SINGLE LOW-VOLTAGE RAIL-TO-RAIL OUTPUT OPERATIONAL AMPLIFIER

Description

The AZV321 is single low-voltage (2.7V to 5.5V) operational amplifier which has rail-to-rail output swing capability. The input common-mode voltage range includes ground. The chip exhibits excellent speed-power ratio, achieving 1MHz of bandwidth and 1V/μs of slew rate with low supply current.

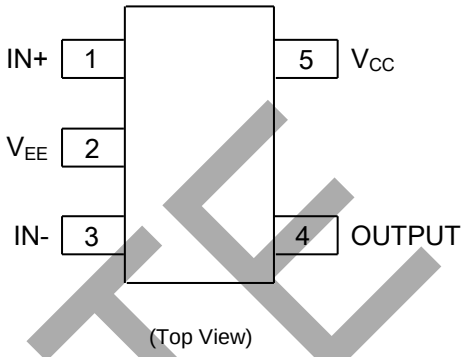
The AZV321 is built with BiCMOS process. It has bipolar input and output stages for improved noise performance, low input offset and higher output current drive.

The AZV321 is available in the package of SC-70-5, which is approximately half the size of SOT-23-5. The small package saves space on PC boards and enables the design of small portable electronic devices. It also allows the designer to place the device closer to the signal source to reduce noise pickup and increase signal integrity.

The AZV321 is also available in standard SOT-23-5 package.

Pin Assignments

KS/K Packages
(SC-70-5/SOT-23-5)



(Top View)

Features

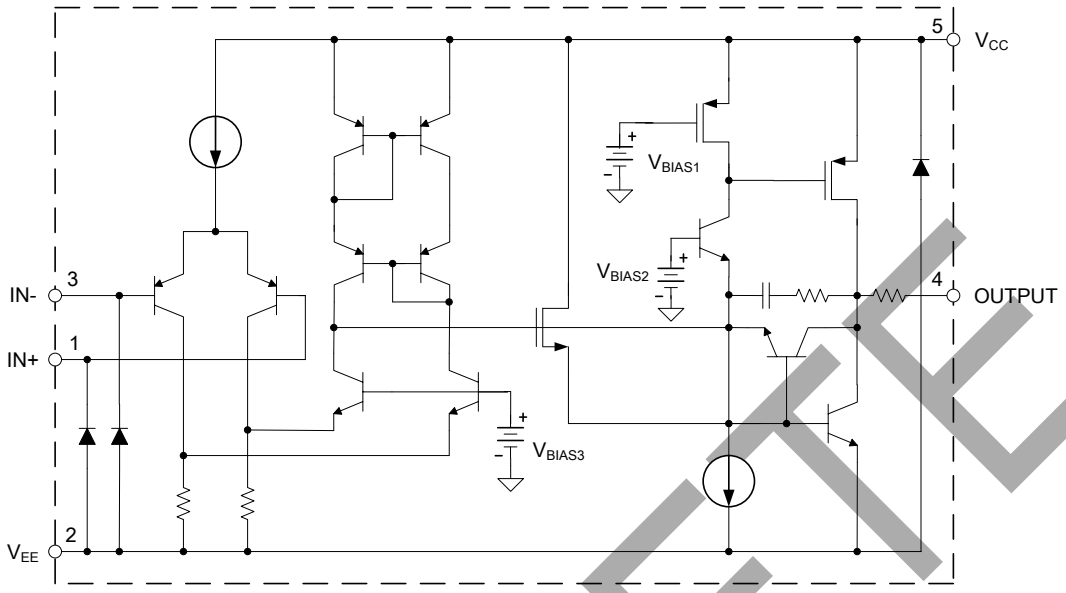
For V_{CC} = 5V and V_{EE} = 0V, typical unless otherwise noted)

- Guaranteed 2.7V to 5.5V Performance
- No Crossover Distortion
- Gain-Bandwidth Product 1MHz
- Industrial Temperature Range: -40°C to +85°C
- Low Supply Current: 130μA
- Rail-to-Rail Output Swing under 10kΩ Load:
  - V_{OH} up to V_{CC}-10mV
  - V_{OL} near to V_{EE}+65mV
- V_{CM}: -0.1V to V_{CC}-0.8V
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, 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

- Active filters
- Low-power, low-voltage applications
- General-purpose portable devices
- Cellular phones, cordless phones
- Battery-powered systems

Functional Block Diagram



Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Rating	Unit
V_{CC}	Power Supply Voltage	6	V
T_J	Operation Junction Temperature	+150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering, 10 Seconds)	+260	°C
—	ESD (Machine Model)	200	V
—	ESD (Human Body Model)	2000	V

