SGM8557-1/SGM8557-2
SGM8557-3/SGM8557-5
15MHz, High Output Drive, High Precision, Low Noise Operational Amplifiers

GENERAL DESCRIPTION

The SGM8557-1 (single), SGM8557-3 (single with shutdown), SGM8557-2 (dual) and SGM8557-5 (dual with shutdown) are low noise, high precision CMOS operational amplifiers that provide a high output current of 240mA, rail-to-rail output operation from a range of 2.7V to 5.5V single supply. The SGM8557-3/5 are both available with shutdown pins that drive the output voltage low.

The SGM8557-1/2/3/5 offer low input offset voltage, low input offset voltage drift and high output current drive. These devices also can achieve a high 15MHz gain-bandwidth product and a high 7V/μs slew rate.

The SGM8557-1/2/3/5 are specifically designed to drive high current load, such as 32Ω headset, V_{BIAS} of RF power amplifier, etc.

The SGM8557-1 is available in Green SOIC-8, MSOP-8 and SOT-23-5 packages. The SGM8557-2 is available in a Green SOIC-8 package. The SGM8557-3 is available in Green SOIC-8 and SOT-23-6 packages. The SGM8557-5 is available in a Green MSOP-10 package. They operate over an ambient temperature range of -40℃ to +125℃.

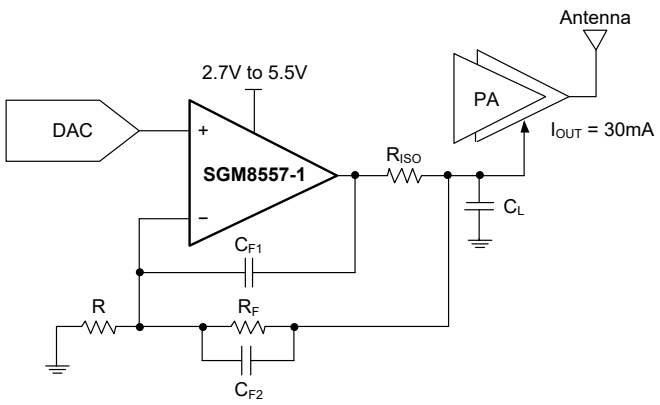
APPLICATIONS

Battery-Powered Equipment
Audio System
Optical Module
DAC Buffer
Industrial Equipment

FEATURES

- **Output Drive Capability: 240mA**
- **Low Input Offset Voltage: 5μV (MAX)**
- **Low Input Offset Voltage Drift: 27nV/℃ (TYP)**
- **Low Noise: 30nV/$\sqrt{Hz}$ at 1kHz**
- **Gain-Bandwidth Product: 15MHz**
- **High Slew Rate: 7V/μs**
- **High Open-Loop Gain (R_L = 2kΩ): 144dB**
- **Power Supply Rejection Ratio: 120dB**
- **Over-Temperature Protection**
- **No Phase Reversal for Overdriven Inputs**
- **Rail-to-Rail Input and Output**
- **Supply Voltage Range: 2.7V to 5.5V**
- **Quiescent Supply Current:**
  1.2mA/Amplifier (TYP)
  0.3μA/Amplifier (TYP) Shutdown Current for SGM8557-3/5
- **-40℃ to +125℃ Operating Temperature Range**
- **Small Packaging:**
  SGM8557-1 Available in Green SOIC-8, MSOP-8, and SOT-23-5 Packages
  SGM8557-2 Available in a Green SOIC-8 Package
  SGM8557-3 Available in Green SOIC-8 and SOT-23-6 Packages
  SGM8557-5 Available in a Green MSOP-10 Package

