## General Description

The AZV321 is single low voltage (2.7-5.5V) op amp 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.

AZV321 is available in the package of SC70-5, 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.

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

## 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$^o$C to +85$^o$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
- $V_{CM}$: -0.2V to $V_{CC}$-0.8V

## Applications

- Active Filters
- Low Power, Low Voltage Applications
- General Purpose Portable Devices
- Cellular Phone, Cordless Phone
- Battery-Powered Systems

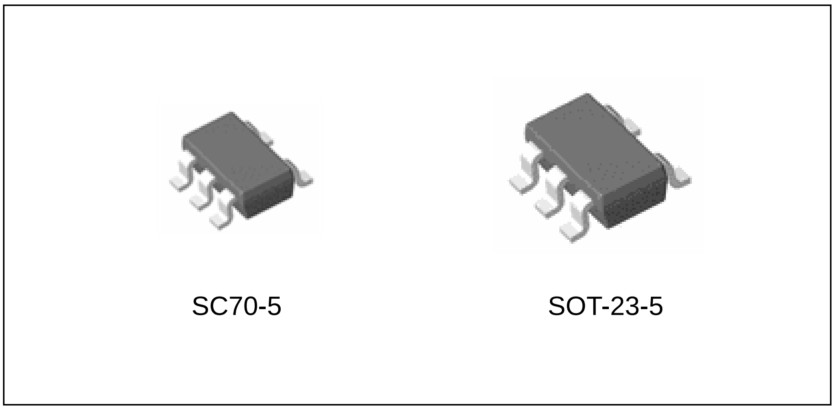



Figure 1. Package Types of AZV321

## Pin Configuration

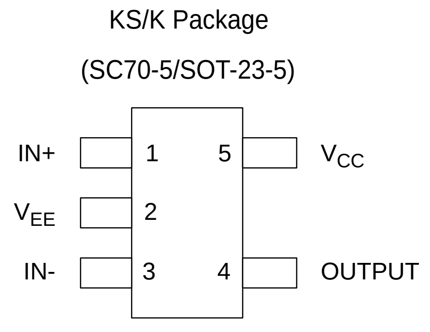



Figure 2. Pin Configuration of AZV321 (Top View)

## Functional Block Diagram

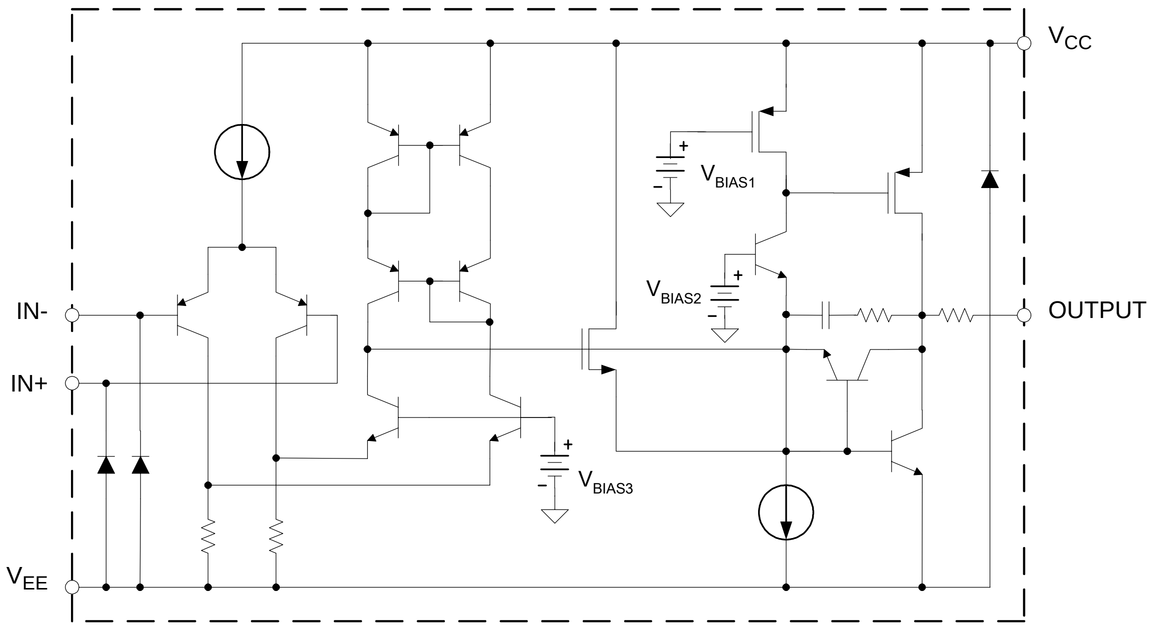
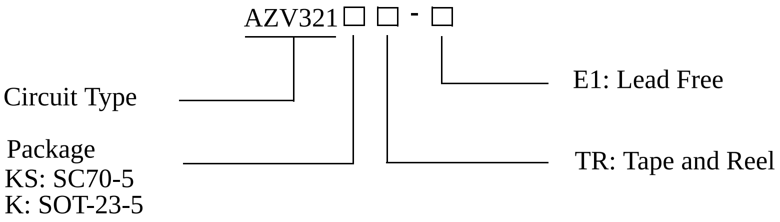



