DESCRIPTION

The AO331 is Rail-to-Rail input CMOS comparator featuring Low-power and Open-Drain output.

The AO331 consists of a single precision voltage comparator with a typical input offset voltage of 1.0mV and high voltage gain.

The AO331 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 AO331 is available in SOT-25 package.

FEATURES

- Wide Supply Voltage Range
- Single Supply: 2.0V to 36V
- Dual Supplies: ±1.0V 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: 200mV at 4mA
- Open Collector Output
- Available in SOT-25 package

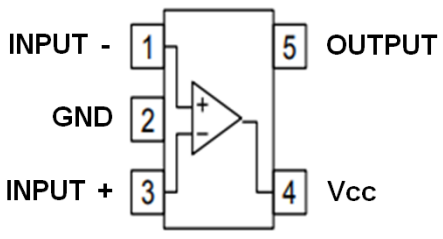
ORDERING INFORMATION

Package Type	Part Number	
SOT-25 SPQ: 3,000pcs/Reel	E5	AO331E5R
		AO331E5VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

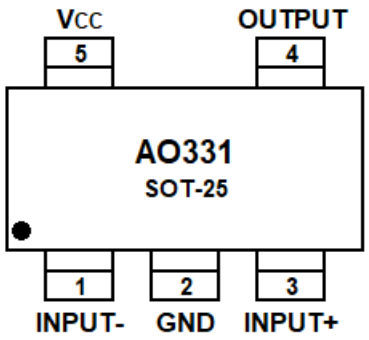
APPLICATION

- Portable and Battery Powered Applications
- Alarm and Surveillance Circuits
- Industrial Instruments
- Sensor Applications
- Personal Computing
- Communication Equipment

TYPICAL APPLICATION



PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	INPUT-	Analog Inverting Input
2	GND	Ground
3	INPUT+	Analog Positive Input
4	OUTPUT	Output
5	V_{CC}	Positive Power Supply Input

ABSOLUTE MAXIMUM RATINGS

V_{CC}, Power Supply Voltage	±20V or 40V
$V_{I(DIFF)}$, Differential Input Voltage	40V
V_I, Input Voltage	-0.3V ~ 40V
T_{opr}, Operating Temperature Range	-40°C ~ 85°C
T_{STG}, Storage Temperature Range	-65°C ~ 150°C

Stress beyond above listed "Absolute Maximum Ratings" may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

NOTE1: 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_{DC} at 25°C).

RECOMMENDED OPERATING CONDITIONS

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

ELECTRICAL CHARACTERISTICS

V_{CC}=5V, GND=0V, T_A=25℃, unless otherwise specified. Bold typeface applies over T_A=-40 to 85℃NOTE2

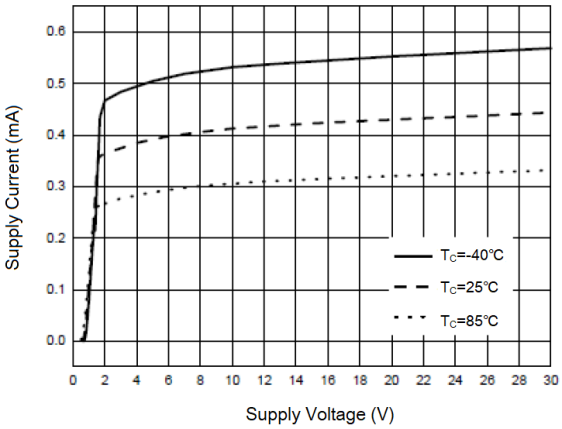
Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Input Offset Voltage	V_{OS}	V_{OUT}=1.4V, V_{CC}=5V to 30V		-	1.0	5.0	mV
				-	-	7.0	
Input Bias Current	I_B	I_{IN}+ or I_{IN}- with output in Linear Range, V_{CM}=0V		-	25	250	nA
				-	-	400	
Input Offset Current	I_{IO}	I_{IN}+ - I_{IN}-, V_{CM}=0V		-	5.0	50	nA
				-	-	200	
Input Common-Mode Voltage RangeNOTE3		V_{CC} = 30V		0	-	V_{CC}-1.5	V
Supply Current	I_{CC}	R_L=∞	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}=1V 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		-	-	1.0	μA
Saturation Voltage	V_{SAT}	V_{IN}-=1V, V_{IN}+=0, I_{SINK}≤4mA		-	200	400	mV
				-	-	500	

NOTE2: These specifications are limited to -40°C ≤ T_A ≤ 85°C. Limits over temperature are guaranteed by design, but not tested in production.

