

## PACKAGE/ORDERING INFORMATION

| MODEL   | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING          | PACKING OPTION      |
|---------|---------------------|-----------------------------|-----------------|--------------------------|---------------------|
| SGM8951 | SOT-23-5            | -40°C to +85°C              | SGM8951YN5G/TR  | SBEXX                    | Tape and Reel, 3000 |
|         | SOIC-8              | -40°C to +85°C              | SGM8951YS8G/TR  | SGM<br>8951YS8<br>XXXXX  | Tape and Reel, 2500 |
| SGM8952 | SOIC-8              | -40°C to +85°C              | SGM8952YS8G/TR  | SGM<br>8952YS8<br>XXXXX  | Tape and Reel, 2500 |
|         | MSOP-8              | -40°C to +85°C              | SGM8952YMS8G/TR | SGM8952<br>YMS8<br>XXXXX | Tape and Reel, 3000 |

## MARKING INFORMATION

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

### SOT-23-5

**YYY X X**

### SOIC-8/MSOP-8

**XXXXX**

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, +V<sub>S</sub> to -V<sub>S</sub>.....6V  
 Voltage at Input/Output Pins  
 ..... (-V<sub>S</sub>) - 0.3V to (+V<sub>S</sub>) + 0.3V  
 Input Common Mode Voltage Range  
 ..... (-V<sub>S</sub>) - 0.1V to (+V<sub>S</sub>) + 0.1V  
 Junction Temperature .....+150°C  
 Storage Temperature Range.....-65°C to +150°C  
 Lead Temperature (Soldering, 10s) .....+260°C  
 ESD Susceptibility  
 HBM.....8000V  
 MM.....400V

## RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range .....-40°C to +85°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.

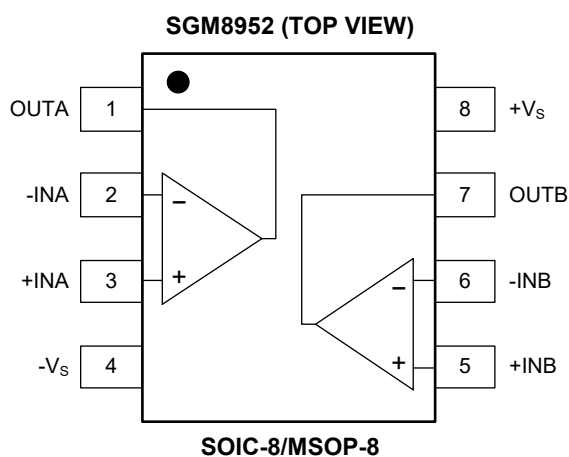
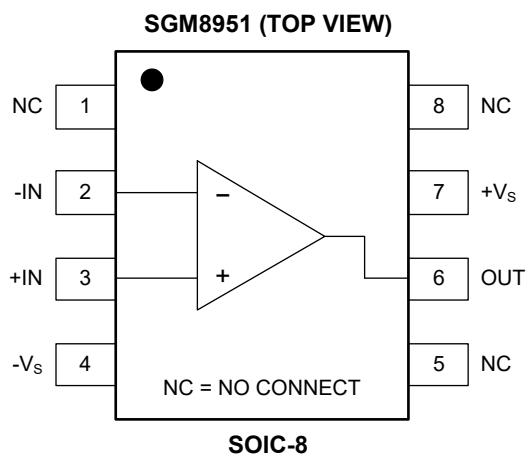
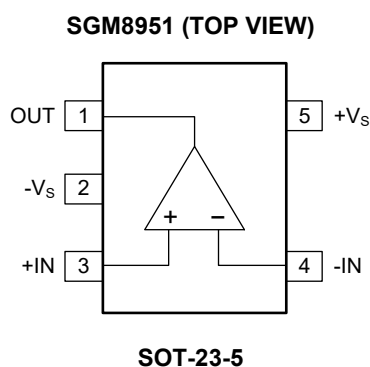
## ESD SENSITIVITY CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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 very small parametric changes could cause the device not to meet its published specifications.

