



SGM8957-1/SGM8957-2

High Precision, Low Power, Rail-to-Rail I/O, CMOS Operational Amplifiers

GENERAL DESCRIPTION

The single SGM8957-1 and dual SGM8957-2 are low power, high precision CMOS operational amplifiers, which can operate from 1.8V to 5.5V single supply or from $\pm 0.9V$ to $\pm 2.75V$ dual power supplies, while consuming only 20 μA quiescent current per amplifier. The SGM8957-1/2 support rail-to-rail input and output operation. The input common mode voltage range is 100mV beyond the rails, and the output swings within 14mV of the rails.

The SGM8957-1/2 feature high impedance inputs, a 25 μV maximum input offset voltage and zero-drift over time and temperature. These devices are designed to provide optimal performance in low voltage and low power systems. These specifications make the operational amplifiers appropriate for a wide range of applications requiring high precision, such as driving ADCs with high linearity.

The SGM8957-1 is available in Green SOT-23-5, SC70-5 and SOIC-8 packages. The SGM8957-2 is available in Green SOIC-8, MSOP-8 and TDFN-3 \times 3-8L packages. They are specified over $-40^{\circ}C$ to $+125^{\circ}C$ temperature range.

FEATURES

- **Low Offset Voltage: 25 μV (MAX)**
- **Low 0.1Hz to 10Hz Noise: 2 μV_{P-P}**
- **Integrated RFI Filter**
- **Rail-to-Rail Input and Output**
- **Support Single or Dual Power Supplies:
1.8V to 5.5V or $\pm 0.9V$ to $\pm 2.75V$**
- **Quiescent Current: 20 μA /Amplifier (TYP)**
- **$-40^{\circ}C$ to $+125^{\circ}C$ Operating Temperature Range**
- **Small Packaging:
SGM8957-1 Available in Green SOT-23-5, SC70-5
and SOIC-8 Packages
SGM8957-2 Available in Green SOIC-8, MSOP-8
and TDFN-3 \times 3-8L Packages**

APPLICATIONS

Temperature Measurements
Medical Instrumentation
Transducer Applications
Electronic Scales
Handheld Test Equipment
Battery-Powered Instruments

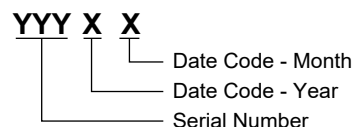
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-----------|---------------------|-----------------------------|--------------------|---------------------------|---------------------|
| SGM8957-1 | SOT-23-5 | -40°C to +125°C | SGM8957-1XN5G/TR | SYBXX | Tape and Reel, 3000 |
| | SC70-5 | -40°C to +125°C | SGM8957-1XC5G/TR | SYCXX | Tape and Reel, 3000 |
| | SOIC-8 | -40°C to +125°C | SGM8957-1XS8G/TR | SGM 89571XS8 XXXXX | Tape and Reel, 2500 |
| SGM8957-2 | SOIC-8 | -40°C to +125°C | SGM8957-2XS8G/TR | SGM 89572XS8 XXXXX | Tape and Reel, 2500 |
| | MSOP-8 | -40°C to +125°C | SGM8957-2XMS8G/TR | SGM89572 XMS8 XXXXX | Tape and Reel, 4000 |
| | TDFN-3×3-8L | -40°C to +125°C | SGM8957-2XTDB8G/TR | SGM 09DB XXXXX | Tape and Reel, 4000 |

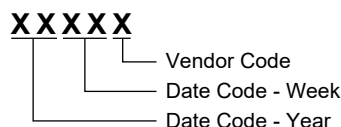
MARKING INFORMATION

NOTE: XX = Date Code. XXXXX = Date Code and Vendor Code.

SOT-23-5/SC70-5



SOIC-8/MSOP-8/TDFN-3×3-8L



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

- Supply Voltage.....6V
- Input Common Mode Voltage Range
..... (-Vs) - 0.3V to (+Vs) + 0.3V
- Junction Temperature.....+150°C
- Storage Temperature Range.....-65°C to +150°C
- Lead Temperature (Soldering, 10s).....+260°C
- ESD Susceptibility
- HBM.....4000V
- MM.....400V
- CDM.....1000V

RECOMMENDED OPERATING CONDITIONS

- Specified Voltage Range.....1.8V to 5.5V
- Operating Temperature Range.....-40°C to +125°C

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to

absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

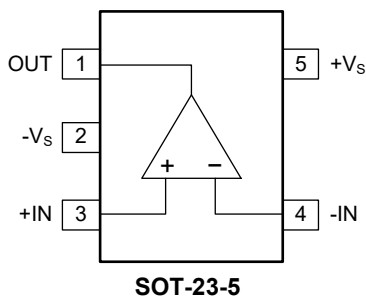
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

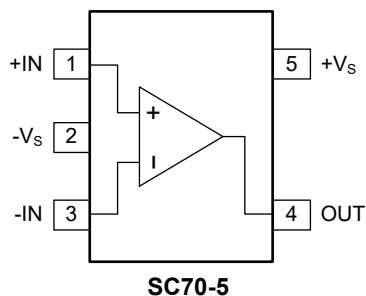
PIN CONFIGURATIONS

SGM8957-1 (TOP VIEW)



