SGM8262-2
High Speed, Ultra-Low Noise, Rail-to-Rail Output, High Output Current Amplifier

GENERAL DESCRIPTION

The SGM8262-2 comprises two voltage feedback operational amplifiers capable of driving heavy loads with excellent linearity and low noise. The low distortion, high output current, and wide output dynamic range make the SGM8262-2 ideal for applications that require a large signal swing into a heavy load.

High speed, rail-to-rail output, low noise, wide band-width and fast slew rate of the SGM8262-2 keep distortion to a minimum.

The SGM8262-2 is available in Green SOIC-8 and TDFN-3×3-8BL packages. It operates over an ambient temperature range of -40℃ to +85℃.

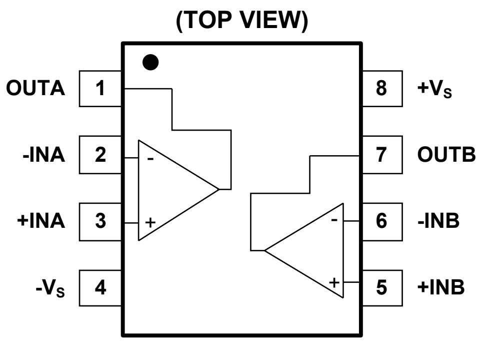
APPLICATIONS

Twisted-Pair Line Drivers
Audio Applications
General-Purpose AC Applications

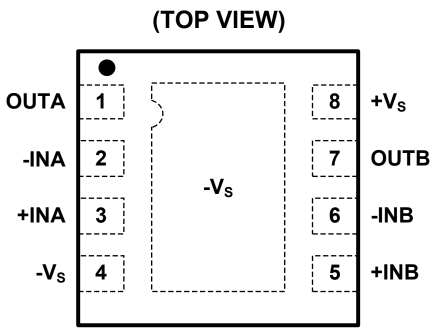
FEATURES

- **Dual Operational Amplifiers**
- **Voltage Feedback**
- **High Open-Loop Gain: 110dB**
- **Unity-Gain Stable**
- **Support Single or Dual Power Supplies:**
  4.5V to 36V or ±2.25V to ±18V
- **Rail-to-Rail Output**
- **High Linear Output Current:**
  310mA Peak Current into 32Ω on ±12V Supplies While Maintaining -55dBc SFDR
- **Ultra-Low Noise:**
  3.5nV/$\sqrt{Hz}$ Voltage Noise Density at 100kHz
  4pA/$\sqrt{Hz}$ Current Noise Density at 100kHz
- **High Speed:**
  22MHz Bandwidth (G = +1, -3dB)
  33V/μs Slew Rate (R_{LOAD} = 32Ω)
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green SOIC-8 and TDFN-3×3-8BL Packages**

PIN CONFIGURATIONS



SOIC-8



TDFN-3×3-8BL

NOTE:
For TDFN-3×3-8BL package, connect thermal die pad to $-V_S$. Soldering the thermal pad improves heat dissipation and provides specified performance.

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8262-2	SOIC-8	-40℃ to +85℃	SGM8262-2YS8G/TR	SGM 82622YS8 XXXXX	Tape and Reel, 2500
	TDFN-3×3-8BL	-40℃ to +85℃	SGM8262-2YTDD8G/TR	SGM 82622DD XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

<u>XX</u><u>XX</u><u>X</u>

- Vendor Code
- Date Code - Week
- Date Code - Year

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..40V
Input Voltage Range .... (-V_S) - 0.3V to (+V_S) + 0.3V
Input Current (All pins except power supply pins)....... ±10mA
Junction Temperature ....+150℃
Storage Temperature Range .... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ....+260℃
ESD Susceptibility
HBM...8000V
MM..400V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range .... -40℃ to +85℃

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.

ELECTRICAL CHARACTERISTICS

(At T_A = +25℃, V_S = 4.5V to 36V or V_S = ±2.25V to ±18V, G = +1, R_{LOAD} = 32Ω, V_{CM} = V_{OUT} = V_S/2, unless otherwise noted.) [1]

