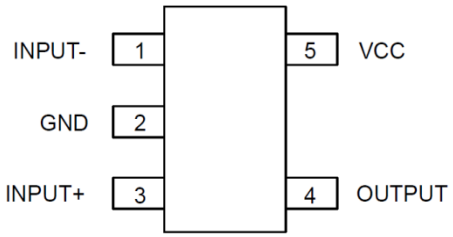
LOW POWER LOW OFFSET VOLTAGE SINGLE COMPARATOR

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 the standard SOT25 package.

Pin Assignments



(Top View)

Features

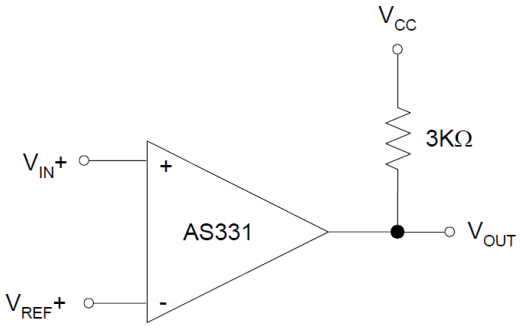
- Wide Supply Voltage Range
  - Single Supply: 2V to 36V
  - Dual Supplies: ±1V to ±18V
- Low Supply Current at VCC=5V: 0.4mA
- Low Input Bias Current: 25nA (Typical)
- Low Input Offset Current:5nA (Typical)
- Low Input Offset Voltage: 1mV (Typical)
- Input Common Mode Voltage Range Includes Ground
- Differential Input Voltage Range Equals to the Power Supply Voltage
- Low Output Saturation Voltage at 4mA: 200mV (Typical)
- Open Collector Output
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

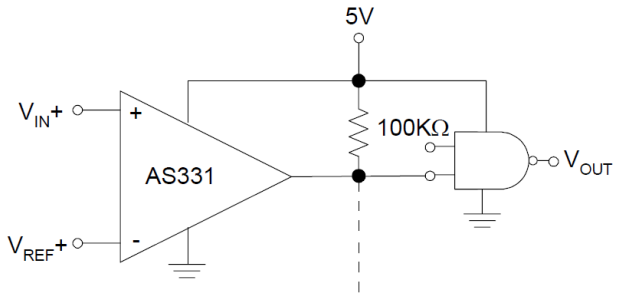
- Battery Charger
- Cordless Telephone
- Switching Power Supply
- DC-DC Module
- PC Motherboard
- Communication Equipment

