SINGLE/DUAL LOW BIAS CURRENT, LOW VOLTAGE, RAIL-TO-RAIL INPUT/OUTPUT CMOS OPERATIONAL AMPLIFIERS

NEW PRODUCT

Description

The AZV831/AZV832 is single/dual channels rail-to-rail input and output amplifier, which provides a wide input common-mode voltage range and output voltage swing capability for maximum signal swings in low supply voltage applications. The device is fully specified to operate from 1.6V to 5.0V single supply, or ±0.8V and ±2.5V dual supply applications. It features very low supply current dissipation 70μA per channel, which is well suitable for today's low-voltage and/or portable systems.

The AZV831/AZV832 features optimal performance in very low bias current of 1pA, which enables the IC to be used for integrators, photodiode amplifiers, and piezoelectric sensors etc. The device has typical 0.5mV input offset voltage and provides 1MHz bandwidth.

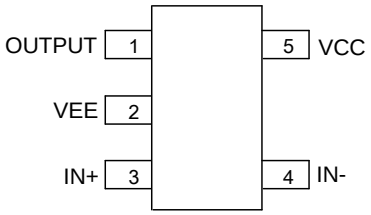
The AZV831/AZV832 adopts the latest packaging technology to meet the most demanding space-constraint applications. The AZV831 is available in standard SOT-23-5 package. The AZV832 is offered in the traditional MSOP-8 and SOIC-8 packages.

Features

- Single Supply Voltage Range: 1.6V to 5.5V
- Ultra-low Input Bias Current: 1pA (Typ.)
- Offset Voltage: 0.5mV (Typ.), 2.5mV (Max.)
- Rail-to-Rail Input
  V_{CM}: 300mV beyond Rails @ V_{CC} = 5V
  Rail-to-Rail Output Swing:
  10kΩ Load: 4mV from Rail
  1kΩ Load: 25mV from Rail
- Supply Current: 70μA/Amplifier
- Unity Gain Stable
  Gain Bandwidth Product: 1.0MHz
- Slew Rate: 0.45V/μs @ V_{CC} = 5.0V
- Operation Ambient Temperature Range: -40°C to +85°C
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3**)

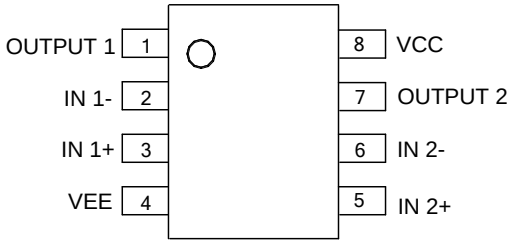
Pin Assignments

(Top View)



SOT-23-5 (AZV831)

(Top View)



SOIC-8/MSOP-8 (AZV832)

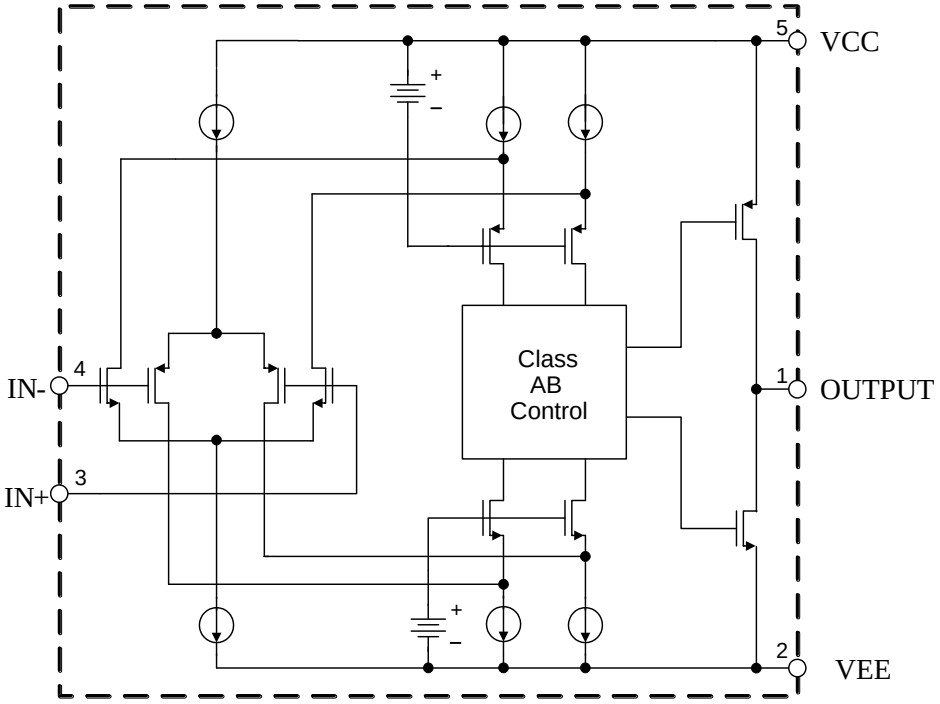
Applications

- Sensors
- Photodiode Amplification
- Battery-Powered Instrumentation
- Pulse Blood Oximeter, Glucose Meter

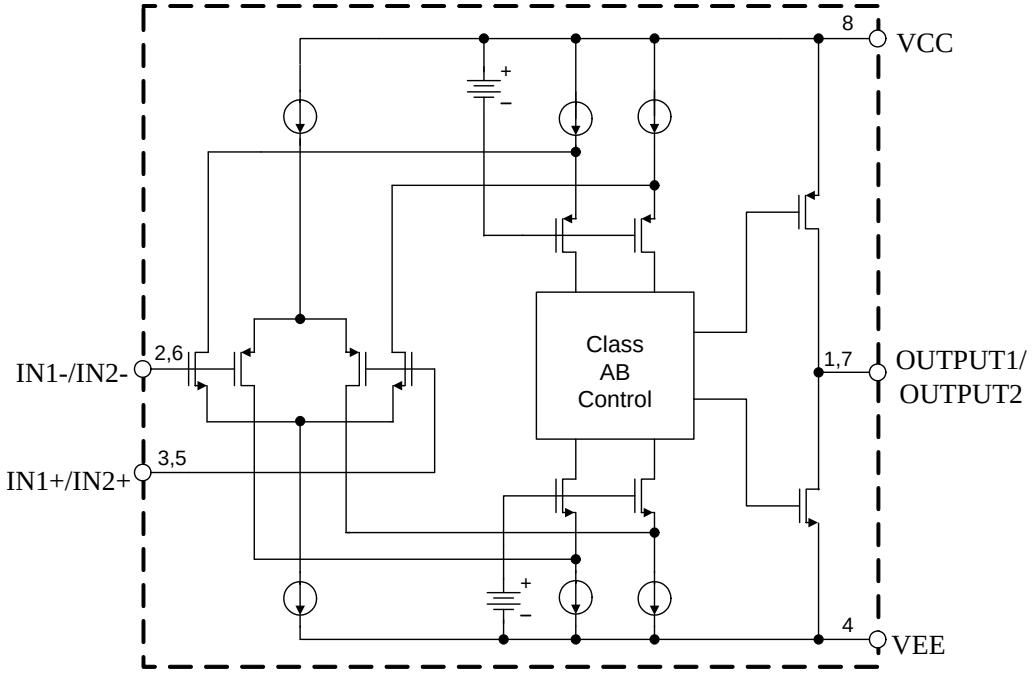
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

NEW PRODUCT

Functional Block Diagram



For AZV831



For AZV832/Amplifier

NEW PRODUCT

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Rating		Unit
V_{CC}	Power Supply Voltage	6.0		V
V_{ID}	Differential Input Voltage	6.0		V
V_{IN}	Input Voltage	-0.3 to V_{CC}+0.5		V
T_J	Operating Junction Temperature	+150		°C
θ_{JA}	Thermal Resistance (Junction to Ambient)	SOT-23-5	220	°C/W
		SOIC-8	150	
		MSOP-8	200	
T_{STG}	Storage Temperature Range	-65 to +150		°C
T_{LEAD}	Lead Temperature (Soldering,10 Seconds)	+260		°C
—	ESD (Human Body Model)	4000		V
—	ESD (Machine Model)	300		V

Note 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.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	1.6	5.5	V
T_A	Operating Ambient Temperature Range	-40	+85	°C

NEW PRODUCT

Electrical Characteristics

1.6V DC Electrical Characteristics (V_{CC} = 1.6V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter		Conditions	Min	Typ	Max	Unit
V_{OS}	Input Offset Voltage		—	—	0.5	2.5	mV
I_B	Input Bias Current		—	—	1.0	—	pA
I_{OS}	Input Offset Current		—	—	1.0	—	pA
V_{CM}	Input Common-mode Voltage Range		—	-0.2	—	1.8	V
CMRR	Common-mode Rejection Ratio		V_{CM} = -0.2V to 1.8V	55	75	—	dB
G_V	Large Signal Voltage Gain		R_L = 10kΩ to V_{CC}/2, V_{OUT} = 0.2V to 1.4V	90	110	—	dB
$\Delta V_{OS}/\Delta T$	Input Offset Voltage Drift		—	—	2.0	—	μV/°C
V_{OL}/V_{OH}	Output Voltage Swing from Rail		R_L = 1kΩ to V_{CC}/2	—	30	50	mV
			R_L = 10kΩ to V_{CC}/2	—	3	15	
I_{SINK}	Output Current	Sink	V_{OUT} = V_{CC}	8	10	—	mA
I_{SOURCE}		Source	V_{OUT} = 0V	5	8.5	—	
Z_{OUT}	Closed-loop Output Impedance		f = 10kHz, A_V = 1	—	9	—	Ω
PSRR	Power Supply Rejection Ratio		V_{CC} = 1.6V to 5.0V	66	80	—	dB
I_{CC}	Supply Current (Per Amplifier)		V_{OUT} = V_{CC}/2, I_{OUT} = 0	—	70	90	μA

1.6V AC Electrical Characteristics (V_{CC} = 1.6V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GBP	Gain Bandwidth Product	R_L = 100kΩ	—	1.0	—	MHz
SR	Slew Rate (Note 5)	1V Step, C_L = 100pF, R_L = 10kΩ	—	0.32	—	V/μs
φ_M	Phase Margin	R_L = 100kΩ	—	67	—	Degrees
THD+N	Total Harmonic Distortion+Noise	f = 1kHz, A_V = 1, V_{IN} = 1V_{pp} R_L = 10kΩ, C_L = 100pF	—	-70	—	dB
e_n	Voltage Noise Density	f = 1kHz	—	27	—	$nV/\sqrt{Hz}$

Note 5: Number specified is the positive slew rate.