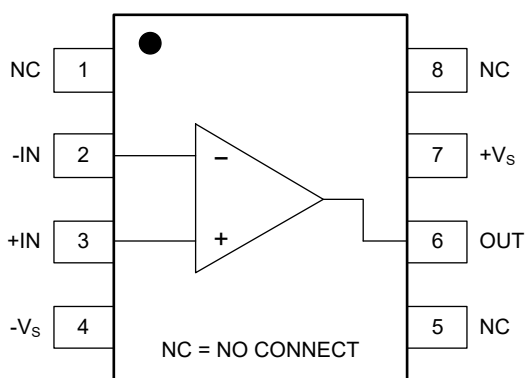
SOT-23-5

SGM8957-1 (TOP VIEW)



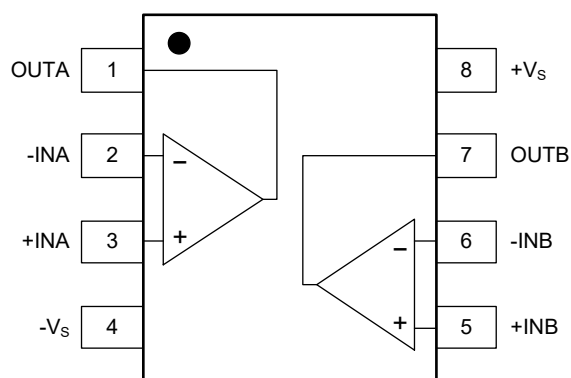
SC70-5

SGM8957-1 (TOP VIEW)



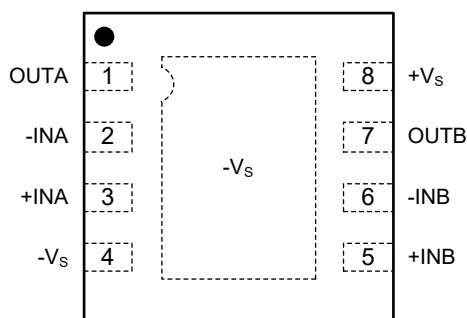
SOIC-8

SGM8957-2 (TOP VIEW)



SOIC-8/MSOP-8

SGM8957-2 (TOP VIEW)



TDFN-3x3-8L

NOTE: For TDFN-3x3-8L package, exposed pad can be connected to -Vs or left floating.

ELECTRICAL CHARACTERISTICS

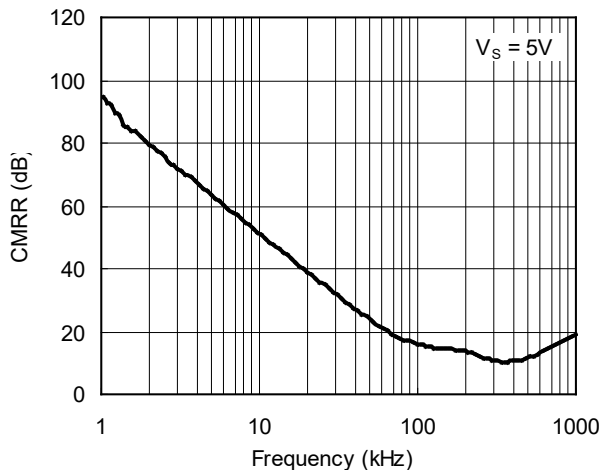
(At T_A = +25°C, V_S = 1.8V to 5.5V, V_{CM} = V_S/2, V_{OUT} = V_S/2 and R_L = 10kΩ to V_S/2, Full = -40°C to +125°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNITS |
|---------------------------------|----------------------|---|-------|--------------------------|-----------------|--------------------------|-------------------|
| Input Characteristics | | | | | | | |
| Input Offset Voltage | V _{OS} | V _S = 5V | +25°C | | 14 | 25 | μV |
| | | | Full | | | 55 | |
| Input Offset Voltage Drift | ΔV _{OS} /ΔT | | Full | | 0.08 | | μV/°C |
| Input Bias Current | I _B | | +25°C | | 130 | | pA |
| Input Common Mode Voltage Range | V _{CM} | | +25°C | (-V _S) - 0.1 | | (+V _S) + 0.1 | V |
| Common Mode Rejection Ratio | CMRR | (-V _S) - 0.1V < V _{CM} < (+V _S) + 0.1V | +25°C | 89 | 100 | | dB |
| | | | Full | 85 | | | |
| Open-Loop Voltage Gain | A _{OL} | (-V _S) + 0.1V < V _{OUT} < (+V _S) - 0.1V R _L = 10kΩ | +25°C | 95 | 121 | | dB |
| | | | Full | 94 | | | |
| Input Impedance | | | | | | | |
| Differential | | | +25°C | | 10 ⁹ | | Ω |
| Common Mode | | | +25°C | | 10 ⁹ | | Ω |
| Output Characteristics | | | | | | | |
| Output Voltage Swing from Rail | | R _L = 10kΩ | +25°C | | 14 | 25 | mV |
| | | | Full | | | 27 | |
| Output Short-Circuit Current | I _{SC} | V _S = 1.8V | +25°C | | 6 | | mA |
| | | V _S = 5V | +25°C | | 60 | | |
| Open-Loop Output Impedance | | f = 350kHz, I _{OUT} = 0 | +25°C | | 1 | | kΩ |
| Power Supply | | | | | | | |
| Specified Voltage Range | V _S | | Full | 1.8 | | 5.5 | V |
| Power Supply Rejection Ratio | PSRR | V _S = 1.8V to 5.5V | +25°C | | 4 | 20 | μV/V |
| | | | Full | | | 25 | |
| Quiescent Current/Amplifier | I _Q | I _{OUT} = 0 | +25°C | | 20 | 37 | μA |
| | | | Full | | | 48 | |
| Turn-On Time | | V _S = 5V | +25°C | | 220 | | μs |
| Dynamic Performance | | | | | | | |
| Gain-Bandwidth Product | GBP | C _L = 100pF | +25°C | | 350 | | kHz |
| Slew Rate | SR | G = +1 | +25°C | | 0.18 | | V/μs |
| Noise | | | | | | | |
| Input Voltage Noise | | f = 0.1Hz to 10Hz | +25°C | | 2 | | μV _{P-P} |