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
DC Performance					
Input Offset Voltage (V_{OS})			±100	±500	μV
	-40℃ to +85℃			±610	
Input Offset Voltage Match			±100	±700	μV
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta T$)			0.5		μV/℃
Input Bias Current (I_B)	V_{CM} = V_S/2		±40	±300	nA
	-40℃ to +85℃			±370	
Input Offset Current (I_{OS})	V_{CM} = V_S/2		±10	±120	nA
Open-Loop Voltage Gain (A_{OL})	V_{OUT} = ±1V, V_S = ±2.5V or 5V	109	115		dB
	V_{OUT} = ±2V, V_S = ±5V or 10V	106	115		
	V_{OUT} = ±3V, V_S = ±18V or 36V	95	110		
Input Characteristics					
Differential Input Impedance	V_S = ±2.25V or 4.5V		38 ǁ 20		kΩ ǁ pF
	V_S = ±18V or 36V		45 ǁ 15		
Common Mode Input Impedance	V_S = ±2.25V or 4.5V		4 ǁ 6		GΩ ǁ pF
	V_S = ±18V or 36V		20 ǁ 5		
Input Common Mode Voltage Range (V_{CM})		(-V_S) + 2		(+V_S) - 2	V
Common Mode Rejection Ratio (CMRR)	ΔV_{CM} = ±0.5V, V_S = ±2.5V or 5V	107	130		dB
	ΔV_{CM} = ±1V, V_S = ±18V or 36V	109	125		
Output Characteristics					
Output Voltage Swing from Rail (V_{OH})	R_{LOAD} = 32Ω, V_S = ±2.5V to ±5V or V_S = 5V to 10V		0.72	1.1	V
Output Voltage Swing from Rail (V_{OL})			0.51	0.64	V
Output Voltage Swing from Rail (V_{OH})	R_{LOAD} = 100Ω		1.1	1.6	V
Output Voltage Swing from Rail (V_{OL})			0.8	1	V
Peak AC Output Current [2]	SFDR ≤ -65dBc, f = 100kHz, V_{OUT} = 0.4V_{P-P}, R_{LOAD} = 1Ω, V_S = ±2.25V or 4.5V		200		mA
	SFDR ≤ -55dBc, f = 100kHz, V_{OUT} = 20V_{P-P}, R_{LOAD} = 32Ω, V_S = ±12V or 24V		310		
Dynamic Performance					
-3dB Gain-Bandwidth Product	V_{OUT} = 0.1V_{P-P}		22		MHz
0.1dB Flatness	V_{OUT} = 0.1V_{P-P}		1.6		MHz
Large-Signal Bandwidth	V_{OUT} = 0.5V_{P-P}, V_S = ±2.25V or 4.5V		23		MHz
	V_{OUT} = 2V_{P-P}, V_S = ±18V or 36V		12		
Slew Rate (SR)	V_{OUT} = 0.5V_{P-P}, V_S = ±2.25V or 4.5V		27		V/μs
	V_{OUT} = 1V_{P-P}, V_S = ±2.5V or 5V		33		
	V_{OUT} = 4V_{P-P}, V_S = ±5V or 10V		49		
	V_{OUT} = 4V_{P-P}, V_S = ±12V or 24V		34		
Noise/Distortion Performance					
Distortion (Worst Harmonic)	f_C = 100kHz, V_{OUT} = 1V_{P-P}, G = +2, V_S = ±2.25V or 4.5V		-95		dBc
	f_C = 100kHz, V_{OUT} = 2V_{P-P}, G = +2, V_S = ±2.5V or 5V		-93		
	f_C = 100kHz, V_{OUT} = 6V_{P-P}, G = +2, V_S = ±5V or 10V		-88		
	f_C = 100kHz, V_{OUT} = 20V_{P-P}, G = +5, V_S = ±12V or 24V		-52		
Input Voltage Noise Density (e_n)	f = 100kHz		3.5		nV/$\sqrt{Hz}$
Input Current Noise Density (i_n)	f = 100kHz		4		pA/$\sqrt{Hz}$

ELECTRICAL CHARACTERISTICS (continued)

(At T_A = +25℃, V_S = 4.5V to 36V or V_S = ±2.25V to ±18V, G = +1, R_{LOAD} = 32Ω, V_{CM} = V_{OUT} = V_S/2, unless otherwise noted.) [1]

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Power Supply					
Operating Voltage Range (Dual Supply)		±2.25		±18	V
Supply Current/Amplifier (I_Q)			9	11.5	mA
Power Supply Rejection Ratio (PSRR)	ΔV_S = ±0.5V	100	115		dB
Audio Performance					
Total Harmonic Distortion + Noise (THD+N)	f = 1kHz, V_{OUT} = 0.5V_{P-P}, V_S = ±2.25V or 4.5V, BW = 80kHz		0.0006		%
			-104		dB
	f = 1kHz, V_{OUT} = 1V_{P-P}, V_S = ±2.5V or 5V, BW = 80kHz		0.0003		%
			-110		dB
	f = 1kHz, V_{OUT} = 6V_{P-P}, V_S = ±5V or 10V, BW = 80kHz		0.00005		%
			-126		dB
	f = 1kHz, V_{OUT} = 3V_{RMS}, V_S = ±12V or 24V, BW = 80kHz		0.00005		%
			-126		dB