## DISCLAIMER

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

## PIN CONFIGURATIONS



## ELECTRICAL CHARACTERISTICS

(At  $T_A = +25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $R_L = 100\text{k}\Omega$  connected to  $V_S/2$  and  $V_{OUT} = V_S/2$ , Full =  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ , unless otherwise noted.)

| PARAMETER                                          |         | CONDITIONS                                                  | TEMP  | MIN  | TYP | MAX | UNITS             |
|----------------------------------------------------|---------|-------------------------------------------------------------|-------|------|-----|-----|-------------------|
| DC Performance                                     |         |                                                             |       |      |     |     |                   |
| Input Offset Voltage (V <sub>OS</sub> )            |         | V <sub>CM</sub> = V <sub>S</sub> /2                         | +25°C |      | 0.2 | 0.8 | mV                |
|                                                    |         |                                                             | Full  |      |     | 1.2 |                   |
| Open-Loop Voltage Gain (A <sub>OL</sub> )          |         | R <sub>L</sub> = 10kΩ, V <sub>OUT</sub> = 0.15V to 4.85V    | +25°C | 78   | 90  |     | dB                |
|                                                    |         |                                                             | Full  | 73   |     |     |                   |
|                                                    |         | R <sub>L</sub> = 100kΩ, V <sub>OUT</sub> = 0.05V to 4.95V   | +25°C |      | 92  |     |                   |
| Input Characteristics                              |         |                                                             |       |      |     |     |                   |
| Input Common Mode Voltage Range (V <sub>CM</sub> ) |         |                                                             | +25°C | -0.1 |     | 5.1 | V                 |
| Common Mode Rejection Ratio (CMRR)                 |         | V <sub>CM</sub> = -0.1V to 5.1V                             | +25°C | 77   | 92  |     | dB                |
|                                                    |         |                                                             | Full  | 73   |     |     |                   |
| Output Characteristics                             |         |                                                             |       |      |     |     |                   |
| Output Voltage Swing from Rail                     |         | R <sub>L</sub> = 2kΩ, V <sub>CM</sub> = V <sub>S</sub> /2   | +25°C |      | 78  | 94  | mV                |
|                                                    |         |                                                             | Full  |      |     | 103 |                   |
|                                                    |         | R <sub>L</sub> = 10kΩ, V <sub>CM</sub> = V <sub>S</sub> /2  | +25°C |      | 16  | 28  |                   |
|                                                    |         |                                                             | Full  |      |     | 33  |                   |
| Output Short-Circuit Current (I <sub>SC</sub> )    |         | R <sub>L</sub> = 10Ω to V <sub>S</sub> /2                   | +25°C | 25   | 32  |     | mA                |
|                                                    |         |                                                             | Full  | 17   |     |     |                   |
| Power Supply                                       |         |                                                             |       |      |     |     |                   |
| Operating Voltage Range                            |         |                                                             |       | 1.8  |     | 5.5 | V                 |
| Quiescent Current                                  | SGM8951 | I <sub>OUT</sub> = 0mA, V <sub>CM</sub> = V <sub>S</sub> /2 | +25°C |      | 26  | 35  | μA                |
|                                                    |         |                                                             | Full  |      |     | 39  |                   |
|                                                    | SGM8952 | I <sub>OUT</sub> = 0mA, V <sub>CM</sub> = V <sub>S</sub> /2 | +25°C |      | 34  | 48  |                   |
|                                                    |         |                                                             | Full  |      |     | 55  |                   |
| Dynamic Performance <sup>(1)</sup>                 |         |                                                             |       |      |     |     |                   |
| Gain-Bandwidth Product (GBP)                       |         | C <sub>L</sub> = 100pF, R <sub>L</sub> = 100kΩ              | +25°C |      | 110 |     | kHz               |
| Slew Rate                                          |         | V <sub>OUT</sub> = 2V <sub>P-P</sub> , A <sub>V</sub> = 1   | +25°C |      | 45  |     | V/ms              |
| Noise/Distortion Performance                       |         |                                                             |       |      |     |     |                   |
| Input Voltage Noise Density (e <sub>n</sub> )      |         | f = 1kHz                                                    | +25°C |      | 115 |     | nV/√Hz            |
| Input Voltage Noise                                |         | f = 0.1Hz to 10Hz                                           | +25°C |      | 3.5 |     | μV <sub>P-P</sub> |

NOTE: 1. Correct power supply bypassing is very important for optimizing SGM8951/2 performance. A  $0.1\mu\text{F}$  and a  $10\mu\text{F}$  capacitors are always used to bypass  $V_S$  pin of SGM8951/2. Please place these two capacitors as close to the SGM8951/2  $V_S$  pin as possible. A large ground plane is also needed to ensure optimum performance.