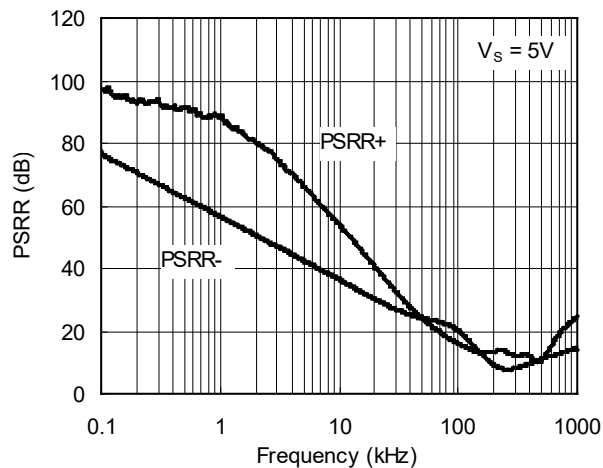
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$ and $C_L = 0\text{pF}$, unless otherwise noted.

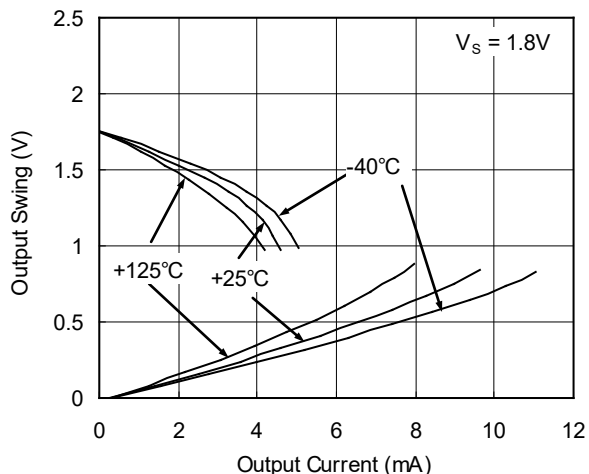
Common Mode Rejection Ratio vs. Frequency



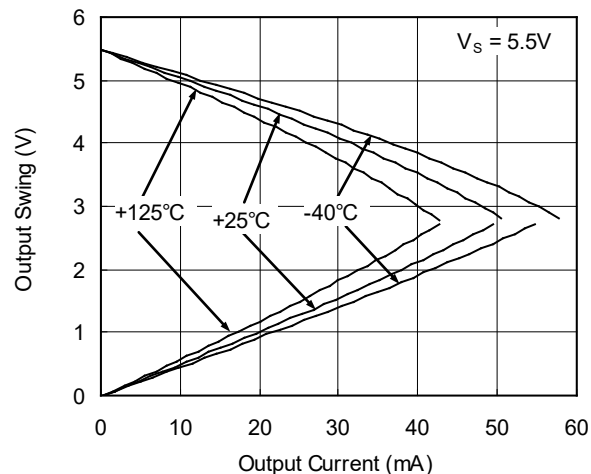
Power Supply Rejection Ratio vs. Frequency



