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

GENERAL DESCRIPTION

The SGM8262-2 is a dual, low noise, high speed operational amplifier with voltage feedback function. The output swing is rail-to-rail with heavy loads. This maximizes the dynamic range and offers high linearity.

The SGM8262-2 features 3.5nV/$\sqrt{Hz}$ low voltage noise at 100kHz with ultra-low distortion. It also has 22MHz wide bandwidth at -3dB and 33V/μs high slew rate. The device is unity-gain stable and has high output drive capability.

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℃.

FEATURES

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

APPLICATIONS

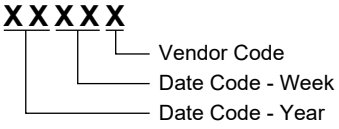
Audio Processing
General-Purpose AC Equipment
Twisted-Pair Wiring Drivers

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.



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

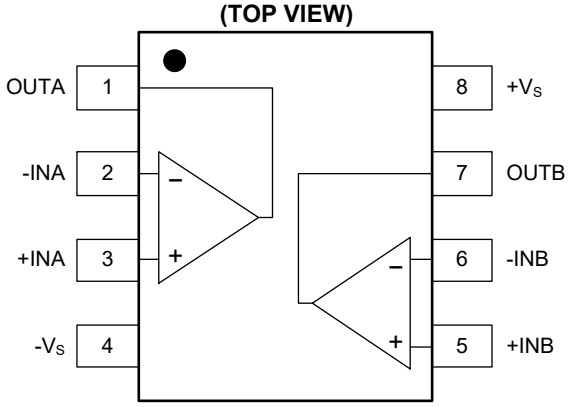
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

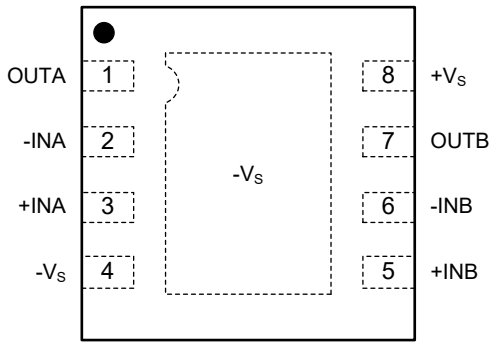
PIN CONFIGURATIONS

(TOP VIEW)



SOIC-8

(TOP VIEW)



TDFN-3×3-8BL

NOTE: For TDFN-3×3-8BL package, connect thermal die pad to $-V_S$. Connect it to $-V_S$ plane to maximize thermal performance.

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 ‖ 20		kΩ ‖ pF
	V_S = ±18V or 36V		45 ‖ 15		
Common Mode Input Impedance	V_S = ±2.25V or 4.5V		4 ‖ 6		GΩ ‖ pF
	V_S = ±18V or 36V		20 ‖ 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

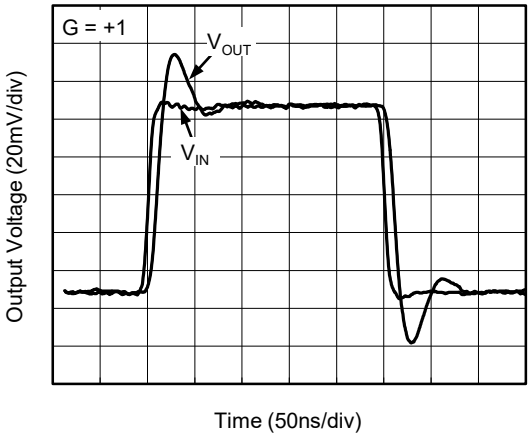
NOTES:

1. Unity-gain can promote characterization. It is recommended to use a gain of 2 or greater to improve stability.
2. Peak AC output current is only for normal AC operation, and continuous DC operation is invalid.