**ELECTRICAL CHARACTERISTICS (continued)**(At  $T_A = +25^\circ\text{C}$ ,  $V_S = 1.8\text{V}$ ,  $R_L = 100\text{k}\Omega$  connected to  $V_S/2$  and  $V_{OUT} = V_S/2$ , Full =  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ , unless otherwise noted.)

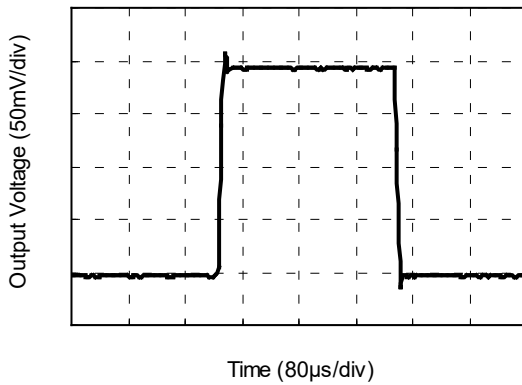
| PARAMETER                                          |         | CONDITIONS                                                  | TEMP  | MIN  | TYP | MAX  | UNITS             |
|----------------------------------------------------|---------|-------------------------------------------------------------|-------|------|-----|------|-------------------|
| DC Performance                                     |         |                                                             |       |      |     |      |                   |
| Input Offset Voltage (V <sub>OS</sub> )            |         | V <sub>CM</sub> = V <sub>S</sub> /2                         | +25°C |      | 0.3 | 0.9  | mV                |
|                                                    |         |                                                             | Full  |      |     | 1.25 |                   |
| Open-Loop Voltage Gain (A <sub>OL</sub> )          |         | R <sub>L</sub> = 10kΩ, V <sub>OUT</sub> = 0.15V to 1.65V    | +25°C | 83   | 100 |      | dB                |
|                                                    |         |                                                             | Full  | 80   |     |      |                   |
|                                                    |         | R <sub>L</sub> = 100kΩ, V <sub>OUT</sub> = 0.05V to 1.75V   | +25°C |      | 107 |      | dB                |
| Input Characteristics                              |         |                                                             |       |      |     |      |                   |
| Input Common Mode Voltage Range (V <sub>CM</sub> ) |         |                                                             | +25°C | -0.1 |     | 1.9  | V                 |
| Common Mode Rejection Ratio (CMRR)                 |         | V <sub>CM</sub> = -0.1V to 1.9V                             | +25°C | 73   | 89  |      | dB                |
|                                                    |         |                                                             | Full  | 70   |     |      |                   |
| Output Characteristics                             |         |                                                             |       |      |     |      |                   |
| Output Voltage Swing from Rail                     |         | R <sub>L</sub> = 2kΩ, V <sub>CM</sub> = V <sub>S</sub> /2   | +25°C |      | 49  | 69   | mV                |
|                                                    |         |                                                             | Full  |      |     | 76   |                   |
|                                                    |         | R <sub>L</sub> = 10kΩ, V <sub>CM</sub> = V <sub>S</sub> /2  | +25°C |      | 11  | 23   |                   |
|                                                    |         |                                                             | Full  |      |     | 28   |                   |
| Output Short-Circuit Current (I <sub>SC</sub> )    |         | R <sub>L</sub> = 10Ω to V <sub>S</sub> /2                   | +25°C | 0.9  | 4   |      | mA                |
|                                                    |         |                                                             | Full  | 0.5  |     |      |                   |
| Power Supply                                       |         |                                                             |       |      |     |      |                   |
| Quiescent Current                                  | SGM8951 | V <sub>CM</sub> = V <sub>S</sub> /2, I <sub>OUT</sub> = 0mA | +25°C |      | 22  | 30   | μA                |
|                                                    |         |                                                             | Full  |      |     | 34   |                   |
|                                                    | SGM8952 | V <sub>CM</sub> = V <sub>S</sub> /2, I <sub>OUT</sub> = 0mA | +25°C |      | 30  | 43   |                   |
|                                                    |         |                                                             | Full  |      |     | 49   |                   |
| Power Supply Rejection Ratio (PSRR)                |         | V <sub>S</sub> = 1.8V to 5.5V, V <sub>CM</sub> = 0.5V       | +25°C | 74   | 80  |      | dB                |
|                                                    |         |                                                             | Full  | 70   |     |      |                   |
| Dynamic Performance <sup>(1)</sup>                 |         |                                                             |       |      |     |      |                   |
| Gain-Bandwidth Product (GBP)                       |         | C <sub>L</sub> = 100pF, R <sub>L</sub> = 100kΩ              | +25°C |      | 100 |      | kHz               |
| Slew Rate                                          |         | V <sub>OUT</sub> = 1V <sub>P-P</sub> , A <sub>V</sub> = 1   | +25°C |      | 40  |      | V/ms              |
| Noise/Distortion Performance                       |         |                                                             |       |      |     |      |                   |
| Input Voltage Noise Density (e <sub>n</sub> )      |         | f = 1kHz                                                    | +25°C |      | 115 |      | nV/√Hz            |
| Input Voltage Noise                                |         | f = 0.1Hz to 10Hz                                           | +25°C |      | 3.5 |      | μV <sub>P-P</sub> |