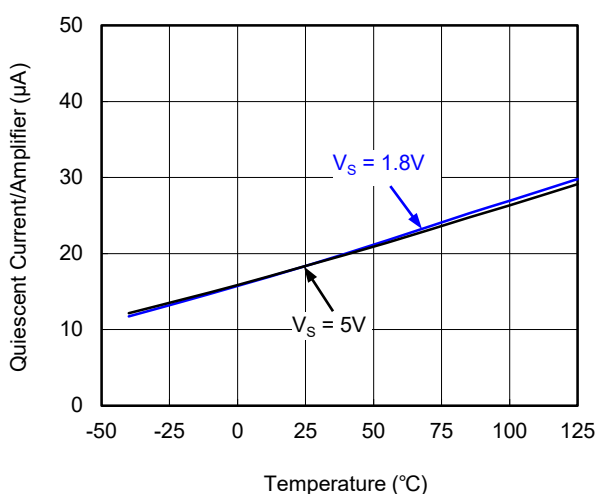
Output Voltage Swing vs. Output Current



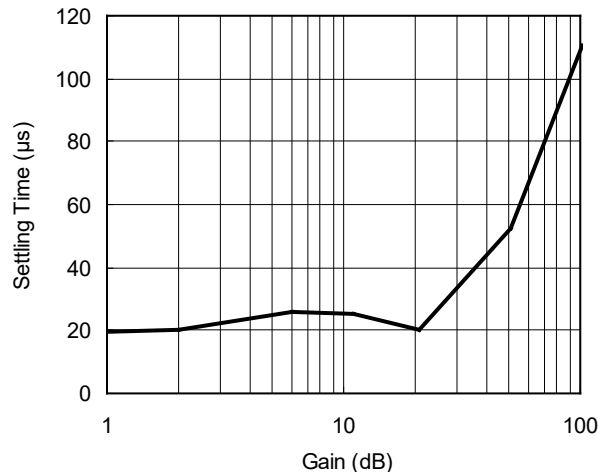
Output Voltage Swing vs. Output Current



Quiescent Current vs. Temperature



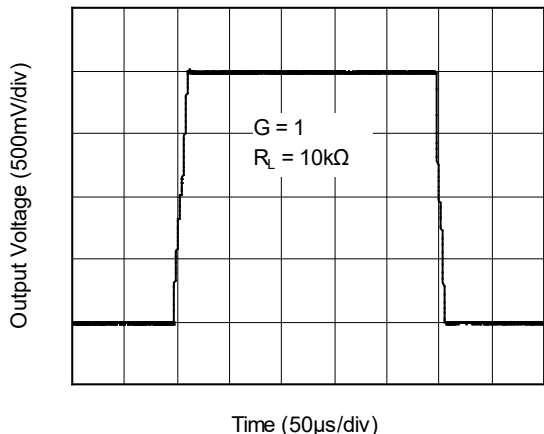
Settling Time vs. Closed-Loop Gain



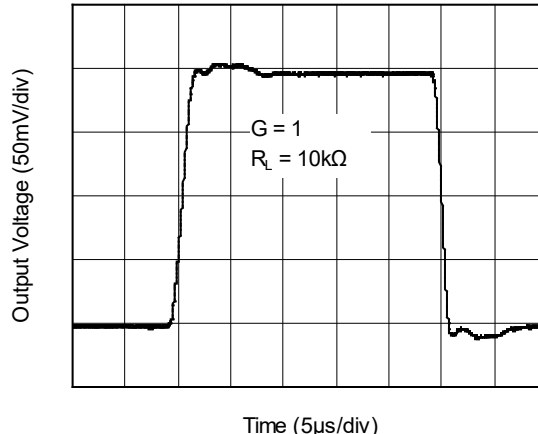
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$ and $C_L = 0\text{pF}$, unless otherwise noted.