TYPICAL OPERATING CIRCUIT



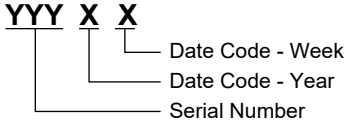
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8557-1	SOIC-8	-40℃ to +125℃	SGM8557-1XS8G/TR	SGM 85571XS8 XXXXX	Tape and Reel, 2500
	MSOP-8	-40℃ to +125℃	SGM8557-1XMS8G/TR	SGM85571 XMS8 XXXXX	Tape and Reel, 4000
	SOT-23-5	-40℃ to +125℃	SGM8557-1AXN5G/TR	GG8XX	Tape and Reel, 3000
	SOT-23-5	-40℃ to +125℃	SGM8557-1BXN5G/TR	GCEXX	Tape and Reel, 3000
SGM8557-2	SOIC-8	-40℃ to +125℃	SGM8557-2XS8G/TR	SGM 85572XS8 XXXXX	Tape and Reel, 2500
SGM8557-3	SOIC-8	-40℃ to +125℃	SGM8557-3XS8G/TR	SGM 85573XS8 XXXXX	Tape and Reel, 2500
	SOT-23-6	-40℃ to +125℃	SGM8557-3XN6G/TR	GCFXX	Tape and Reel, 3000
SGM8557-5	MSOP-10	-40℃ to +125℃	SGM8557-5XMS10G/TR	SGM85575 XMS10 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

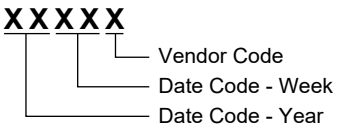
SOT-23-5/SOT-23-6

(1) XX = Date Code.



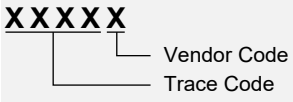
SOIC-8/MSOP-8

(2) XXXXX = Date Code and Vendor Code.



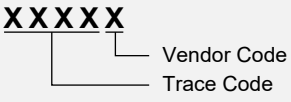
SGM8557-2: SOIC-8

(3) XXXXX = Trace Code and Vendor Code.



SGM8557-5: MSOP-10

(4) XXXXX = Trace 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, $+V_S$ to $-V_S$ 6V
All Other Pins ..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 7000V
MM 400V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +125℃
Operating Supply Voltage Range ..... 2.7V to 5.5V

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

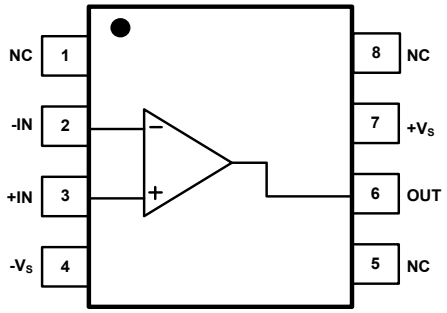
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

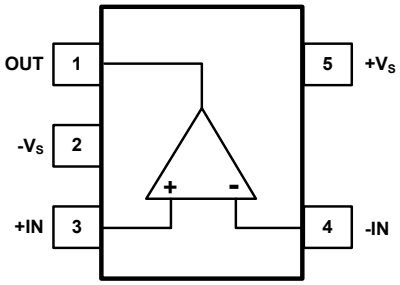
PIN CONFIGURATIONS

SGM8557-1 (TOP VIEW)



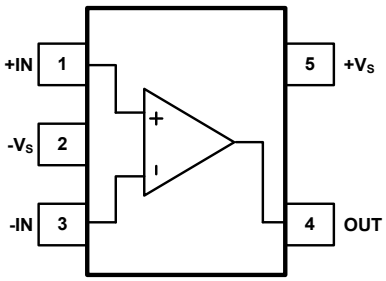
SOIC-8/MSOP-8

SGM8557-1AXN5G (TOP VIEW)



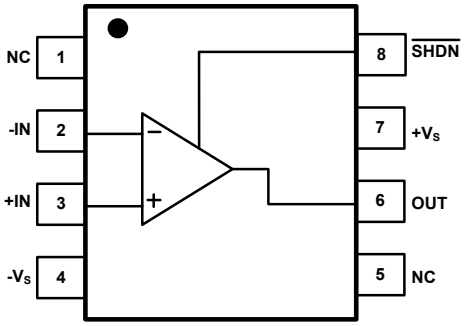
SOT-23-5

SGM8557-1BXN5G (TOP VIEW)



