



SGM8271/SGM8272/SGM8274 High Voltage Rail-to-Rail Output Operational Amplifiers

GENERAL DESCRIPTION

The SGM8271 (single), SGM8272 (dual) and SGM8274 (quad) are high voltage operational amplifiers, which can operate from 4.5V to 36V single supply or from $\pm 2.25V$ to $\pm 18V$ dual power supplies. They provide a wide input common mode voltage range and rail-to-rail output voltage swing.

The SGM8271/2/4 provide high slew rate, low offset, drift and bias current.

The SGM8271 is available in Green SOT-23-5, MSOP-8 and SOIC-8 packages. The SGM8272 is available in Green SOIC-8 and MSOP-8 packages. The SGM8274 is available in Green SOIC-14 and TSSOP-14 packages. They are specified over the extended $-40^{\circ}C$ to $+125^{\circ}C$ temperature range.

FEATURES

- Rail-to-Rail Output
- Wide Input Common Mode Voltage Range
- Low Offset Voltage: 3mV (MAX)
- Low Input Bias Current
- Low Input Offset Current
- Low Quiescent Current: 150 μ A/Amplifier
- Output Short-Circuit Protection
- High Input Impedance
- High Slew Rate: 7V/ μ s
- Small Packaging:
 - SGM8271 Available in Green SOT-23-5, MSOP-8 and SOIC-8 Packages
 - SGM8272 Available in Green MSOP-8 and SOIC-8 Packages
 - SGM8274 Available in Green TSSOP-14 and SOIC-14 Packages

APPLICATIONS

High Impedance Sensor
Precision Instrumentation
Photodiode Amplifier
Phase-Locked Loop Filter
High End, Professional Audio
Medical
ATE
DAC Output Amplifier

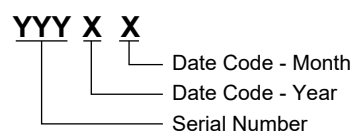
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---------|---------------------|-----------------------------|------------------|---------------------------|---------------------|
| SGM8271 | SOT-23-5 | -40°C to +85°C | SGM8271AYN5G/TR | SBDXX | Tape and Reel, 3000 |
| | SOT-23-5 | -40°C to +85°C | SGM8271BYN5G/TR | SG5XX | Tape and Reel, 3000 |
| | MSOP-8 | -40°C to +85°C | SGM8271YMS8G/TR | SGM8271 YMS8 XXXXX | Tape and Reel, 3000 |
| | SOIC-8 | -40°C to +85°C | SGM8271YS8G/TR | SGM 8271YS8 XXXXX | Tape and Reel, 2500 |
| | SOIC-8 | -40°C to +125°C | SGM8271XS8G/TR | SGM 8271XS8 XXXXX | Tape and Reel, 2500 |
| SGM8272 | MSOP-8 | -40°C to +85°C | SGM8272YMS8G/TR | SGM8272 YMS8 XXXXX | Tape and Reel, 3000 |
| | SOIC-8 | -40°C to +85°C | SGM8272YS8G/TR | SGM 8272YS8 XXXXX | Tape and Reel, 2500 |
| | SOIC-8 | -40°C to +125°C | SGM8272XS8G/TR | SGM 8272XS8 XXXXX | Tape and Reel, 2500 |
| SGM8274 | SOIC-14 | -40°C to +85°C | SGM8274YS14G/TR | SGM8274YS14 XXXXX | Tape and Reel, 2500 |
| | SOIC-14 | -40°C to +125°C | SGM8274XS14G/TR | SGM8274XS14 XXXXX | Tape and Reel, 2500 |
| | TSSOP-14 | -40°C to +85°C | SGM8274YTS14G/TR | SGM8274 YTS14 XXXXX | Tape and Reel, 3000 |

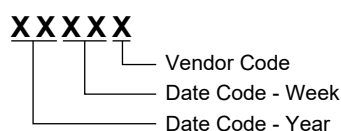
MARKING INFORMATION

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

SOT-23-5



SOIC-8/MSOP-8/SOIC-14/TSSOP-14



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, +Vs to -Vs | 40V |
| Input Common Mode Voltage Range | (-Vs) - 0.1V to (+Vs) - 1.5V |
| Input/Output Voltage Range | (-Vs) - 0.3V to (+Vs) + 0.3V |
| Differential Input Voltage..... | 1.5V |
| Junction Temperature..... | +150°C |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (Soldering, 10s)..... | +260°C |
| ESD Susceptibility | |
| HBM..... | 4000V |
| MM (SGM8271/2) | 150V |
| MM (SGM8274) | 300V |

RECOMMENDED OPERATING CONDITIONS

| | |
|-----------------------------------|-----------------|
| Operating Temperature Range | -40°C to +125°C |
|-----------------------------------|-----------------|

NOTE:

1. Proper power supply sequencing is recommended for the CMOS device. Always sequence Vs on first, followed by the inputs and outputs.