Figure 3. Functional Block Diagram of AZV321

## Ordering Information




| Package | Temperature Range | Part Number | Marking ID | Packing Type |
|---|---|---|---|---|
| | | Lead Free | Lead Free | |
| SC70-5 | -40 to 85$^o$C | AZV321KSTR-E1 | 21 | Tape & Reel |
| SOT-23-5 | -40 to 85$^o$C | AZV321KTR-E1 | E6T | Tape & Reel |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

## Absolute Maximum Ratings (Note 1)

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

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.

## Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 2.7 | 5.5 | V |
| Ambient Operating Temperature Range | $T_A$ | -40 | 85 | $^o$C |

## 2.7V Electrical Characteristics

All limits are guaranteed for $T_A$=25$^o$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 to 85$^o$C, unless otherwise specified. (Note 2)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | | | 1.7 | 7 | mV |
| | | | | | **9** | |
| Input Bias Current | $I_B$ | | | 11 | 250 | nA |
| | | | | | **500** | |
| Input Offset Current | $I_{IO}$ | | | 5 | 50 | nA |
| | | | | | **150** | |
| Input Common Mode Voltage Range | $V_{CM}$ | for CMRR≥50dB | -0.2 | | 1.9 | V |
| Supply Current | $I_{CC}$ | $V_O$=$V_{CC}$/2, $A_{VCL}$=1, no load | | 80 | 170 | μA |
| | | | | | **270** | |
| Common Mode Rejection Ratio | CMRR | 0≤$V_{CM}$≤1.7V | 50 | 65 | | dB |
| Power Supply Rejection Ratio | PSRR | 2.7V≤$V_{CC}$≤5V $V_O$=1V, | 50 | 60 | | dB |
| Output Short Circuit Current | $I_{SOURCE}$ | $V_O$=0V | 5 | 20 | | mA |
| | $I_{SINK}$ | $V_O$=2.7V | 10 | 30 | | mA |
| Output Voltage Swing | $V_{OH}$ | $R_L$=10kΩ to 1.35V | 2.60 | 2.69 | | V |
| | $V_{OL}$ | | | 60 | 180 | mV |
| Gain Bandwidth Product | GBWP | $C_L$=200pF | | 1 | | MHz |
| Phase Margin | $\phi_M$ | | | 60 | | Deg |
| Gain Margin | $G_M$ | | | 10 | | dB |