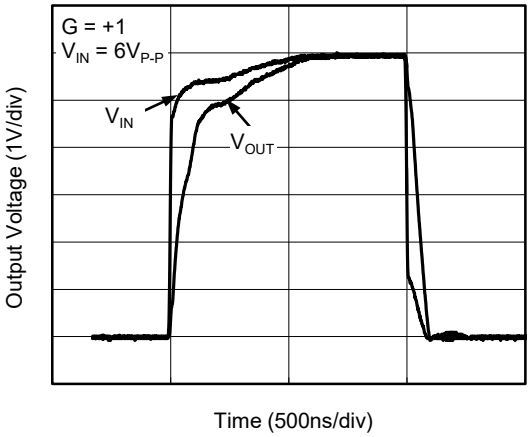
TYPICAL PERFORMANCE CHARACTERISTICS

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

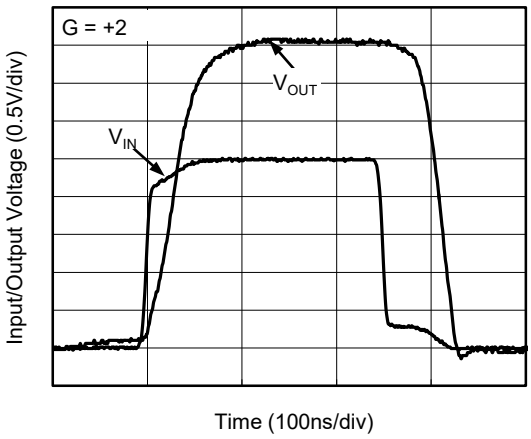
Small-Signal Step Response



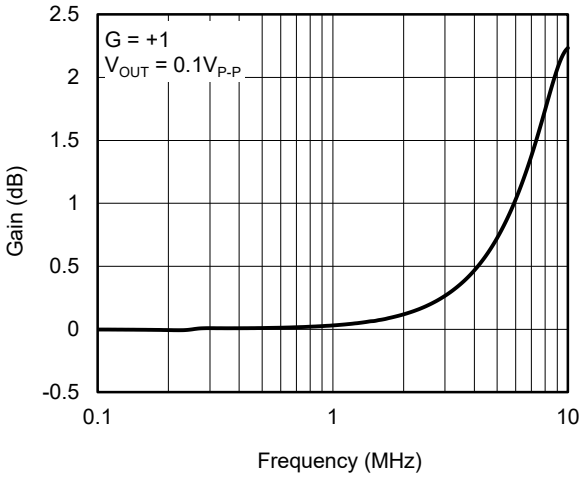
Large-Signal Step Response



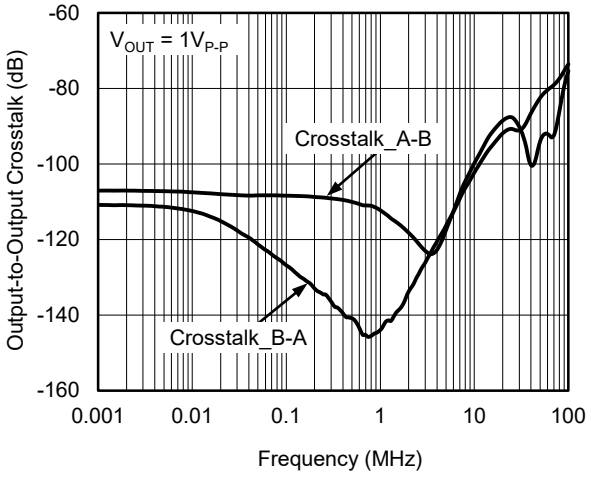
Output Overdrive Recovery



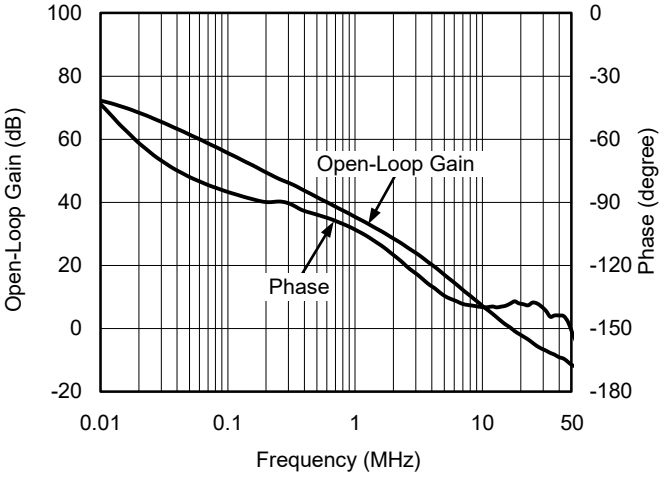
0.1dB Flatness