NEW PRODUCT

Electrical Characteristics (Cont.)

1.8V DC Electrical Characteristics (V_{CC} = 1.8V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter		Conditions	Min	Typ	Max	Unit
V_{OS}	Input Offset Voltage		—	—	0.5	2.5	mV
I_B	Input Bias Current		—	—	1.0	—	pA
I_{OS}	Input Offset Current		—	—	1.0	—	pA
V_{CM}	Input Common-mode Voltage Range		—	-0.2	—	2.0	V
CMRR	Common-mode Rejection Ratio		V_{CM} = -0.2V to 2.0V	55	75	—	dB
G_V	Large Signal Voltage Gain		R_L = 10kΩ to V_{CC}/2, V_{OUT} = 0.2V to 1.6V	90	112	—	dB
$\Delta V_{OS}/\Delta T$	Input Offset Voltage Drift		—	—	2.0	—	µV/°C
V_{OL}/V_{OH}	Output Voltage Swing from Rail		R_L = 1kΩ to V_{CC}/2	—	25	50	mV
			R_L = 10kΩ to V_{CC}/2	—	3	15	
I_{SINK}	Output Current	Sink	V_{OUT} = V_{CC}	12	16	—	mA
I_{SOURCE}		Source	V_{OUT} = 0V	10	14	—	
Z_{OUT}	Closed-loop Output Impedance		f = 10kHz	—	9	—	Ω
PSRR	Power Supply Rejection Ratio		V_{CC} = 1.6V to 5.0V	66	80	—	dB
I_{CC}	Supply Current (Per Amplifier)		V_{OUT} = V_{CC}/2, I_{OUT} = 0	—	70	90	µA

1.8V AC Electrical Characteristics (V_{CC} = 1.8V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GBP	Gain Bandwidth Product	R_L = 100kΩ	—	1.0	—	MHz
SR	Slew Rate (Note 5)	1V Step, C_L = 100pF, R_L = 10kΩ	—	0.34	—	V/µs
φ_M	Phase Margin	R_L = 100kΩ	—	67	—	Degrees
THD+N	Total Harmonic Distortion+Noise	f = 1kHz, A_V = 1, V_{IN} = 1V_{pp} R_L = 10kΩ, C_L = 100pF	—	-70	—	dB
e_n	Voltage Noise Density	f = 1kHz	—	27	—	$nV/\sqrt{Hz}$

Note 5: Number specified is the positive slew rate.

NEW PRODUCT

Electrical Characteristics (Cont.)

3.0V DC Electrical Characteristics (V_{CC} = 3.0V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter		Conditions	Min	Typ	Max	Unit
V_{OS}	Input Offset Voltage		—	—	0.5	2.5	mV
I_B	Input Bias Current		—	—	1.0	—	pA
I_{OS}	Input Offset Current		—	—	1.0	—	pA
V_{CM}	Input Common-mode Voltage Range		—	-0.3	—	3.3	V
CMRR	Common-mode Rejection Ratio		V_{CM} = -0.3V to 1.8V	62	80	—	dB
			V_{CM} = -0.3V to 3.3V	58	75	—	
G_V	Large Signal Voltage Gain		R_L = 1kΩ to V_{CC}/2 , V_{OUT} = 0.2V to 2.8V	90	110	—	dB
			R_L = 10kΩ to V_{CC}/2, V_{OUT} = 0.1V to 2.9V	95	115	—	
$\Delta V_{OS}/\Delta T$	Input Offset Voltage Drift		—	—	2.0	—	µV/°C
V_{OL}/V_{OH}	Output Voltage Swing from Rail		R_L = 1kΩ to V_{CC}/2	—	20	50	mV
			R_L = 10kΩ to V_{CC}/2	—	3	15	
I_{SINK}	Output Current	Sink	V_{OUT} = V_{CC}	50	60	—	mA
I_{SOURCE}		Source	V_{OUT} = 0V	50	65	—	
Z_{OUT}	Closed-loop Output Impedance		f = 10kHz	—	9	—	Ω
PSRR	Power Supply Rejection Ratio		V_{CC} = 1.6V to 5.0V	66	80	—	dB
I_{CC}	Supply Current (Per Amplifier)		V_{OUT} = V_{CC}/2, I_{OUT} = 0	—	70	90	µA

3.0V AC Electrical Characteristics (V_{CC} = 3.0V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GBP	Gain Bandwidth Product	R_L = 100kΩ	—	1.0	—	MHz
SR	Slew Rate (Note 5)	G = 1, 2V Step, C_L = 100pF, R_L = 10kΩ	—	0.40	—	V/µs
φ_M	Phase Margin	R_L = 100kΩ	—	67	—	Degrees
THD+N	Total Harmonic Distortion+Noise	f = 1kHz, G = 1, V_{IN} = 1V_{pp} R_L = 10kΩ, C_L = 100pF	—	-70	—	dB
e_n	Voltage Noise Density	f = 1kHz	—	27	—	$nV/\sqrt{Hz}$

Note 5: Number specified is the positive slew rate.

NEW PRODUCT

Electrical Characteristics (Cont.)

5.0V DC Electrical Characteristics (V_{CC} = 5.0V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

Symbol	Parameter		Conditions	Min	Typ	Max	Unit
V_{OS}	Input Offset Voltage		—	—	0.5	2.5	mV
I_B	Input Bias Current		—	—	1.0	—	pA
I_{OS}	Input Offset Current		—	—	1.0	—	pA
V_{CM}	Input Common-mode Voltage Range		—	-0.3	—	5.3	V
CMRR	Common-mode Rejection Ratio		V_{CM} = -0.3V to 3.8V	70	85	—	dB
			V_{CM} = -0.3V to 5.3V	65	90	—	
G_V	Large Signal Voltage Gain		R_L = 1kΩ to V_{CC}/2, V_{OUT} = 0.2V to 4.8V	80	92	—	dB
			R_L = 10kΩ to V_{CC}/2, V_{OUT} = 0.05V to 4.95V	85	98	—	
$\Delta V_{OS}/\Delta T$	Input Offset Voltage Drift		—	—	2.0	—	µV/°C
V_{OL}/V_{OH}	Output Voltage Swing from Rail		R_L = 1kΩ to V_{CC}/2	—	25	50	mV
			R_L = 10kΩ to V_{CC}/2	—	4	15	
I_{SINK}	Output Current	Sink	V_{OUT} = V_{CC}	100	150	—	mA
I_{SOURCE}		Source	V_{OUT} = 0V	110	185	—	
—	Closed-loop Output Impedance		f = 1kHz, A_V = 1	—	9	—	Ω
PSRR	Power Supply Rejection Ratio		V_{CC} = 1.6V to 5.0V	66	80	—	dB
I_{CC}	Supply Current (Per Amplifier)		V_{OUT} = V_{CC}/2, I_{OUT} = 0	—	70	90	µA

5.0V AC Electrical Characteristics (V_{CC} = 5.0V, V_{EE} = 0, V_{OUT} = V_{CC}/2, V_{CM} = V_{CC}/2, T_A = +25°C, unless otherwise noted.)

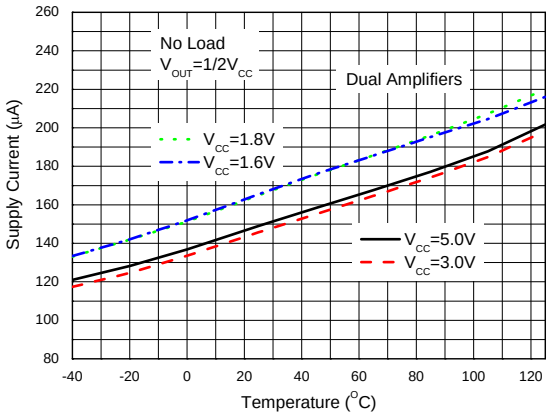
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GBP	Gain Bandwidth Product	R_L = 100kΩ	—	1.0	—	MHz
SR	Slew Rate (Note 5)	2V Step, C_L = 100pF, R_L = 10kΩ	—	0.45	—	V/µs
φ_M	Phase Margin	R_L = 100kΩ	—	67	—	Degrees
THD+N	THD+N	f = 1kHz, A_V = 1, V_{IN} = 1V_{PP} R_L = 10kΩ, C_L = 100pF	—	-70	—	dB
e_n	Voltage Noise Density	f = 1kHz	—	27	—	$nV/\sqrt{Hz}$

Note 5: Number specified is the positive slew rate.