Note: 1. Stresses greater than those listed under *Absolute Maximum Ratings* can 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 can affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	2.7	5.5	V
T_A	Ambient Operating Temperature Range	-40	+85	°C

Electrical Characteristics

AZV321-2.7V Electrical Characteristics (All limits are guaranteed for T_A = +25°C, V_{CC} = 2.7V, V_{EE} = 0V, V_{CM} = 1.0V, V_O = V_{CC}/2 and R_L > 1MΩ, limits in **bold types** are guaranteed for T_A = -40°C to +85°C, unless otherwise specified.) (Note 2)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	—	—	1.7	7	mV
			—	—	**9**	
I_B	Input Bias Current	—	—	11	250	nA
			—	—	**500**	
I_{IO}	Input Offset Current	—	—	5	50	nA
			—	—	**150**	
V_{CM}	Input Common Mode Voltage Range	For CMRR ≥ 50dB	-0.1	—	1.9	V
I_{CC}	Supply Current	V_O = V_{CC}/2, A_{VCL} = 1, no load	—	80	170	μA
			—	—	**270**	
CMRR	Common Mode Rejection Ratio	0 ≤ V_{CM} ≤ 1.7V	50	65	—	dB
PSRR	Power Supply Rejection Ratio	2.7V ≤ V_{CC} ≤ 5V, V_O = 1V	50	60	—	dB
I_{SOURCE}	Output Short-Circuit Current	V_O = 0V	5	20	—	mA
I_{SINK}		V_O = 2.7V	10	30	—	mA
V_{OH}	Output Voltage Swing	R_L = 10kΩ to 1.35V	2.60	2.69	—	V
V_{OL}			—	60	180	mV
GBWP	Gain Bandwidth Product	C_L = 200pF	—	1	—	MHz
ϕ_M	Phase Margin	—	—	60	—	Deg
G_M	Gain Margin	—	—	10	—	dB

Note: 2. Limits over the full temperature are guaranteed by design, but not tested in production.

Electrical Characteristics (continued)

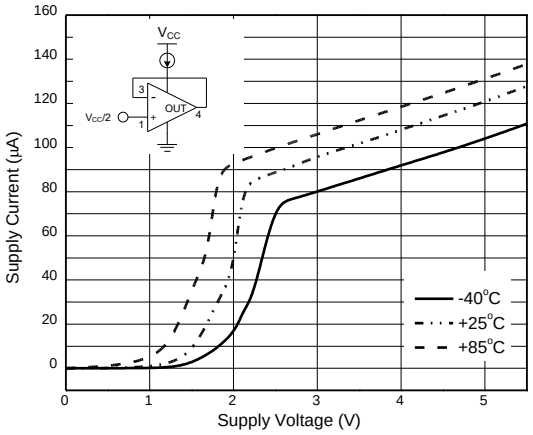
AZV321-5V Electrical Characteristics (All limits are guaranteed for T_A = +25°C, V_{CC} = 5V, V_{EE} = 0V, V_{CM} = 2.0V, V_O = V_{CC}/2 and R_L > 1MΩ, limits in **bold types** are guaranteed for T_A = -40°C to +85°C, unless otherwise specified.) (Note 2)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage	—	—	1.7	7	mV
			—	—	**9**	
I_B	Input Bias Current	—	—	11	250	nA
			—	—	**500**	
I_{IO}	Input Offset Current	—	—	5	50	nA
			—	—	**150**	
V_{CM}	Input Common Mode Voltage Range	For CMRR ≥ 50dB	-0.1	—	4.2	V
I_{CC}	Supply Current	V_O = V_{CC}/2, A_{VCL} = 1, no load	—	130	250	μA
			—	—	**350**	
G_V	Large Signal Voltage Gain	R_L = 2kΩ	84	100	—	dB
			80	—	—	
CMRR	Common Mode Rejection Ratio	0 ≤ V_{CM} ≤ 4V	50	65	—	dB
PSRR	Power Supply Rejection Ratio	2.7V ≤ V_{CC} ≤ 5V, V_O = 1V V_{CM} = 1V	50	60	—	dB
I_{SOURCE}	Output Short-Circuit Current	V_O = 0V	5	60	—	mA
I_{SINK}		V_O = 5V	10	160	—	mA
V_{OH}	Output Voltage Swing	R_L = 2kΩ to 2.5V	4.7	4.96	—	V
			4.6	—	—	
		R_L = 10kΩ to 2.5V	4.9	4.99	—	
			4.8	—	—	
V_{OL}		R_L = 2kΩ to 2.5V	—	120	300	mV
			—	—	**400**	
		R_L = 10kΩ to 2.5V	—	65	180	
			—	—	**280**	
SR	Slew Rate	—	—	1	—	V/μS
GBWP	Gain Bandwidth Product	C_L = 200pF	—	1	—	MHz
ϕ_M	Phase Margin	—	—	60	—	Deg
G_M	Gain Margin	—	—	10	—	dB