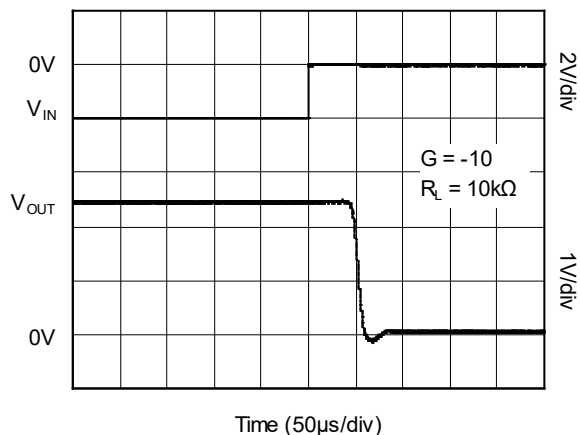
Large-Signal Step Response



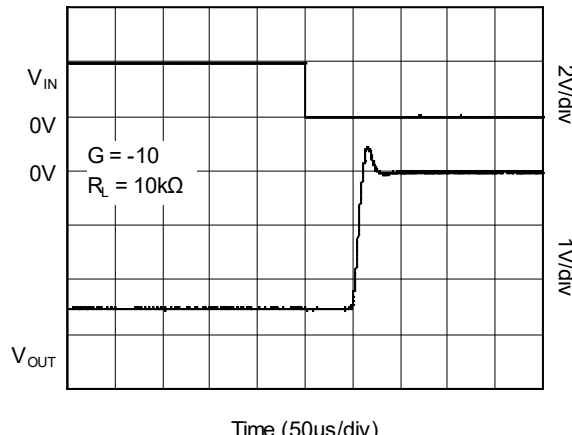
Small-Signal Step Response



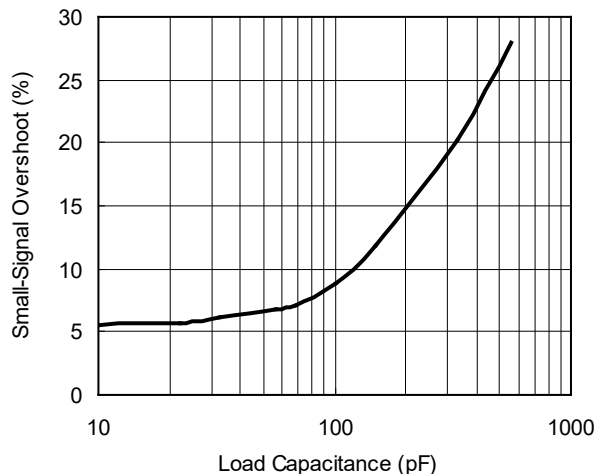
Positive Over-Voltage Recovery



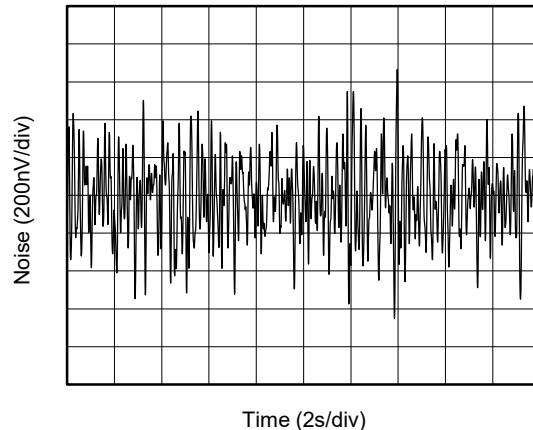
Negative Over-Voltage Recovery



Small-Signal Overshoot vs. Load Capacitance

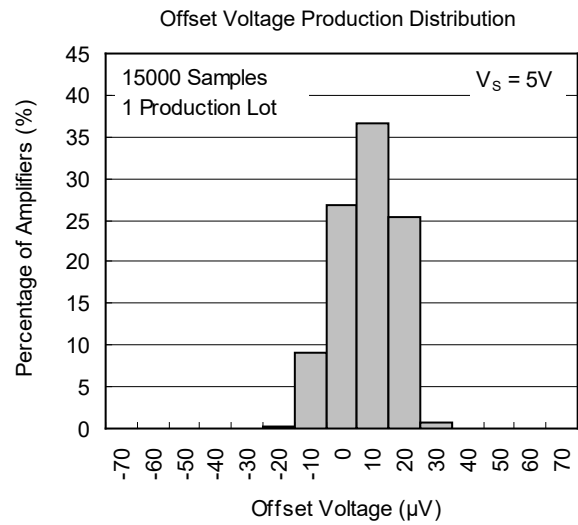
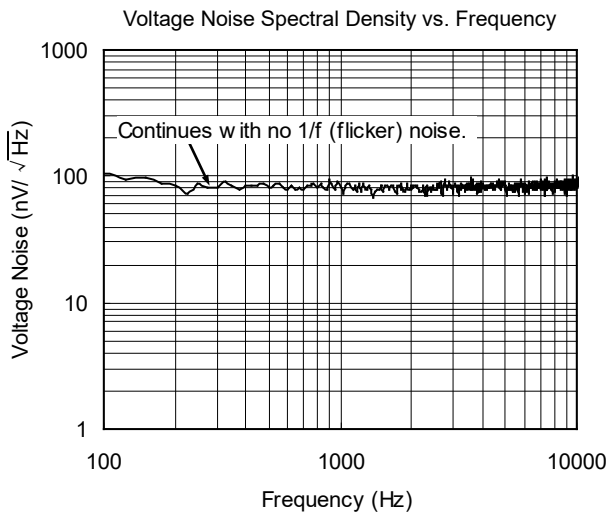


0.1Hz to 10Hz Noise



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 5\text{V}$ and $C_L = 0\text{pF}$, unless otherwise noted.



REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| OCTOBER 2020 – REV.A.2 to REV.A.3 | Page |
|---|-------------|
| Updated Typical Performance Characteristics section | 6 |
| Deleted Achieving Output Swing to the Operational Amplifier Negative Rail section | 8 |

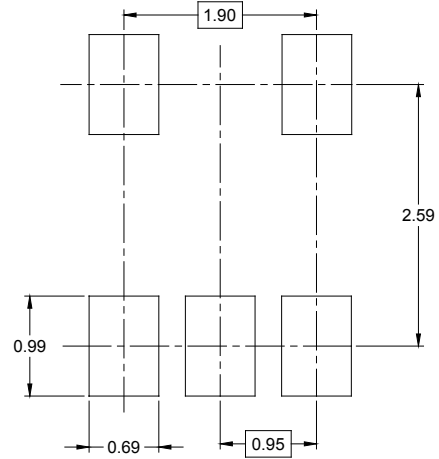
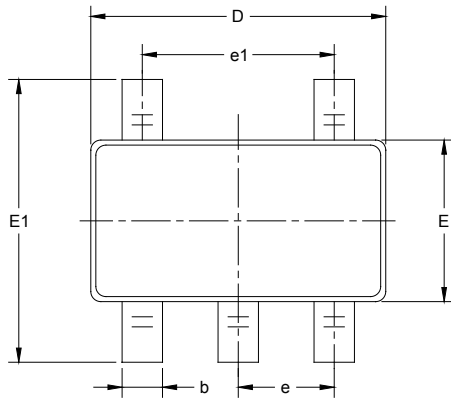
| OCTOBER 2016 – REV.A.1 to REV.A.2 | Page |
|---|-------------|
| Changed Typical Performance Characteristics section | 5 |

| APRIL 2016 – REV.A to REV.A.1 | Page |
|--|-------------|
| Added SOIC-8 and MSOP-8 packages | All |

