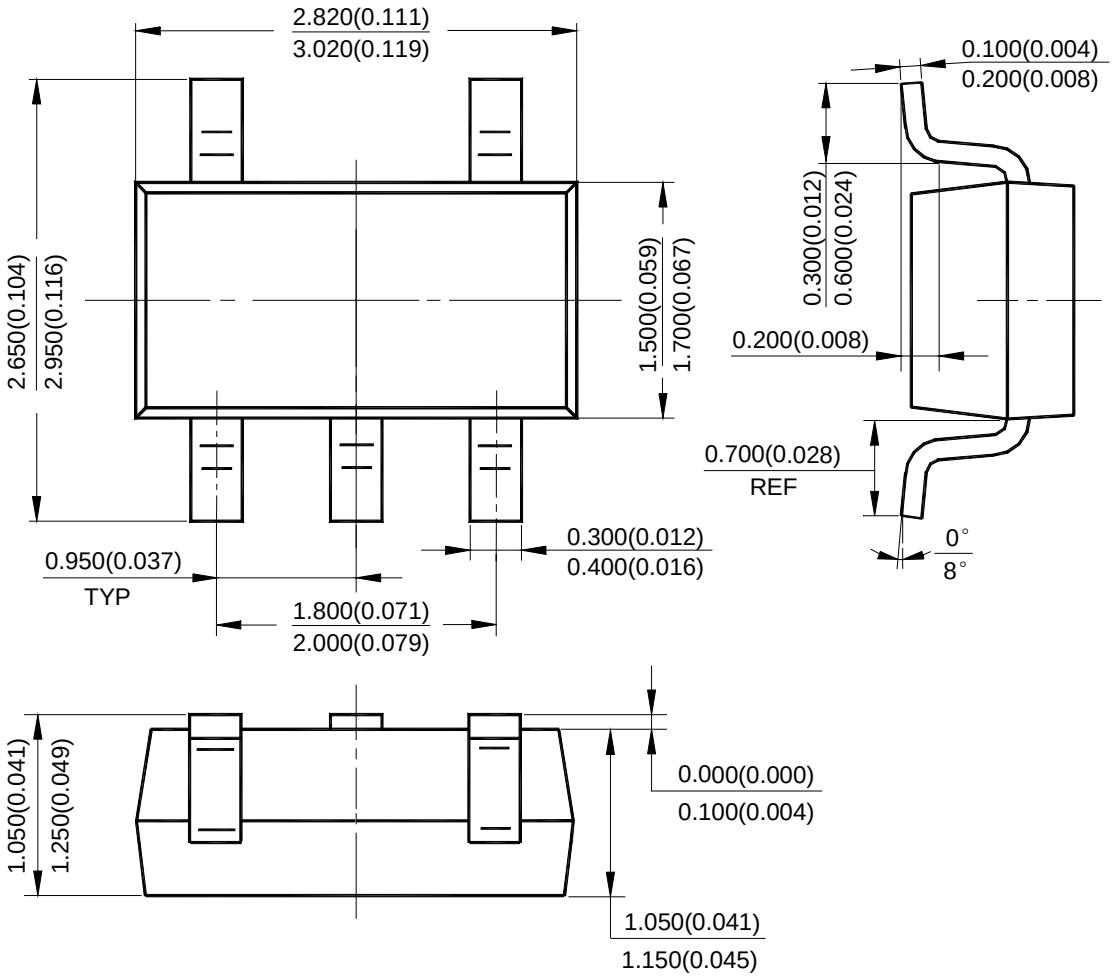


Figure 24. Squarewave Oscillator

Mechanical Dimensions

SOT-23-5 **Unit: mm(inch)**



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