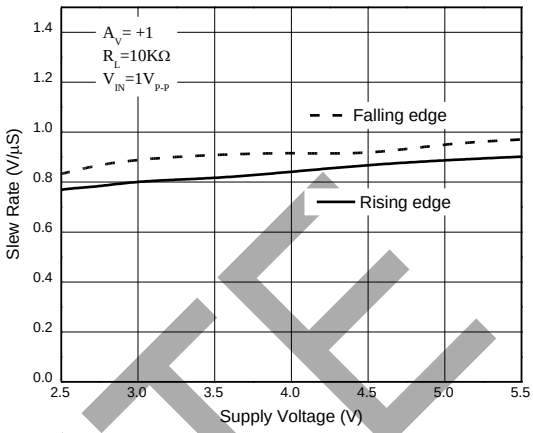
Note: 2. Limits over the full temperature are guaranteed by design, but not tested in production.

Performance Characteristics

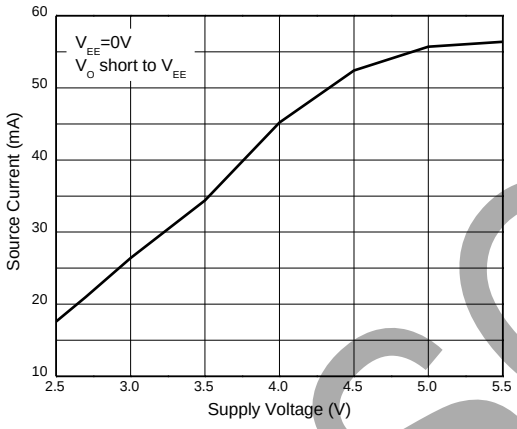
Supply Current vs. Supply Voltage



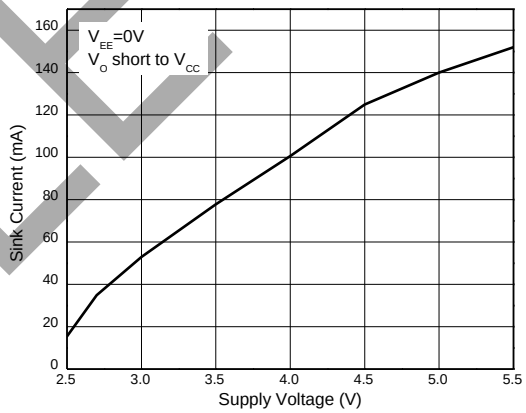
Slew Rate vs. Supply Voltage



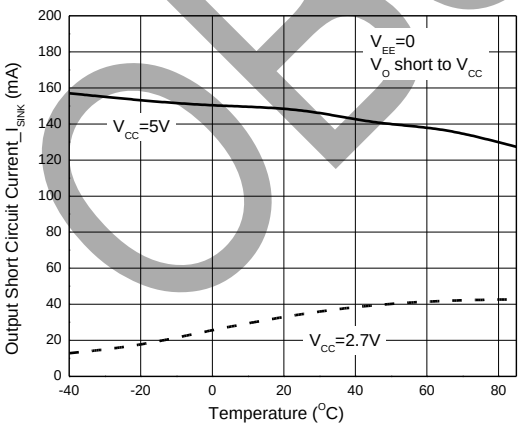
Output Source Current vs. Supply Voltage