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

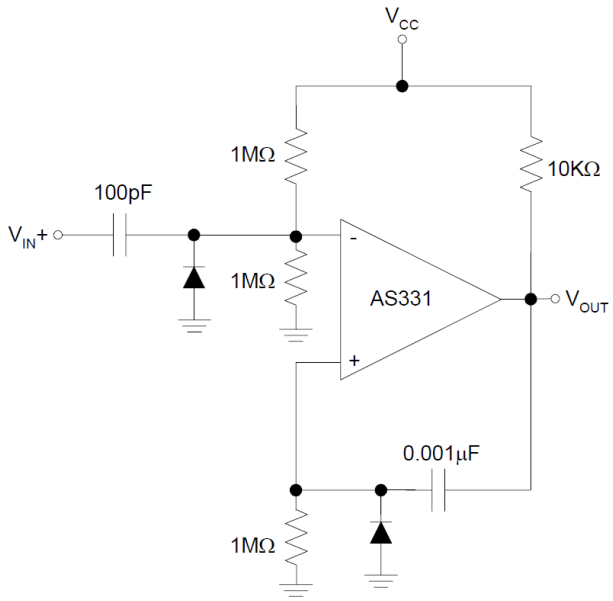
Typical Application



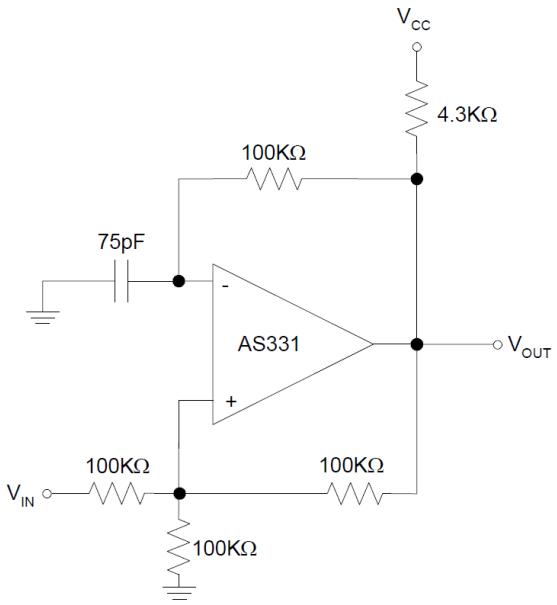
Basic Comparator



Driving CMOS

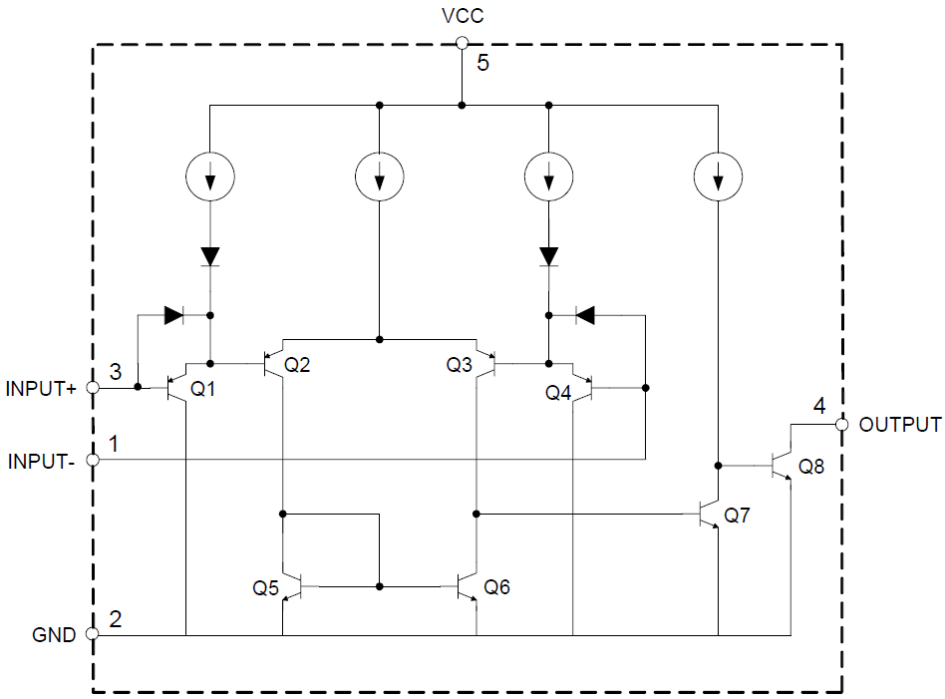


One Shot Multivibrator



Squarewave Oscillator

Functional Block Diagram



Absolute Maximum Ratings (@ T_A = +25°C, unless otherwise specified.) (Note 4)

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 (VIN<-0.3V) (Note 5)	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 120	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C

Notes:
4. 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.
5. 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 (@ T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	2	36	V
T_A	Operating Ambient Temperature Range	-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 6)

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	
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 7)	—	V_{CC}=30V		0	—	V_{CC}-1.5	V
Supply Current	I_{CC}	R_L=∞	V_{CC}=5V	—	0.4	1	mA
				—	—	2	
			V_{CC}=30V	—	0.5	1.7	
				—	—	3	
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, RL=5.1kΩ		—	200	—	ns
Response Time	—	R_L=5.1kΩ		—	1.3	—	µA
Output Sink Current	I_{SINK}	V_{IN}-=1V, V_{IN}+=0V, V_{OUT}=1.5V		6	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	

Notes: 6. These specifications are limited to -40°C≤T_A≤85°C. Limits over temperature are guaranteed by design, but not tested in production.