NOTE: 1. Correct power supply bypassing is very important for optimizing SGM8951/2 performance. A  $0.1\mu\text{F}$  and a  $10\mu\text{F}$  capacitors are always used to bypass  $V_S$  pin of SGM8951/2. Please place these two capacitors as close to the SGM8951/2  $V_S$  pin as possible. A large ground plane is also needed to ensure optimum performance.

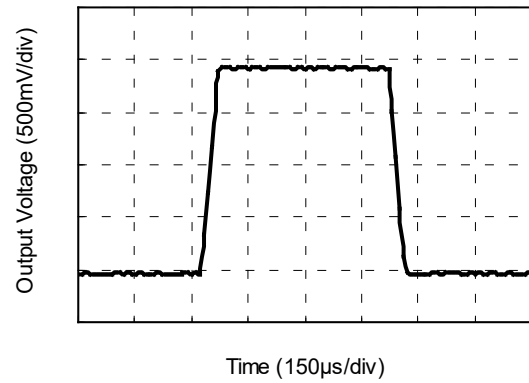
## TYPICAL PERFORMANCE CHARACTERISTICS

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

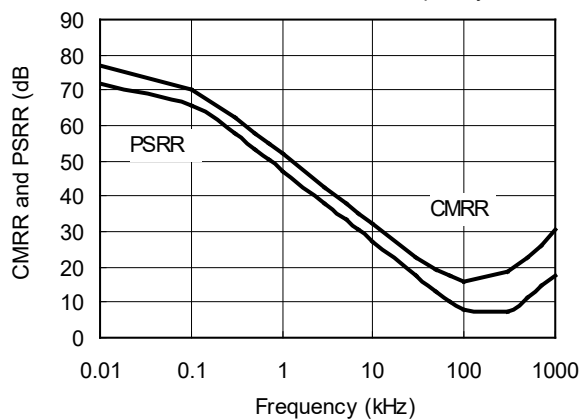