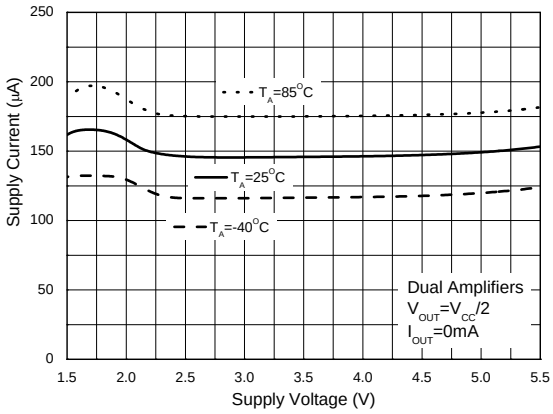
NEW PRODUCT

Performance Characteristics

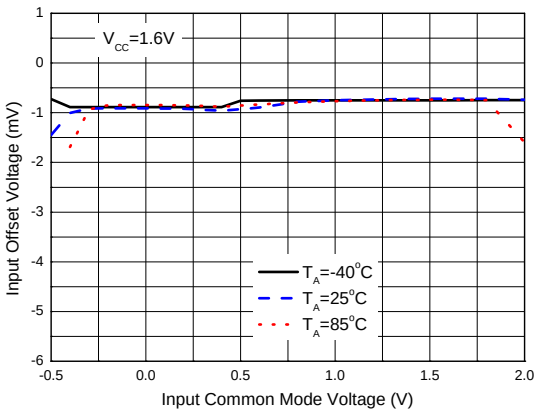
Supply Current vs. Temperature



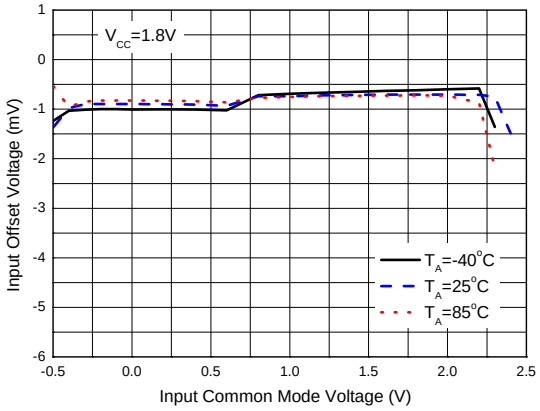
Supply Current vs. Supply Voltage



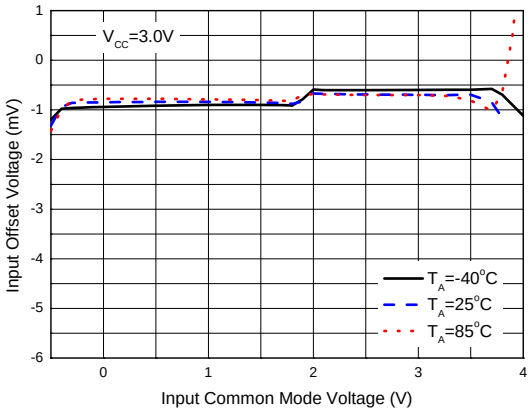
Input Offset Voltage vs. Input Common Mode Voltage



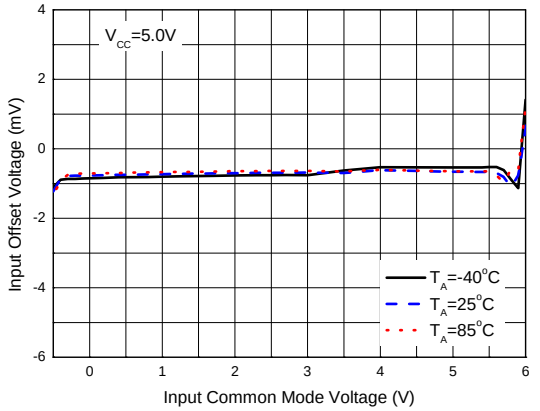
Input Offset Voltage vs. Input Common Mode Voltage



Input Offset Voltage vs. Input Common Mode Voltage



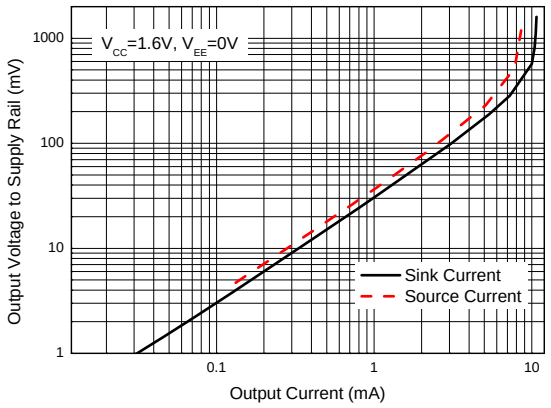
Input Offset Voltage vs. Input Common Mode Voltage



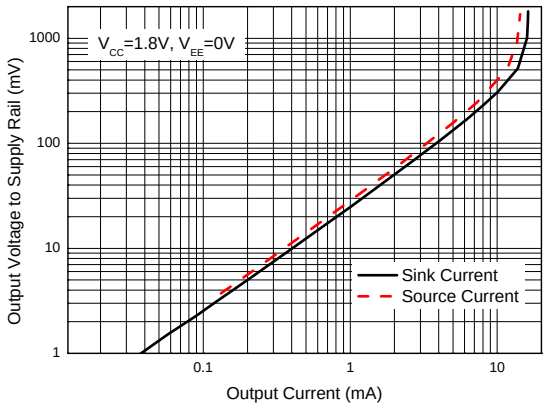
NEW PRODUCT

Performance Characteristics (Cont.)

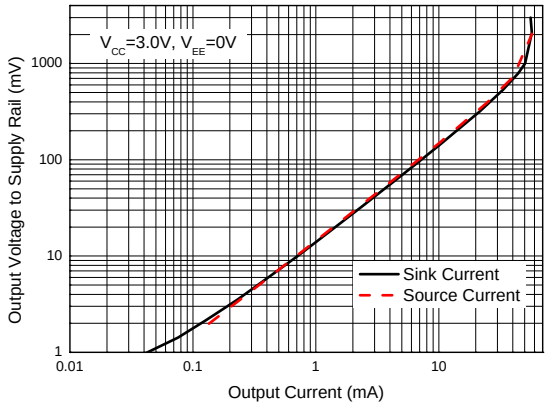
Output Voltage vs. Output Current



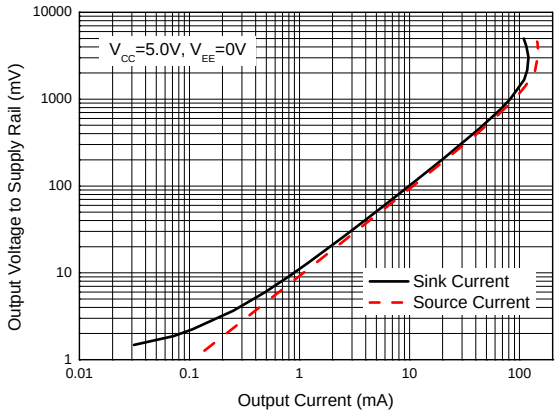
Output Voltage vs. Output Current



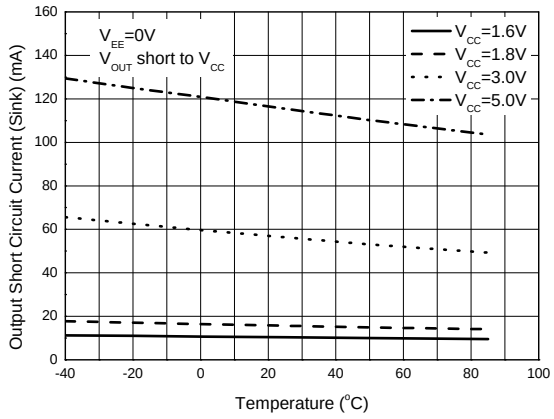
Output Voltage vs. Output Current



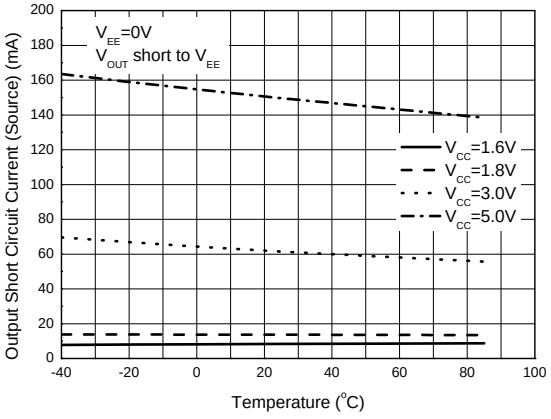
Output Voltage vs. Output Current



Output Short Circuit Current vs. Temperature



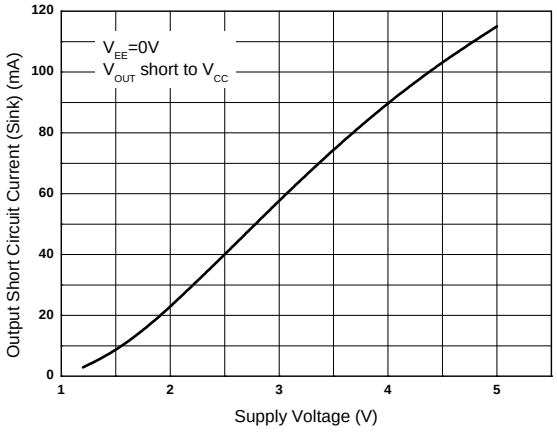
Output Short Circuit Current vs. Temperature



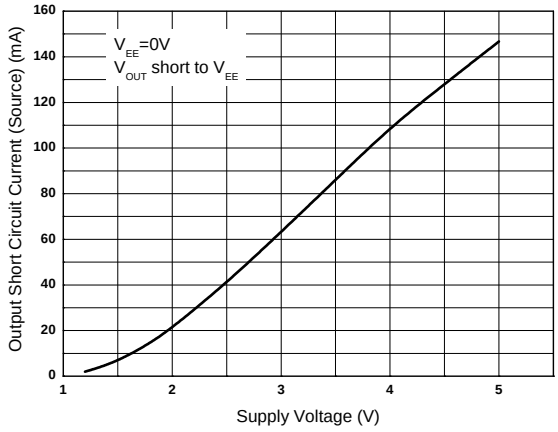
NEW PRODUCT

Performance Characteristics (Cont.)