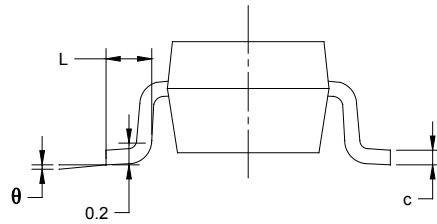
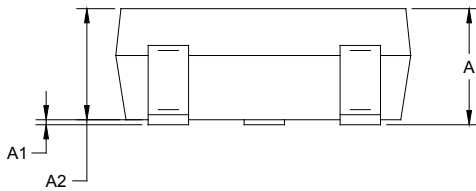
| Changes from Original (SEPTEMBER 2015) to REV.A | Page |
|--|-------------|
| Changed from product preview to production data | All |

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



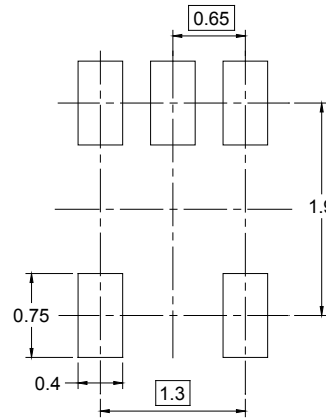
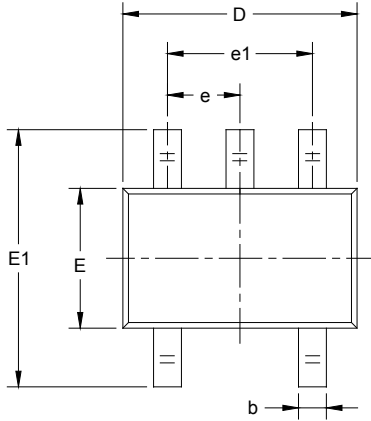
RECOMMENDED LAND PATTERN (Unit: mm)



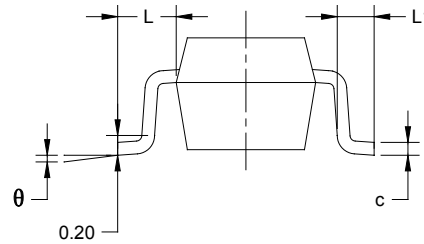
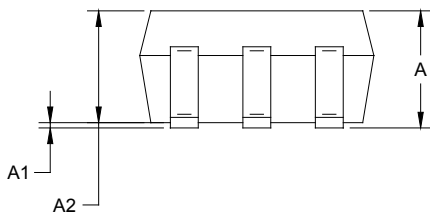
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 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° |

PACKAGE OUTLINE DIMENSIONS

SC70-5



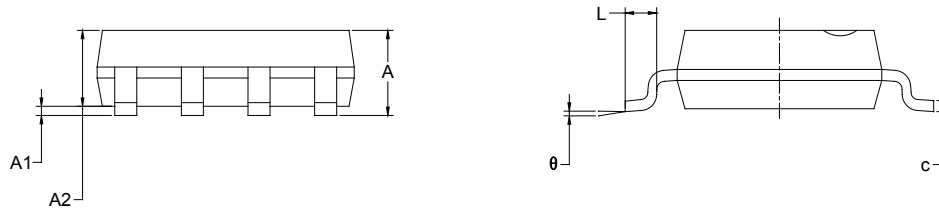
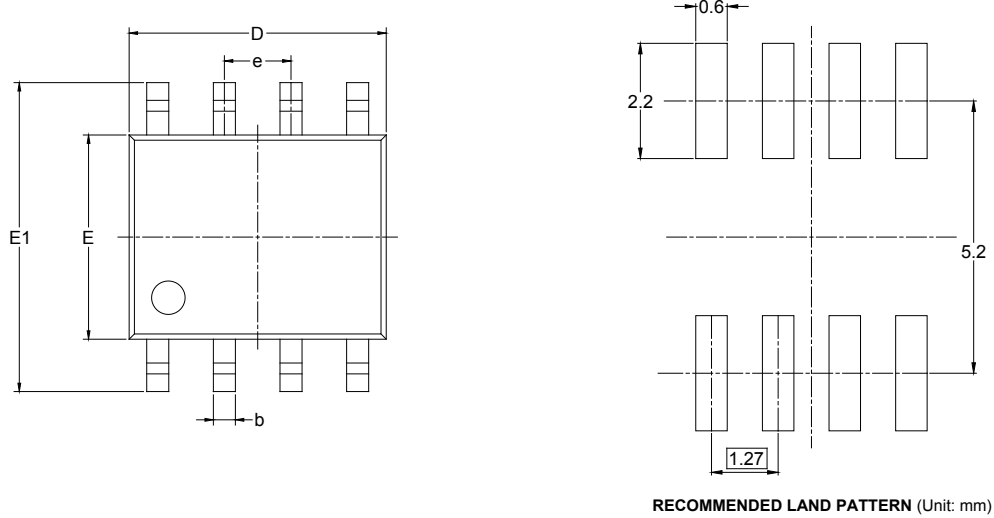
RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.000 | 0.035 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| c | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 1.150 | 1.350 | 0.045 | 0.053 |
| E1 | 2.150 | 2.450 | 0.085 | 0.096 |
| e | 0.65 TYP | | 0.026 TYP | |
| e1 | 1.300 BSC | | 0.051 BSC | |
| L | 0.525 REF | | 0.021 REF | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| θ | 0° | 8° | 0° | 8° |