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

## 5V Electrical Characteristics

All limits are guaranteed for $T_A$=25$^o$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 to 85$^o$C,unless otherwise specified. (Note 2)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | | | 1.7 | 7 | mV |
| | | | | | **9** | |
| Input Bias Current | $I_B$ | | | 11 | 250 | nA |
| | | | | | **500** | |
| Input Offset Current | $I_{IO}$ | | | 5 | 50 | nA |
| | | | | | **150** | |
| Input Common Mode Voltage Range | $V_{CM}$ | for CMRR≥50dB | -0.2 | | 4.2 | V |
| Supply Current | $I_{CC}$ | $V_O$=$V_{CC}$/2, $A_{VCL}$=1, no load | | 130 | 250 | μA |
| | | | | | **350** | |
| Large Signal Voltage Gain | $G_V$ | $R_L$=2kΩ | 84 | 100 | | dB |
| | | | **80** | | | |
| Common Mode Rejection Ratio | CMRR | 0≤$V_{CM}$≤4V | 50 | 65 | | dB |
| Power Supply Rejection Ratio | PSRR | 2.7V≤$V_{CC}$≤5V $V_O$=1V, $V_{CM}$=1V | 50 | 60 | | dB |
| Output Short Circuit Current | $I_{SOURCE}$ | $V_O$=0V | 5 | 60 | | mA |
| | $I_{SINK}$ | $V_O$=5V | 10 | 160 | | mA |
| Output Voltage Swing | $V_{OH}$ | $R_L$=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** | |
| Slew Rate | SR | | | 1 | | V/μS |
| Gain Bandwidth Product | GBWP | $C_L$=200pF | | 1 | | MHz |
| Phase Margin | $\phi_M$ | | | 60 | | Deg |
| Gain Margin | $G_M$ | | | 10 | | dB |