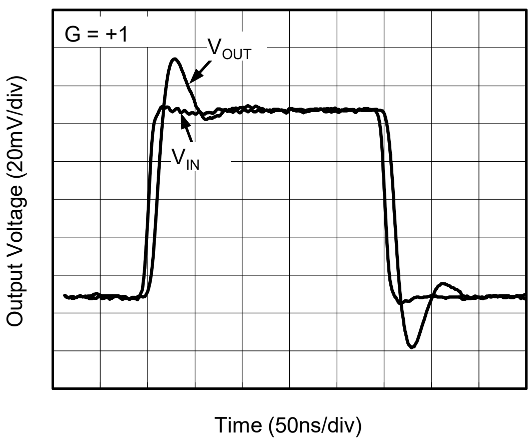
NOTES:

1. Unity gain used to facilitate characterization. To improve stability, a gain of 2 or greater is recommended.
2. Peak AC output current specification assumes normal AC operation and is not valid for continuous DC operation.

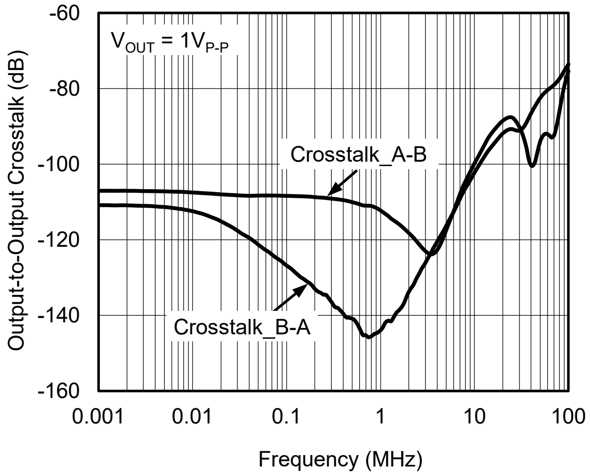
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = ±5V, R_{LOAD} = 32Ω, unless otherwise noted.