Small Signal Step Response



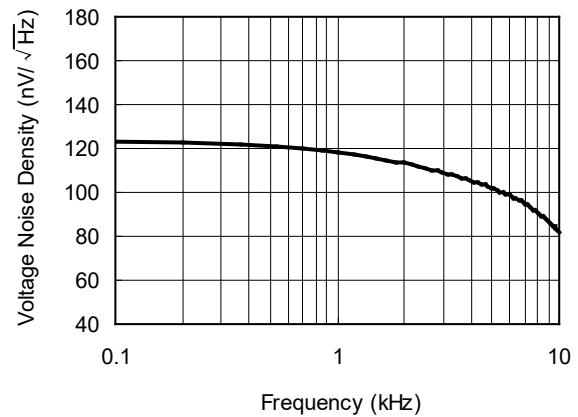
Large Signal Step Response



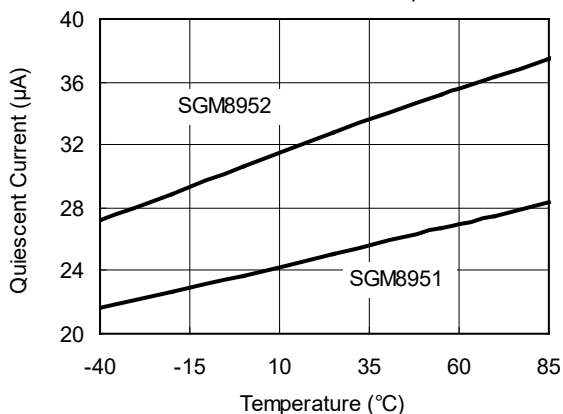
CMRR and PSRR vs. Frequency



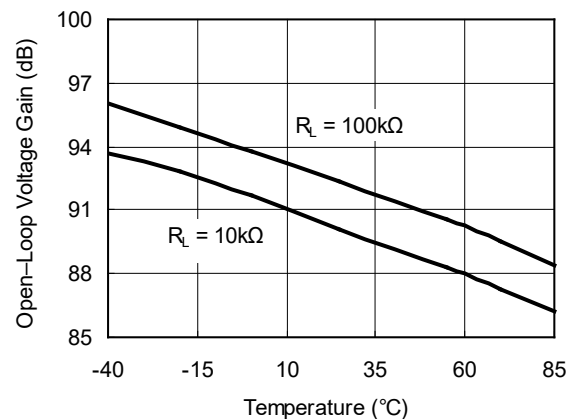
Voltage Noise Spectral Density  
vs. Frequency



Quiescent Current vs. Temperature

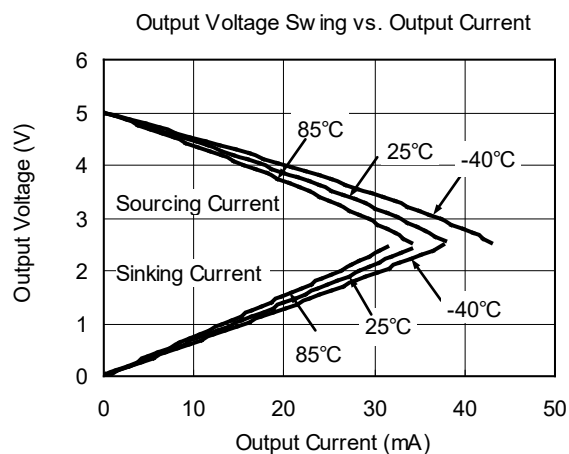
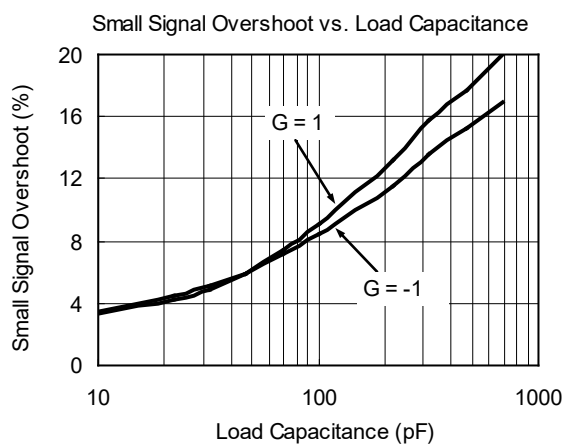
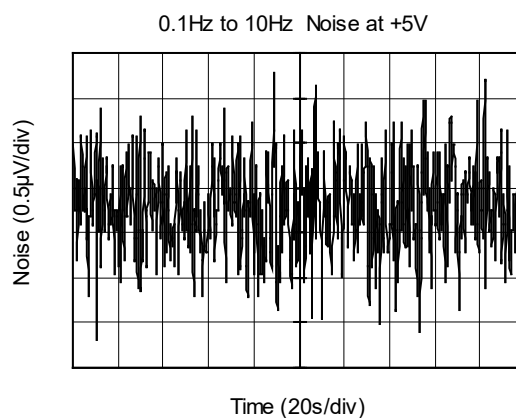
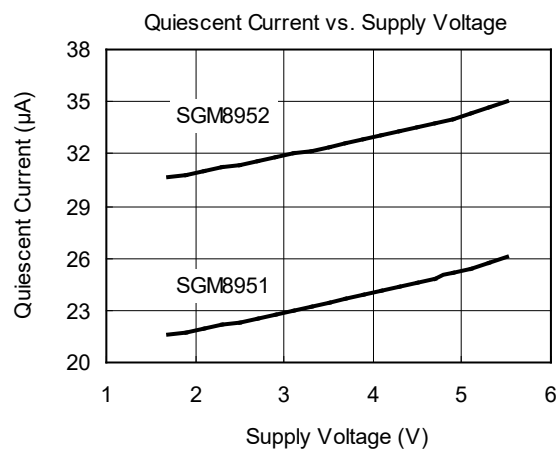
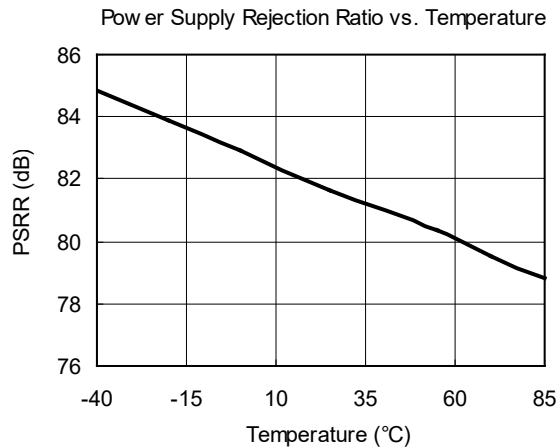
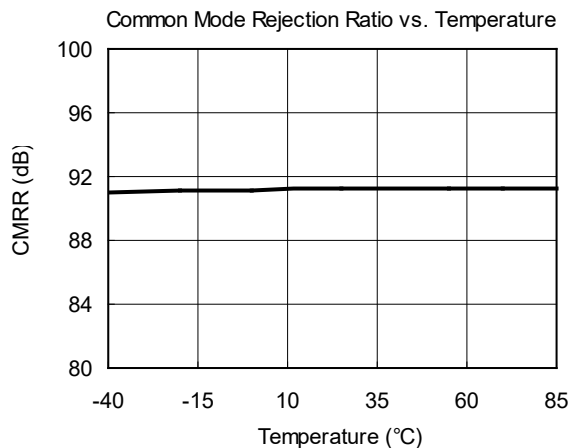


