



SGM8261-1/SGM8261-2

Bipolar-Input, High Performance, Ultra-Low Noise Operational Amplifiers

GENERAL DESCRIPTION

The single SGM8261-1 and dual SGM8261-2 are bipolar-input, low noise operational amplifiers optimized for high voltage systems. These devices operate from 3.6V to 36V single supply or from $\pm 1.8V$ to $\pm 18V$ dual power supplies, while consuming 3.8mA quiescent current per amplifier.

The SGM8261-1/2 have impressive dynamic characteristics with various loads. The rail-to-rail output swing with a 2k Ω load is within 185mV of the rails. This results in large headroom and wide dynamic range. The SGM8261-1/2 are unity-gain stable and offer a $\pm 65mA$ high output current. They feature $1.6nV/\sqrt{Hz}$ ultra-low noise at 1kHz with 0.00002% distortion.

The SGM8261-1 is available in a Green SOIC-8 package. The SGM8261-2 is available in Green SOIC-8, MSOP-8 and TDFN-3 \times 3-8BL packages. They operate over an ambient temperature range of $-40^{\circ}C$ to $+85^{\circ}C$.

FEATURES

- **Excellent Sound Quality**
- **Ultra-Low Input Voltage Noise: $1.6nV/\sqrt{Hz}$ at 1kHz**
- **Ultra-Low Distortion: 0.00002% at 1kHz**
- **Unity-Gain Stable**
- **Gain-Bandwidth Product: 16MHz (G = +1)**
- **High Slew Rate: 16V/ μs**
- **High Open-Loop Gain: 140dB**
- **Low Offset Voltage: $\pm 350\mu V$ (MAX)**
- **Rail-to-Rail Output**
- **Support Single or Dual Power Supplies:
3.6V to 36V or $\pm 1.8V$ to $\pm 18V$**
- **Low Quiescent Current: 3.8mA/Amplifier**
- **$-40^{\circ}C$ to $+85^{\circ}C$ Operating Temperature Range**
- **Small Packaging:
SGM8261-1 Available in a Green SOIC-8 Package
SGM8261-2 Available in Green SOIC-8, MSOP-8
and TDFN-3 \times 3-8BL Packages**

APPLICATIONS

Professional Audio Instrument
High-End A/V Receiving Machines
Analog and Digital Mixing Control Boards

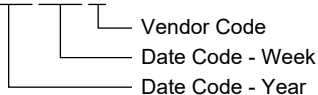
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-----------|---------------------|-----------------------------|--------------------|----------------------------|---------------------|
| SGM8261-1 | SOIC-8 | -40°C to +85°C | SGM8261-1YS8G/TR | SGM 82611YS8 XXXXXX | Tape and Reel, 2500 |
| SGM8261-2 | SOIC-8 | -40°C to +85°C | SGM8261-2YS8G/TR | SGM 82612YS8 XXXXXX | Tape and Reel, 2500 |
| | MSOP-8 | -40°C to +85°C | SGM8261-2YMS8G/TR | SGM82612 YMS8 XXXXXX | Tape and Reel, 4000 |
| | TDFN-3×3-8BL | -40°C to +85°C | SGM8261-2YTDD8G/TR | SGM 82612DD XXXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

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, +Vs to -Vs 40V
 Input Voltage Range (-Vs) - 0.3V to (+Vs) + 0.3V
 Input Current (All pins except power supply pins)..... ±10mA
 Output Short-Circuit Current ±100mA
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10s) +260°C
 ESD Susceptibility
 HBM 8000V
 MM 300V
 CDM 1000V

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.

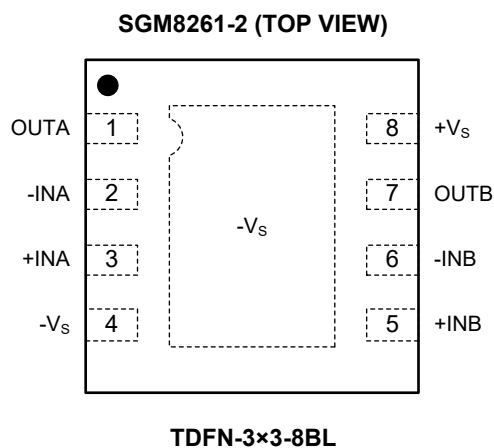
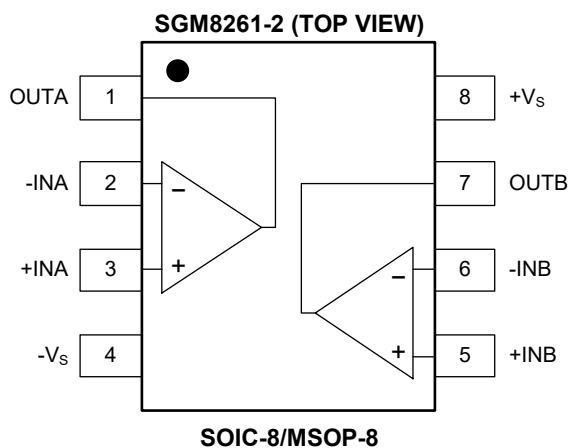
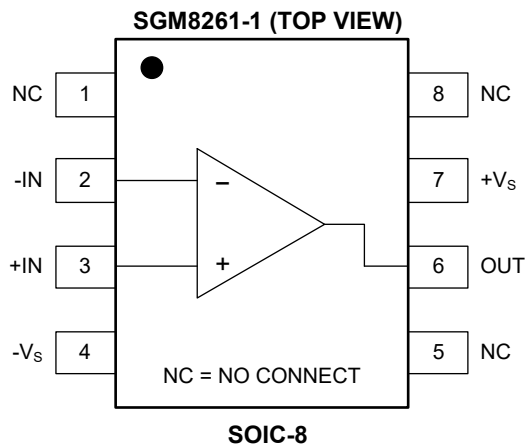
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged 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



NOTE: For TDFN-3x3-8BL package, connect exposed pad to -Vs.