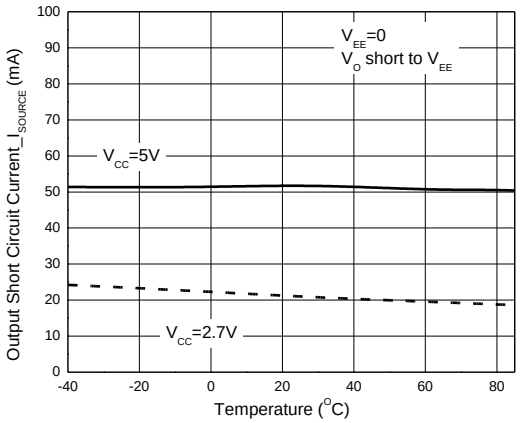
Output Sink Current vs. Supply Voltage



Short-Circuit Current_I_{SINK} vs. Temperature

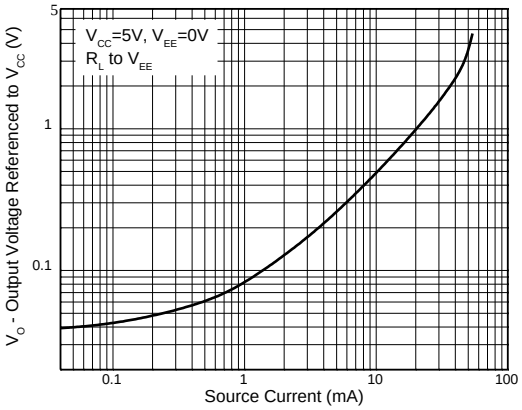


Short-Circuit Current_I_{SOURCE} vs. Temperature

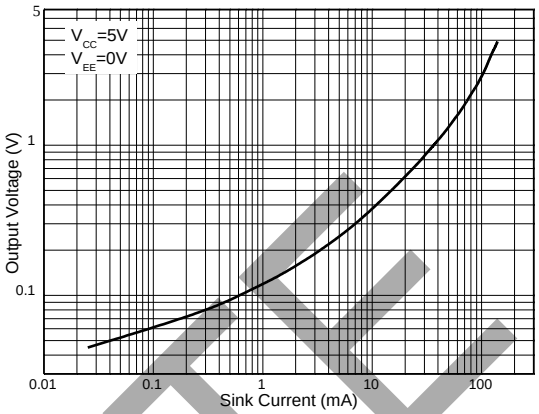


Performance Characteristics (continued)