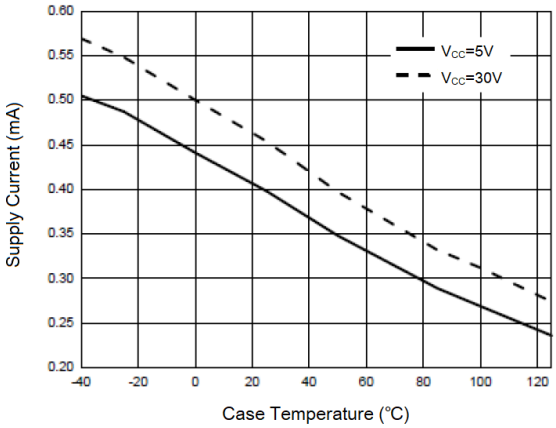
NOTE3: The input common mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at 25°C). The upper end of the common mode voltage range is V_{CC}-1.5V (at 25°C), but either or both inputs can go to 18V without damages, independent of the magnitude of the V_{CC}.

TYPICAL PERFORMANCE CHARACTERISTICS

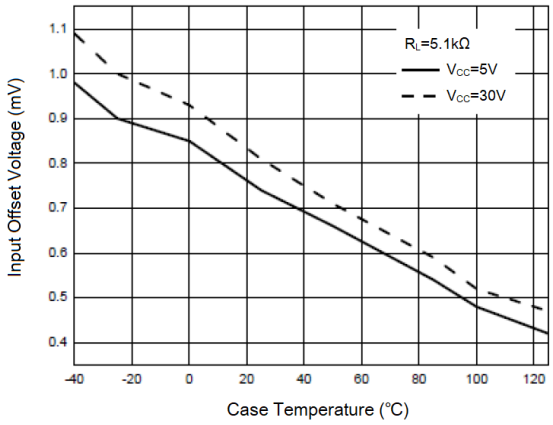
1. Supply Voltage vs. Supply Current



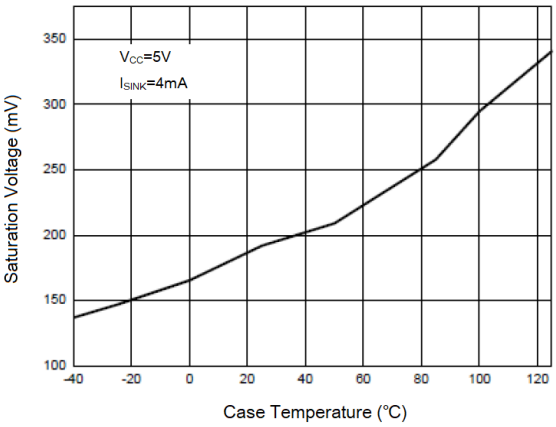
2. Supply Current vs. Case Temperature



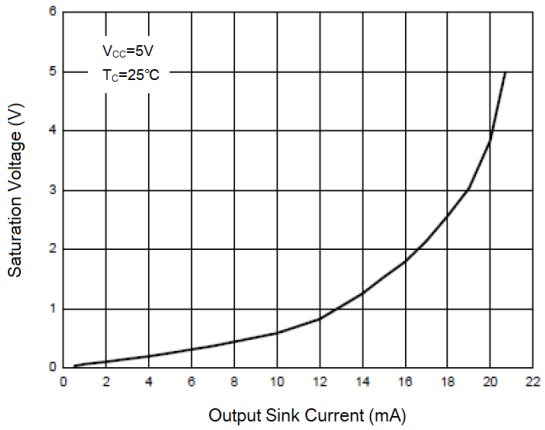
3. Input Offset Voltage vs. Case Temperature