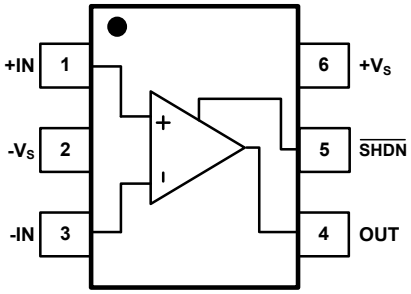
SOT-23-5

SGM8557-3 (TOP VIEW)



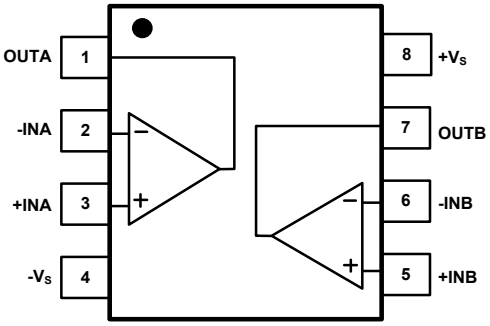
SOIC-8

SGM8557-3 (TOP VIEW)



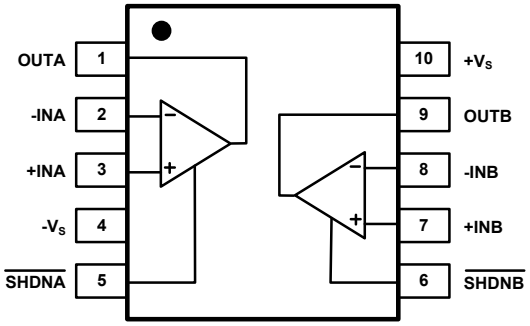
SOT-23-6

SGM8557-2 (TOP VIEW)



SOIC-8

SGM8557-5 (TOP VIEW)



MSOP-10

ELECTRICAL CHARACTERISTICS

(V_S = 2.7V to 5V, $-V_S$ = 0V, V_{CM} = V_S/2, V_{OUT} = V_S/2, R_L connected to V_S/2, $V_{\overline{SHDN}}$ = V_S, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Input Characteristics								
Input Offset Voltage	V_{OS}	V_S = 2.7V		+25℃		2.4	5	μV
		V_S = 5V		+25℃		2.8	5	
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	V_S = 2.7V		Full		27	126	nV/℃
		V_S = 5V		Full		27	130	
Input Bias Current	I_B	V_S = 5V		+25℃		240		pA
Input Offset Current	I_{OS}	V_S = 5V		+25℃		480		pA
Input Common Mode Voltage Range	V_{CM}	Inferred from CMRR test		Full	$(-V_S)$ - 0.1		$(+V_S)$ + 0.1	V
Common Mode Rejection Ratio	CMRR	V_S = 2.7V, $(-V_S)$ - 0.1V < V_{CM} < $(+V_S)$ + 0.1V		+25℃	106	120		dB
				Full	102			
		V_S = 5V, $(-V_S)$ - 0.1V < V_{CM} < $(+V_S)$ + 0.1V		+25℃	106	120		
				Full	90			
Open-Loop Voltage Gain	A_{OL}	V_S = 2.7V, $(-V_S)$ + 0.2V < V_{OUT} < $(+V_S)$ - 0.2V	R_L = 2kΩ	+25℃	112	135		dB
				Full	109			
			R_L = 200Ω	+25℃	110	136		
				Full	107			
		V_S = 5V, $(-V_S)$ + 0.2V < V_{OUT} < $(+V_S)$ - 0.2V	R_L = 2kΩ	+25℃	117	144		
				Full	114			
			R_L = 200Ω	+25℃	110	142		
				Full	107			
Output Characteristics								
Output Voltage Swing from Rail	V_{OUT}	V_S = 2.7V	R_L = 32Ω	+25℃		240	300	mV
				Full			370	
			R_L = 200Ω	+25℃		45	60	
				Full			72	
			R_L = 2kΩ	+25℃		5	10	
				Full			11	
			I_{OUT} = 10mA	+25℃		60	95	
				Full			115	
		V_S = 5V	R_L = 32Ω	+25℃		390	485	
				Full			580	
			R_L = 200Ω	+25℃		72	90	
				Full			110	
			R_L = 2kΩ	+25℃		8	15	
				Full			18	
			I_{OUT} = 10mA	+25℃		60	82	
				Full			98	
Short-Circuit Current Limit	I_{SC}	V_S = 2.7V		+25℃	92	120		mA
				Full	64			
		V_S = 5V		+25℃	182	240		
				Full	148			