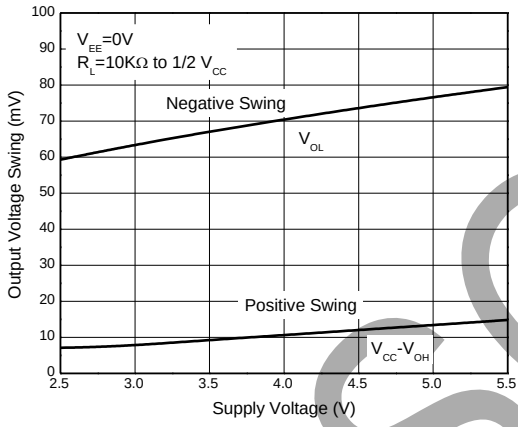
Output Voltage vs. Source Current



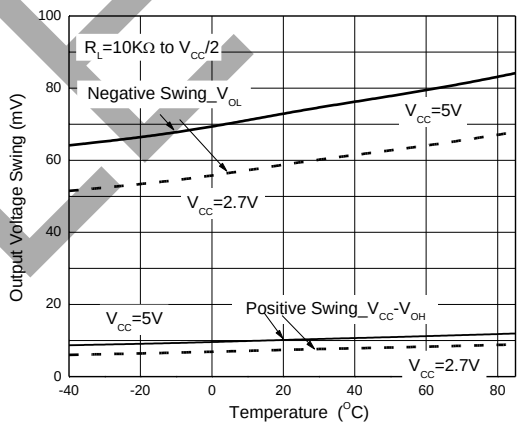
Output Voltage vs. Sink Current



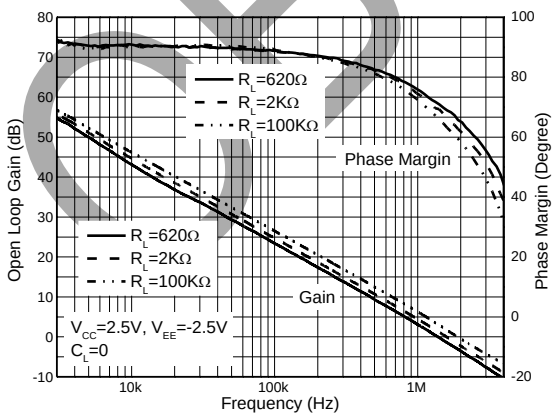
Output Voltage Swing vs. Supply Voltage



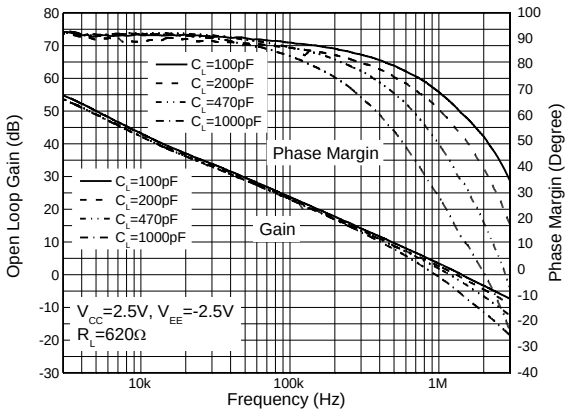
Output Voltage Swing vs. Temperature



Gain and Phase vs. Frequency and Resistive Load

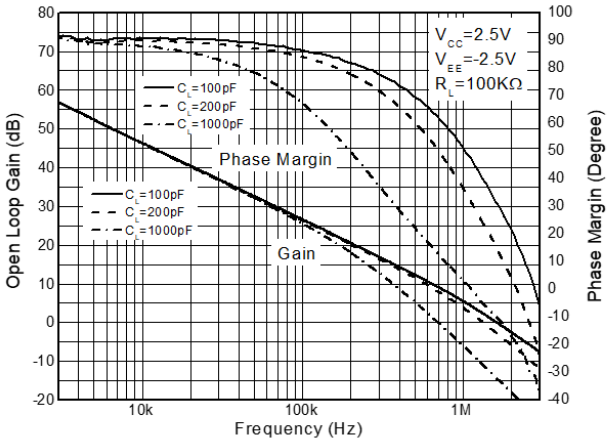


Gain and Phase vs. Frequency and Capacitive Load

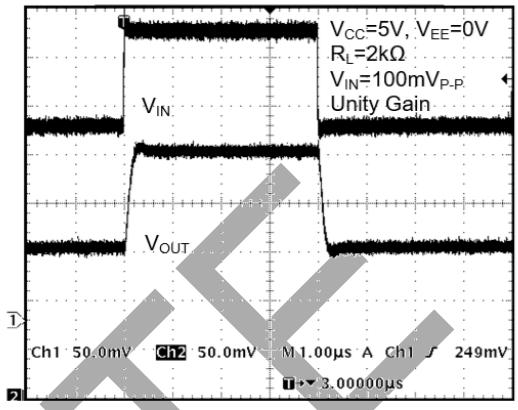


Performance Characteristics (continued)

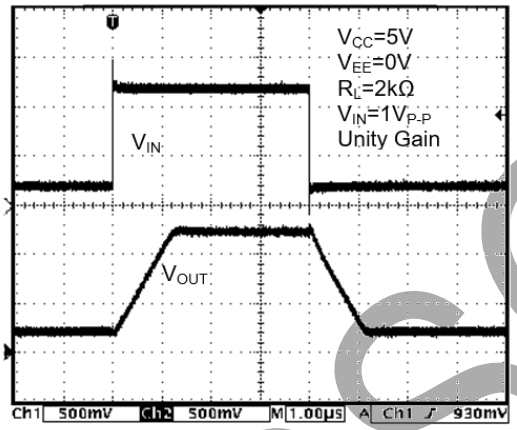
Gain and Phase vs. Frequency and Capacitive Load



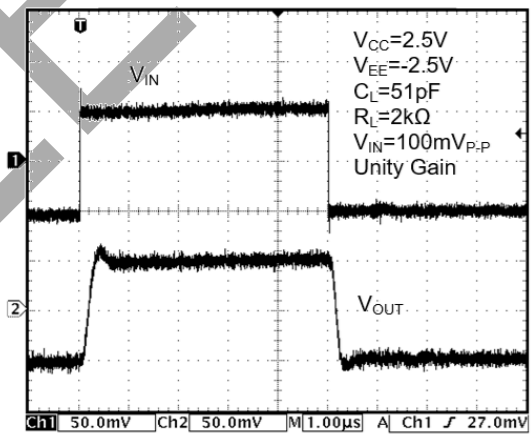
Non-Inverting Input Small-Signal Pulse Response



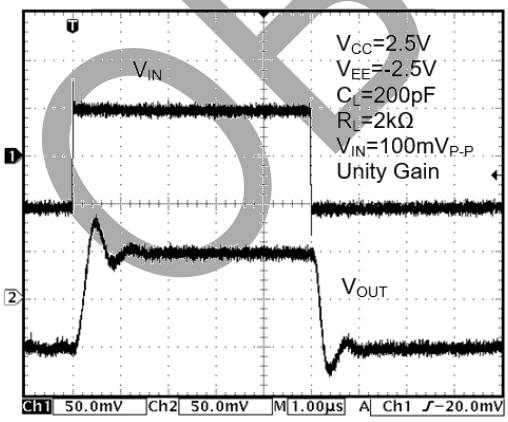
Non-Inverting Input Large-Signal Pulse Response