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

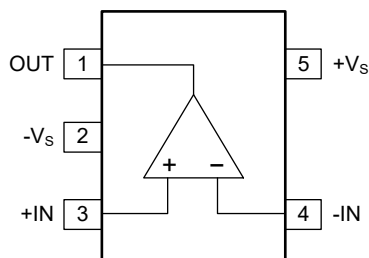
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

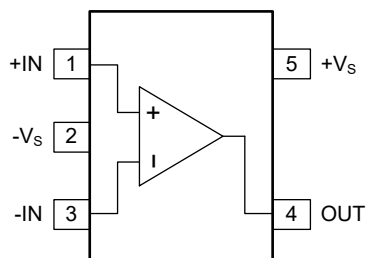
PIN CONFIGURATIONS

SGM8271AYN5G (TOP VIEW)



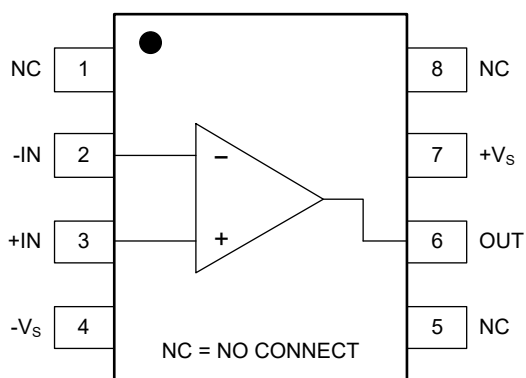
SOT-23-5

SGM8271BYN5G (TOP VIEW)



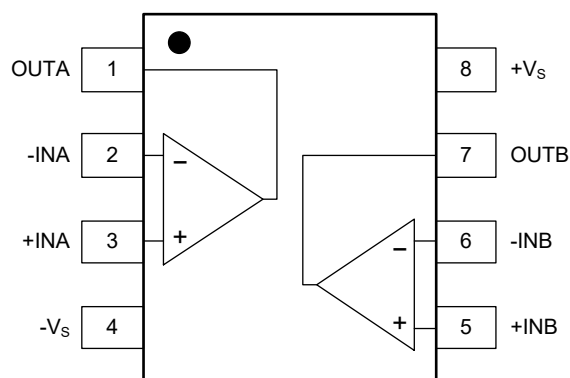
SOT-23-5

SGM8271 (TOP VIEW)



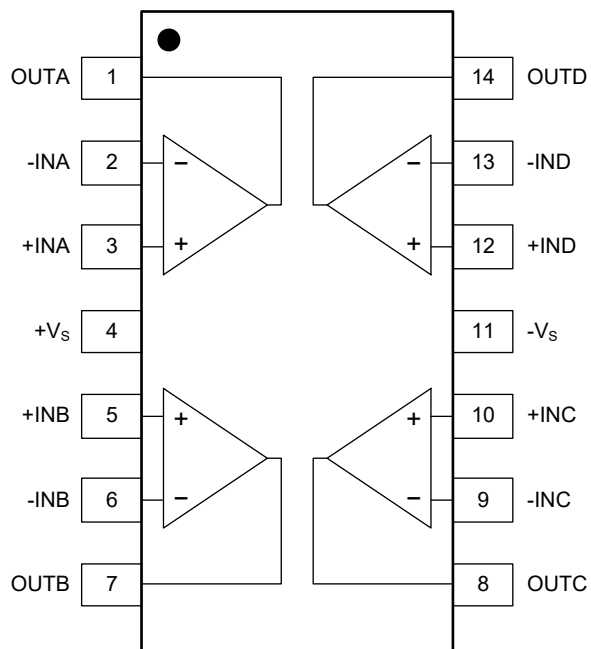
SOIC-8/MSOP-8

SGM8272 (TOP VIEW)



SOIC-8/MSOP-8

SGM8274 (TOP VIEW)



SOIC-14/TSSOP-14

ELECTRICAL CHARACTERISTICS

($V_S = 5V$, $R_L = 2k\Omega$ connected to 2.5V, unless otherwise noted.)