ELECTRICAL CHARACTERISTICS

(At $T_A = +25^\circ\text{C}$, $V_S = 4.5\text{V}$ to 36V or $V_S = \pm 2.25\text{V}$ to $\pm 18\text{V}$, $R_L = 2\text{k}\Omega$, $V_{CM} = V_{OUT} = V_S/2$, unless otherwise noted.)

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|--|----------------|---------------------------|----------------|------------------------------|
| Input Characteristics | | | | | |
| Input Offset Voltage (V_{OS}) | $V_S = \pm 15\text{V}$ | | ± 100 | ± 350 | μV |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | | | ± 450 | |
| Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$) | $V_S = \pm 15\text{V}$ | | 1 | | $\mu\text{V}/^\circ\text{C}$ |
| Input Bias Current (I_B) | $V_{CM} = V_{OUT} = V_S/2$ | | ± 40 | ± 300 | nA |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | | | ± 550 | |
| Input Offset Current (I_{OS}) | $V_{CM} = V_{OUT} = V_S/2$ | | ± 25 | ± 165 | nA |
| Input Common Mode Voltage Range (V_{CM}) | | $(-V_S) + 1.8$ | | $(+V_S) - 1.8$ | V |
| Common Mode Rejection Ratio (CMRR) | $V_S = 4.5\text{V}$, $(-V_S) + 1.8\text{V} \leq V_{CM} \leq (+V_S) - 1.8\text{V}$ | 102 | 120 | | dB |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | 99 | | | |
| | $V_S = 36\text{V}$, $(-V_S) + 1.8\text{V} \leq V_{CM} \leq (+V_S) - 1.8\text{V}$ | 122 | 135 | | |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | 110 | | | |
| Open-Loop Voltage Gain (A_{OL}) | $(-V_S) + 0.2\text{V} \leq V_{OUT} \leq (+V_S) - 0.2\text{V}$, $R_L = 10\text{k}\Omega$ | 110 | 140 | | dB |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | 107 | | | |
| | $(-V_S) + 0.6\text{V} \leq V_{OUT} \leq (+V_S) - 0.6\text{V}$, $R_L = 2\text{k}\Omega$ | 112 | 140 | | |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | 109 | | | |
| Input Impedance | | | | | |
| Differential | | | $32\text{k} \parallel 10$ | | $\Omega \parallel \text{pF}$ |
| Common Mode | | | $10^9 \parallel 4$ | | $\Omega \parallel \text{pF}$ |
| Output Characteristics | | | | | |
| Output Voltage Swing from Rail | $R_L = 10\text{k}\Omega$ | | ± 40 | ± 65 | mV |
| | $R_L = 2\text{k}\Omega$ | | ± 185 | ± 275 | |
| Output Short-Circuit Current (I_{SC}) | | | ± 65 | | mA |
| Audio Performance | | | | | |
| Total Harmonic Distortion + Noise (THD+N) | $G = +1$, $V_{OUT} = 3V_{RMS}$, $f = 1\text{kHz}$ | | 0.00002 | | % |
| | | | -134 | | dB |
| Intermodulation Distortion (IMD) | $G = +1$, $V_{OUT} = 3V_{RMS}$, SMPTE/DIN, Two-Tone, 4:1 (60Hz and 7kHz) | | 0.000015 | | % |
| | | | -136 | | dB |
| | $G = +1$, $V_{OUT} = 3V_{RMS}$, DIM 30, (3kHz square wave and 15kHz sine wave) | | 0.000032 | | % |
| | | | -130 | | dB |
| $G = +1$, $V_{OUT} = 3V_{RMS}$, CCIF Twin-Tone, (19kHz and 20kHz) | | 0.00013 | | % | |
| | | -118 | | dB | |
| Frequency Response | | | | | |
| Gain-Bandwidth Product (GBP) | $G = +100$ | | 45 | | MHz |
| | $G = +1$ | | 16 | | |
| Slew Rate (SR) | $G = -1$ | | 16 | | V/ μs |
| Full Power Bandwidth ⁽¹⁾ | $V_{OUT} = 1V_{P-P}$ | | 2 | | MHz |
| Overload Recovery Time | $G = -10$ | | 500 | | ns |
| Channel Separation (Dual) | $f = 1\text{kHz}$ | | -140 | | dB |

NOTE: 1. Full-Power Bandwidth = Slew Rate/($2\pi \times V_P$).