Open-Loop Voltage Gain vs. Temperature



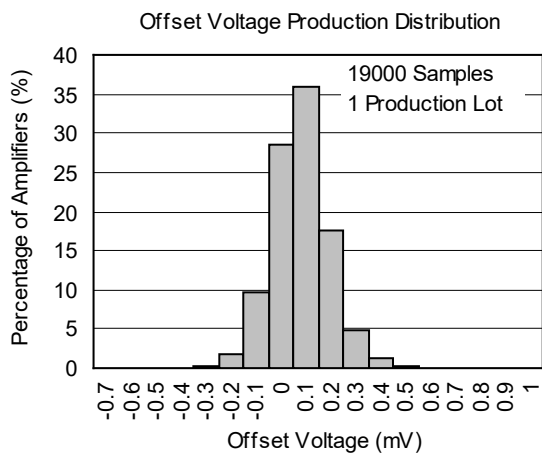
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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



## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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



REVISION HISTORY

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

| MAY 2013 – REV.A to REV.A.1                      | Page |
|--------------------------------------------------|------|
| Changed Electrical Characteristics section ..... | 4, 5 |

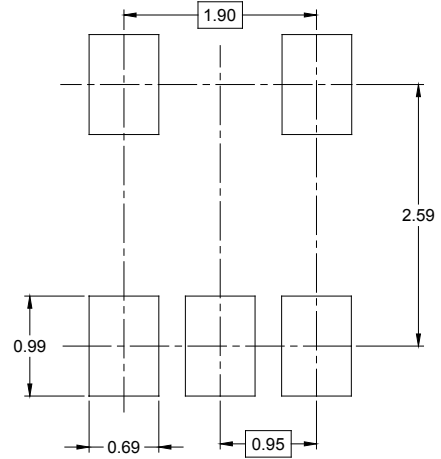
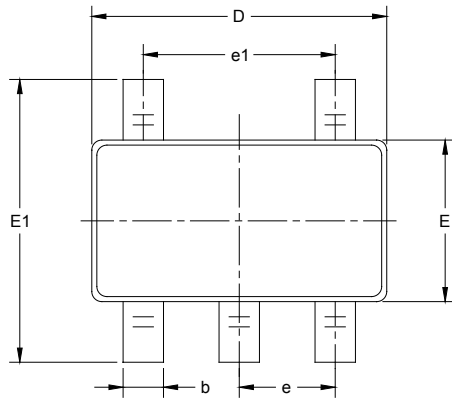
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| Changes from Original (DECEMBER 2012) to REV.A       | Page |
|------------------------------------------------------|------|
| Changed from product preview to production data..... | All  |