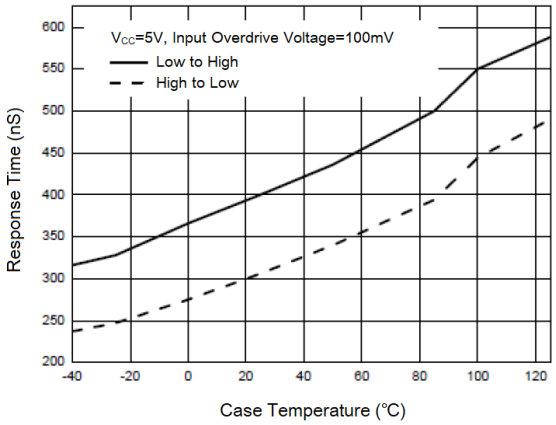
4. Saturation Voltage vs. Case Temperature



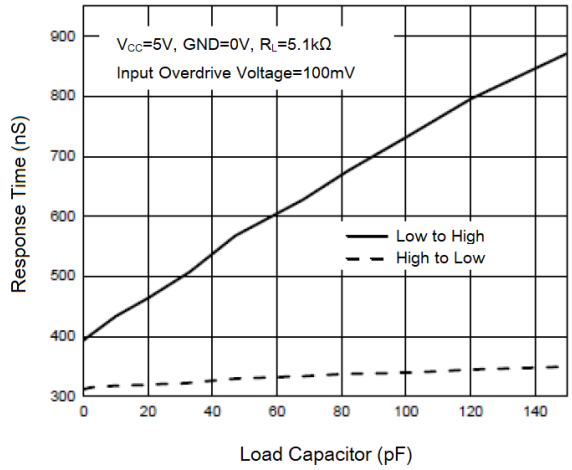
5. Saturation Voltage vs. Output Sink Current



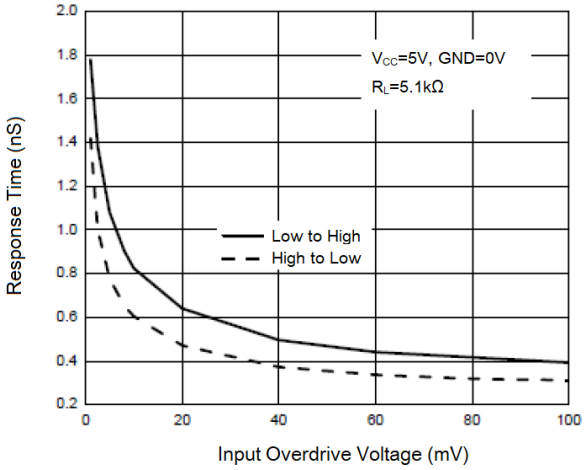
6. Response Time vs. Case Temperature



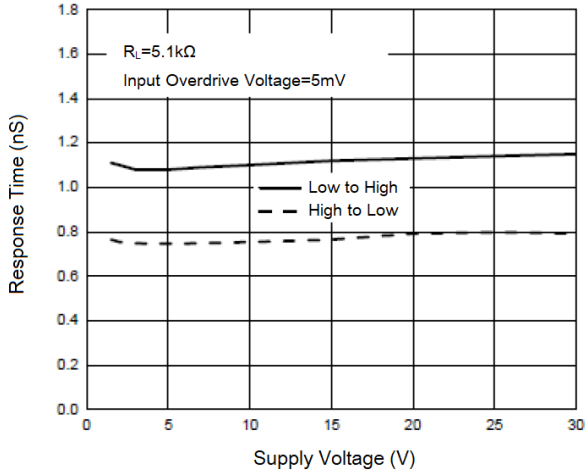
7. Response Time vs. Load Capacitor



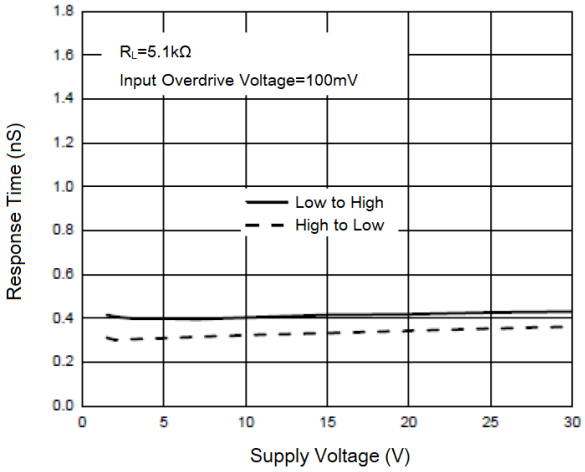
8. Response Time vs. Input Overdrive Voltage