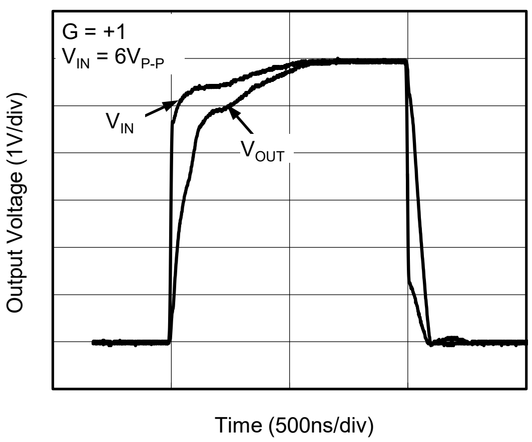
Small-Signal Step Response



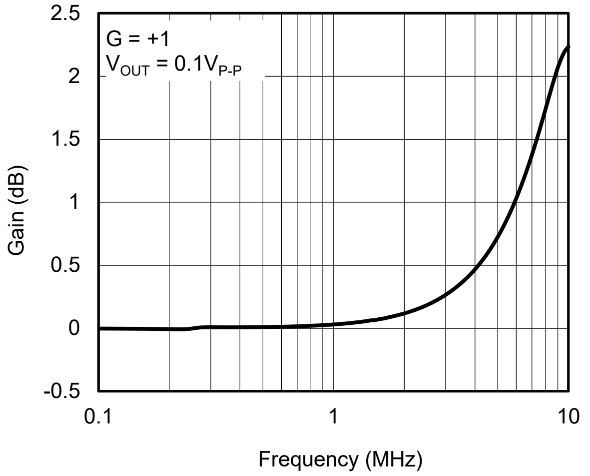
Crosstalk vs. Frequency



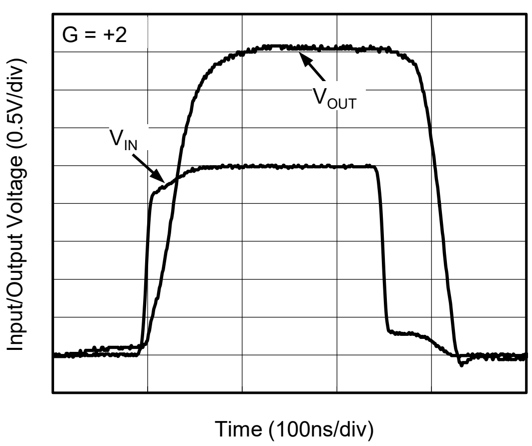
Large-Signal Step Response



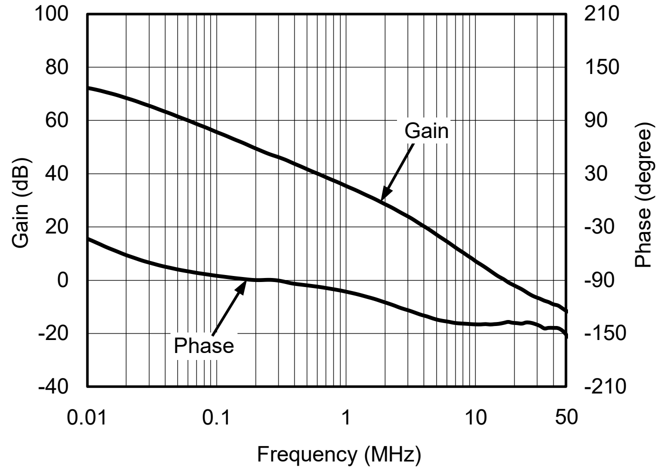
0.1dB Flatness



Output Overdrive Recovery



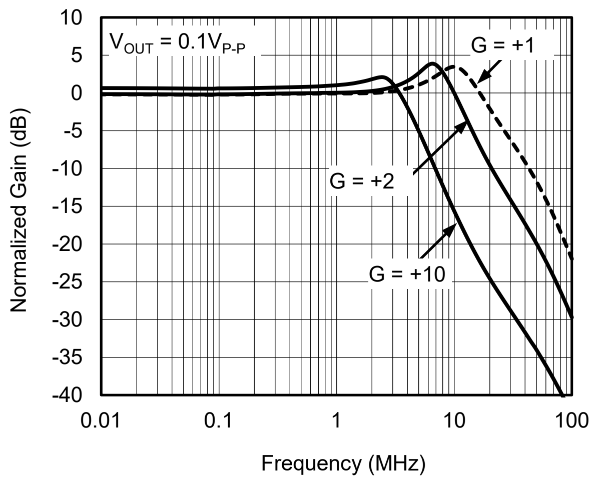
Open-Loop Gain and Phase vs. Frequency



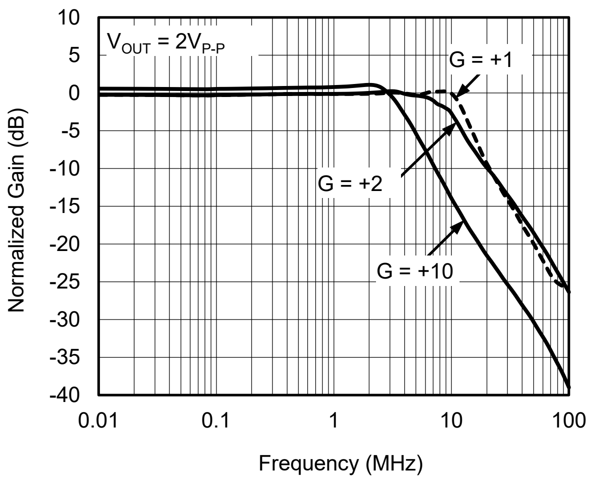
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = ±5V, R_{LOAD} = 32Ω, unless otherwise noted.

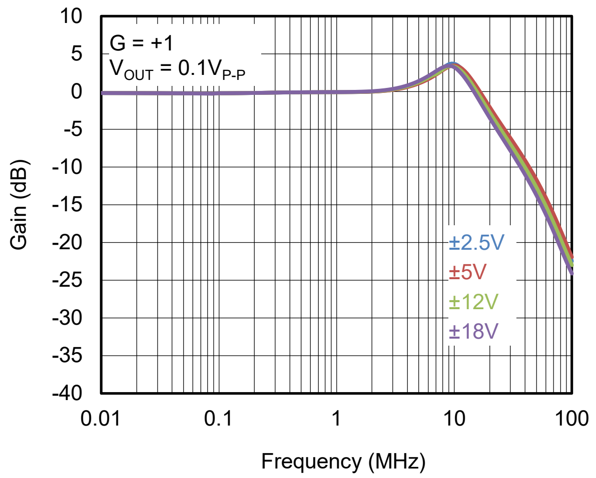
Small-Signal Frequency Response for Various Gains