| PARAMETER | CONDITIONS | SGM8271/2/4 | | | | | | |
|---|---|-------------|--------------------------|----------------|-----------------|------------------|-------|---------|
| | | TYP | MIN/MAX OVER TEMPERATURE | | | | UNITS | MIN/MAX |
| | | +25°C | +25°C | -40°C to +85°C | -40°C to +125°C | | | |
| Input Offset Voltage (V_{OS}) | $V_{CM} = 2.5V$ | 0.6 | 3.0 | 3.8 | 3.9 | mV | MAX | |
| Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$) | | 3 | | | | $\mu V/^\circ C$ | TYP | |
| Input Bias Current (I_B) | | 20 | | | | pA | TYP | |
| Input Offset Current (I_{OS}) | | 20 | | | | pA | TYP | |
| Open-Loop Voltage Gain (A_{OL}) | $V_{OUT} = 0.5V$ to $4.5V$, $R_L = 5k\Omega$ | 86 | 75 | 72 | 70 | dB | MIN | |
| Output Voltage Swing from Rail | V_{OH} $R_L = 10k\Omega$ | 16 | 39 | 43 | 46 | mV | MAX | |
| | V_{OL} $R_L = 10k\Omega$ | 14 | 30 | 34 | 38 | mV | MAX | |
| Output Short-Circuit Current (I_{SC}) | Sink $R_L = 10\Omega$ | 46.2 | 34.1 | 21.5 | 11.0 | mA | MIN | |
| | Source $R_L = 10\Omega$ | 44.4 | 30.5 | 20.7 | 12.3 | | | |
| Input Common Mode Voltage Range (V_{CM}) | | -0.1 to 3.5 | | | | V | TYP | |
| Common Mode Rejection Ratio (CMRR) | $V_{CM} = -0.1V$ to $3.5V$ | 84 | 67 | 62 | 60 | dB | MIN | |
| Power Supply Rejection Ratio (PSRR) | $V_S = 4.5V$ to $36V$ | 103 | 82 | 80 | 78 | dB | MIN | |
| Quiescent Current/Amplifier | $I_{OUT} = 0A$ | 144 | 275 | 309 | 329 | μA | MAX | |
| Gain-Bandwidth Product (GBP) | $C_L = 100pF$, $V_{CM} = 2.5V$ | 1.4 | | | | MHz | TYP | |
| Gain Margin | $C_L = 100pF$, $V_{CM} = 2.5V$ | -10 | | | | dB | TYP | |
| Phase Margin | $C_L = 100pF$, $V_{CM} = 2.5V$ | 50 | | | | $^\circ$ | TYP | |
| Channel-to-Channel Crosstalk | $f = 1MHz$ | -80 | | | | dB | TYP | |
| Slew Rate (SR) | Up $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 5 | | | | $V/\mu s$ | TYP | |
| | Down $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 5 | | | | $V/\mu s$ | TYP | |
| Overload Recovery Time (ORT) | Up $V_{IN} \times G = V_S$ | 2.0 | | | | μs | TYP | |
| | Down $V_{IN} \times G = V_S$ | 4.0 | | | | | | |
| Settling Time (t_s) | $C_L = 100pF$, $A_V = 1$, 200mV output step | 2 | | | | μs | TYP | |
| Input Voltage Noise Density (e_n) | $f = 20kHz$, $V_{CM} = 2.5V$ | 30 | | | | nV/\sqrt{Hz} | TYP | |
| | $f = 1kHz$, $V_{CM} = 2.5V$ | 45 | | | | | | |
| Total Harmonic Distortion + Noise (THD+N) | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 600\Omega$ | 0.018 | | | | % | TYP | |
| | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 2k\Omega$ | 0.009 | | | | | | |

ELECTRICAL CHARACTERISTICS (continued)

($V_S = \pm 5V$, $R_L = 2k\Omega$ connected to 0V, unless otherwise noted.)

| PARAMETER | CONDITIONS | SGM8271/2/4 | | | | | | |
|---|---|-------------|--------------------------|-------------------|--------------------|------------------|-------|-------------|
| | | TYP | MIN/MAX OVER TEMPERATURE | | | | UNITS | MIN/ MAX |
| | | +25°C | +25°C | -40°C to +85°C | -40°C to +125°C | | | |
| Input Offset Voltage (V_{OS}) | $V_{CM} = 0V$ | 0.6 | 3.0 | 3.8 | 3.9 | mV | MAX | |
| Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$) | | 3 | | | | $\mu V/^\circ C$ | TYP | |
| Input Bias Current (I_B) | | 20 | | | | pA | TYP | |
| Input Offset Current (I_{OS}) | | 20 | | | | pA | TYP | |
| Open-Loop Voltage Gain (A_{OL}) | $V_{OUT} = -4.5V$ to $4.5V$, $R_L = 5k\Omega$ | 93 | 81 | 78 | 76 | dB | MIN | |
| Output Voltage Swing from Rail | V_{OH} $R_L = 10k\Omega$ | 28 | 67 | 73 | 79 | mV | MAX | |
| | V_{OL} $R_L = 10k\Omega$ | 23 | 39 | 47 | 62 | mV | MAX | |
| Output Current (I_{OUT}) | | 60 | | | | mA | TYP | |
| Input Common Mode Voltage Range (V_{CM}) | | -5.1 to 3.5 | | | | V | TYP | |
| Common Mode Rejection Ratio (CMRR) | $V_{CM} = -5.1V$ to $3.5V$ | 92 | 75 | 68 | 66 | dB | MIN | |
| Quiescent Current/Amplifier | $I_{OUT} = 0A$ | 145 | 276 | 311 | 332 | μA | MAX | |
| Gain-Bandwidth Product (GBP) | $C_L = 100pF$, $V_{CM} = 0V$ | 1.4 | | | | MHz | TYP | |
| Gain Margin | $C_L = 100pF$, $V_{CM} = 0V$ | -10 | | | | dB | TYP | |
| Phase Margin | $C_L = 100pF$, $V_{CM} = 0V$ | 50 | | | | $^\circ$ | TYP | |
| Channel-to-Channel Crosstalk | $f = 1MHz$ | -80 | | | | dB | TYP | |
| Slew Rate (SR) | Up $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 6 | | | | $V/\mu s$ | TYP | |
| | Down $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 4 | | | | $V/\mu s$ | TYP | |
| Overload Recovery Time (ORT) | Up $V_{IN} \times G = V_S$ | 1.5 | | | | μs | TYP | |
| | Down $V_{IN} \times G = V_S$ | 2.5 | | | | | | |
| Settling Time (t_s) | $C_L = 100pF$, $A_V = 1$, 200mV output step | 2 | | | | μs | TYP | |
| Input Voltage Noise Density (e_n) | $f = 20kHz$, $V_{CM} = 0V$ | 30 | | | | nV/\sqrt{Hz} | TYP | |
| | $f = 1kHz$, $V_{CM} = 0V$ | 45 | | | | | | |
| Total Harmonic Distortion + Noise (THD+N) | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 600\Omega$ | 0.018 | | | | % | TYP | |
| | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 2k\Omega$ | 0.009 | | | | | | |