Crosstalk vs. Frequency



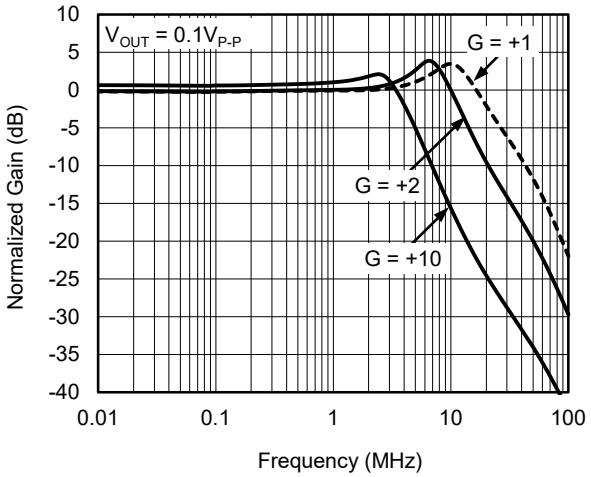
Open-Loop Gain and Phase vs. Frequency



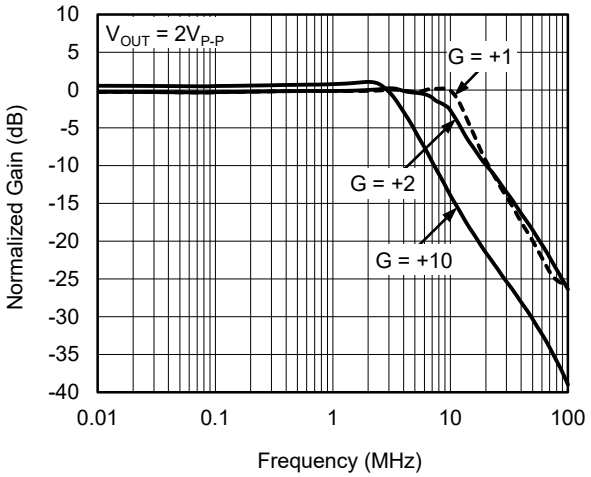
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

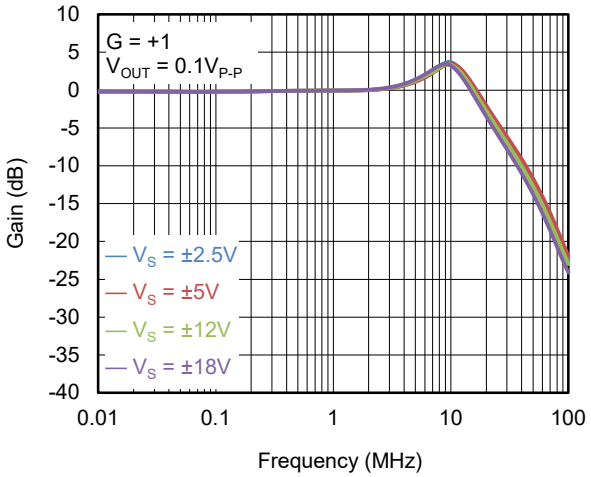
Small-Signal Frequency Response for Various Gains



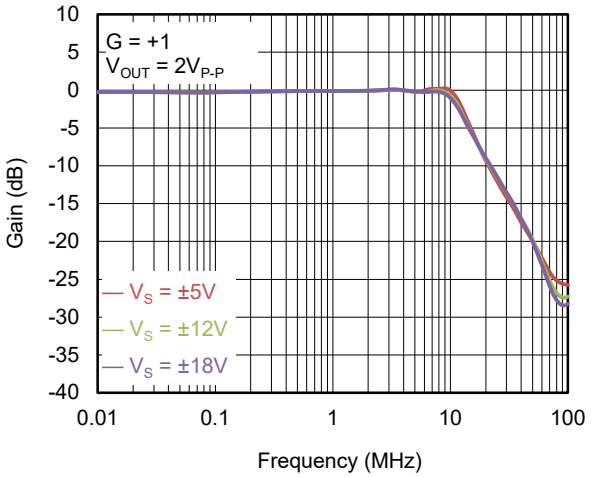
Large-Signal Frequency Response for Various Gains