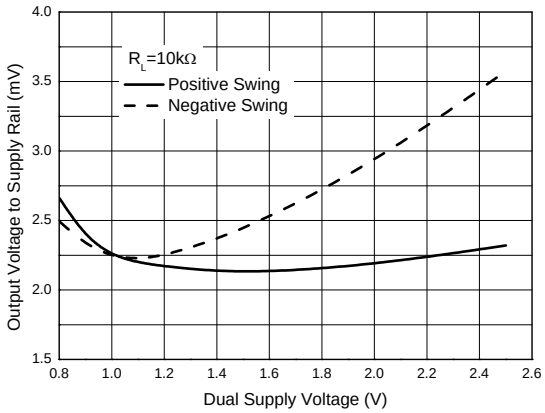
Output Short Circuit Current vs. Supply Voltage



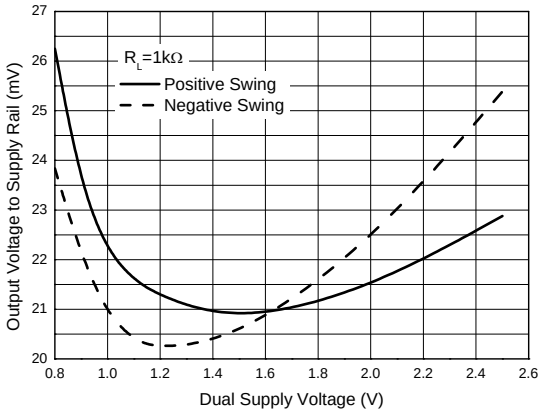
Output Short Circuit Current vs. Supply Voltage



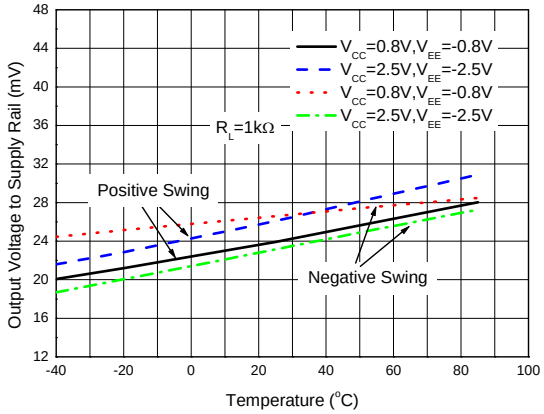
Output Voltage Swing vs. Supply Voltage



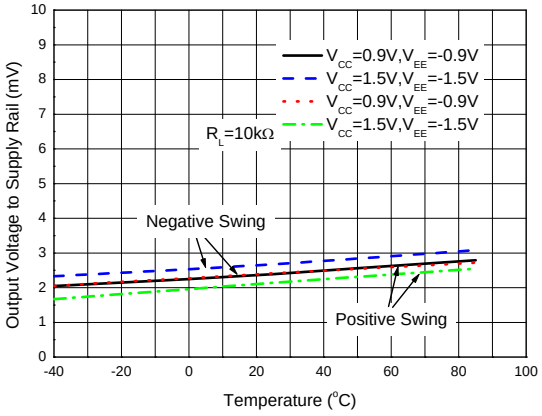
Output Voltage Swing vs. Supply Voltage



Output Voltage Swing vs. Temperature



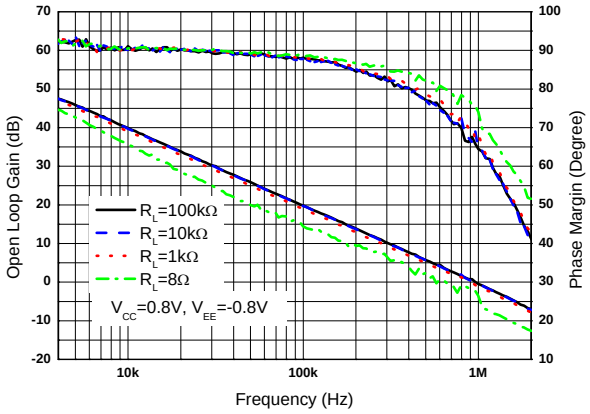
Output Voltage Swing vs. Temperature



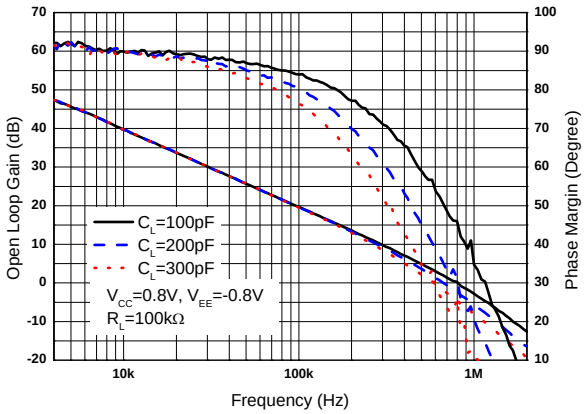
NEW PRODUCT

Performance Characteristics (Cont.)

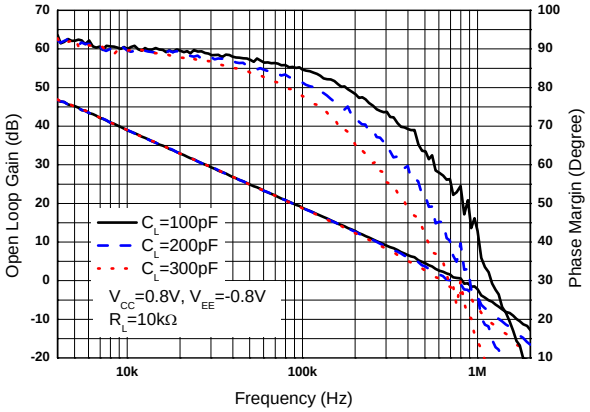
Gain and Phase vs. Frequency with Resistive Load



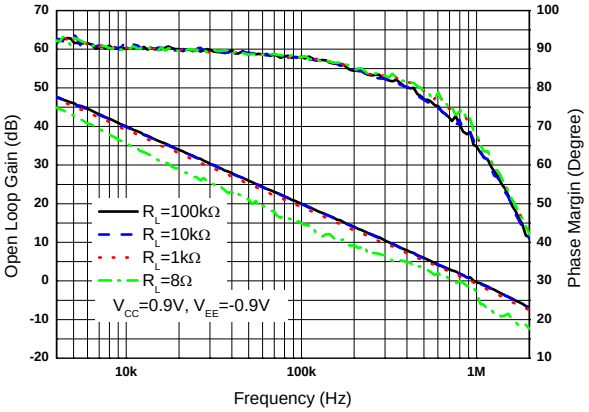
Gain and Phase vs. Frequency with Capacitive Load



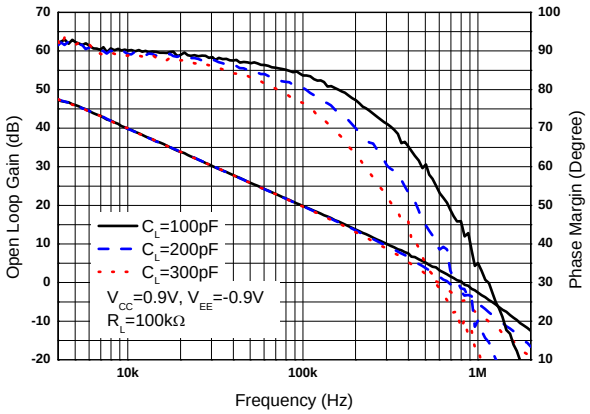
Gain and Phase vs. Frequency with Capacitive Load



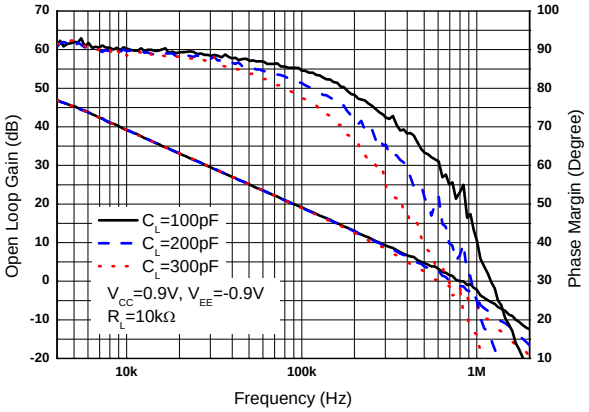
Gain and Phase vs. Frequency with Resistive Load