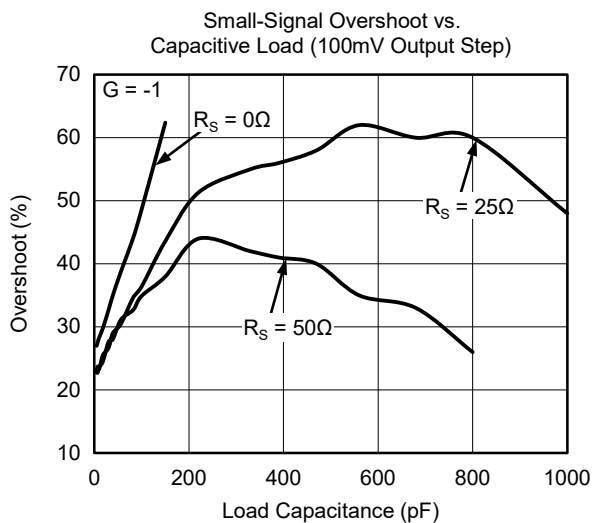
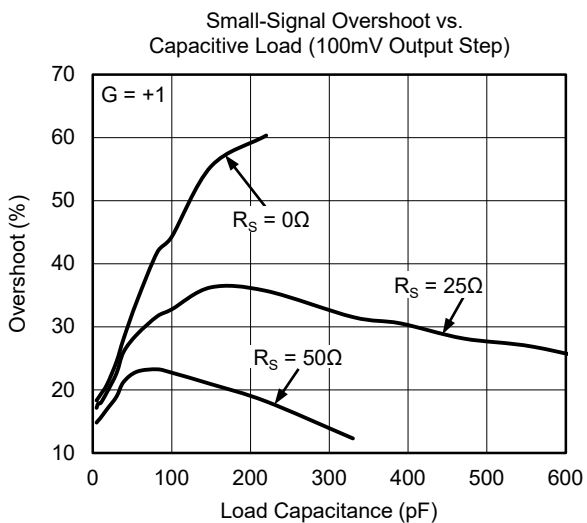
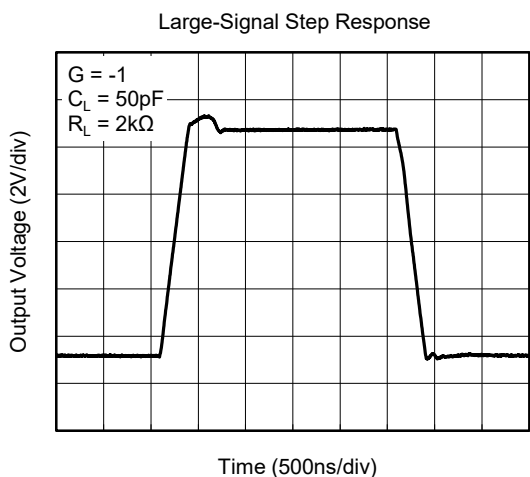
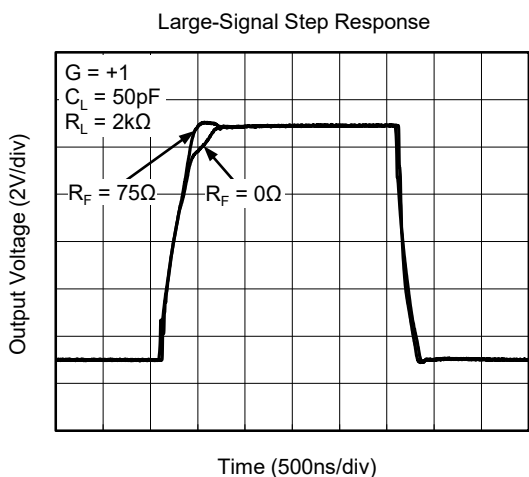
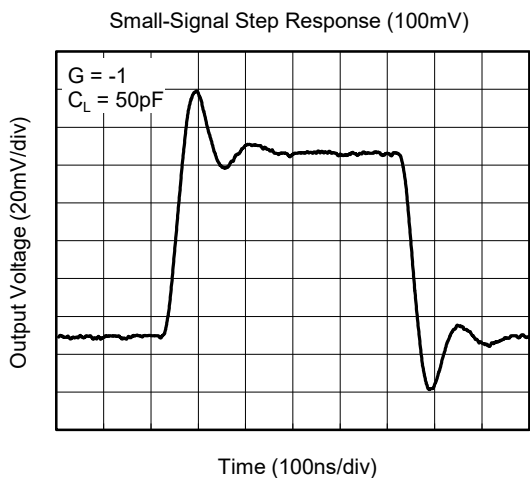
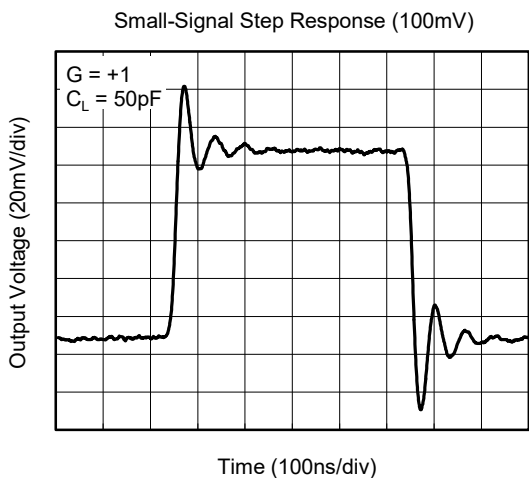
ELECTRICAL CHARACTERISTICS (continued)

(At $T_A = +25^\circ\text{C}$, $V_S = 4.5\text{V}$ to 36V or $V_S = \pm 2.25\text{V}$ to $\pm 18\text{V}$, $R_L = 2\text{k}\Omega$, $V_{CM} = V_{OUT} = V_S/2$, unless otherwise noted.)

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------------------------|---|------------|-----|----------|------------------------------|
| Noise Performance | | | | | |
| Input Voltage Noise | $f = 20\text{Hz}$ to 20kHz | | 1.7 | | μV_{P-P} |
| Input Voltage Noise Density (e_n) | $f = 10\text{Hz}$ | | 5 | | $\text{nV}/\sqrt{\text{Hz}}$ |
| | $f = 100\text{Hz}$ | | 2 | | |
| | $f = 1\text{kHz}$ | | 1.6 | | |
| Input Current Noise Density (i_n) | $f = 1\text{kHz}$ | | 6 | | $\text{pA}/\sqrt{\text{Hz}}$ |
| Power Supply | | | | | |
| Supply Voltage (V_S) | | ± 1.8 | | ± 18 | V |
| Specified Voltage (V_S) | | ± 2.25 | | ± 18 | V |
| Quiescent Current/Amplifier (I_Q) | $V_S = 3.6\text{V}$ to 36V , $I_{OUT} = 0$ | | 3.8 | 5 | mA |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | | | 5.5 | |
| Power Supply Rejection Ratio (PSRR) | $V_S = \pm 1.8\text{V}$ to $\pm 18\text{V}$ | | 0.1 | 1 | $\mu\text{V}/\text{V}$ |
| | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ | | | 1.5 | |