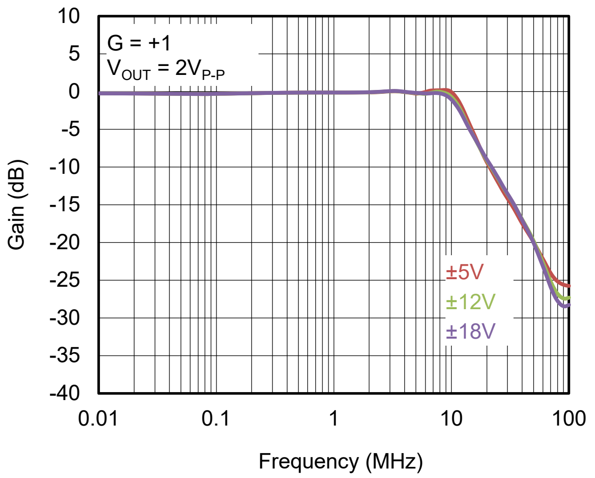
Large-Signal Frequency Response for Various Gains



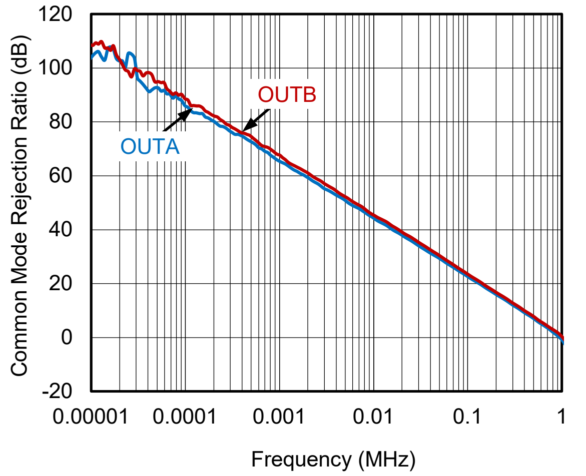
Small-Signal Frequency Response for Various Supplies



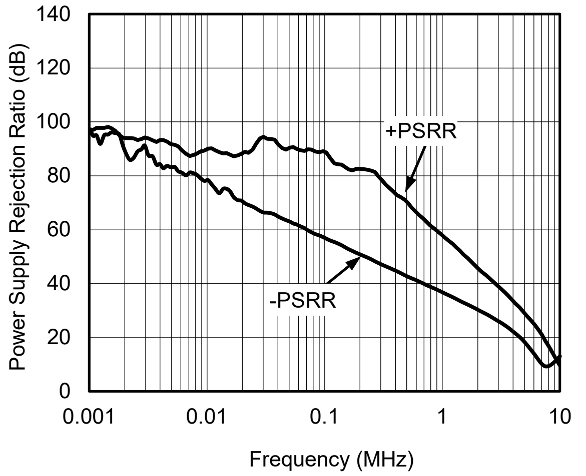
Large-Signal Frequency Response for Various Supplies



CMRR vs. Frequency (Referred to Input)