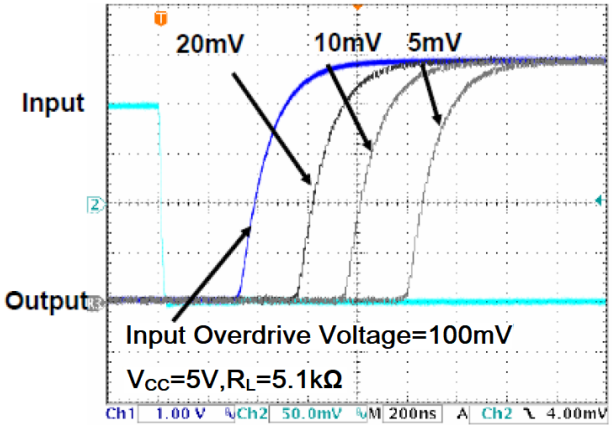
9. Response Time vs. Supply Voltage



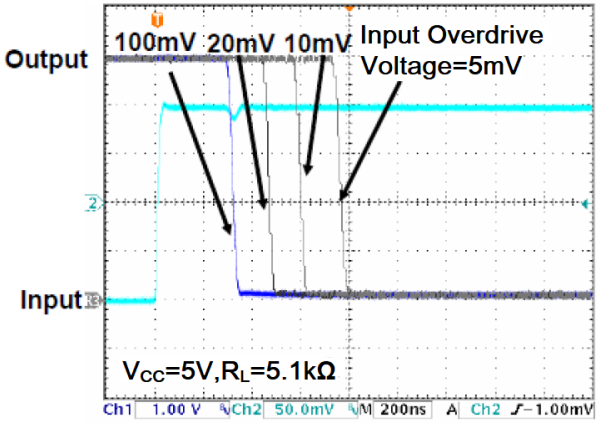
10. Response Time vs. Supply Voltage



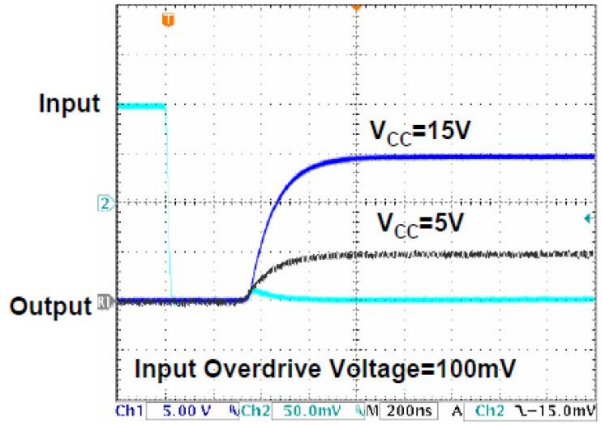
11. Response Time for Positive Transition



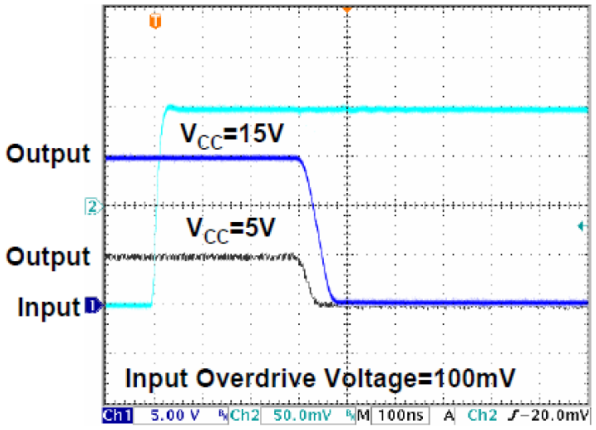
12. Response Time for Negative Transition