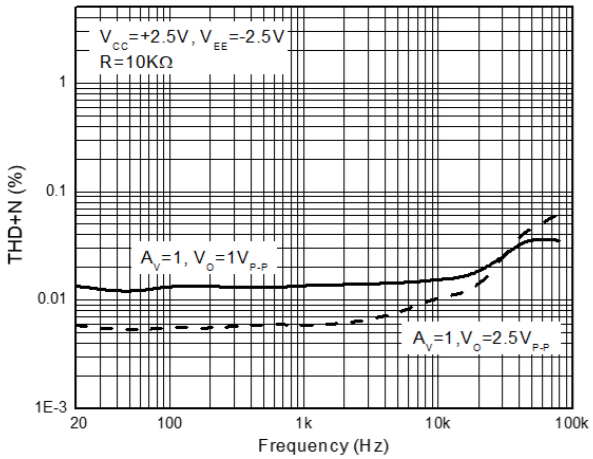
Output with Excessive Capacitive Load



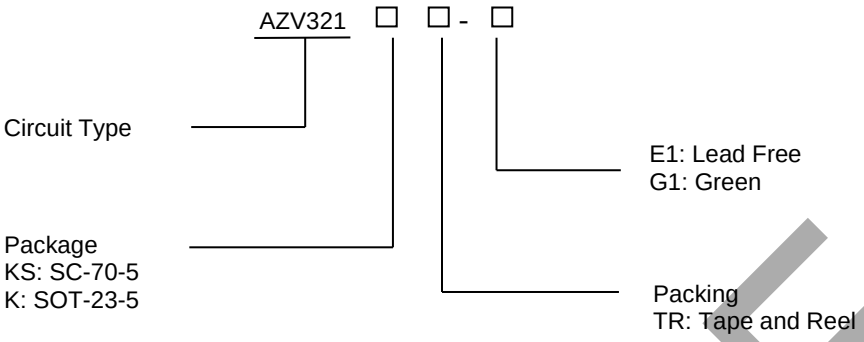
Output with Excessive Capacitive Load



THD+N vs. Frequency



Ordering Information



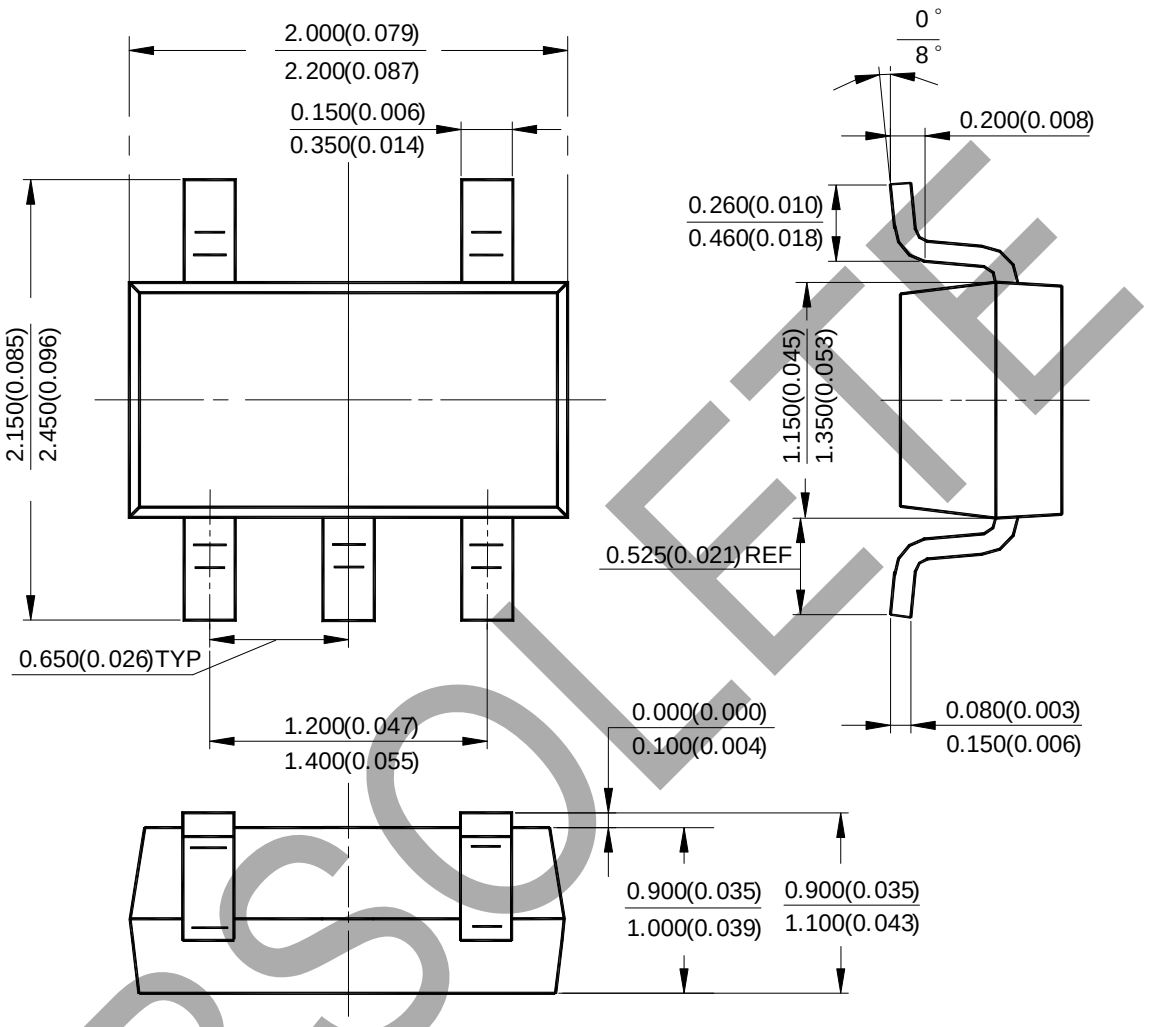
Package	Temperature Range	Orderable Part Number		Marking ID		Packing
		Lead Free	Green	Lead Free	Green	
SC-70-5	-40°C to +85°C	AZV321KSTR-E1	AZV321KSTR-G1	21	B1	Tape & Reel
SOT-23-5		AZV321KTR-E1	AZV321KTR-G1	E6D	G6D	Tape & Reel