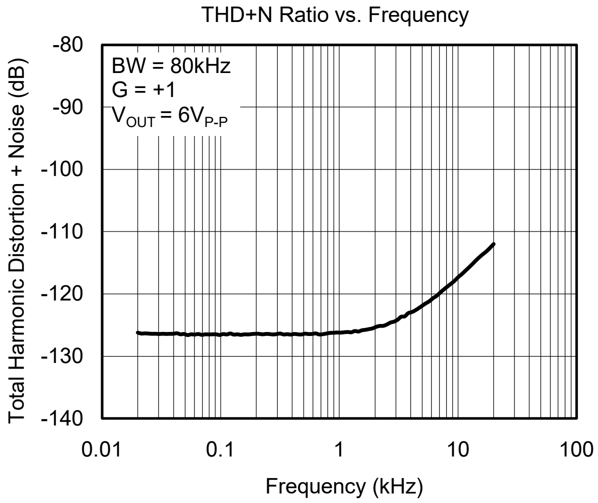


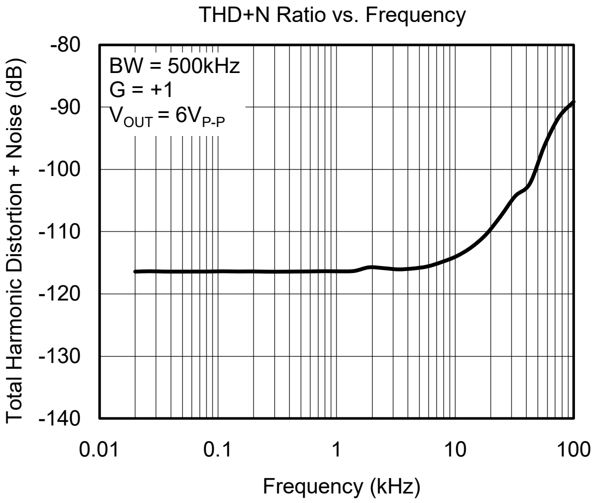
PSRR vs. Frequency (Referred to Input)

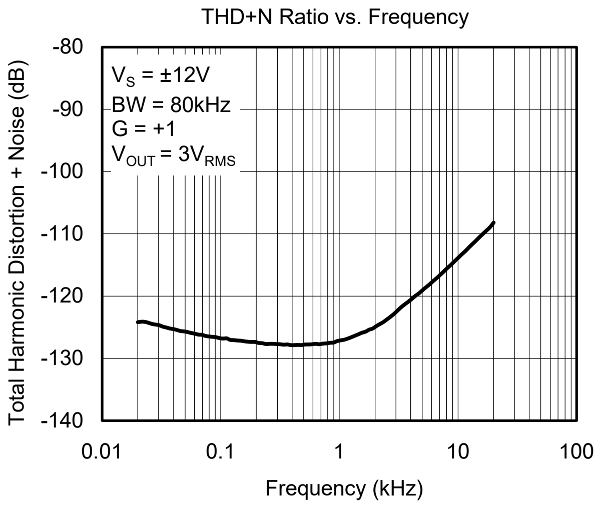


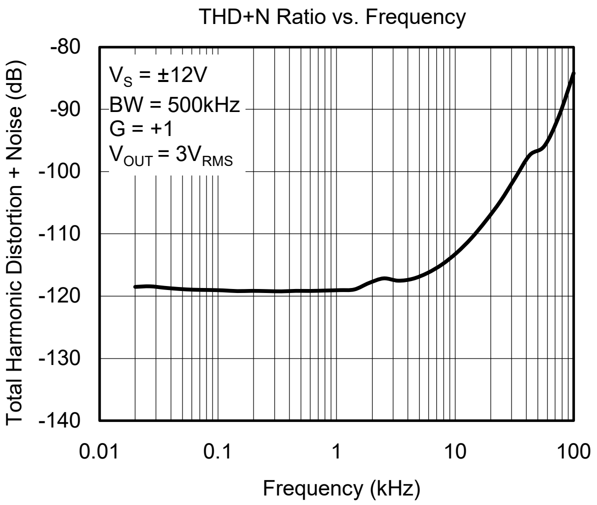
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

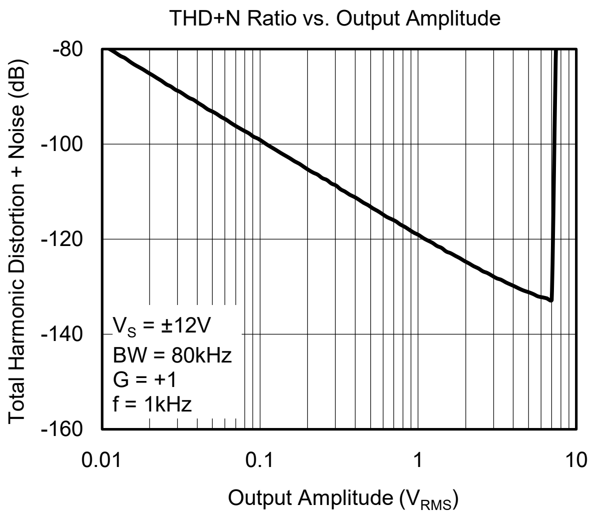
At T_A = +25℃, V_S = ±5V, R_{LOAD} = 32Ω, unless otherwise noted.











APPLICATION INFORMATION

The SGM8262-2 is a voltage feedback operational amplifier that features rail-to-rail output stage. The SGM8262-2 can operate from a wide supply range, ±2.25V to ±18V.