Gain and Phase vs. Frequency with Capacitive Load



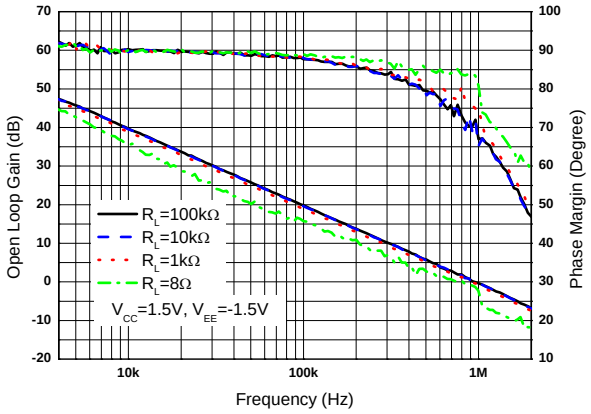
Gain and Phase vs. Frequency with Capacitive Load



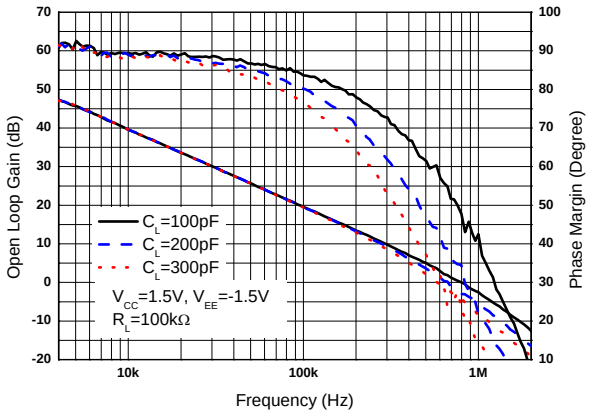
NEW PRODUCT

Performance Characteristics (Cont.)

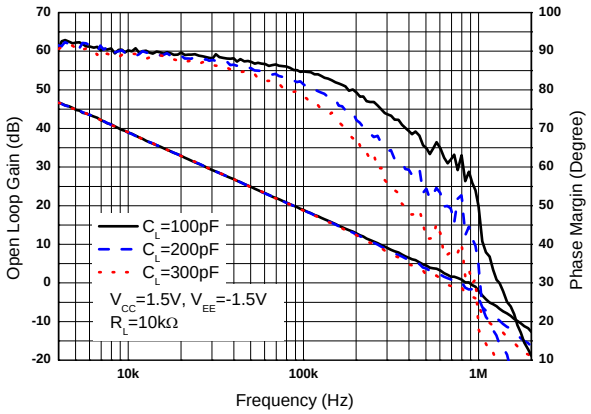
Gain and Phase vs. Frequency with Resistive Load



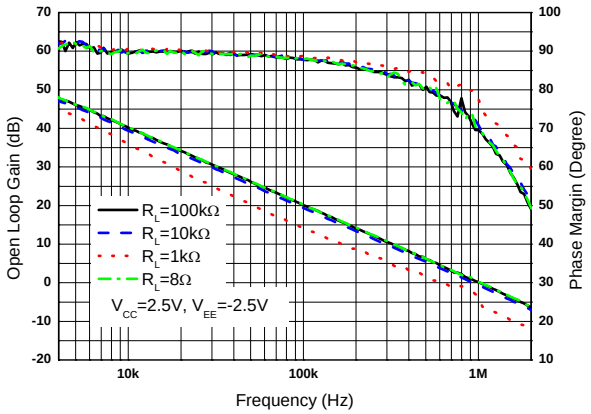
Gain and Phase vs. Frequency with Capacitive Load



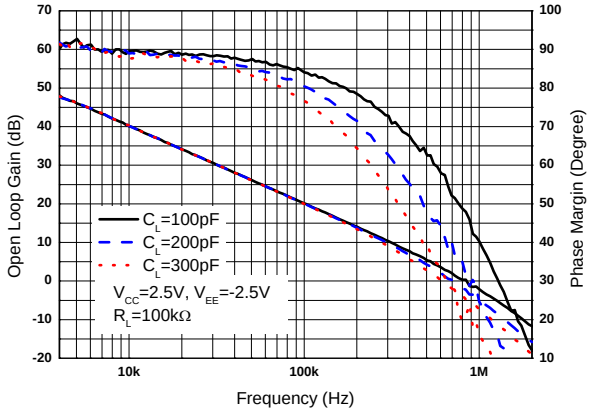
Gain and Phase vs. Frequency with Capacitive Load



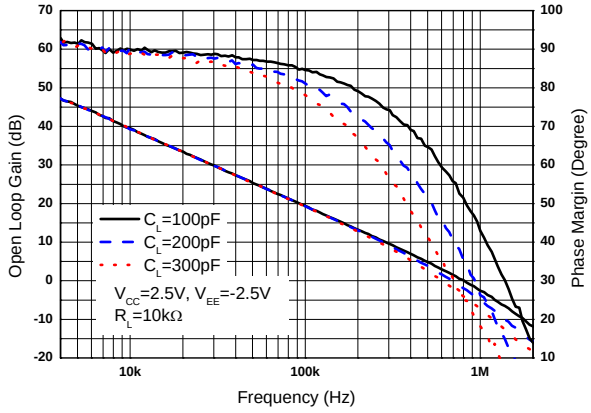
Gain and Phase vs. Frequency with Resistive Load



Gain and Phase vs. Frequency with Capacitive Load



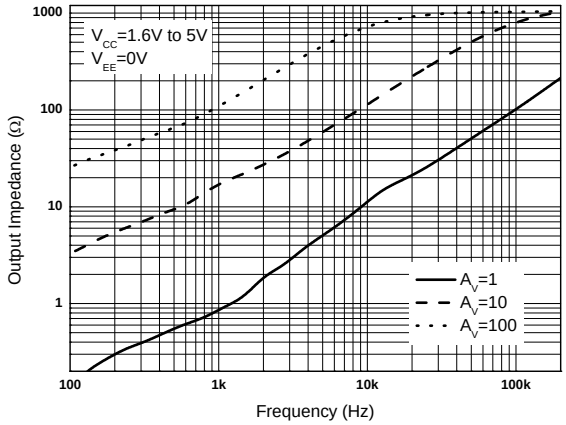
Gain and Phase vs. Frequency with Capacitive Load



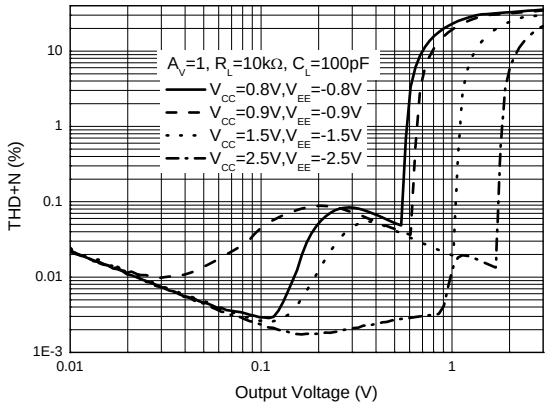
NEW PRODUCT

Performance Characteristics (Cont.)

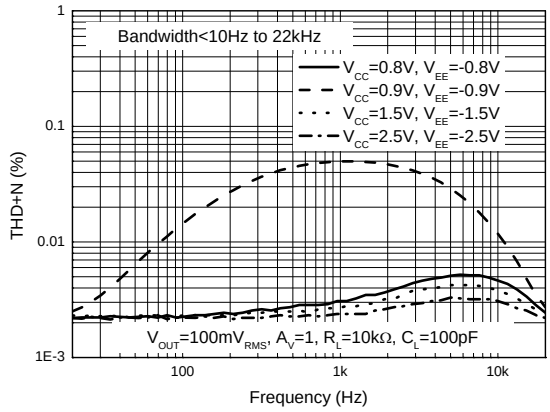
Output Impedance vs. Frequency



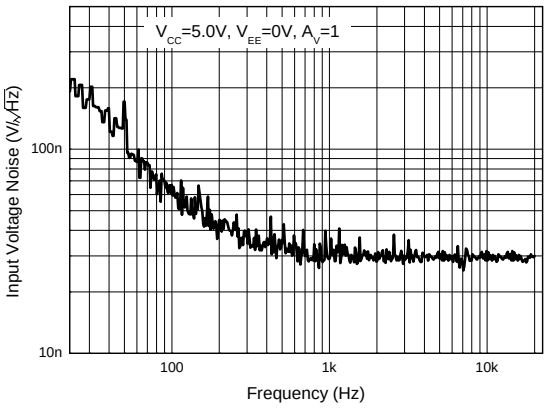
THD+N vs. Output Voltage



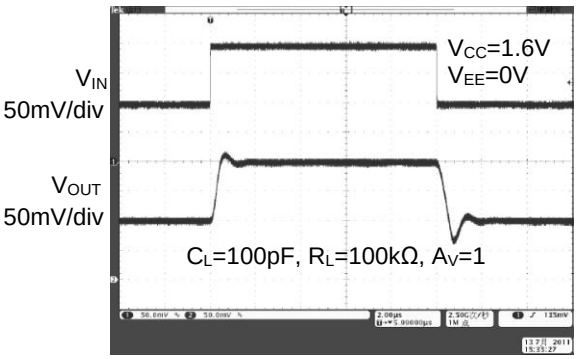
THD+N vs. Frequency



Input Voltage Noise Density

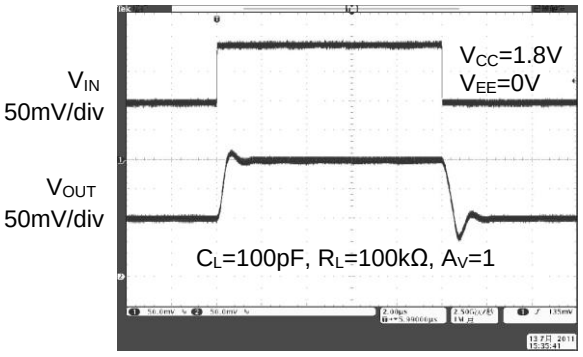


Small Signal Pulse Response



Time (2µs/div)