Note: 3. Diodes Incorporated'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.

Package Outline Dimensions (All dimensions in mm(inch).)

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

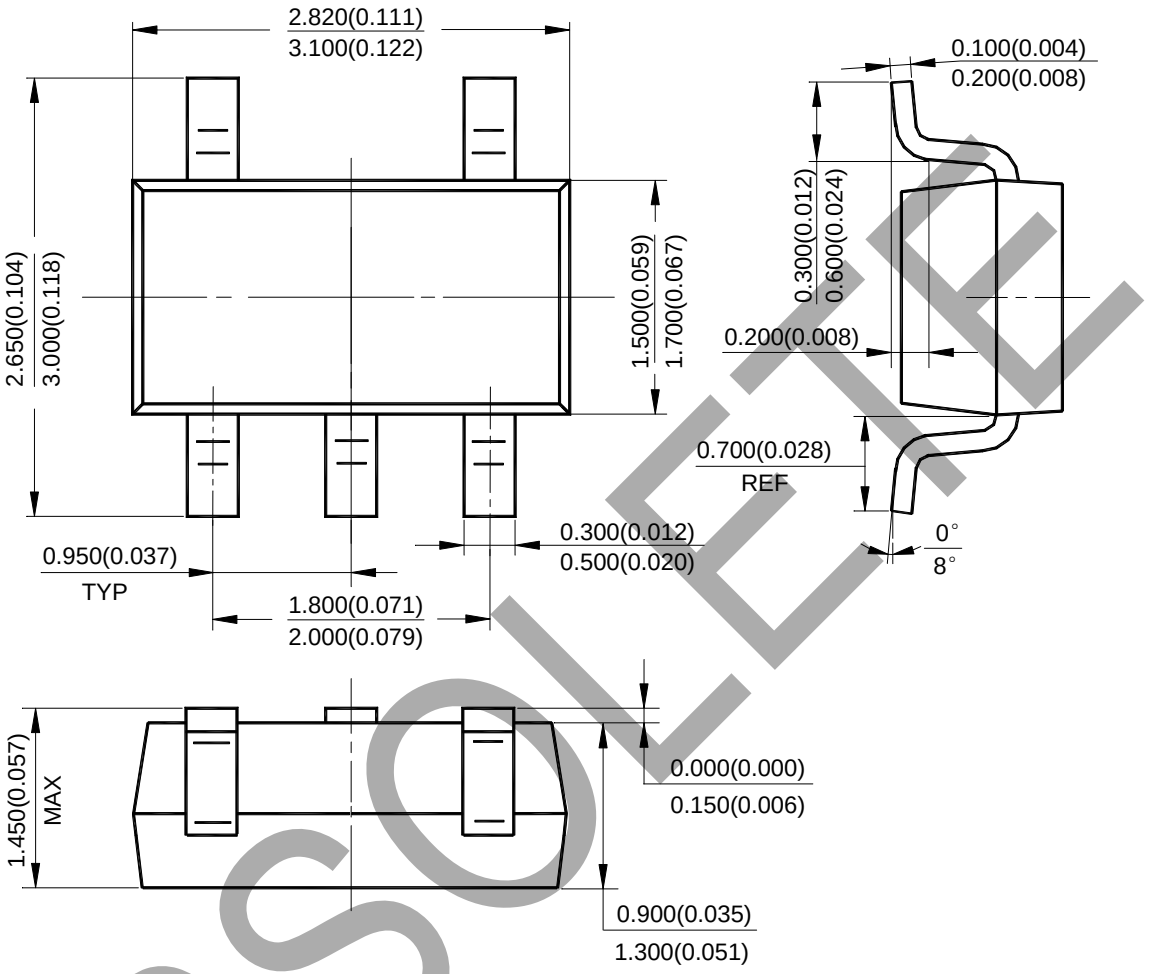
SC-70-5



Package Outline Dimensions (continued) (All dimensions in mm(inch).)