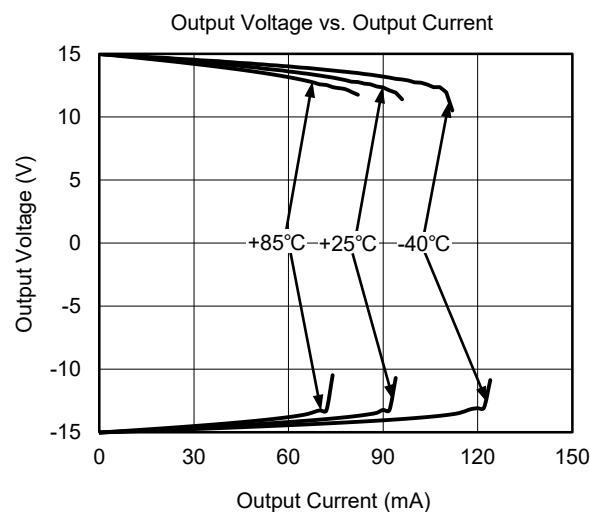
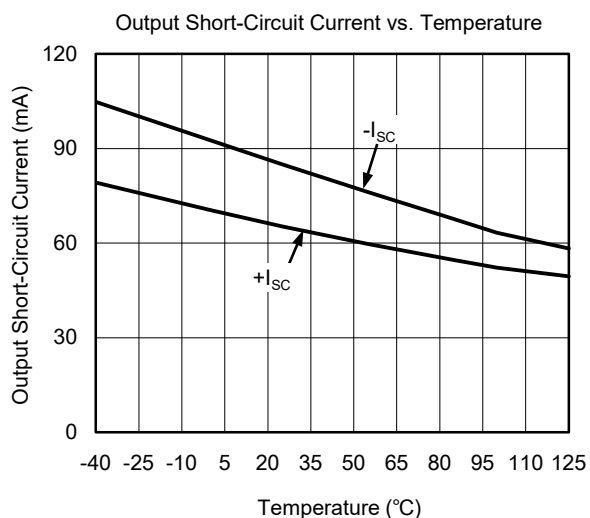
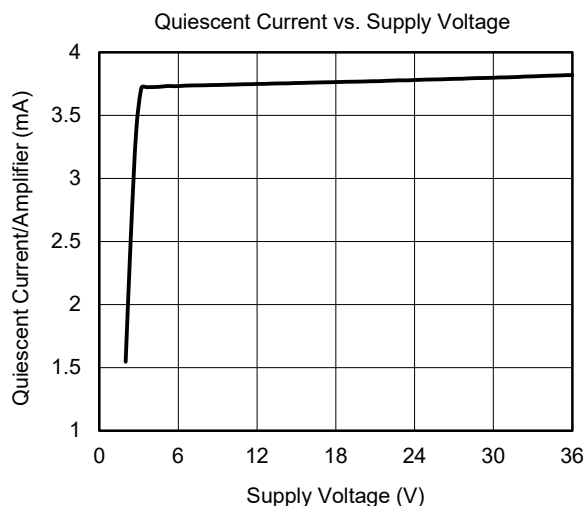
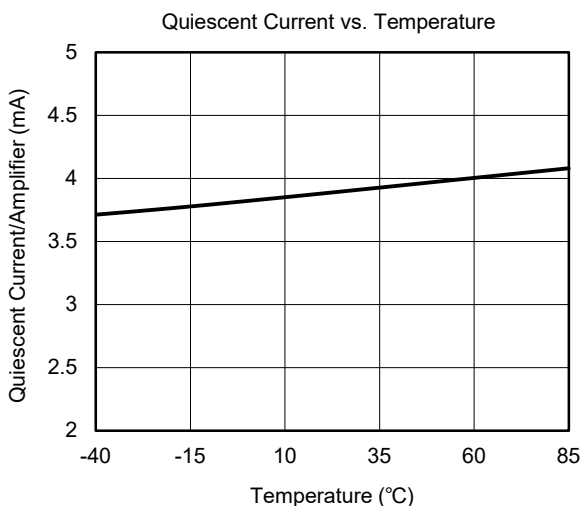
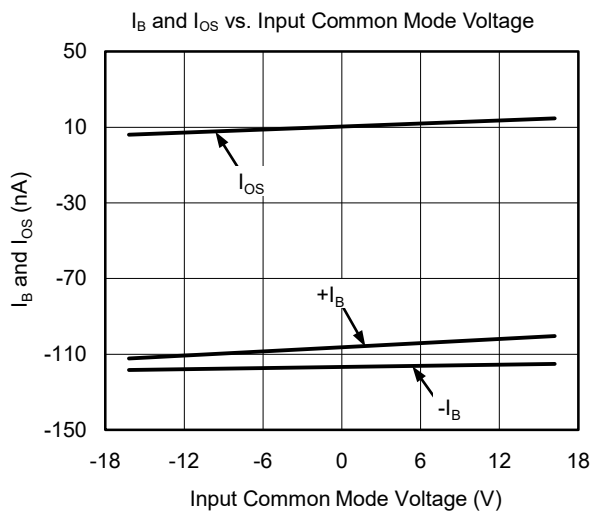
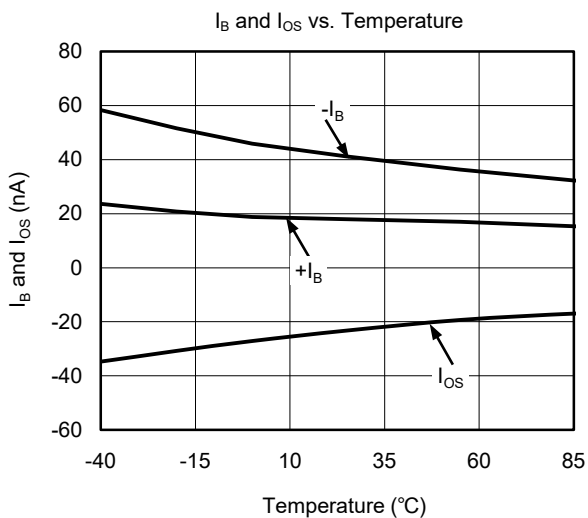
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