ELECTRICAL CHARACTERISTICS (continued)

($V_S = \pm 15V$, $R_L = 2k\Omega$ connected to 0V, unless otherwise noted.)

| PARAMETER | CONDITIONS | SGM8271/2/4 | | | | | | |
|---|---|---------------|--------------------------|-------------------|--------------------|------------------|-------|-------------|
| | | TYP | MIN/MAX OVER TEMPERATURE | | | | UNITS | MIN/ MAX |
| | | +25°C | +25°C | -40°C to +85°C | -40°C to +125°C | | | |
| Input Offset Voltage (V_{OS}) | $V_{CM} = 0V$ | 0.6 | 3.0 | 3.8 | 3.9 | mV | MAX | |
| Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$) | | 3 | | | | $\mu V/^\circ C$ | TYP | |
| Input Bias Current (I_B) | | 20 | | | | pA | TYP | |
| Input Offset Current (I_{OS}) | | 20 | | | | pA | TYP | |
| Open-Loop Voltage Gain (A_{OL}) | $V_{OUT} = -14.5V$ to $14.5V$, $R_L = 5k\Omega$ | 100 | 85 | 82 | 80 | dB | MIN | |
| Output Voltage Swing from Rail | V_{OH} $R_L = 10k\Omega$ | 67 | 174 | 193 | 210 | mV | MAX | |
| | V_{OL} $R_L = 10k\Omega$ | 63 | 102 | 124 | 148 | mV | MAX | |
| Output Current (I_{OUT}) | | 60 | | | | mA | TYP | |
| Input Common Mode Voltage Range (V_{CM}) | | -15.1 to 13.5 | | | | V | TYP | |
| Common Mode Rejection Ratio (CMRR) | $V_{CM} = -15.1V$ to $13.5V$ | 95 | 79 | 71 | 66 | dB | MIN | |
| Quiescent Current/Amplifier | $I_{OUT} = 0A$ | 150 | 286 | 320 | 337 | μA | MAX | |
| Gain-Bandwidth Product (GBP) | $C_L = 100pF$, $V_{CM} = 0V$ | 1.4 | | | | MHz | TYP | |
| Gain Margin | $C_L = 100pF$, $V_{CM} = 0V$ | -10 | | | | dB | TYP | |
| Phase Margin | $C_L = 100pF$, $V_{CM} = 0V$ | 50 | | | | $^\circ$ | TYP | |
| Channel-to-Channel Crosstalk | $f = 1MHz$ | -80 | | | | dB | TYP | |
| Slew Rate (SR) | Up $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 7 | | | | $V/\mu s$ | TYP | |
| | Down $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 4 | | | | $V/\mu s$ | TYP | |
| Overload Recovery Time (ORT) | Up $V_{IN} \times G = V_S$ | 0.5 | | | | μs | TYP | |
| | Down $V_{IN} \times G = V_S$ | 1.0 | | | | | | |
| Settling Time (t_s) | $C_L = 100pF$, $A_V = 1$, 200mV output step | 2 | | | | μs | TYP | |
| Input Voltage Noise Density (e_n) | $f = 20kHz$, $V_{CM} = 0V$ | 29 | | | | nV/\sqrt{Hz} | TYP | |
| | $f = 1kHz$, $V_{CM} = 0V$ | 43 | | | | | | |
| Total Harmonic Distortion + Noise (THD+N) | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 600\Omega$ | 0.018 | | | | % | TYP | |
| | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 2k\Omega$ | 0.009 | | | | | | |