PACKAGE OUTLINE DIMENSIONS

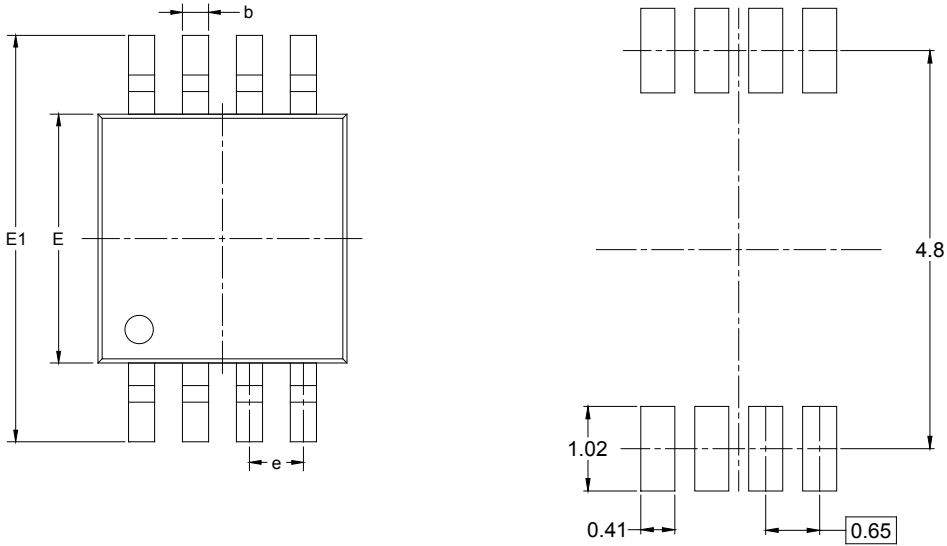
SOIC-8



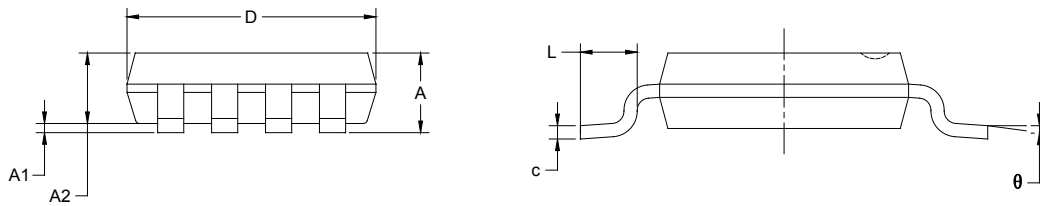
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

PACKAGE OUTLINE DIMENSIONS

MSOP-8



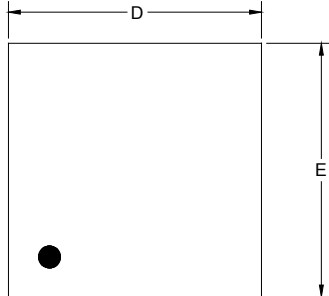
RECOMMENDED LAND PATTERN (Unit: mm)



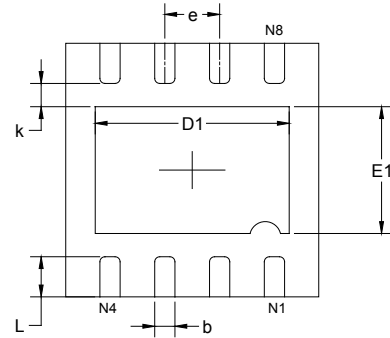
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250 | 0.380 | 0.010 | 0.015 |
| c | 0.090 | 0.230 | 0.004 | 0.009 |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 4.750 | 5.050 | 0.187 | 0.199 |
| e | 0.650 BSC | | 0.026 BSC | |
| L | 0.400 | 0.800 | 0.016 | 0.031 |
| θ | 0° | 6° | 0° | 6° |