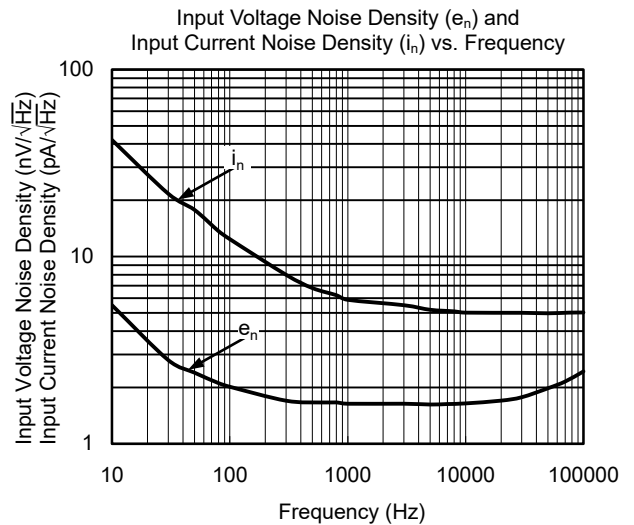
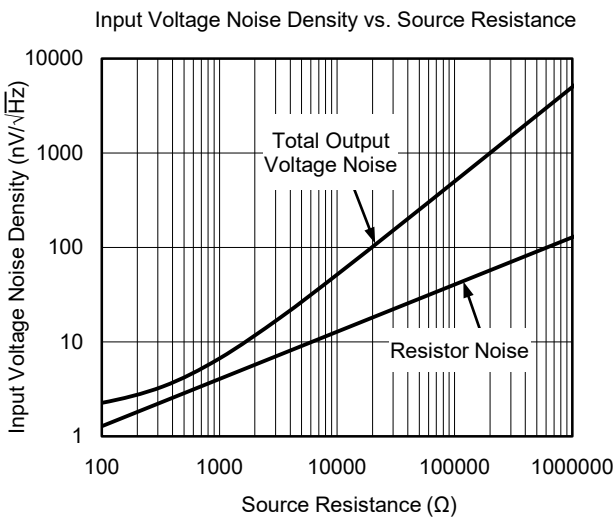
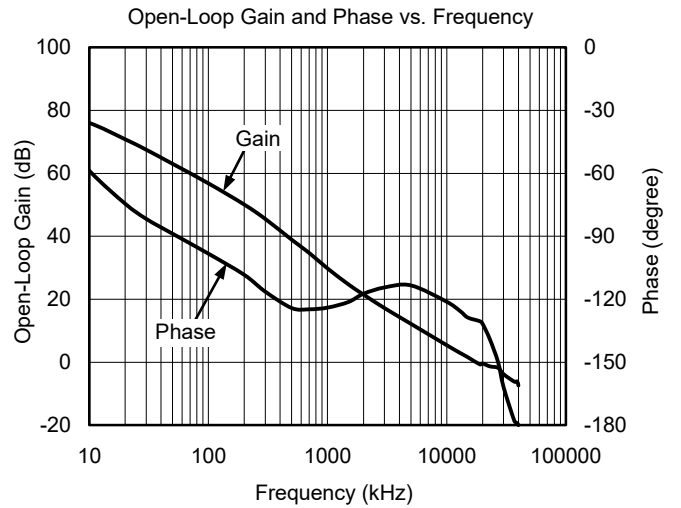
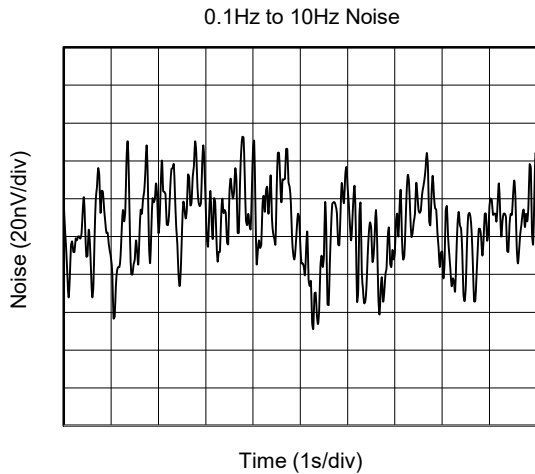
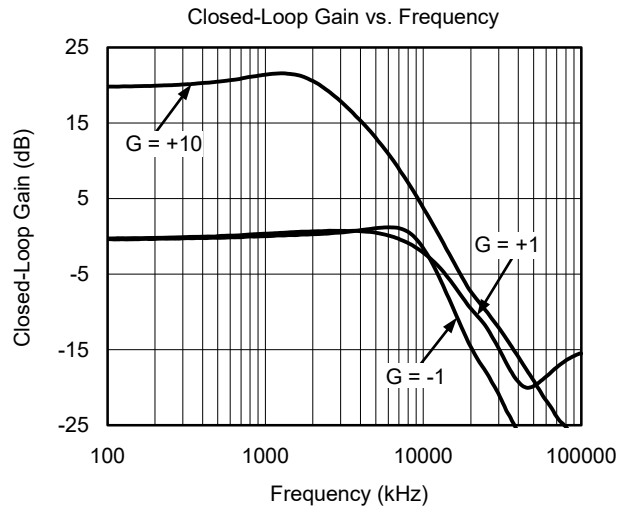
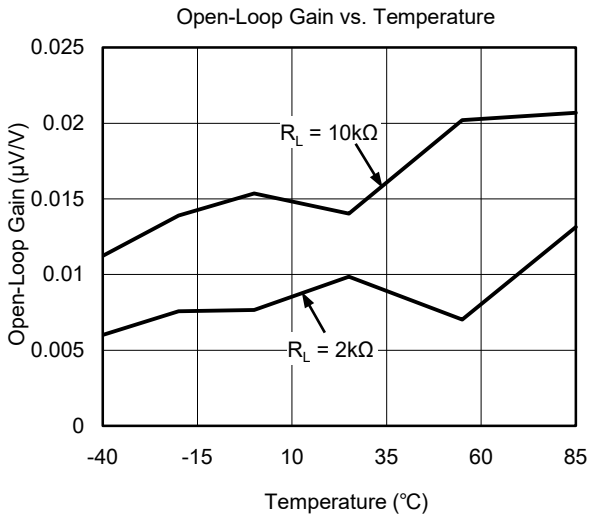
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