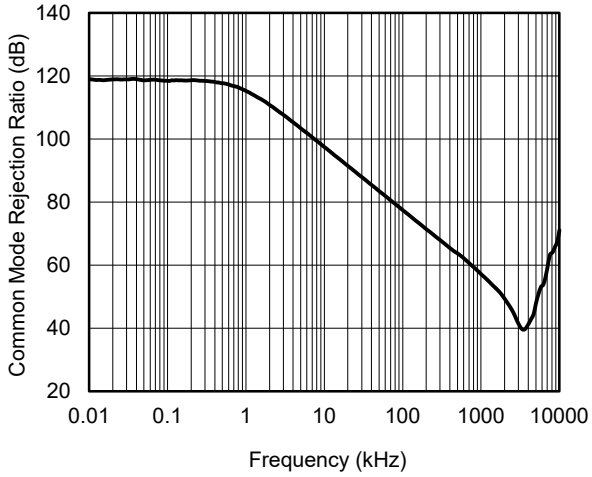
Small-Signal Frequency Response for Various Supplies



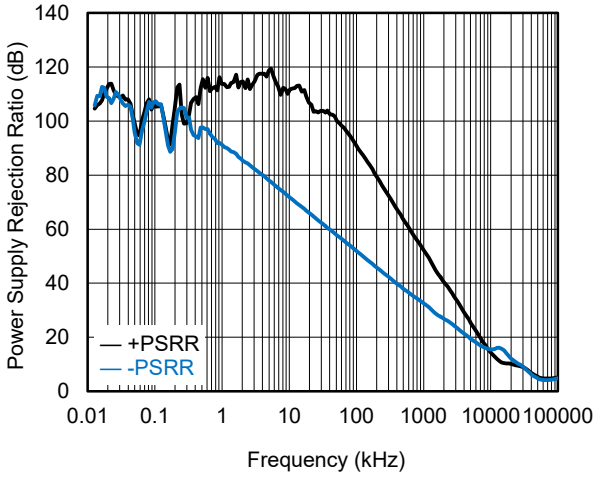
Large-Signal Frequency Response for Various Supplies



CMRR vs. Frequency (Referred to Input)



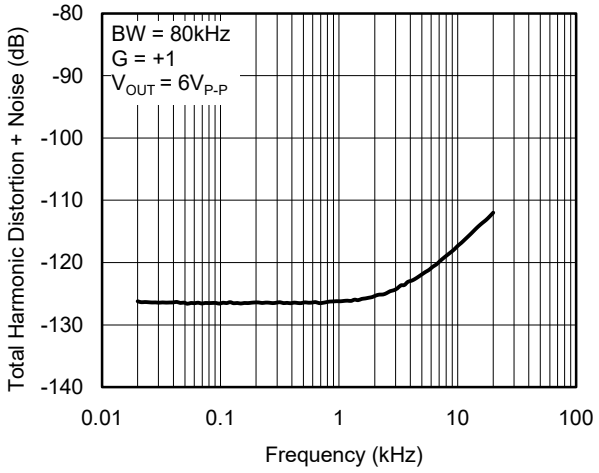
PSRR vs. Frequency (Referred to Input)



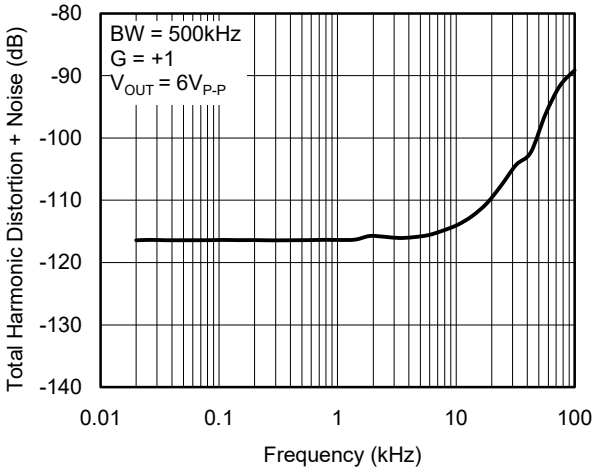
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