Power Supply and Decoupling

The SGM8262-2 can be powered with a good quality, well-regulated, low noise supply from ±2.25V to ±18V. Pay careful attention to decoupling the power supply. Use high quality capacitors with low equivalent series resistance (ESR), such as multilayer ceramic capacitors (MLCCs), to minimize the supply voltage ripple and power dissipation. Locate a 0.1μF MLCC decoupling capacitor(s) no more than 1/8 inch away from the power supply pin(s). A large tantalum 10μF to 22μF capacitor is recommended to provide good decoupling for lower frequency signals and to supply current for fast, large signal changes at the SGM8262-2 outputs.

Layout Considerations

As with all high speed applications, pay careful attention to printed circuit board (PCB) layout to prevent associated board parasitics from becoming problematic. The PCB should have a low impedance return path (or ground) to the supply. Removing the ground plane from all layers in the immediate area of the amplifier helps to reduce stray capacitances. The signal routing should be short and direct in order to minimize the parasitic inductance and capacitance associated with these traces. Locate termination resistors and loads as close as possible to their respective inputs and outputs. Keep input traces as far apart as possible from the output traces to minimize coupling (crosstalk) though the board.

When the SGM8262-2 is configured as a differential driver, as in some line driving applications, provide a symmetrical layout to the extent possible in order to maximize balanced performance. When running differential signals over a long distance, the traces on the PCB should be close together or any differential wiring should be twisted together to minimize the area of the inductive loop that is formed. This reduces the radiated energy and makes the circuit less susceptible to RF interference. Adherence to strip line design techniques for long signal traces (greater than approximately 1 inch) is recommended.

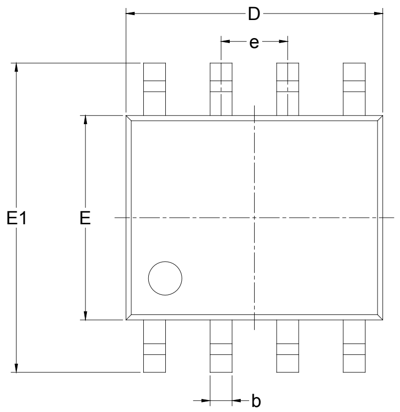
REVISION HISTORY

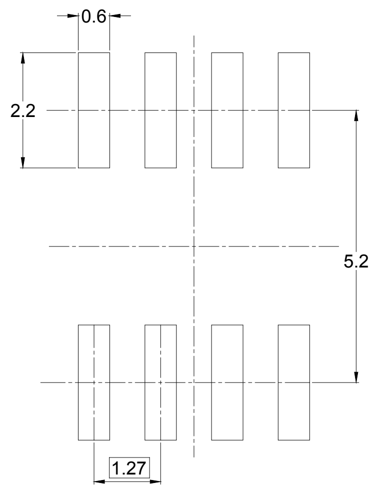
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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

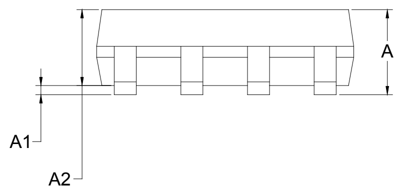
PACKAGE OUTLINE DIMENSIONS

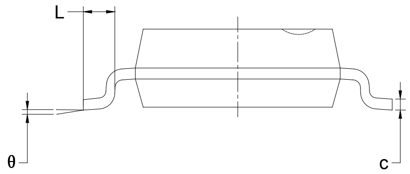
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

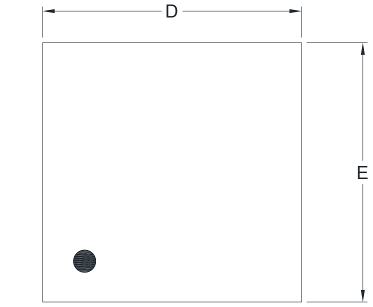




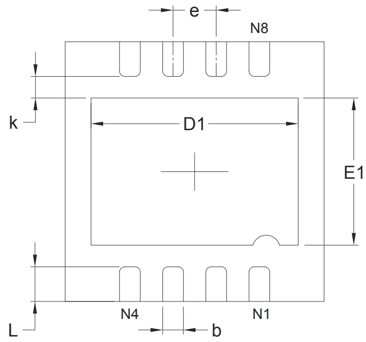
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	**MAX**	**MIN**	**MAX**
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27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