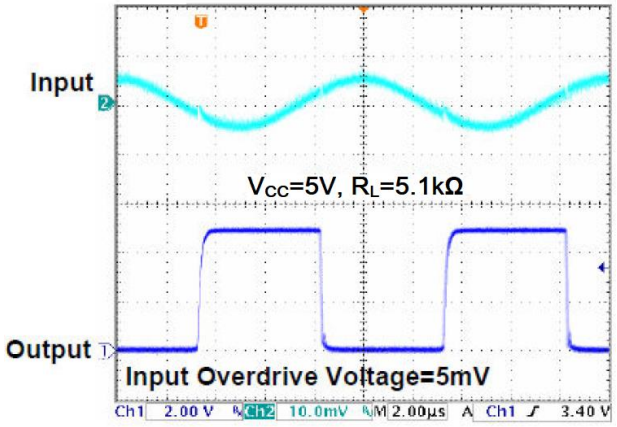
13. Response Time for Positive Transition



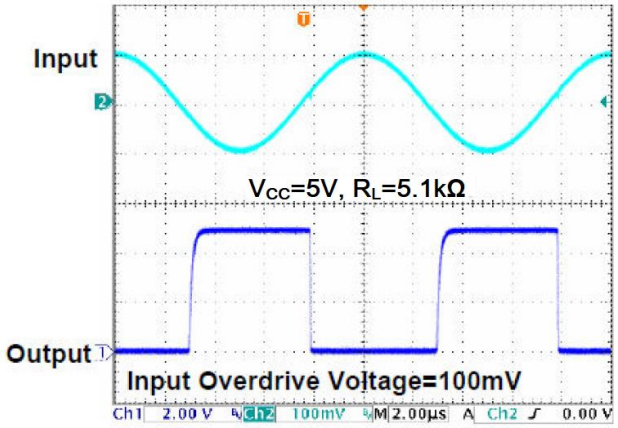
14. Response Time for Negative Transition