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

## Typical Performance Characteristics

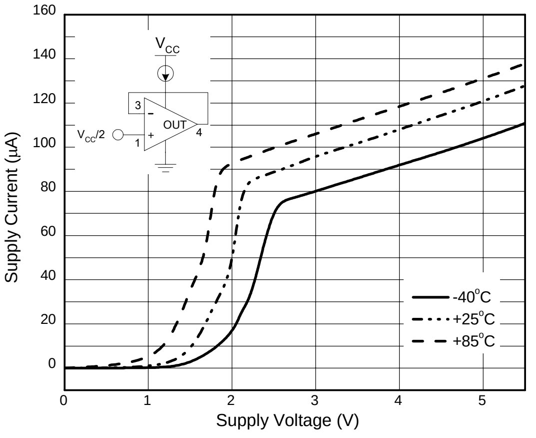



Figure 4. Supply Current vs. Supply Voltage

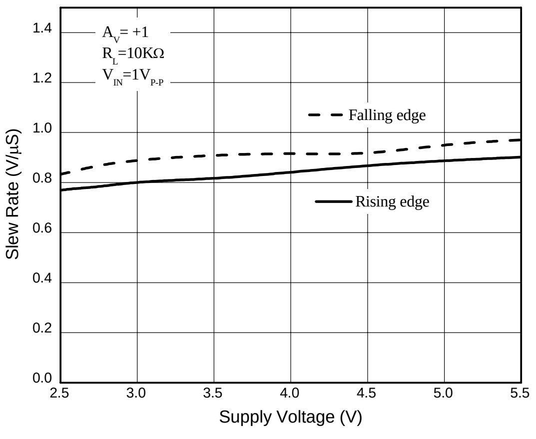



Figure 5. Slew Rate vs. Supply Voltage

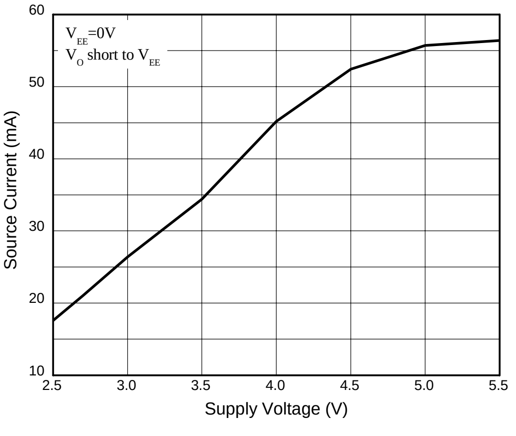



Figure 6. Output Source Current vs. Supply voltage

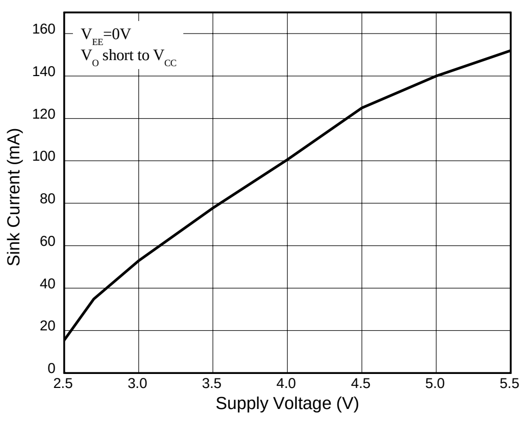



Figure 7. Output Sink Current vs. Supply Voltage

## Typical Performance Characteristics (Continued)

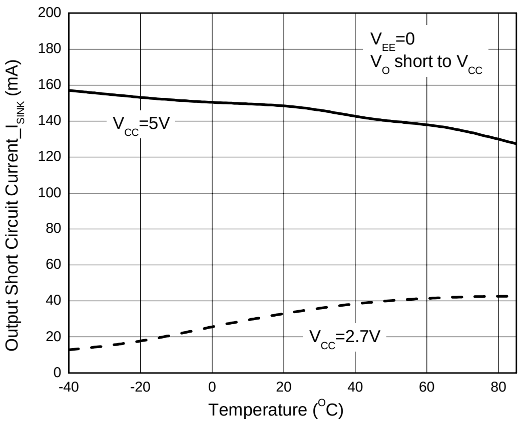