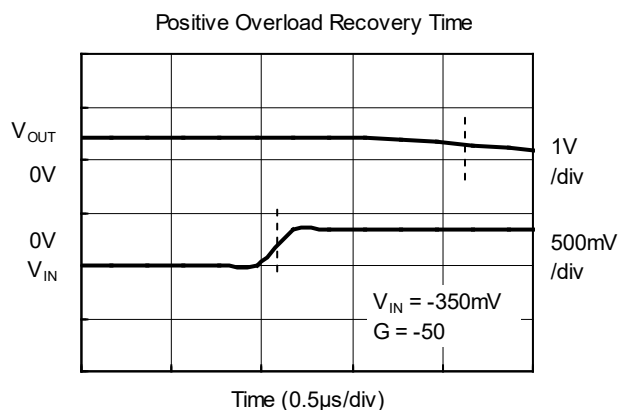
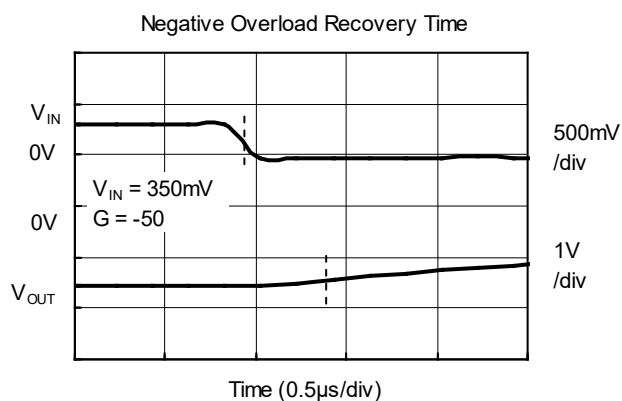
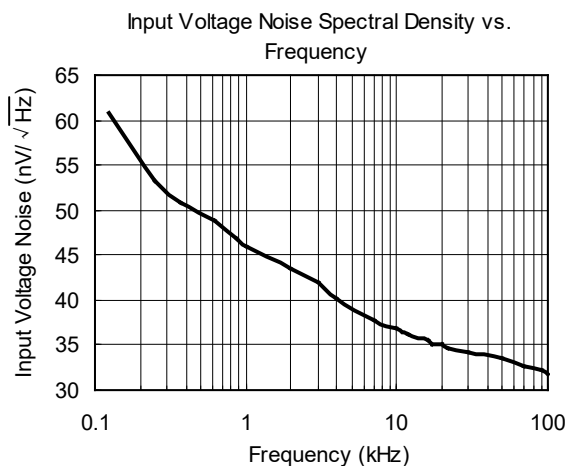
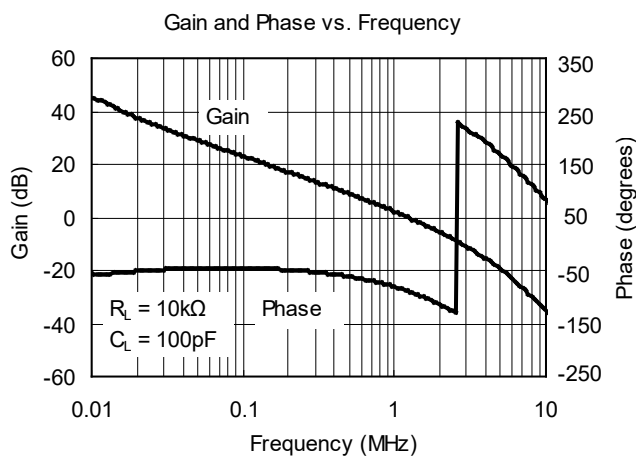
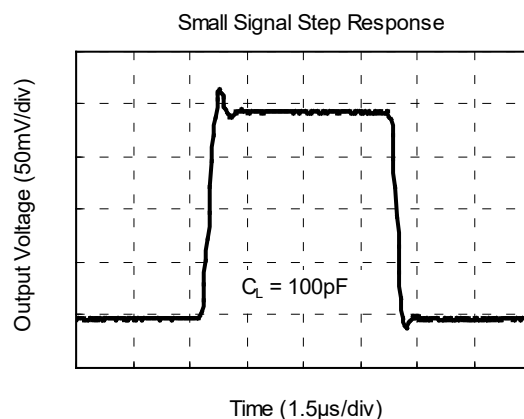
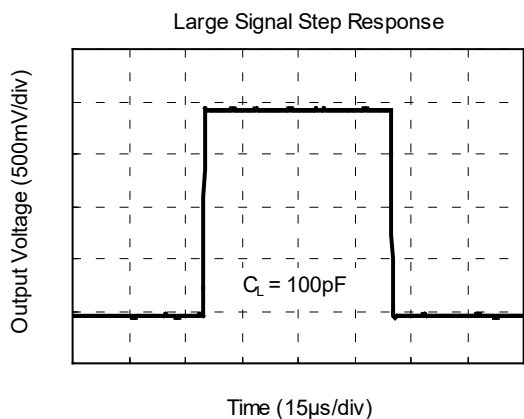
ELECTRICAL CHARACTERISTICS (continued)

($V_S = \pm 18V$, $R_L = 2k\Omega$ connected to 0V, unless otherwise noted.)