7. 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 +36V without damages, independent of the magnitude of the V_{CC}.

Performance Characteristics

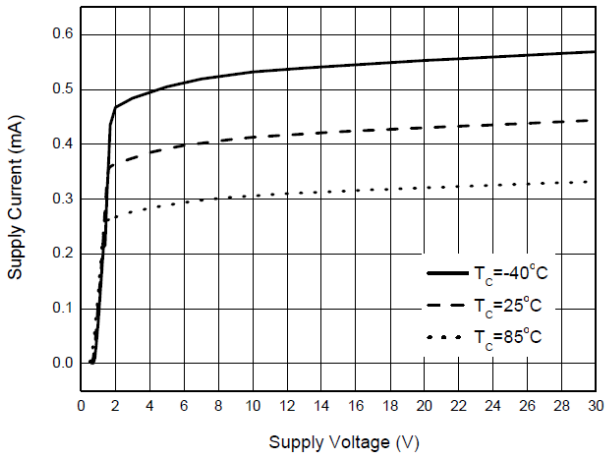


Fig. 1 Supply Current vs. Supply Voltage

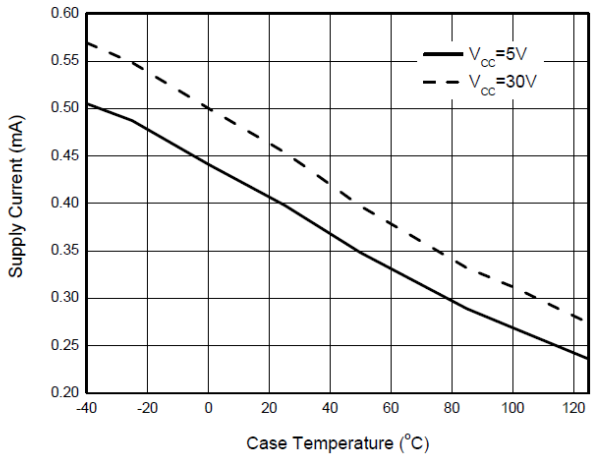


Fig. 2 Supply Current vs. Case Temperature

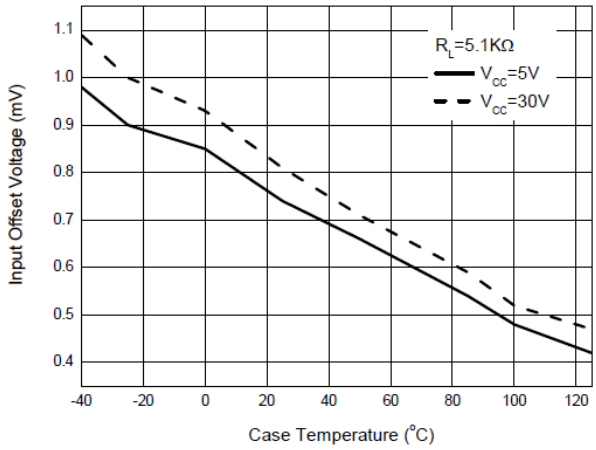