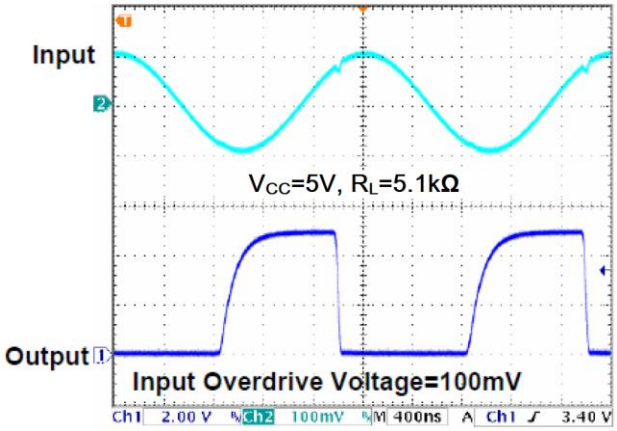
15. 100kHz Response



16. 100kHz Response

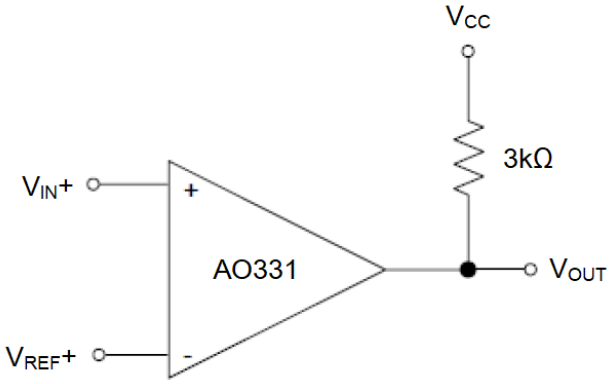


17. 500kHz Response

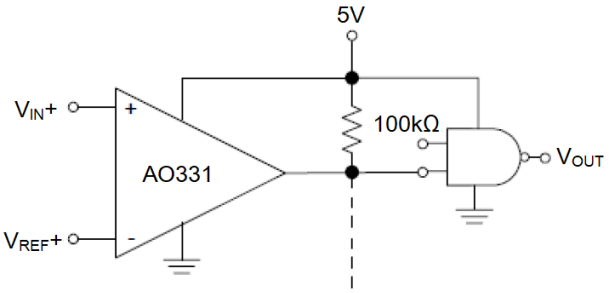


TYPICAL APPLICATIONS

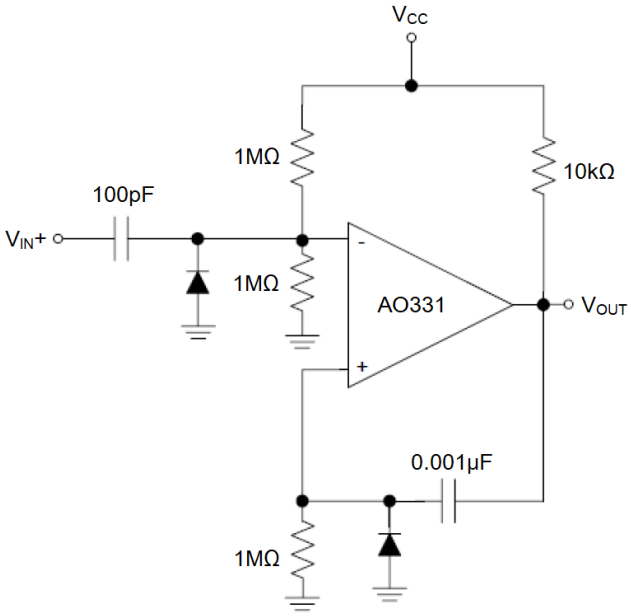
1. Basic Comparator



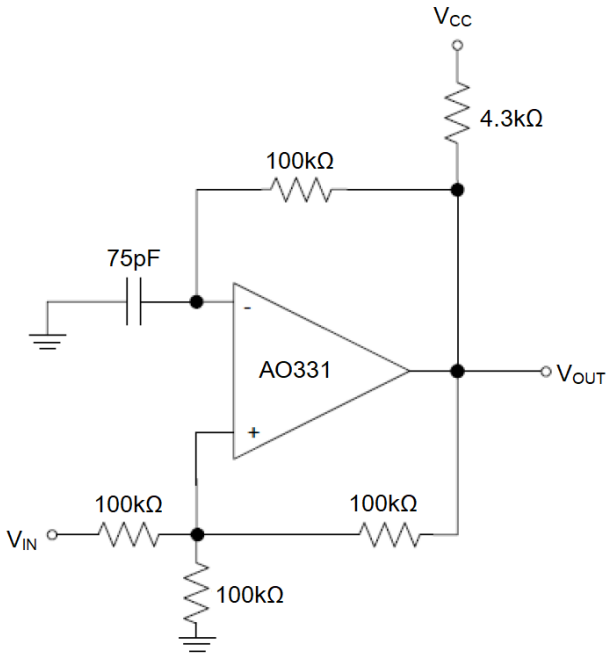