PACKAGE OUTLINE DIMENSIONS

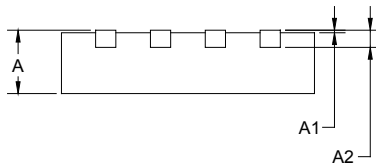
TDFN-3x3-8L



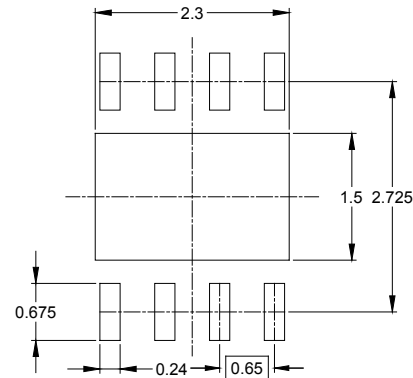
TOP VIEW



BOTTOM VIEW



SIDE VIEW



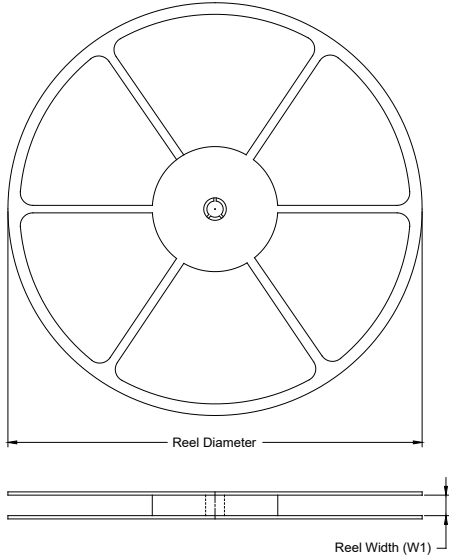
RECOMMENDED LAND PATTERN (Unit: mm)

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A2 | 0.203 REF | | 0.008 REF | |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 2.200 | 2.400 | 0.087 | 0.094 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 1.400 | 1.600 | 0.055 | 0.063 |
| k | 0.200 MIN | | 0.008 MIN | |
| b | 0.180 | 0.300 | 0.007 | 0.012 |
| e | 0.650 TYP | | 0.026 TYP | |
| L | 0.375 | 0.575 | 0.015 | 0.023 |

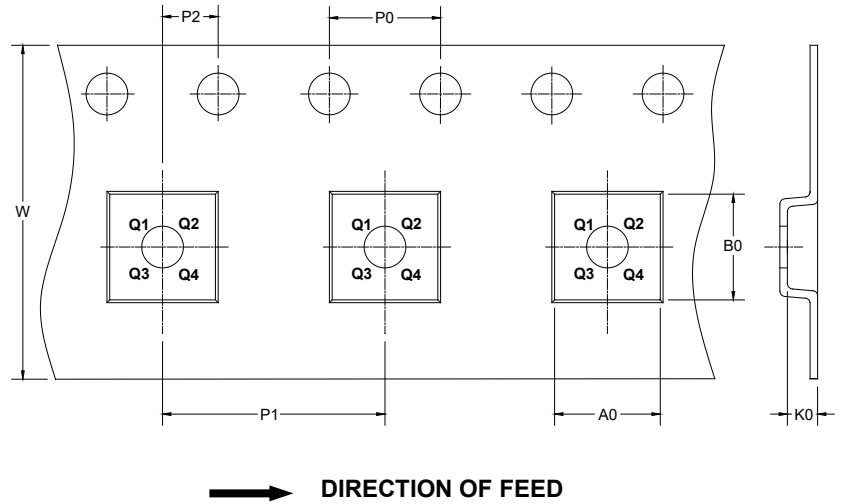
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

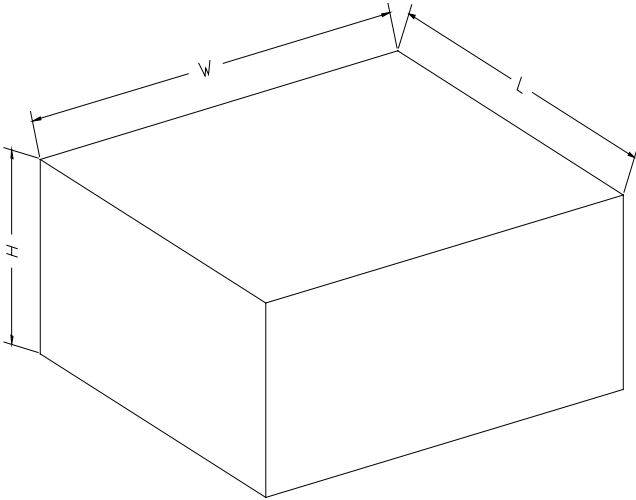
KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOT-23-5 | 7" | 9.5 | 3.20 | 3.20 | 1.40 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |
| SC70-5 | 7" | 9.5 | 2.25 | 2.55 | 1.20 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |
| SOIC-8 | 13" | 12.4 | 6.40 | 5.40 | 2.10 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |
| MSOP-8 | 13" | 12.4 | 5.20 | 3.30 | 1.50 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |
| TDFN-3×3-8L | 13" | 12.4 | 3.35 | 3.35 | 1.13 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |

D20001

PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

| Reel Type | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-------------|-------------|------------|-------------|--------------|
| 7" (Option) | 368 | 227 | 224 | 8 |
| 7" | 442 | 410 | 224 | 18 |
| 13" | 386 | 280 | 370 | 5 |

DD0002

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)