Fig. 3 Input Offset Voltage vs. Case Temperature

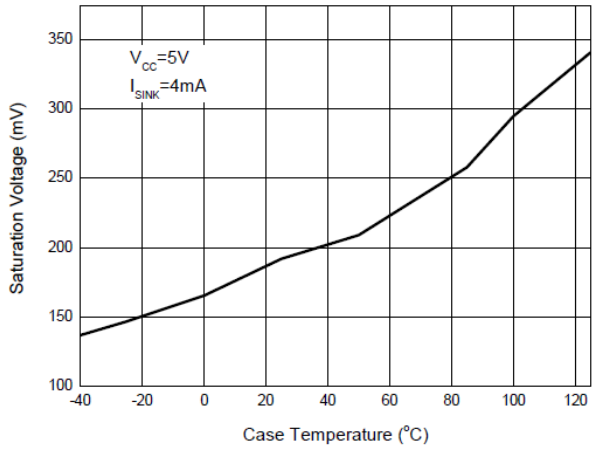


Fig. 4 Saturation Voltage vs. Case Temperature

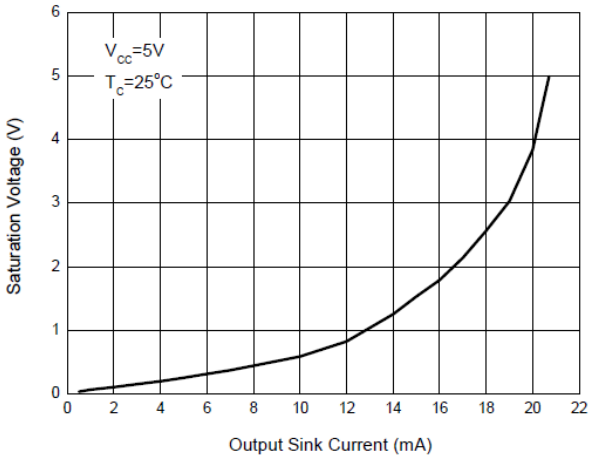


Fig. 5 Saturation Voltage vs. Output Sink Current

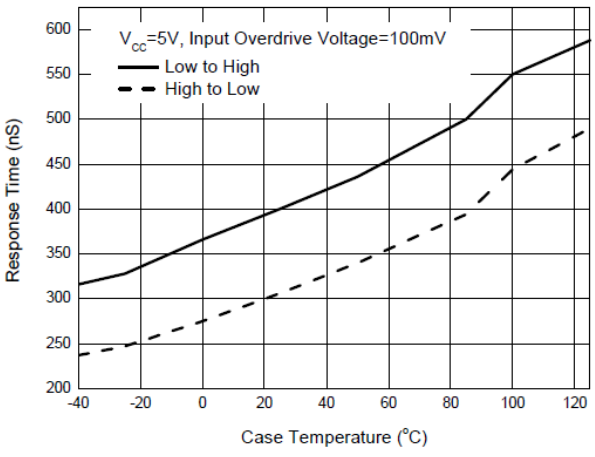


Fig. 6 Response Time vs. Case Temperature

Performance Characteristics (continued)