| PARAMETER | CONDITIONS | SGM8271/2/4 | | | | | | |
|---|---|---------------|--------------------------|-------------------|--------------------|------------------|-------|-------------|
| | | TYP | MIN/MAX OVER TEMPERATURE | | | | UNITS | MIN/ MAX |
| | | +25°C | +25°C | -40°C to +85°C | -40°C to +125°C | | | |
| Input Offset Voltage (V_{OS}) | $V_{CM} = 0V$ | 0.6 | 3.0 | 3.8 | 3.9 | mV | MAX | |
| Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$) | | 3 | | | | $\mu V/^\circ C$ | TYP | |
| Input Bias Current (I_B) | | 20 | | | | pA | TYP | |
| Input Offset Current (I_{OS}) | | 20 | | | | pA | TYP | |
| Open-Loop Voltage Gain (A_{OL}) | $V_{OUT} = -17.5V$ to $17.5V$, $R_L = 5k\Omega$ | 101 | 87 | 84 | 82 | dB | MIN | |
| Output Voltage Swing from Rail | V_{OH} $R_L = 10k\Omega$ | 81 | 208 | 231 | 251 | mV | MAX | |
| | V_{OL} $R_L = 10k\Omega$ | 73 | 119 | 146 | 172 | mV | MAX | |
| Output Current (I_{OUT}) | | 60 | | | | mA | TYP | |
| Input Common Mode Voltage Range (V_{CM}) | | -18.1 to 16.5 | | | | V | TYP | |
| Common Mode Rejection Ratio (CMRR) | $V_{CM} = -18.1V$ to $16.5V$ | 91 | 78 | 72 | 69 | dB | MIN | |
| Quiescent Current/Amplifier | $I_{OUT} = 0A$ | 157 | 299 | 332 | 352 | μA | MAX | |
| Gain-Bandwidth Product (GBP) | $C_L = 100pF$, $V_{CM} = 0V$ | 1.4 | | | | MHz | TYP | |
| Gain Margin | $C_L = 100pF$, $V_{CM} = 0V$ | -10 | | | | dB | TYP | |
| Phase Margin | $C_L = 100pF$, $V_{CM} = 0V$ | 50 | | | | $^\circ$ | TYP | |
| Channel-to-Channel Crosstalk | $f = 1MHz$ | -80 | | | | dB | TYP | |
| Slew Rate (SR) | Up $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 7 | | | | $V/\mu s$ | TYP | |
| | Down $V_{OUT} = 2V_{P-P}$ step, $C_L = 100pF$, $A_V = 1$ | 4 | | | | $V/\mu s$ | TYP | |
| Overload Recovery Time (ORT) | Up $V_{IN} \times G = V_S$ | 0.5 | | | | μs | TYP | |
| | Down $V_{IN} \times G = V_S$ | 1.0 | | | | | | |
| Settling Time (t_s) | $C_L = 100pF$, $A_V = 1$, 200mV output step | 2 | | | | μs | TYP | |
| Input Voltage Noise Density (e_n) | $f = 20kHz$, $V_{CM} = 0V$ | 29 | | | | nV/\sqrt{Hz} | TYP | |
| | $f = 1kHz$, $V_{CM} = 0V$ | 43 | | | | | | |
| Total Harmonic Distortion + Noise (THD+N) | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 600\Omega$ | 0.018 | | | | % | TYP | |
| | $V_{OUT} = 2V_{P-P}$, $f = 1kHz$, $A_V = 1$, $R_L = 2k\Omega$ | 0.009 | | | | | | |

TYPICAL PERFORMANCE CHARACTERISTICS

At $V_s = \pm 15V$, $R_L = 2k\Omega$ connected to $0V$, unless otherwise noted.



REVISION HISTORY

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

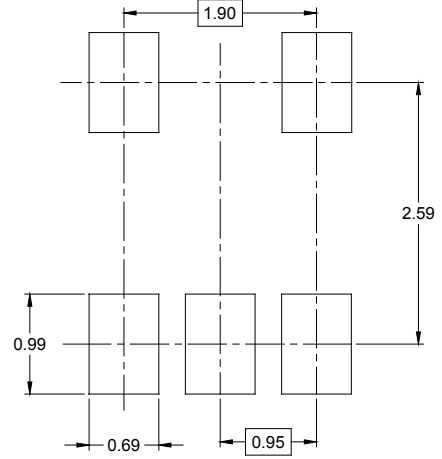
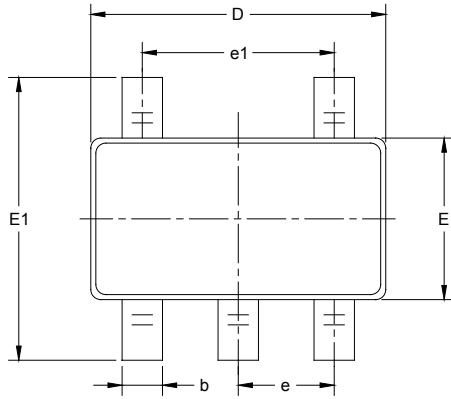
| JANUARY 2017 – REV.A.1 to REV.A.2 | Page |
|--|-------------|
| Added Differential Input Voltage | 3 |

| JANUARY 2016 – REV.A to REV.A.1 | Page |
|---|-------------|
| Changed CMRR minimum at $V_S = 5V, \pm 5V$ | 5~6 |
| Deleted Output Current (I_{OUT}) conditions | 6~8 |
| Updated SOIC-14 and TSSOP-14 packages | 14~15 |
| Deleted differential voltage | 1 |