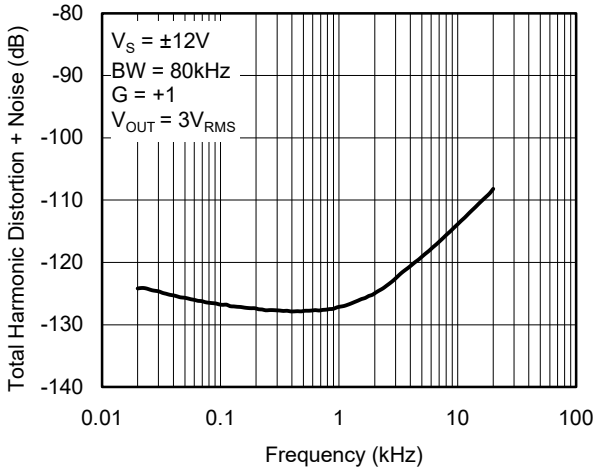
THD+N Ratio vs. Frequency



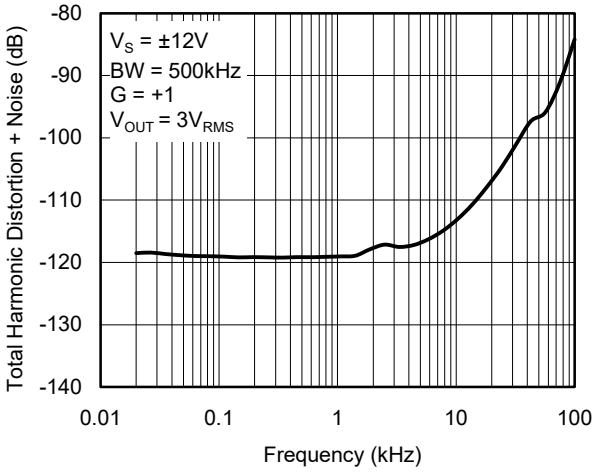
THD+N Ratio vs. Frequency



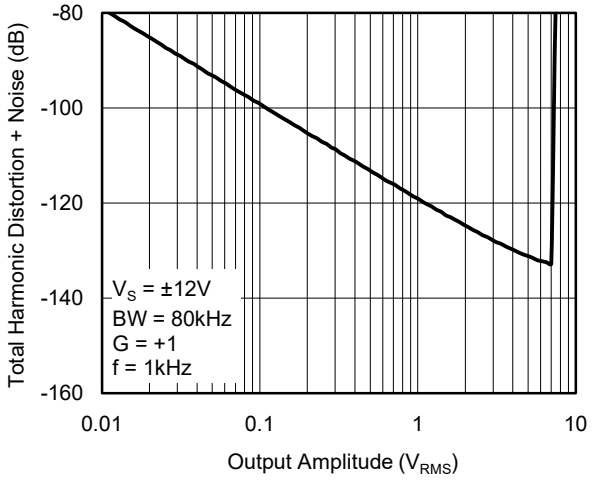
THD+N Ratio vs. Frequency



THD+N Ratio vs. Frequency



THD+N Ratio vs. Output Amplitude



APPLICATION INFORMATION

The SGM8262-2 is a dual, low noise, high speed operational amplifier with voltage feedback function. The output swing is rail-to-rail with heavy loads. The SGM8262-2 is optimized for high voltage operation from ±2.25V to ±18V dual supplies.

Power Supply and Decoupling

The supported voltage of the power supply for SGM8262-2 is from ±2.25V to ±18V. Also, the customer should ensure that the source of the power supply is low noise and well-regulated. The power supply should be decoupled suitably. The power supply ripple and power dissipation can be decreased dramatically by using low ESR capacitor. The multilayer ceramic capacitors (MLCCs) are good choices for decoupling. A 0.1μF MLCC capacitor should be placed as close as possible (0.125 inches) to the power supply pin of the SGM8262-2. For decoupling the low-frequency signals, 10μF to 22μF tantalum capacitors should be taken into account so that it can convey the current for large and fast signal changes.