Small Signal Pulse Response

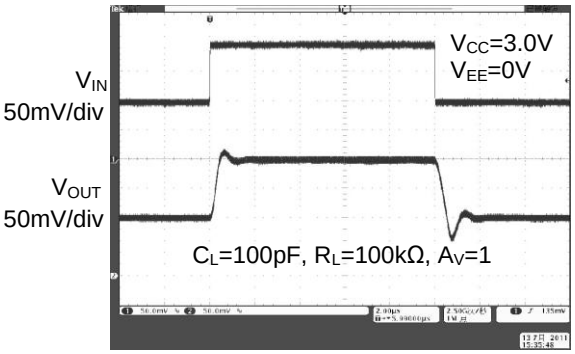


Time (2µs/div)

NEW PRODUCT

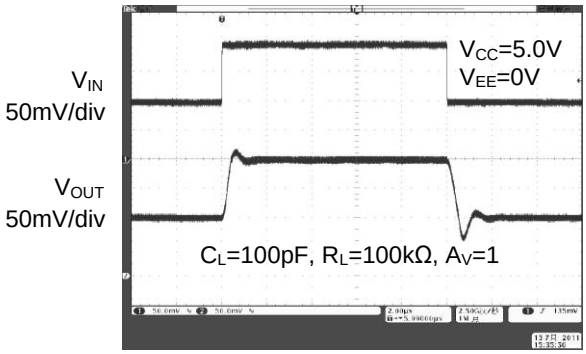
Performance Characteristics (Cont.)

Small Signal Pulse Response



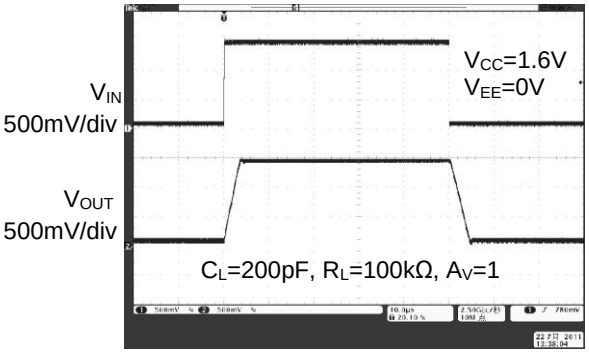
Time (2µs/div)

Small Signal Pulse Response



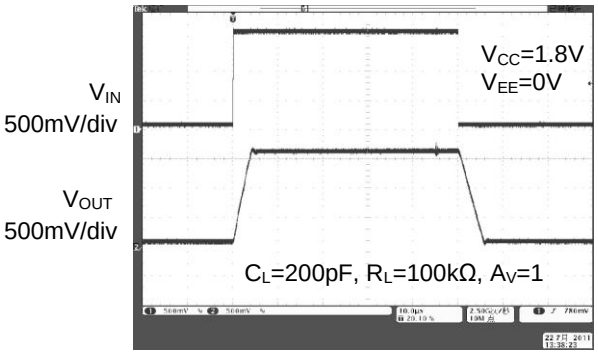
Time (2µs/div)

Large Signal Pulse Response



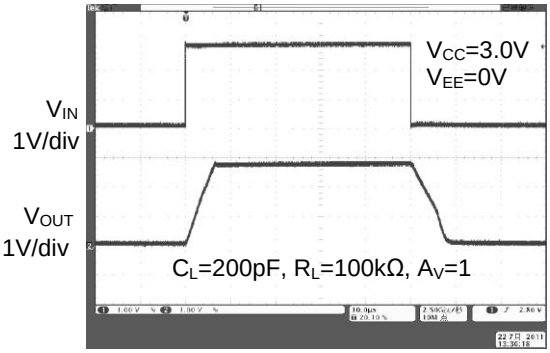
Time (10µs/div)

Large Signal Pulse Response



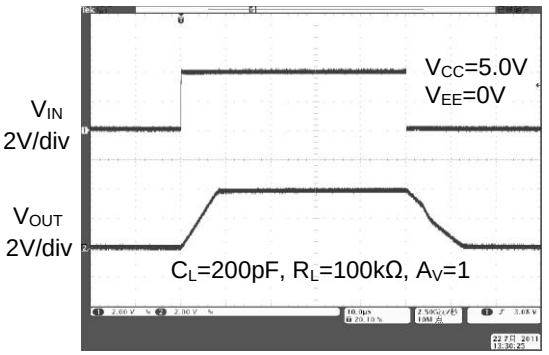
Time (10µs/div)

Large Signal Pulse Response



Time (10µs/div)

Large Signal Pulse Response

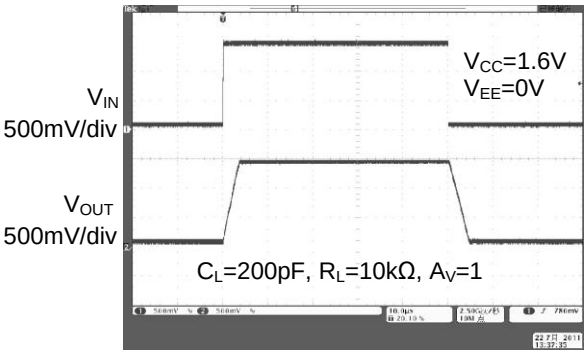


Time (10µs/div)

NEW PRODUCT

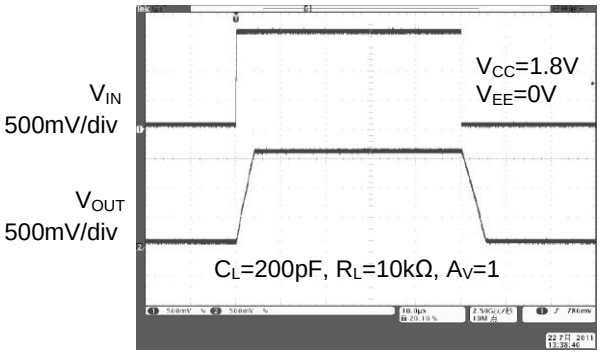
Performance Characteristics (Cont.)

Large Signal Pulse Response



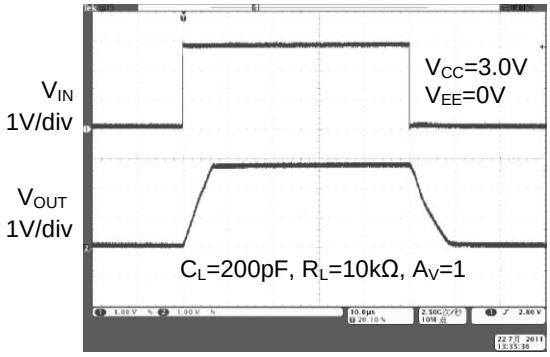
Time (10µs/div)

Large Signal Pulse Response



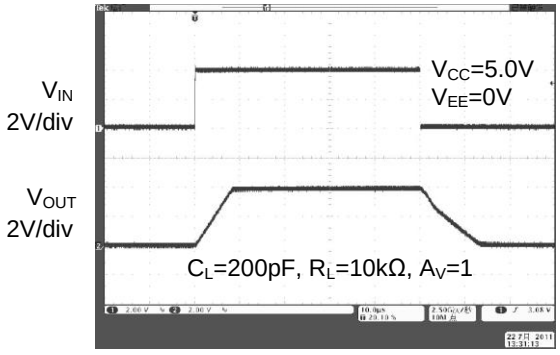
Time (10µs/div)

Large Signal Pulse Response



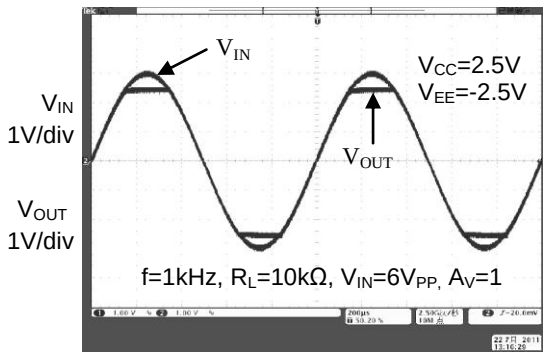
Time (10µs/div)

Large Signal Pulse Response



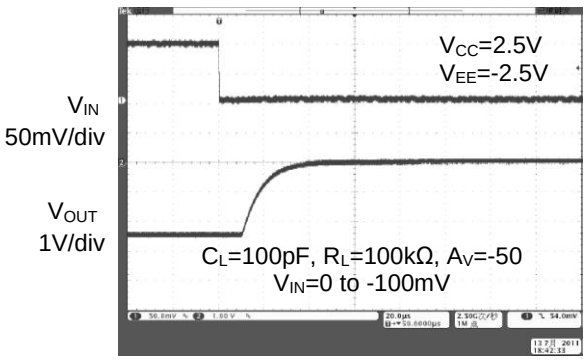
Time (10µs/div)

No Phase Reversal



Time (200µs/div)

Overload Recovery Time

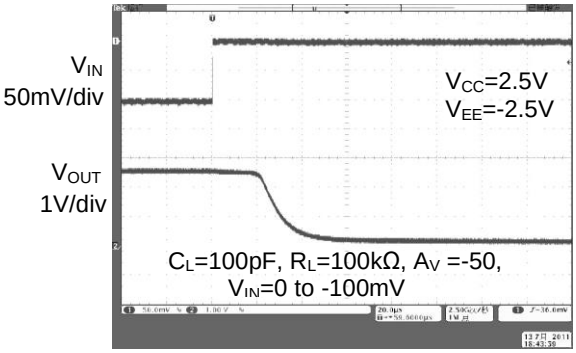


Time (20µs/div)

NEW PRODUCT

Performance Characteristics (Cont.)