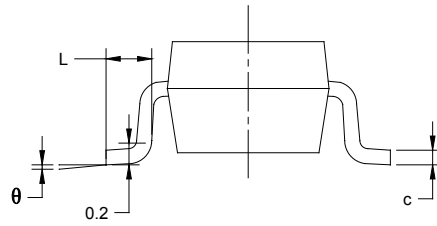
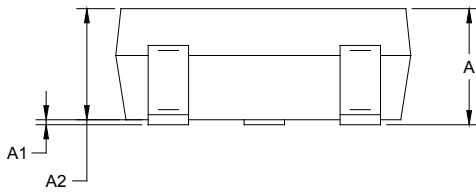
| Changes from Original (AUGUST 2012) to REV.A | Page |
|---|-------------|
| Changed from product preview to production data | All |

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



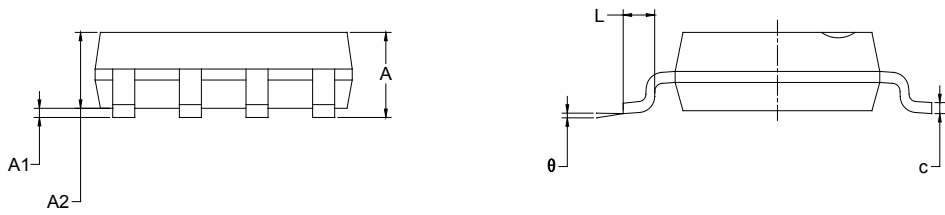
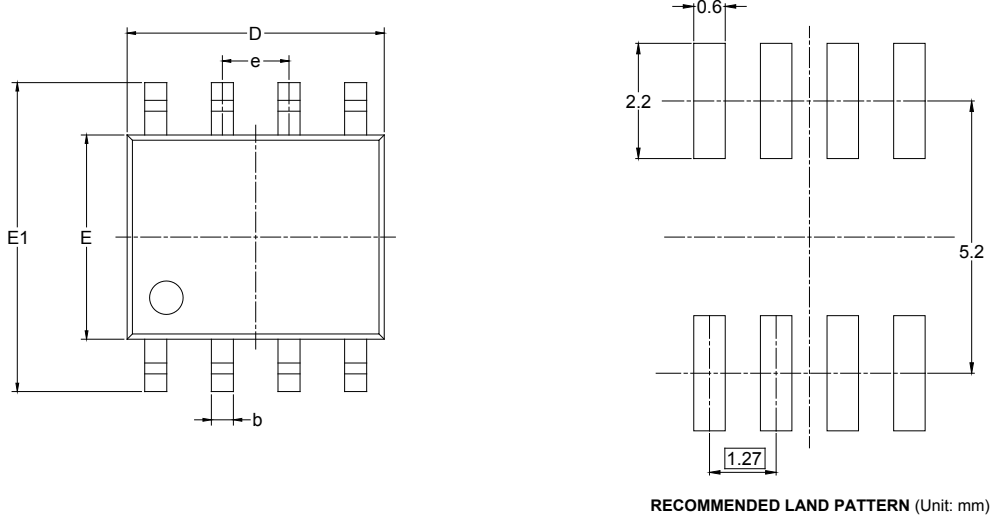
RECOMMENDED LAND PATTERN (Unit: mm)



| 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

SOIC-8



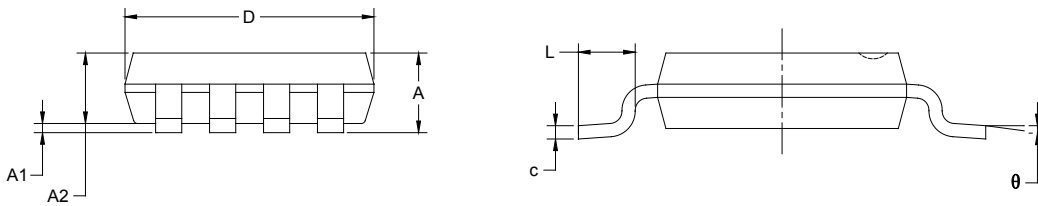
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 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)

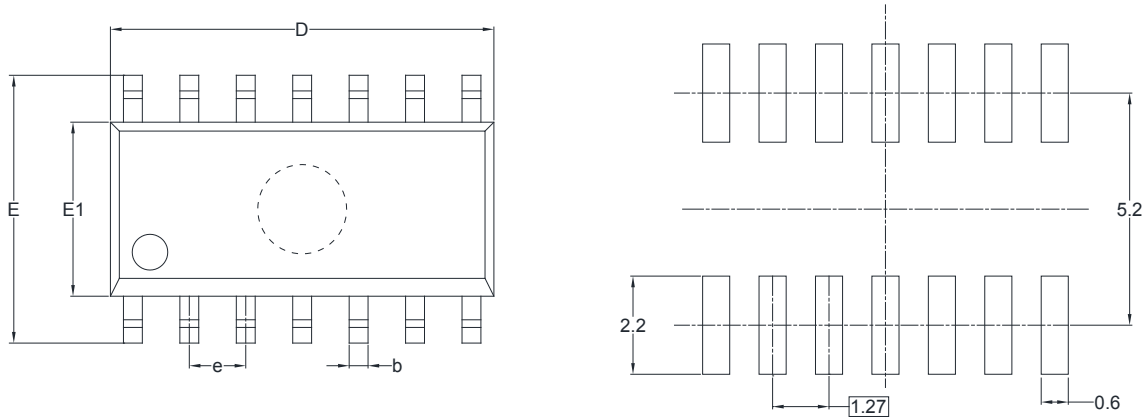


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250 | 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° |