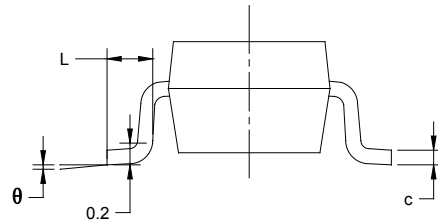
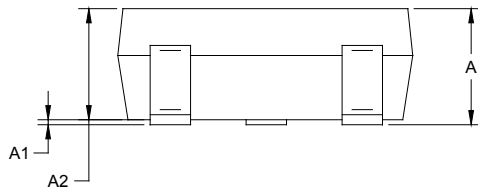
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## PACKAGE OUTLINE DIMENSIONS

### SOT-23-5



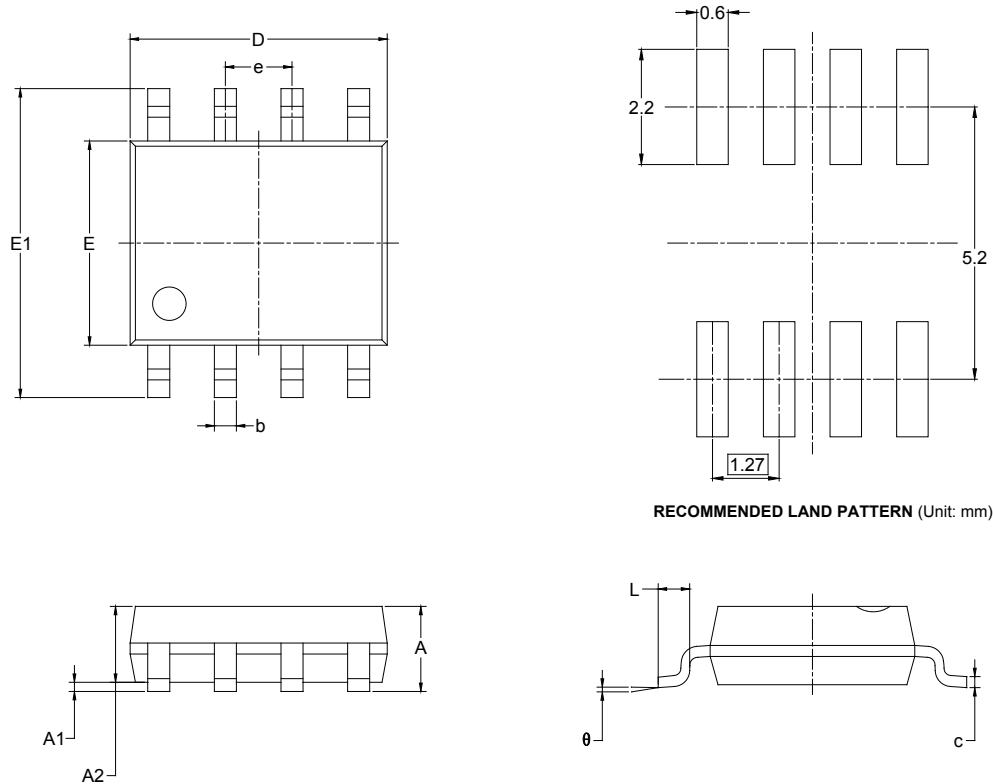
RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>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