Figure 8. Short Circuit Current_$I_{SINK}$ vs. Temperature

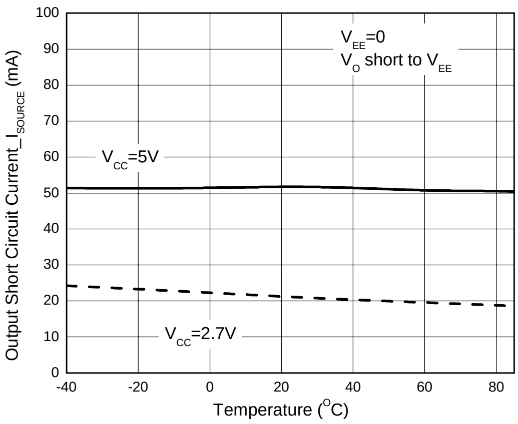



Figure 9. Short Circuit Current_$I_{SOURCE}$ vs. Temperature

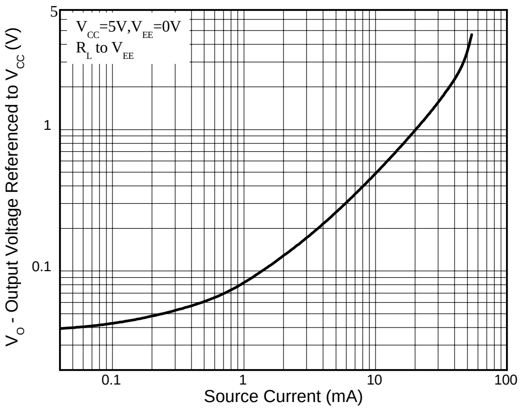



Figure 10. Output Voltage vs.Source Current

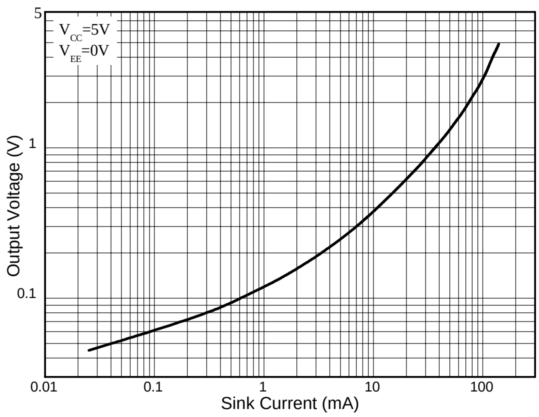



Figure 11. Output Voltage vs. Sink Current

## Typical Performance Characteristics (Continued)

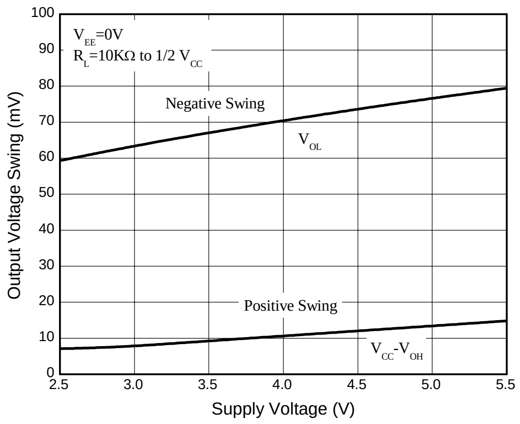