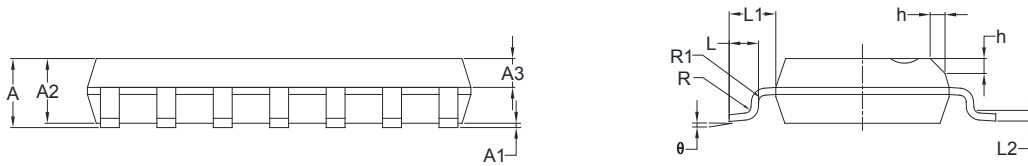
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOIC-14



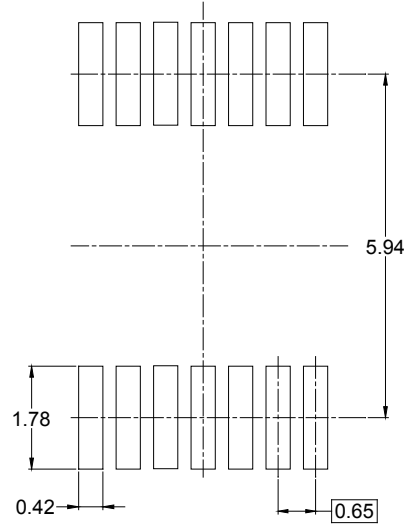
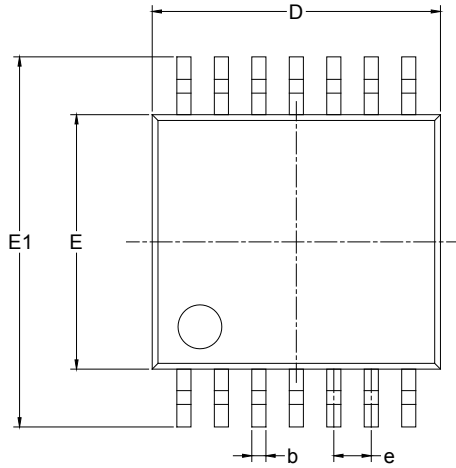
RECOMMENDED LAND PATTERN (Unit: mm)



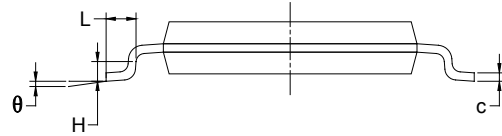
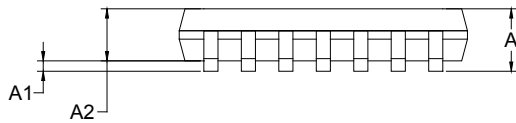
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A1 | 0.10 | 0.25 | 0.004 | 0.010 |
| A2 | 1.25 | 1.65 | 0.049 | 0.065 |
| A3 | 0.55 | 0.75 | 0.022 | 0.030 |
| b | 0.36 | 0.49 | 0.014 | 0.019 |
| D | 8.53 | 8.73 | 0.336 | 0.344 |
| E | 5.80 | 6.20 | 0.228 | 0.244 |
| E1 | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| L | 0.45 | 0.80 | 0.018 | 0.032 |
| L1 | 1.04 REF | | 0.040 REF | |
| L2 | 0.25 BSC | | 0.01 BSC | |
| R | 0.07 | | 0.003 | |
| R1 | 0.07 | | 0.003 | |
| h | 0.30 | 0.50 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |

PACKAGE OUTLINE DIMENSIONS

TSSOP-14



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | | 1.200 | | 0.047 |
| A1 | 0.050 | 0.150 | 0.002 | 0.006 |
| A2 | 0.800 | 1.050 | 0.031 | 0.041 |
| b | 0.190 | 0.300 | 0.007 | 0.012 |
| c | 0.090 | 0.200 | 0.004 | 0.008 |
| D | 4.860 | 5.100 | 0.191 | 0.201 |
| E | 4.300 | 4.500 | 0.169 | 0.177 |
| E1 | 6.250 | 6.550 | 0.246 | 0.258 |
| e | 0.650 BSC | | 0.026 BSC | |
| L | 0.500 | 0.700 | 0.02 | 0.028 |
| H | 0.25 TYP | | 0.01 TYP | |
| θ | 1° | 7° | 1° | 7° |

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 |
| SOIC-14 | 13" | 16.4 | 6.60 | 9.30 | 2.10 | 4.0 | 8.0 | 2.0 | 16.0 | Q1 |
| TSSOP-14 | 13" | 12.4 | 6.95 | 5.60 | 1.20 | 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