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

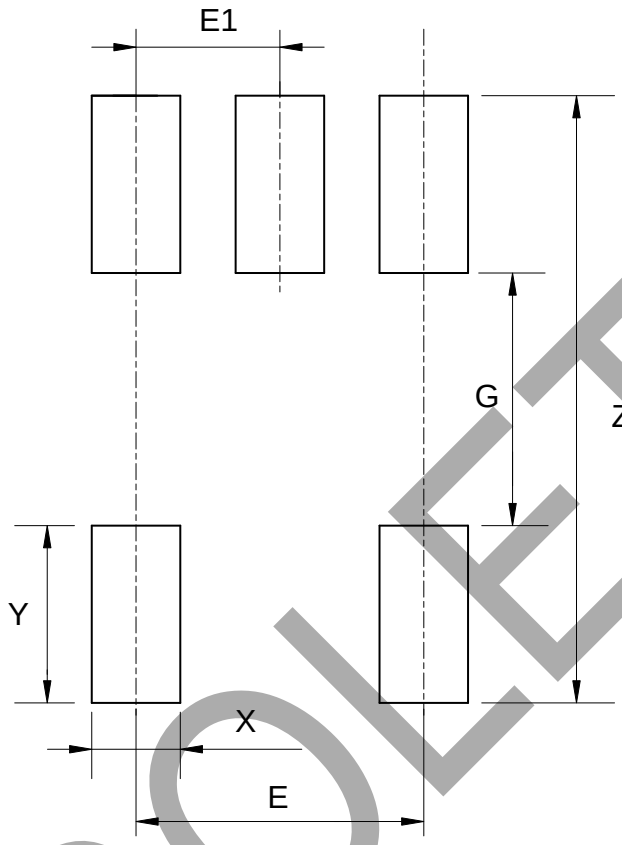
SOT-23-5



Suggested Pad Layout

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

SC-70-5

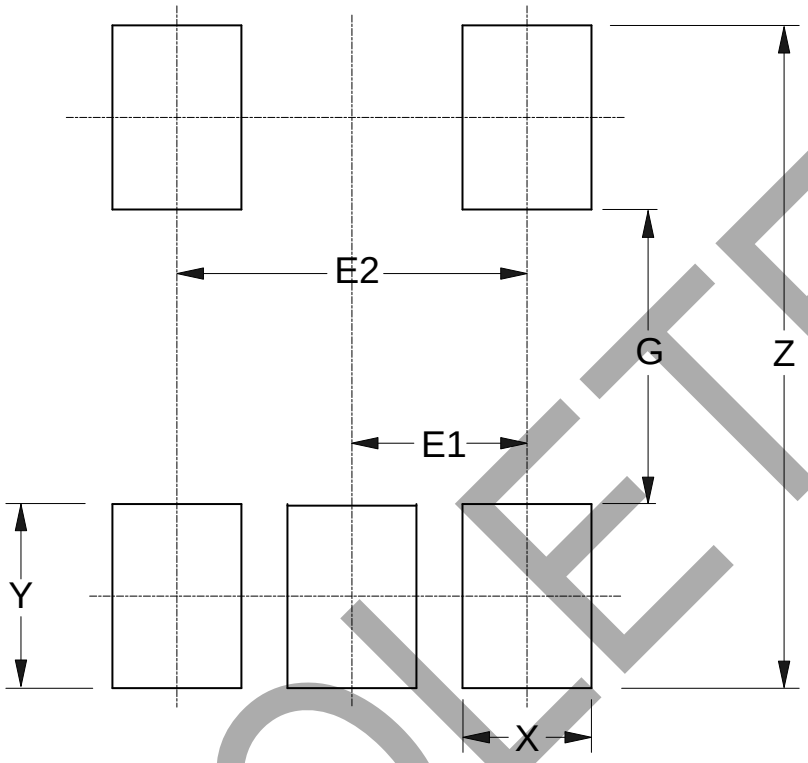


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)	E1 (mm)/(inch)
Value	2.740/0.108	1.140/0.045	0.400/0.016	0.800/0.031	1.300/0.051	0.650/0.026

Suggested Pad Layout (continued)

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

SOT-23-5



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

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