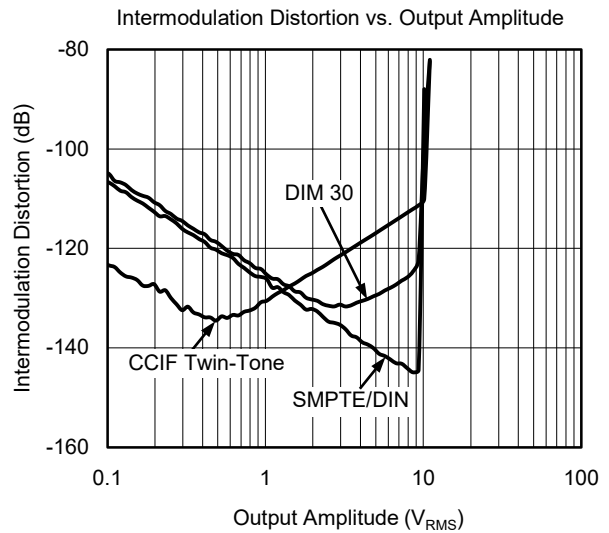
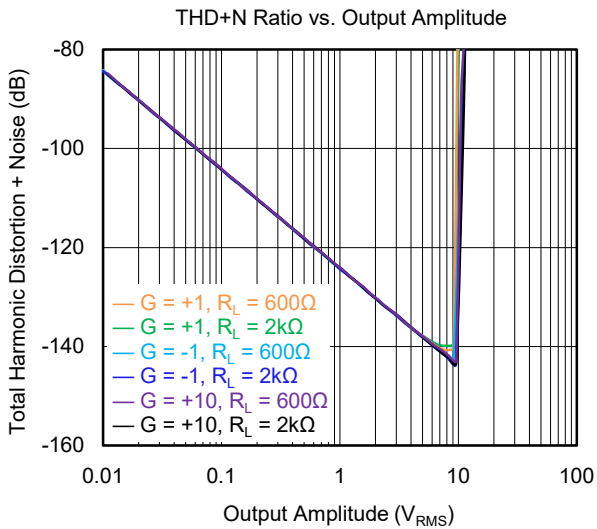
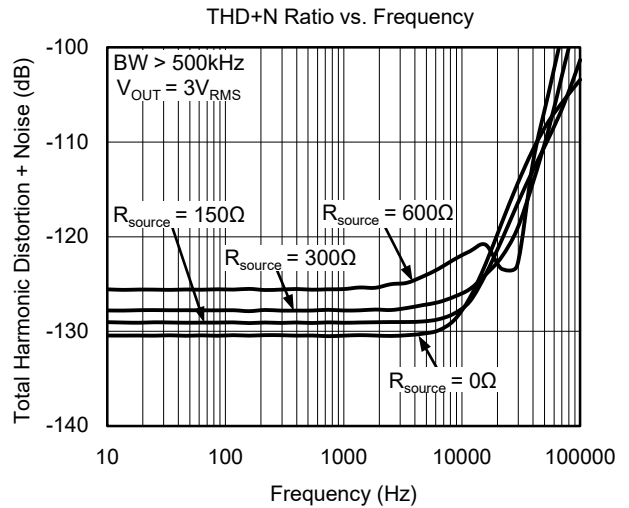
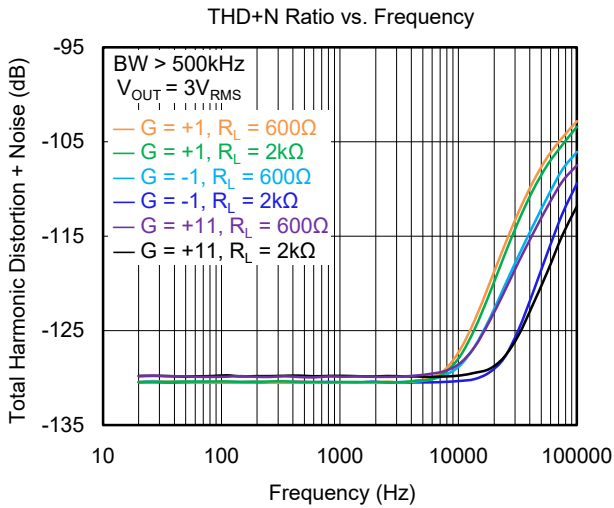
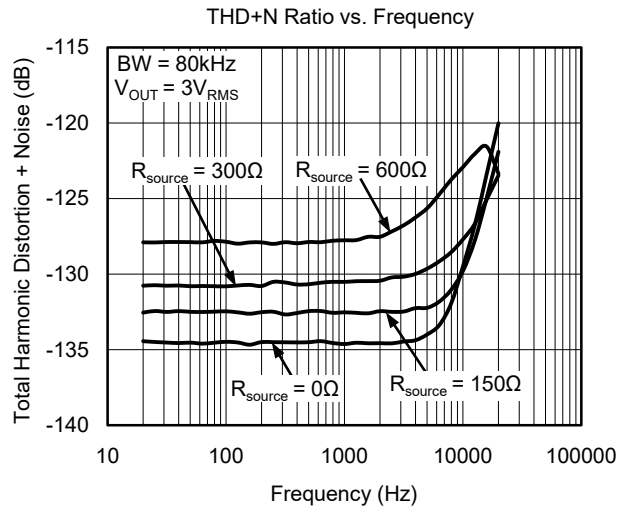
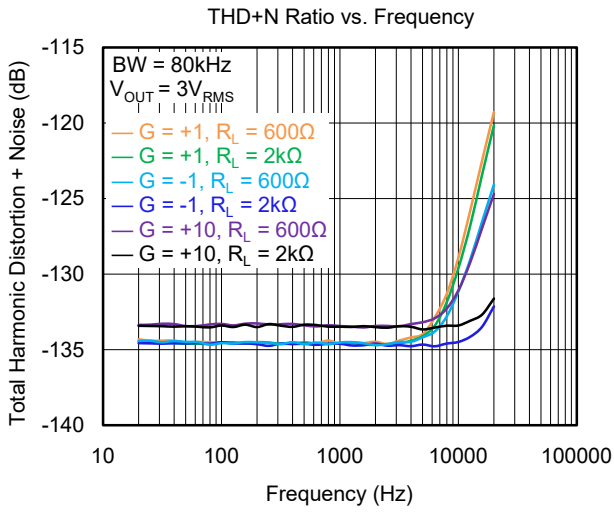
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