Layout

A good PCB layout is important for the performance of SGM8262-2 in high speed applications in order to prevent the parasitic effects from the board. The PCB should have a low impedance loop (or ground) to the power supply. Removing the GND planes for all of the layers of the PCB board can simply reduce the stray capacitors. Also, the PCB traces should be placed as short as possible in order to reduce parasitic inductance and capacitance. The resistors or loads should be placed as close as possible to the terminals of the SGM8262-2. The input traces of the SGM8262-2 should be placed away from the output trace to minimize coupling (crosstalk).

If the SGM8262-2 is used for differential driver, the customers should guarantee the symmetrical layout to obtain better output performance. If the trace for the differential signal is long, please make sure that place the two differential traces as close as possible, or twist them together in order to reduce the inductive loop. The above method can enhance the anti-interference ability for RF signal by reducing the radiated energy. It is recommended to use strip line for the signal trace which is longer than 1 inch.

REVISION HISTORY

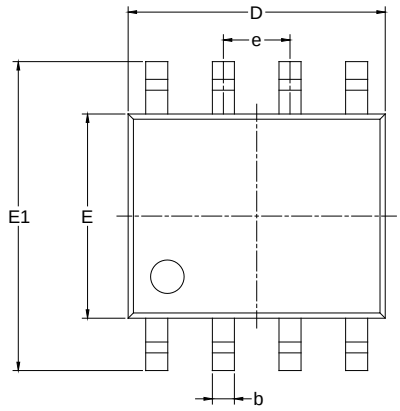
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

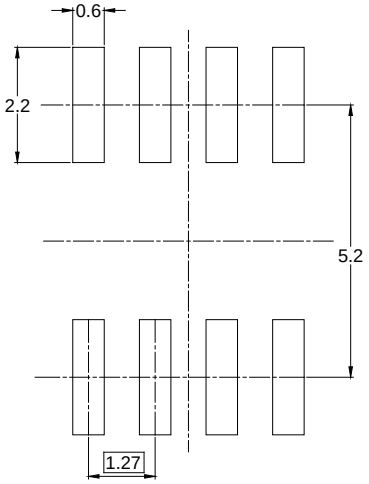
MARCH 2023 – REV.A to REV.A.1	Page
Updated Typical Performance Characteristics section	7

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

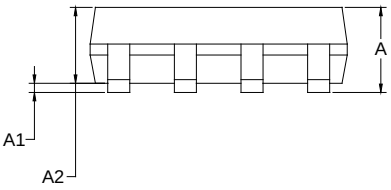
PACKAGE OUTLINE DIMENSIONS

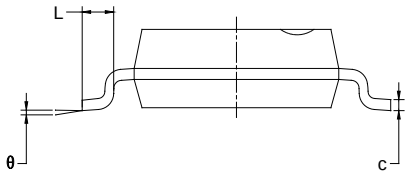
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)



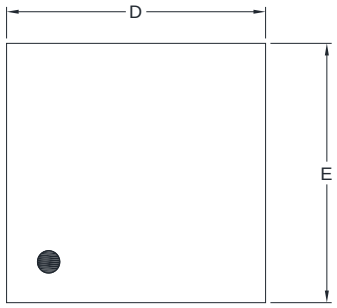


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

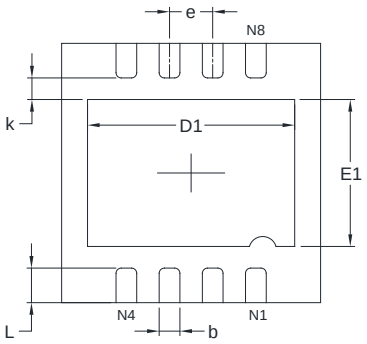
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