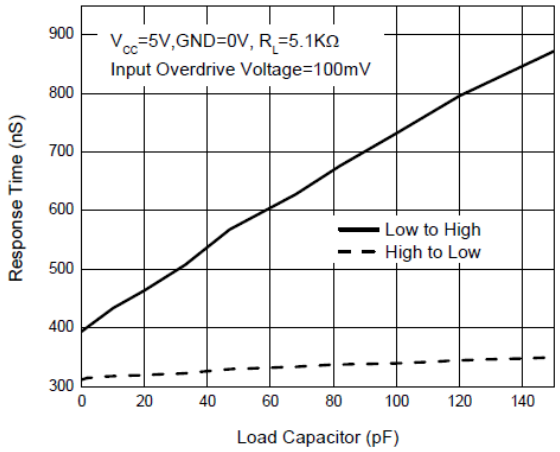


Fig. 7 Response Time vs. Load Capacitor

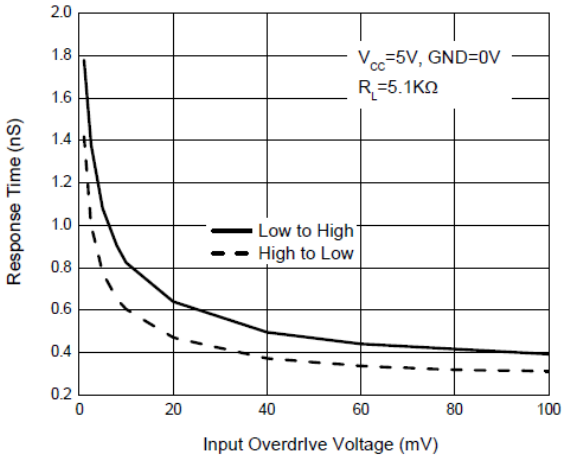


Fig. 8 Response Time vs. Input Overdrive Voltage

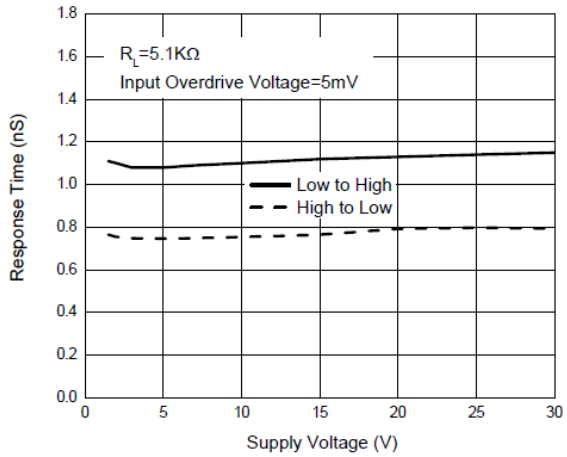


Fig. 9 Response Time vs. Supply Voltage

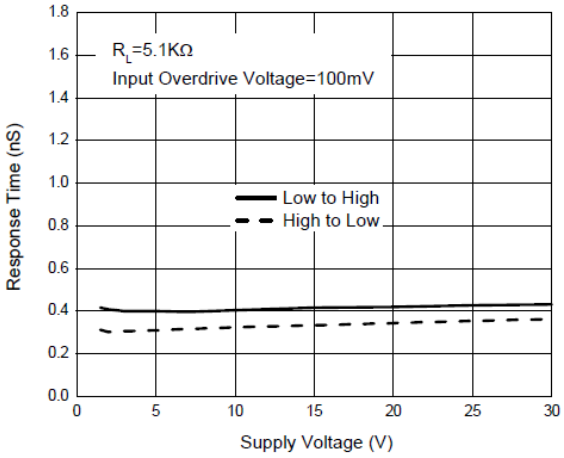


Fig. 10 Response Time vs. Supply Voltage

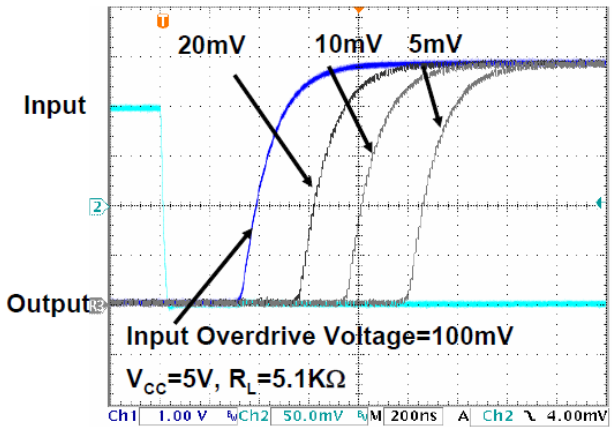


Fig. 11 Response Time for Positive Transition

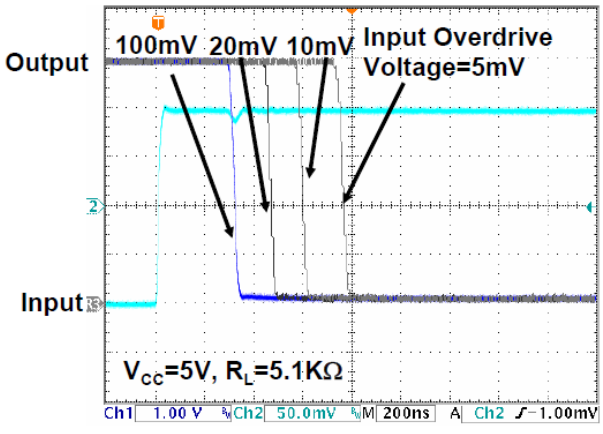


Fig. 12 Response Time for Negative Transition

Performance Characteristics (continued)