Figure 12. Output Voltage Swing vs. Supply Voltage

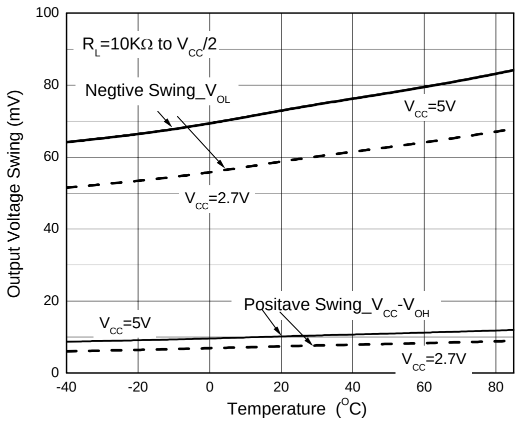



Figure 13. Output Voltage Swing vs. Temperature

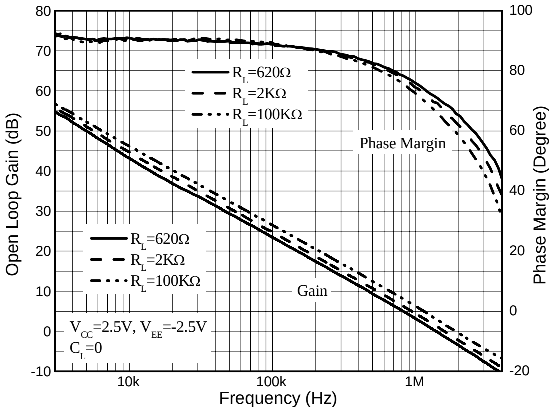



Figure 14. Gain and Phase vs. Frequency and Resistive Load

## Typical Performance Characteristics (Continued)

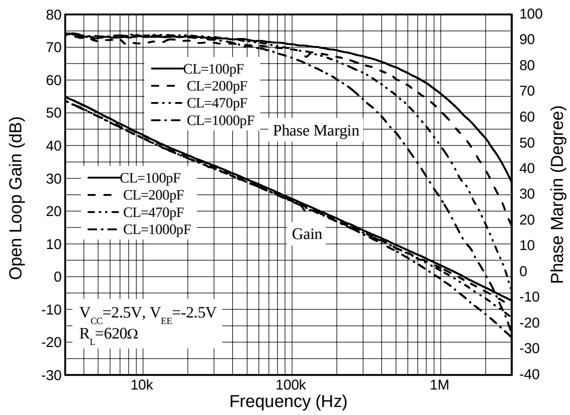



Figure 15. Gain and Phase vs. Frequency and Capacitive Load

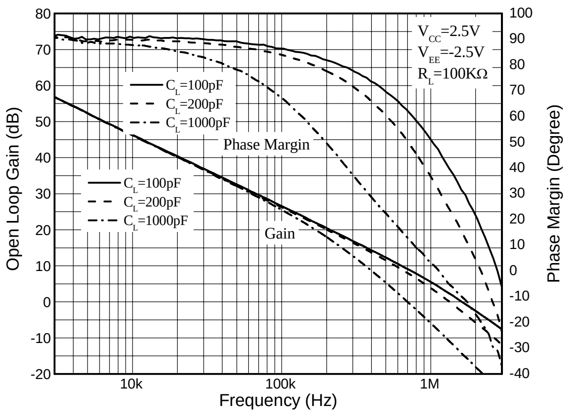



Figure 16. Gain and Phase vs. Frequency and Capacitive Load

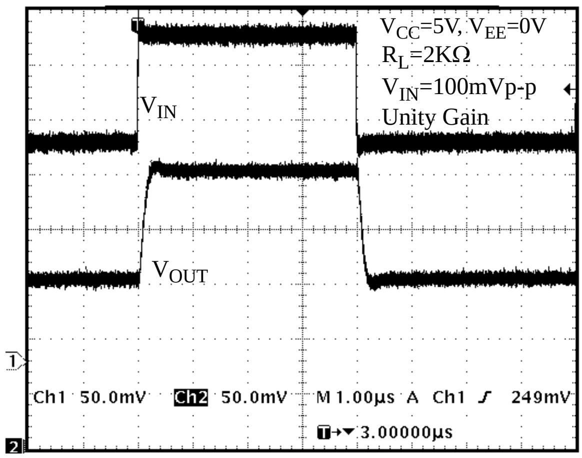