PACKAGE OUTLINE DIMENSIONS

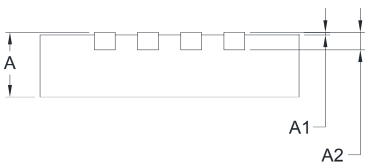
TDFN-3×3-8BL



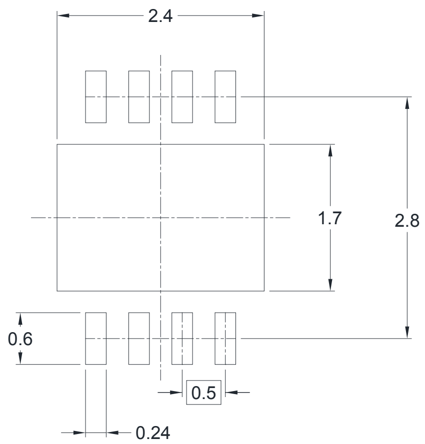
TOP VIEW



BOTTOM VIEW



SIDE VIEW

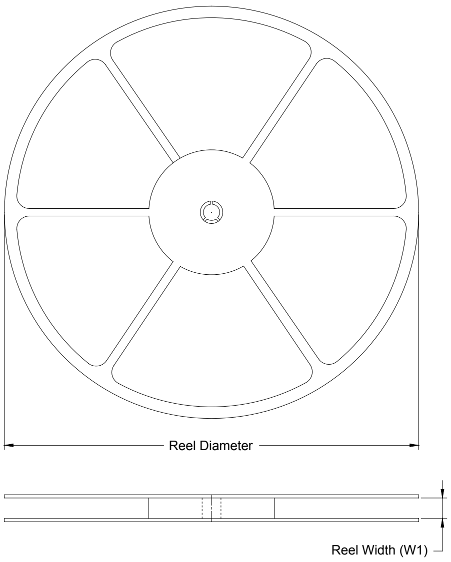


RECOMMENDED LAND PATTERN (Unit: mm)

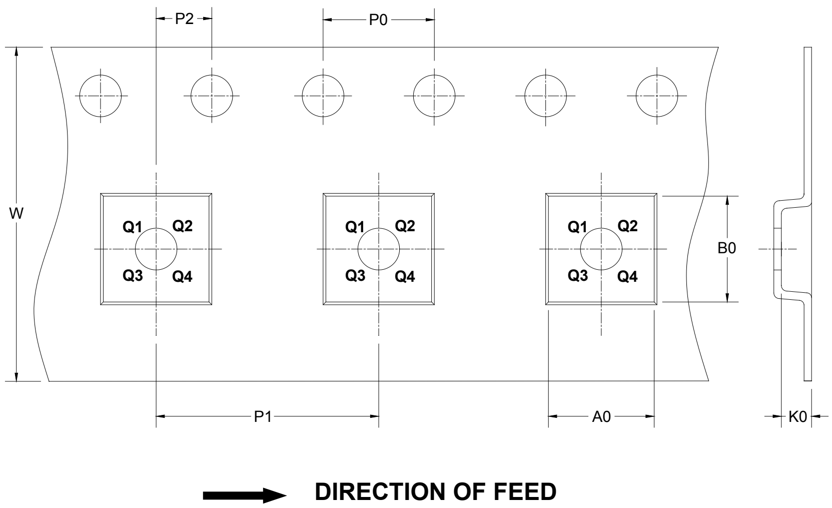
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.300	2.500	0.091	0.098
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



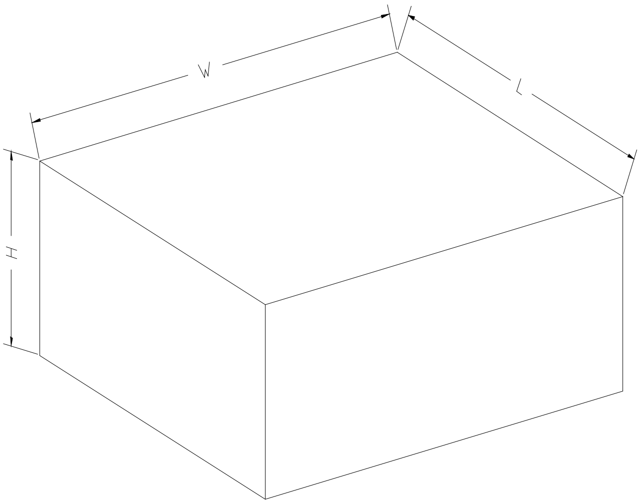
NOTE: The picture is only for reference. Please make the object as the standard.

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
TDFN-3×3-8BL	13″	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD0001

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