2. Driving CMOS



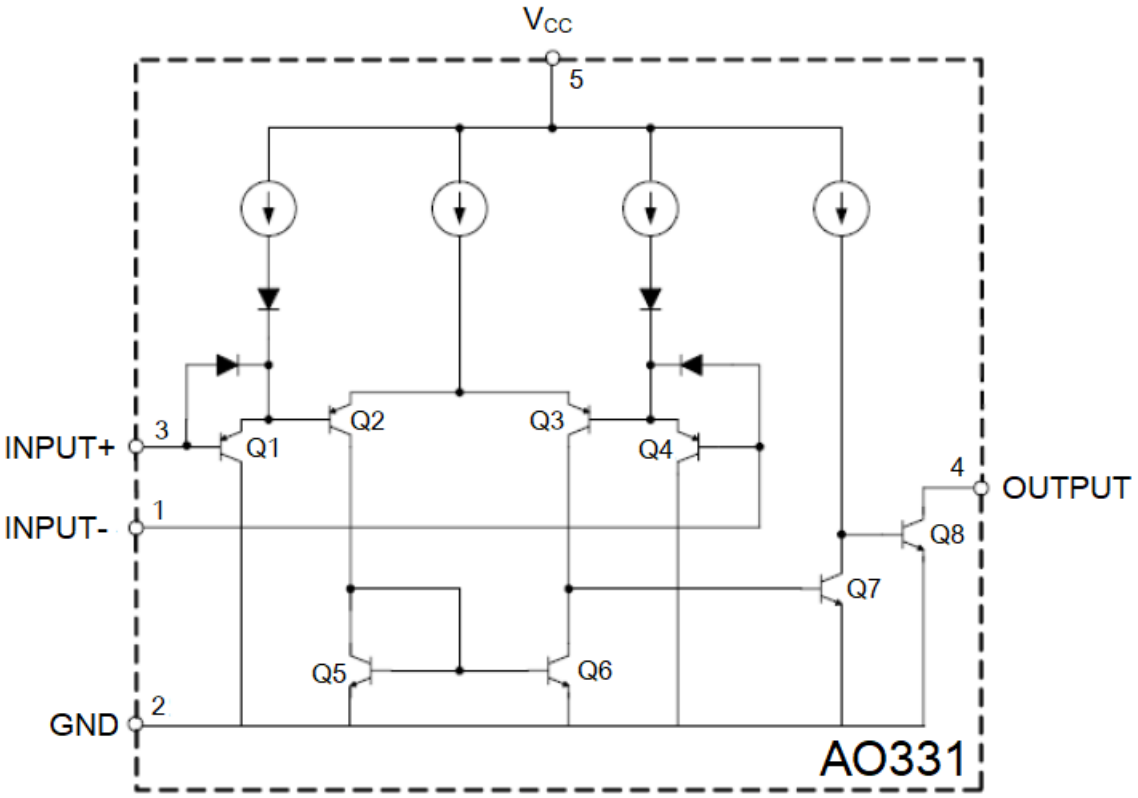
3. One Shot Multi-Vibrator



4. Square-Wave Oscillator

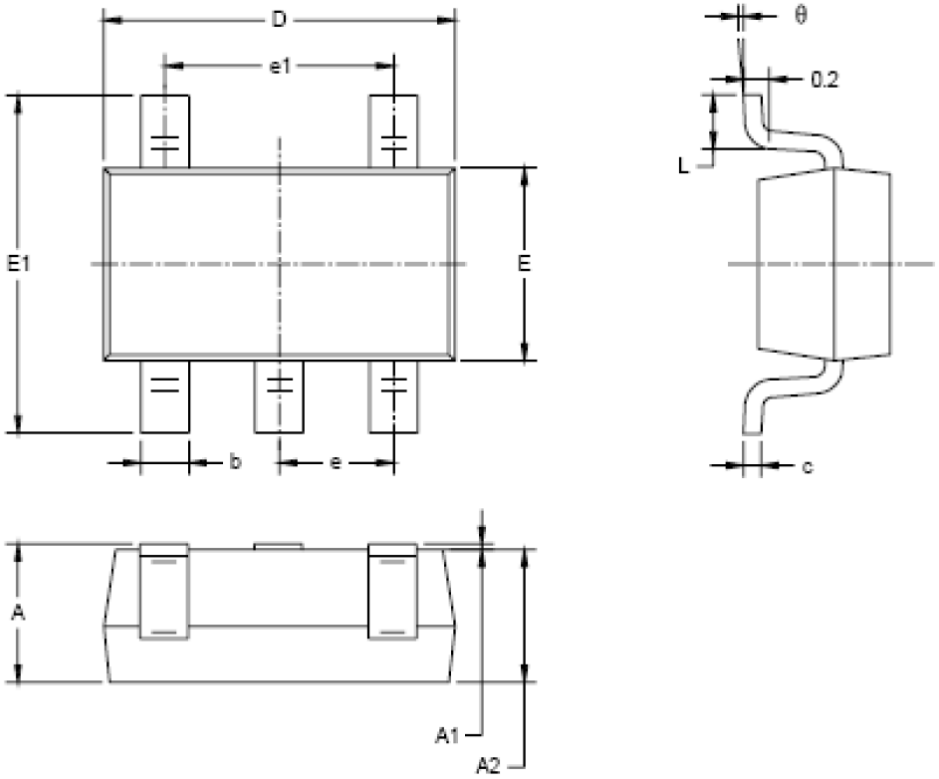


BLOCK DIAGRAM



PACKAGE INFORMATION

Dimension in SOT-25 (Unit: mm)



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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