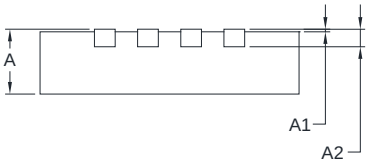
TDFN-3×3-8BL



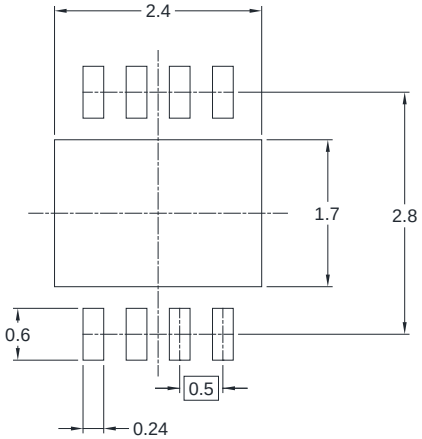
TOP VIEW



BOTTOM VIEW



SIDE VIEW



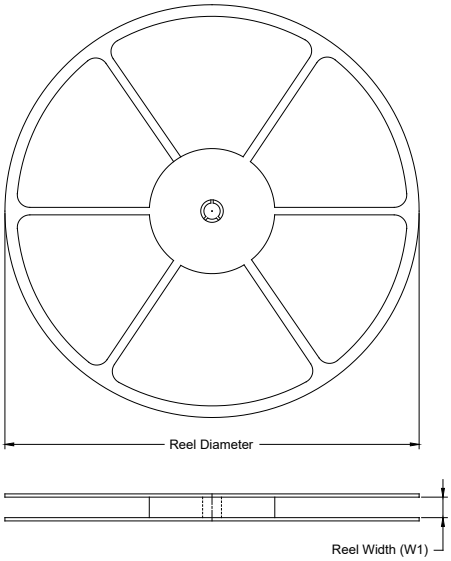
RECOMMENDED LAND PATTERN (Unit: mm)

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

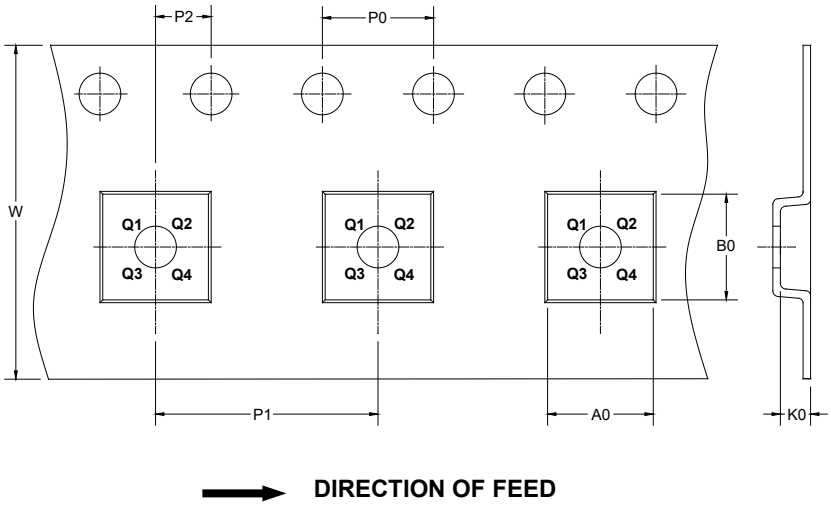
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

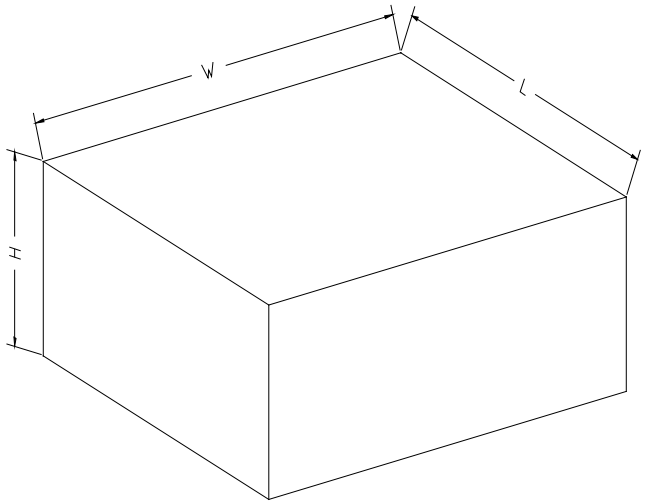
NOTE: The picture is only for reference. Please make the object as the standard.

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