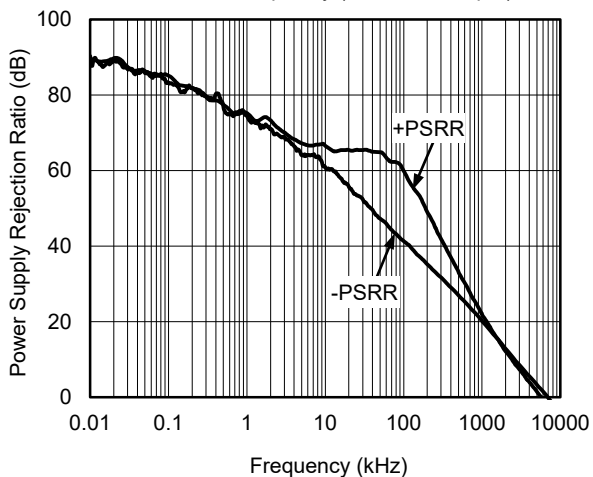
At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



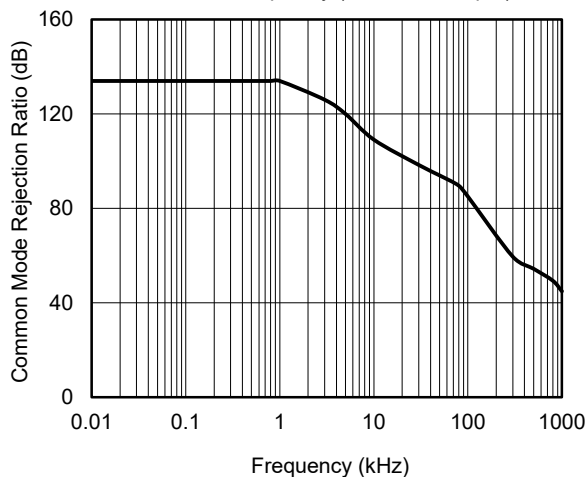
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 15\text{V}$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.

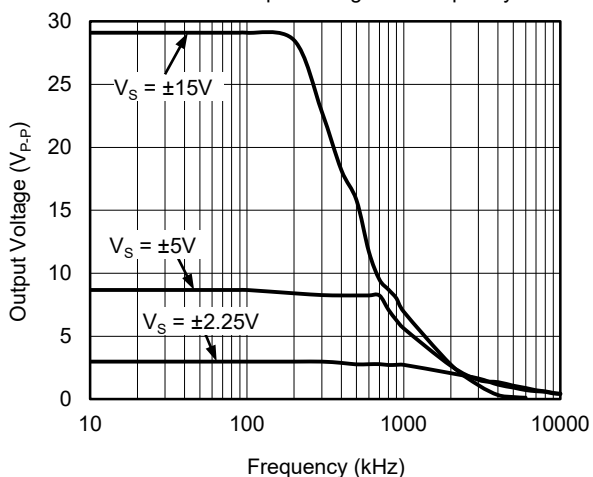
PSRR vs. Frequency (Referred to Input)



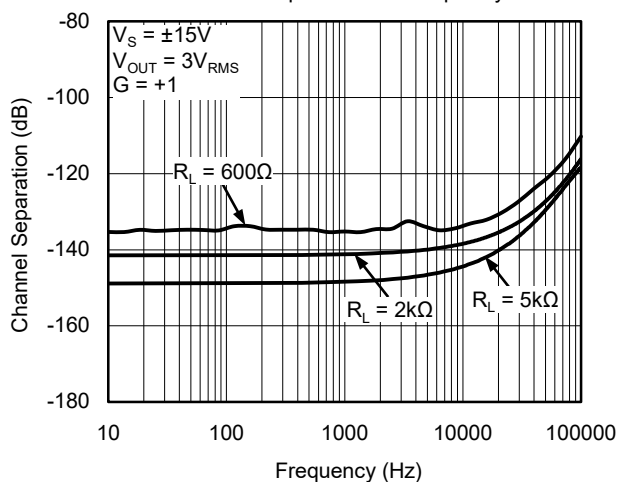
CMRR vs. Frequency (Referred to Input)