Overload Recovery Time



Time (20µs/div)

NEW PRODUCT

Ordering Information

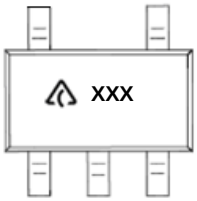
AZV831/2 X X - X

Product Name	Package	Packing	RoHS/Green
	K : SOT-23-5 (AZV831) M : SOIC-8 (AZV832) MM : MSOP-8 (AZV832)	TR : Tape & Reel	G1 : Green

Package	Temperature Range	Part Number	Marking ID	Packing
SOT-23-5	-40 to +85°C	AZV831KTR-G1	G4D	3000/7" Tape & Reel
SOIC-8	-40 to +85°C	AZV832MTR-G1	832M-G1	4000/13" Tape & Reel
MSOP-8	-40 to +85°C	AZV832MMTR-G1	832MM-G1	4000/13" Tape & Reel

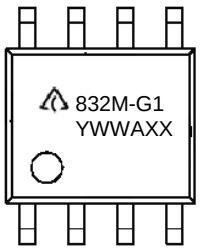
Marking Information

(1) SOT-23-5



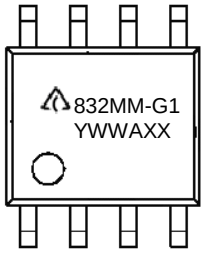
: Logo
XXX: Marking ID (See Ordering Information)

(2) SOIC-8



First Lines: Logo and Marking ID (See Ordering Information)
Second Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: 7th and 8th Digits of Batch Number

(3) MSOP-8

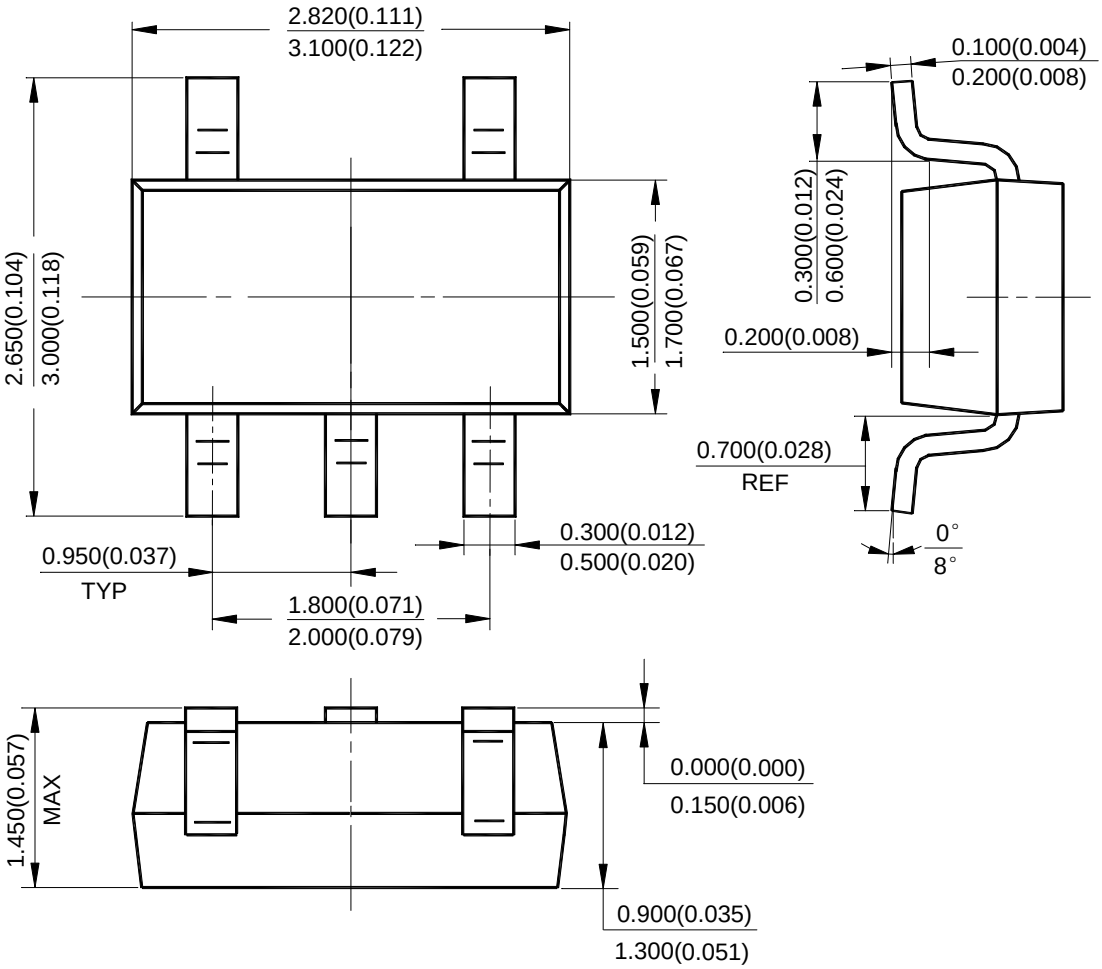


First Lines: Logo and Marking ID (See Ordering Information)
Second Line: Date Code
Y: Year
WW: Work Week of Molding
A: Assembly House Code
XX: 7th and 8th Digits of Batch Number