Figure 17. Non-Inverting Input Small Signal Pulse Response

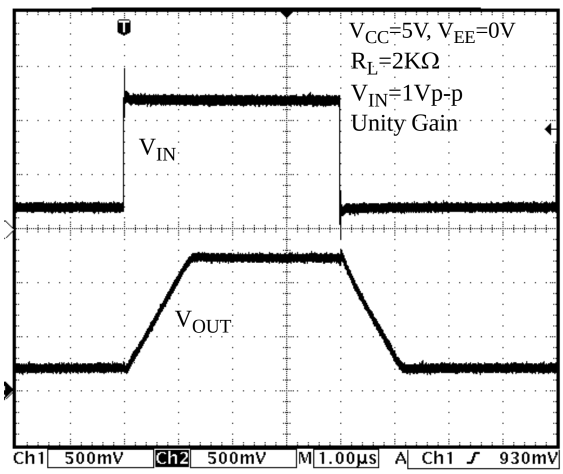



Figure 18. Non-Inverting Input Large Signal Pulse Response

## Typical Performance Characteristics (Continued)

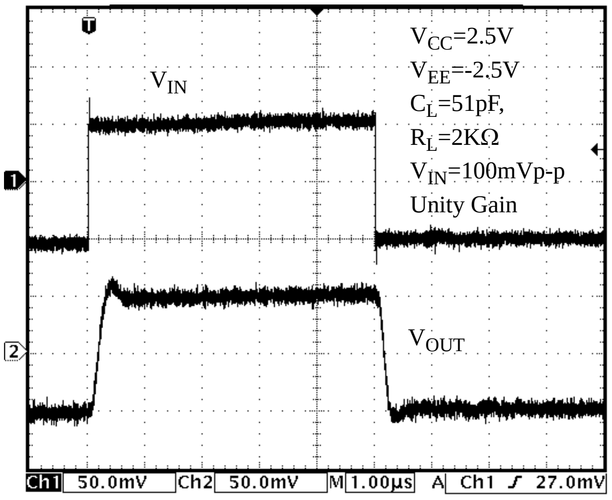



Figure 19. Output with Excessive Capacitive Load

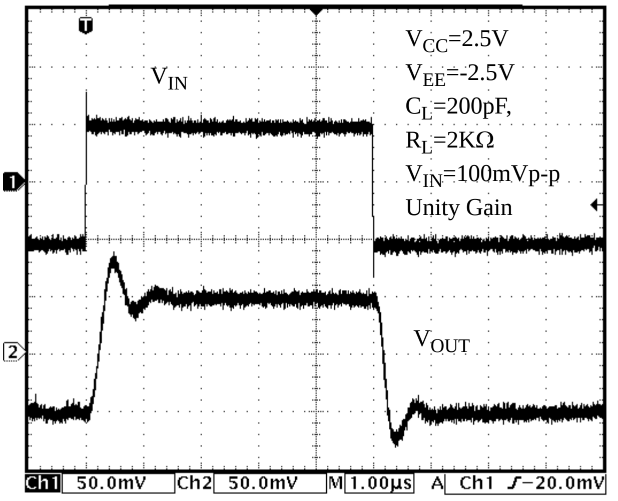



Figure 20. Output with Excessive Capacitive Load

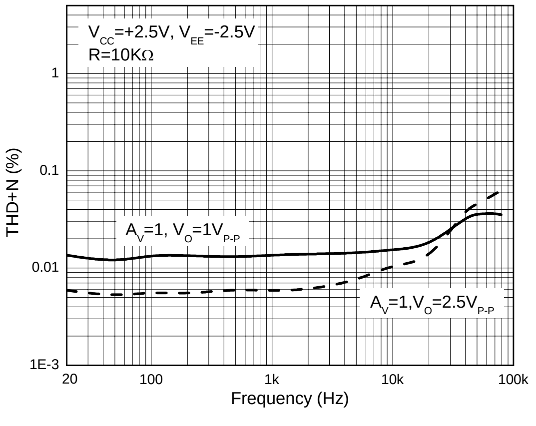
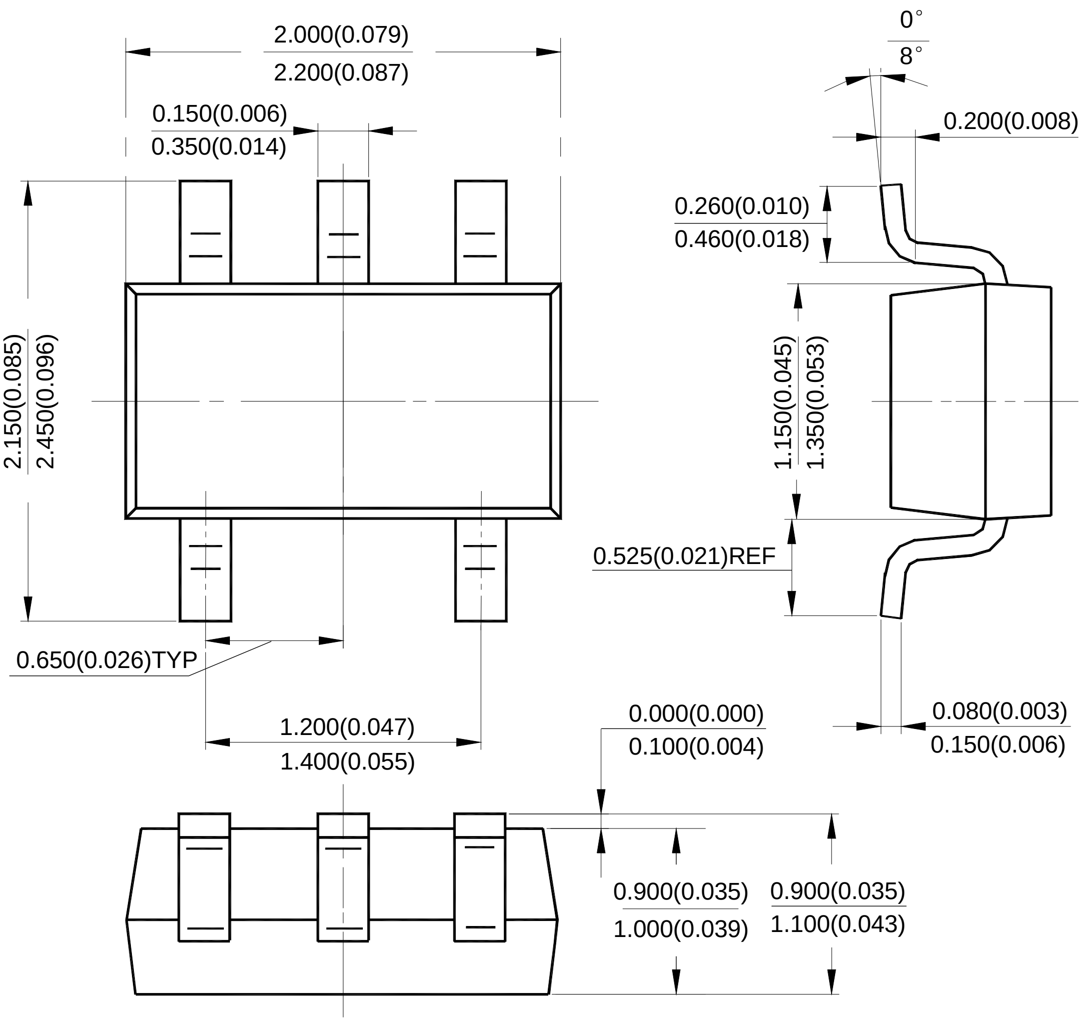