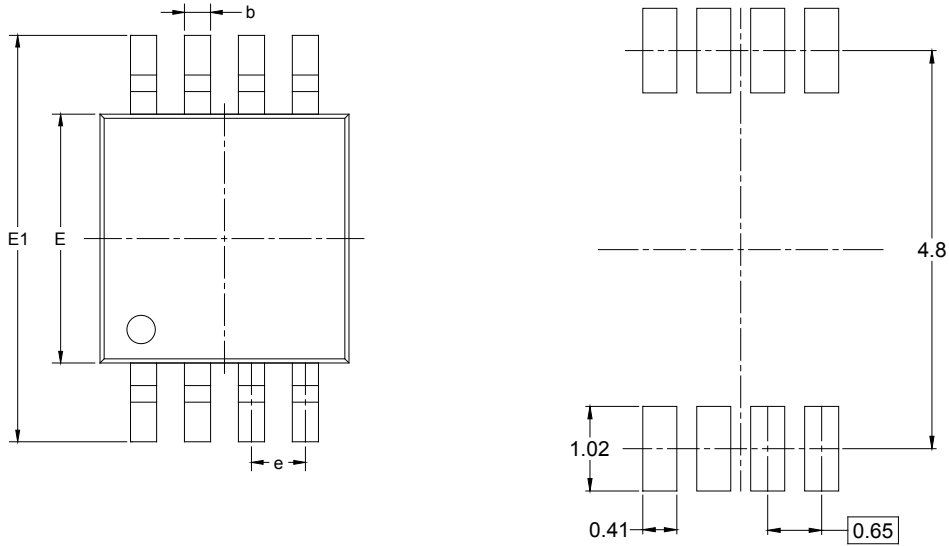
### SOIC-8



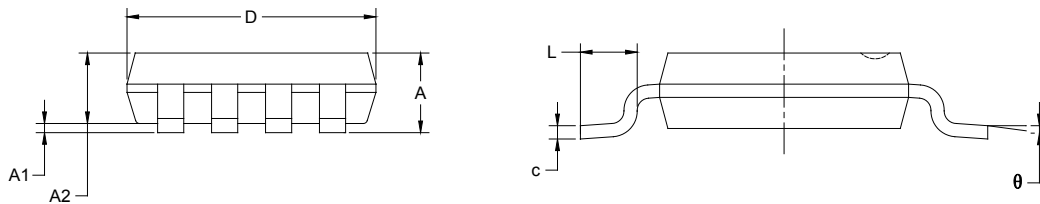
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 1.350                        | 1.750 | 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)

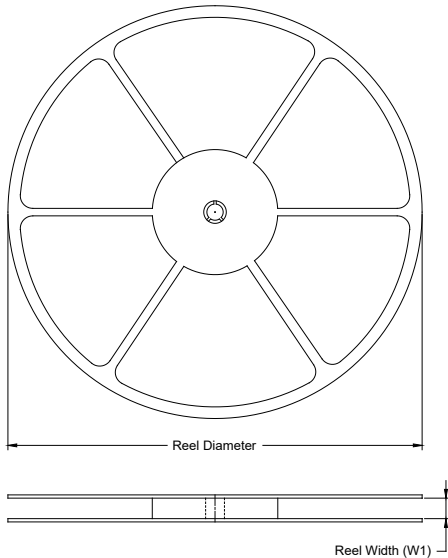


| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 0.820                        | 1.100 | 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°    |

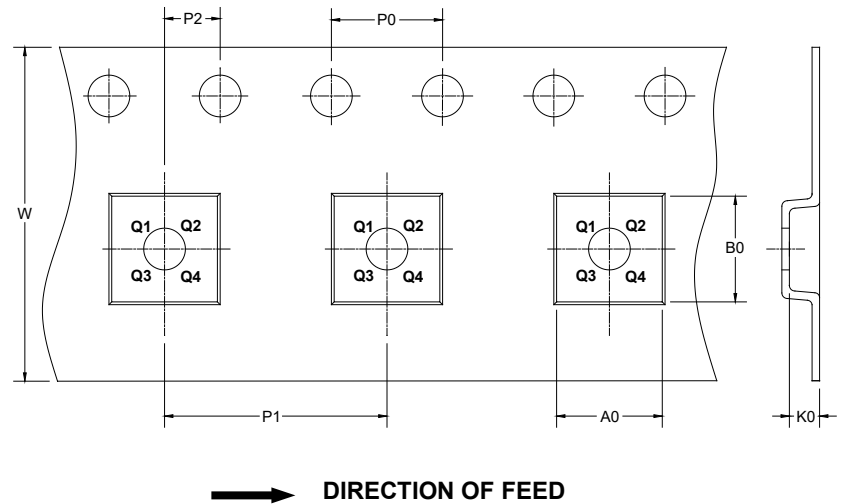
# PACKAGE INFORMATION

## 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            |
| 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            |

DD0001

## 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