NEW PRODUCT

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

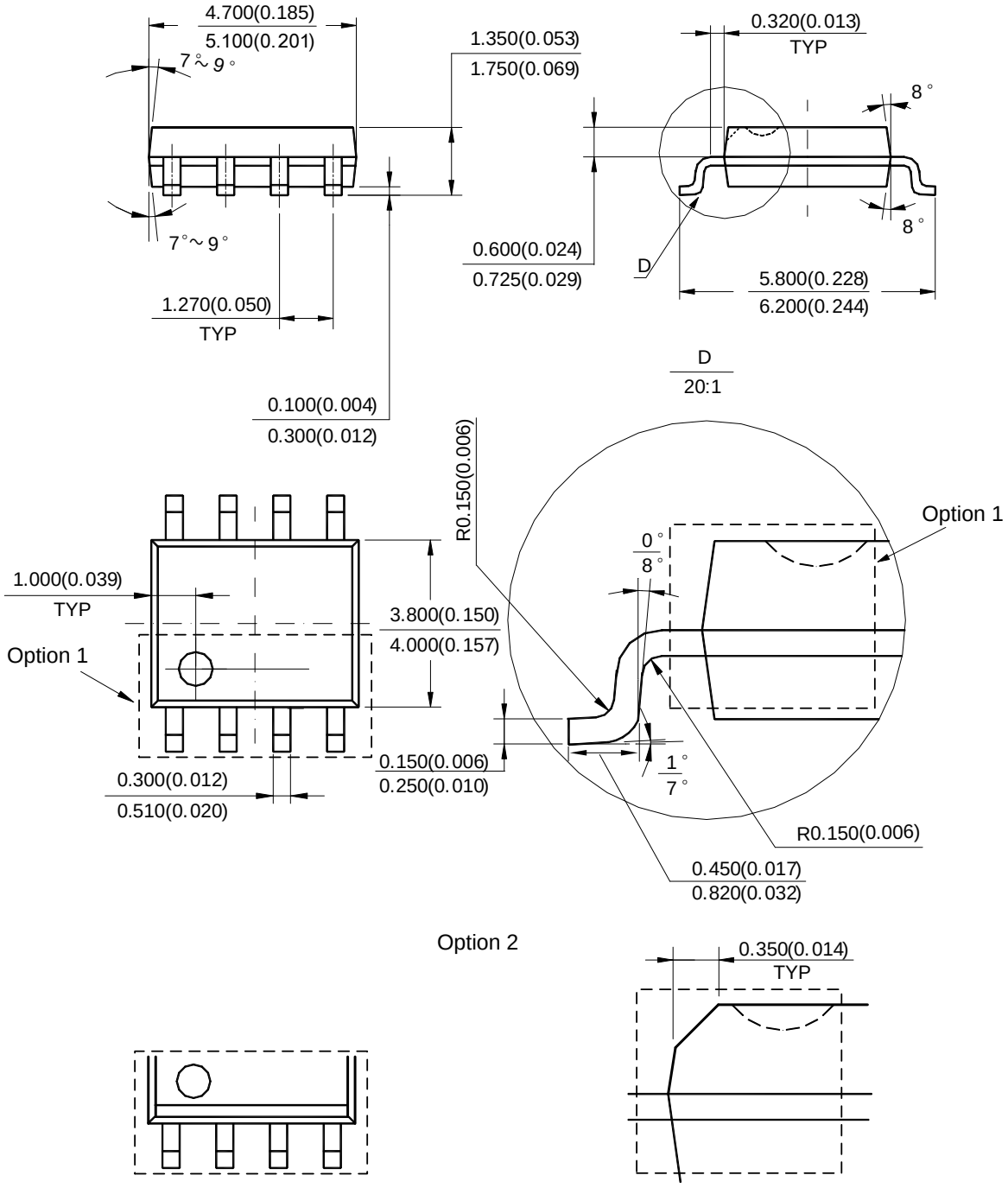
(1) Package Type: SOT-23-5



NEW PRODUCT

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

(2) Package Type: SOIC-8

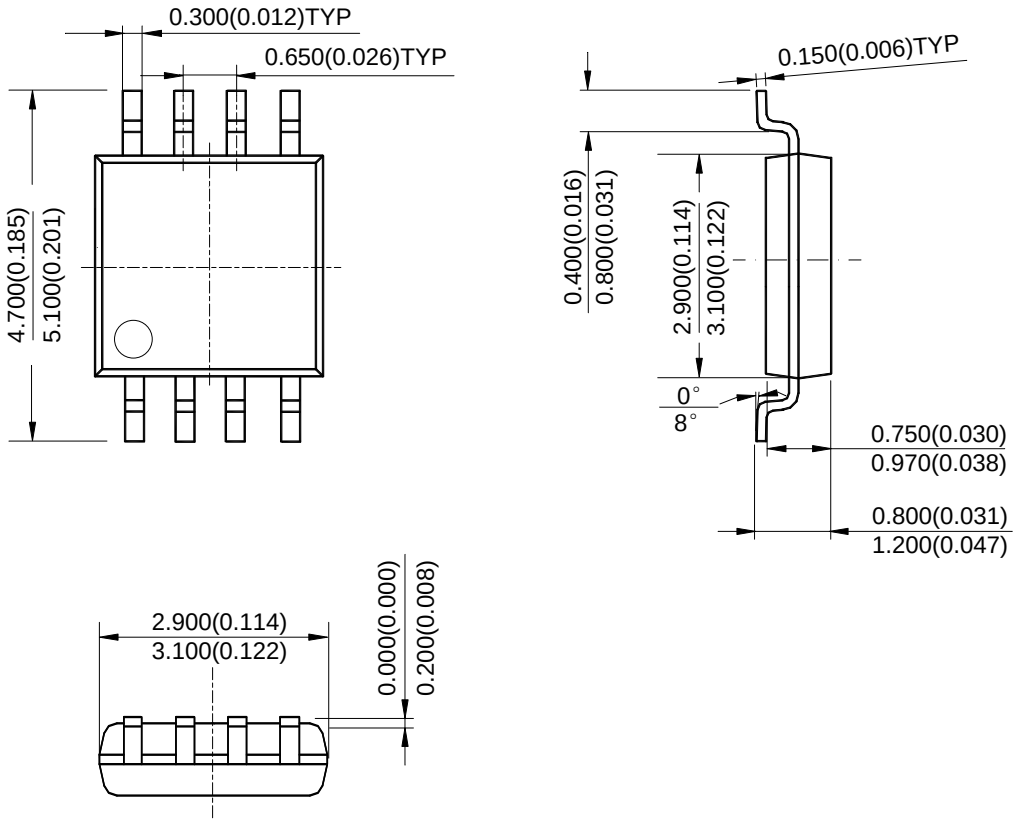


Note: Eject hole, oriented hole and mold mark is optional.

NEW PRODUCT

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

(3) Package Type: MSOP-8

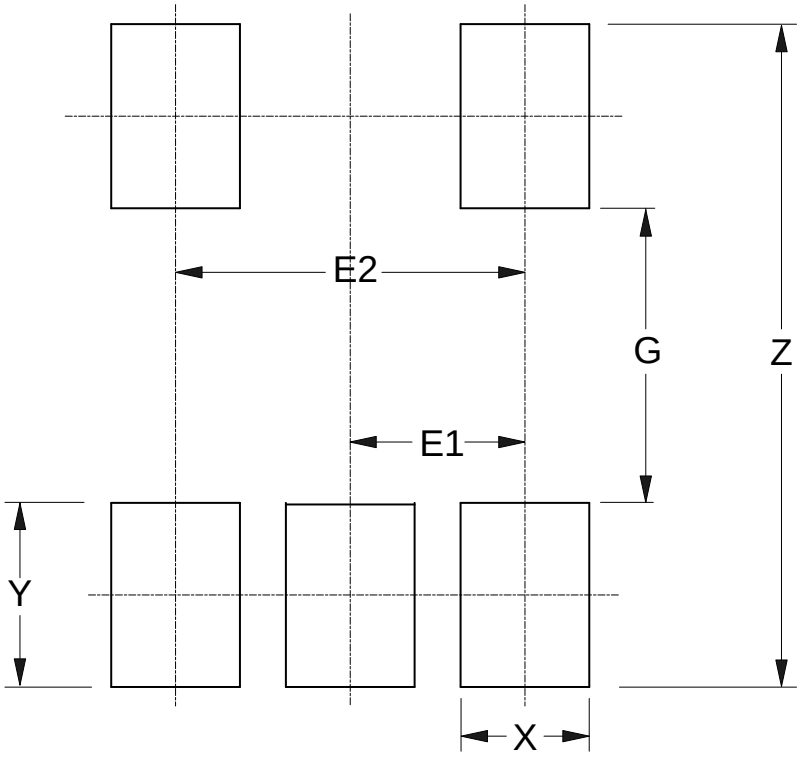


Note: Eject hole, oriented hole and mold mark is optional.

NEW PRODUCT

Suggested Pad Layout

(1) Package Type: SOT-23-5

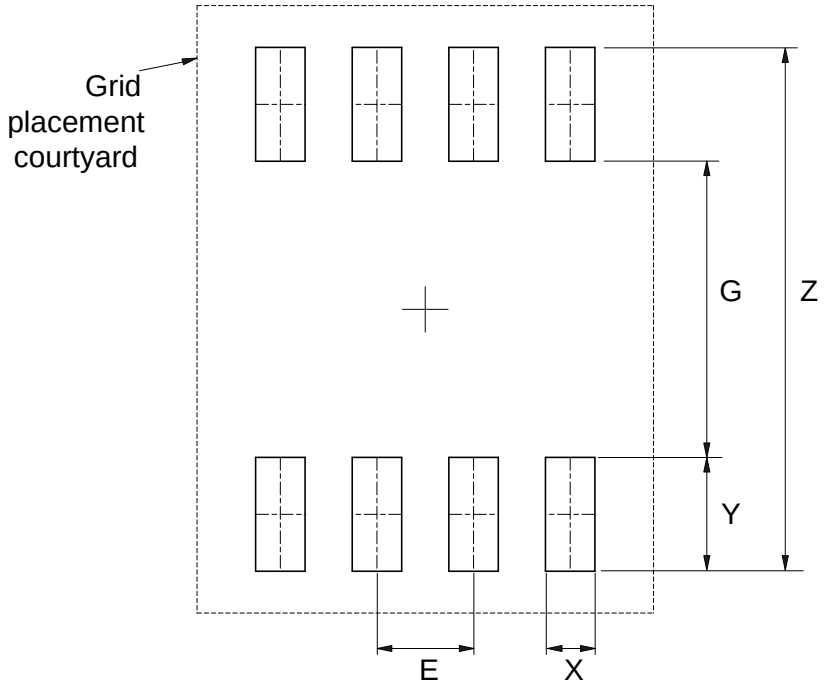


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

NEW PRODUCT

Suggested Pad Layout (Cont.)

(2) Package Type: SOIC-8

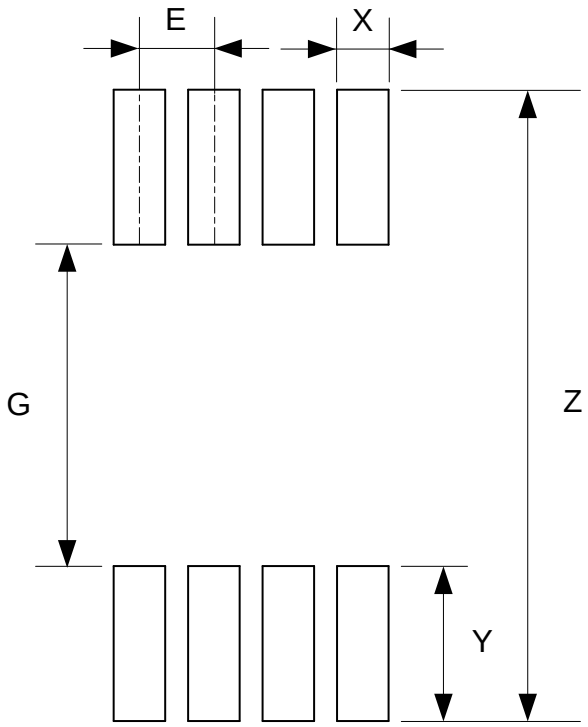


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	6.900/0.272	3.900/0.154	0.650/0.026	1.500/0.059	1.270/0.050

NEW PRODUCT

Suggested Pad Layout (Cont.)

(3) Package Type: MSOP-8



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	5.500/0.217	2.800/0.110	0.450/0.018	1.350/0.053	0.650/0.026

NEW PRODUCT

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