Maximum Output Voltage vs. Frequency



Channel Separation vs. Frequency



REVISION HISTORY

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

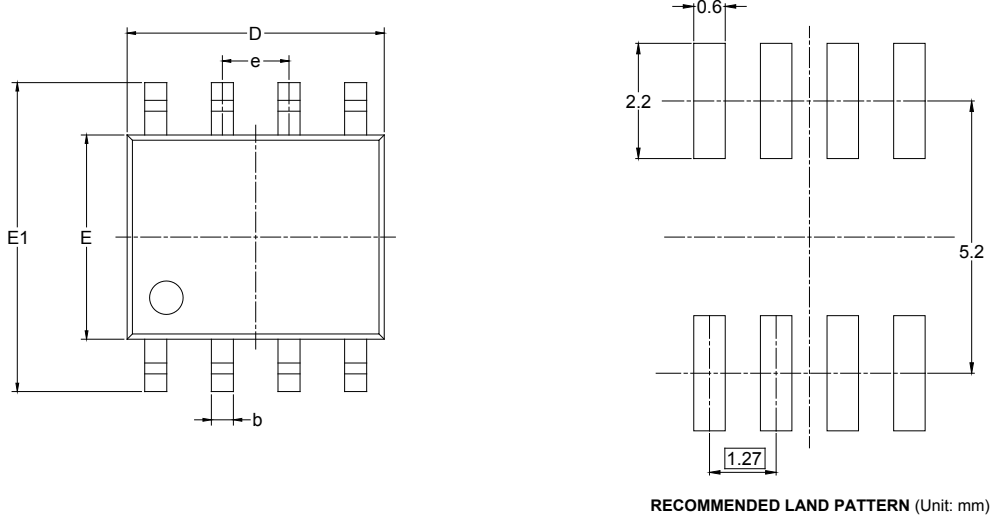
| APRIL 2020 – REV.A.1 to REV.A.2 | Page |
|---|-------------|
| Deleted TDFN-3×3-8AL Package | All |
| Updated Typical Performance Characteristics section | 8, 9 |

| MAY 2017 – REV.A to REV.A.1 | Page |
|------------------------------------|-------------|
| Changed supply voltage range | 1 |

| Changes from Original (MAY 2017) to REV.A | Page |
|--|-------------|
| Changed from product preview to production data..... | All |

PACKAGE OUTLINE DIMENSIONS

SOIC-8



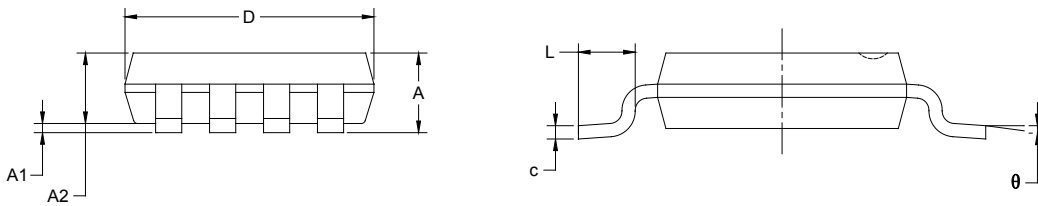
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|----------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b |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



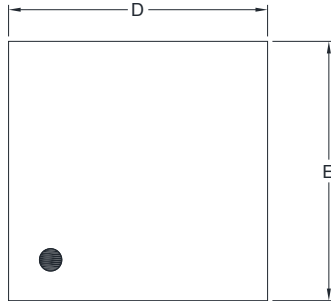
RECOMMENDED LAND PATTERN (Unit: mm)



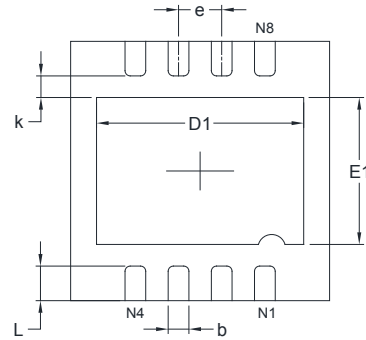
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250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

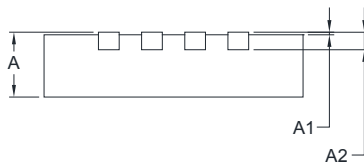
TDFN-3x3-8BL



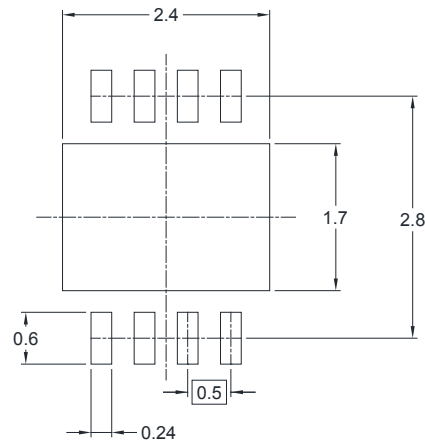
TOP VIEW



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 | 2.300 | 2.500 | 0.091 | 0.098 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 1.600 | 1.800 | 0.063 | 0.071 |
| k | 0.200 MIN | | 0.008 MIN | |
| b | 0.180 | 0.300 | 0.007 | 0.012 |
| e | 0.500 TYP | | 0.020 TYP | |
| L | 0.300 | 0.500 | 0.012 | 0.020 |

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 |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| 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-3×3-8BL | 13" | 12.4 | 3.35 | 3.35 | 1.13 | 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 |
|-----------|-------------|------------|-------------|--------------|
| 13" | 386 | 280 | 370 | 5 |

DD0002