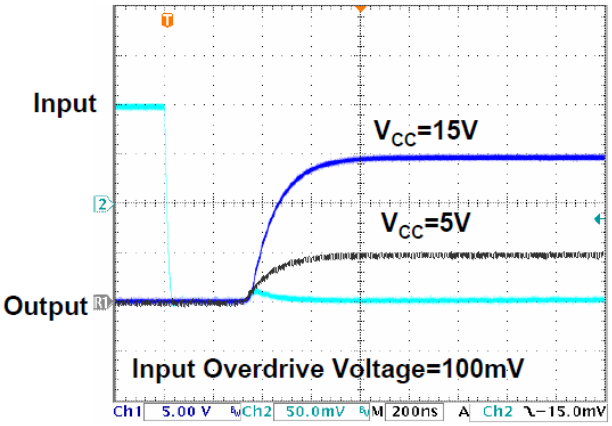


Fig. 13 Response Time for Positive Transition

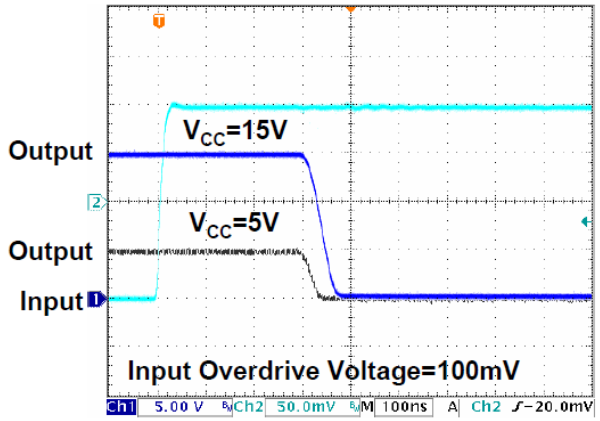


Fig. 14 Response Time for Negative Transition

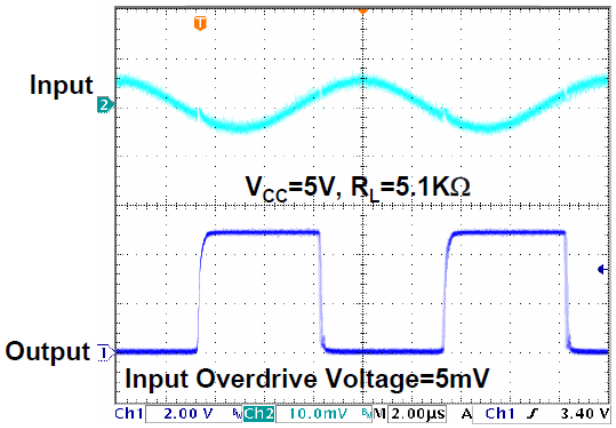


Fig. 15 100kHz Response

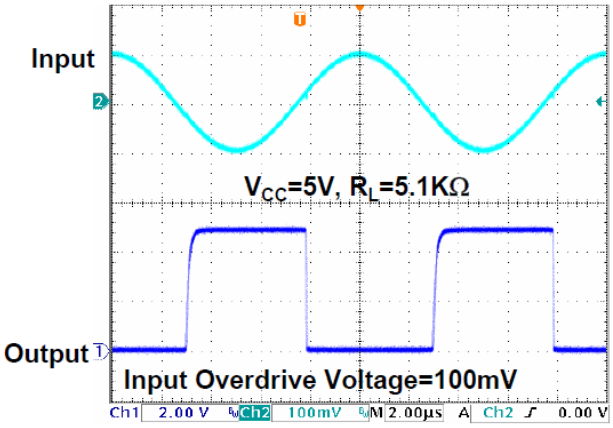


Fig. 16 100kHz Response

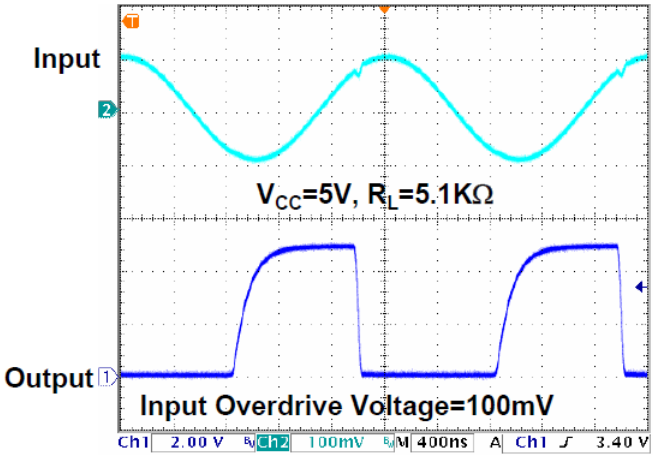
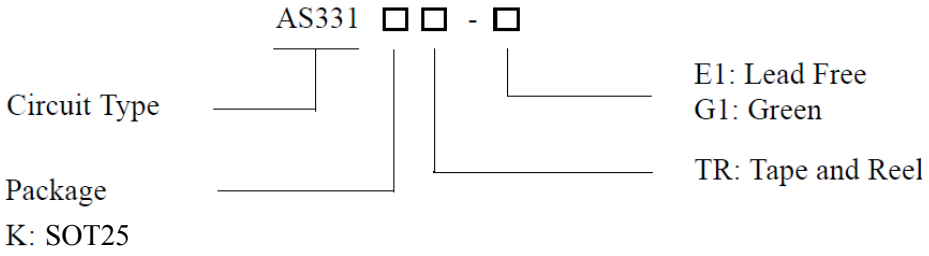


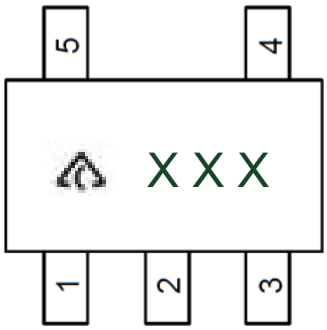
Fig. 17 500kHz Response

Ordering Information



Part Number	Marking ID	Package	Temperature Range	Packing Type
AS331KTR-G1	GEA	SOT25	-40 to 85°C	Tape & Reel

Marking Information



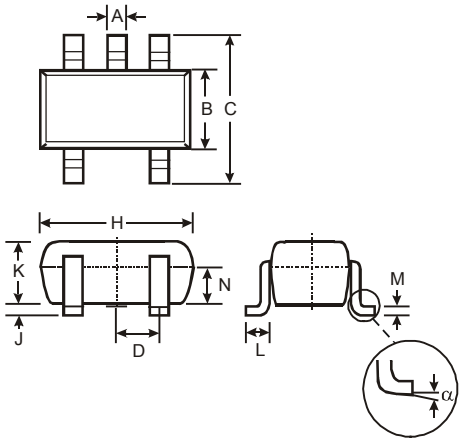
LOGO

XXX : Marking ID

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT25

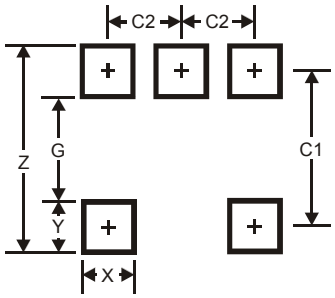


SOT25			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT25



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

Mechanical Data

- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.016 grams (Approximate)

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