Figure 21. THD+N vs. Frequency

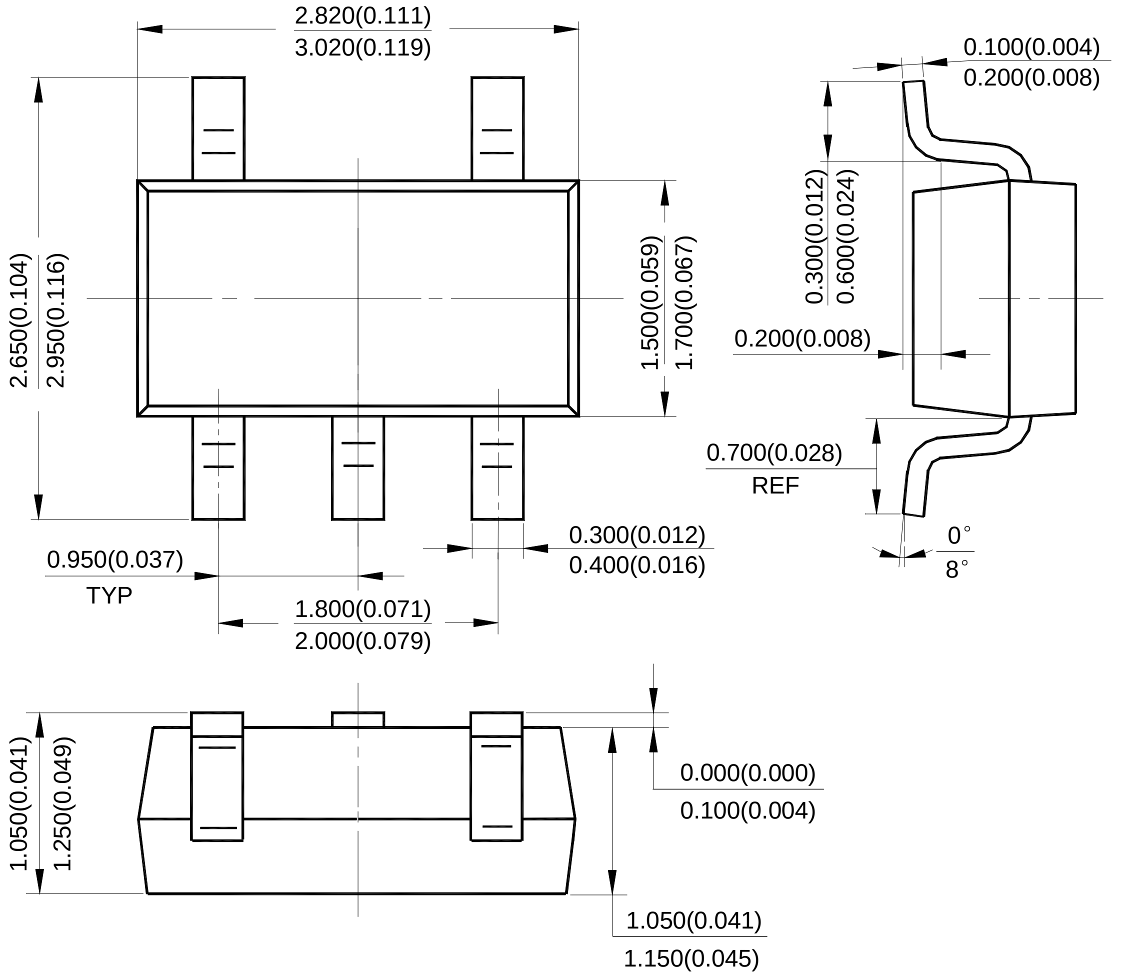
## Mechanical Dimensions

**SC70-5** **Unit: mm(inch)**



## Mechanical Dimensions

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



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