ELECTRICAL CHARACTERISTICS (continued)

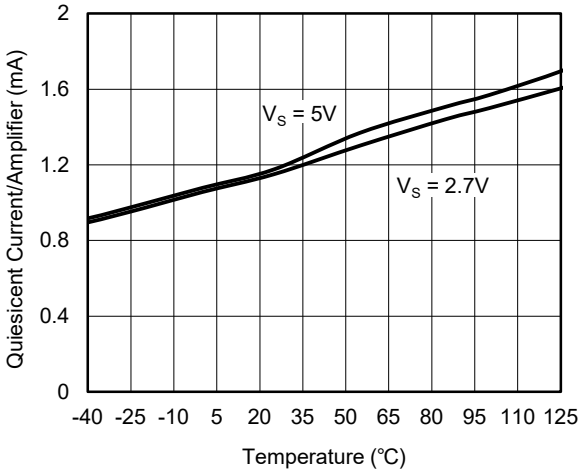
(V_S = 2.7V to 5V, $-V_S$ = 0V, V_{CM} = V_S/2, V_{OUT} = V_S/2, R_L connected to V_S/2, $V_{\overline{SHDN}}$ = V_S, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Power-Down Disable (SGM8557-3/5 Only)							
Shutdown Supply Current/Amplifier	$I_{Q(\overline{SHDN})}$	$V_{\overline{SHDN}}$ = 0V, R_L = ∞, V_S = 5V	+25℃		0.3	2	μA
$\overline{SHDN}$ Logic Threshold	V_{IL}	Shutdown mode	+25℃			0.8	V
	V_{IH}	Normal mode	+25℃	$(+V_S) \times 0.5$			
$\overline{SHDN}$ Input Bias Current		$-V_S < V_{\overline{SHDN}} < V_S$	+25℃		50		pA
Shutdown Output Impedance	R_{OUT}	$V_{\overline{SHDN}}$ = 0V	+25℃		10		Ω
Output Voltage in Shutdown	$V_{OUT(\overline{SHDN})}$	$V_{\overline{SHDN}}$ = 0V, R_L = 200Ω	+25℃		70		mV
Power Supply							
Supply Voltage Range	V_S	Inferred from PSRR test	Full	2.7		5.5	V
Power Supply Rejection Ratio	PSRR		+25℃	102	120		dB
			Full	94			
Quiescent Supply Current/Amplifier	I_Q	V_S = 2.7V	+25℃		1.15	1.62	mA
		V_S = 5V	+25℃		1.15	1.65	
			Full			2.15	
Dynamic Performance							
Gain-Bandwidth Product	GBP		+25℃		15		MHz
Slew Rate	SR		+25℃		7		V/μs
Total Harmonic Distortion + Noise	THD+N	V_S = 5V, R_L = 32Ω, f = 10kHz, BW = 10Hz to 90kHz, V_{OUT} = $2V_{P-P}$, A_{VCL} = 1V/V	+25℃		0.017		%
Input Capacitance	C_{IN}		+25℃		20		pF
Channel-to-Channel Isolation		f = 1kHz, R_L = 100kΩ	+25℃		-125		dB
Capacitive-Load Stability		A_{VCL} = 1V/V, no sustained oscillations	+25℃		780		pF
Noise							
Input Voltage Noise		f = 0.1Hz to 10Hz	+25℃		0.5		μV_{P-P}
Input Voltage Noise Density	e_n	f = 1kHz	+25℃		30		$nV/\sqrt{Hz}$
		f = 10kHz	+25℃		28		

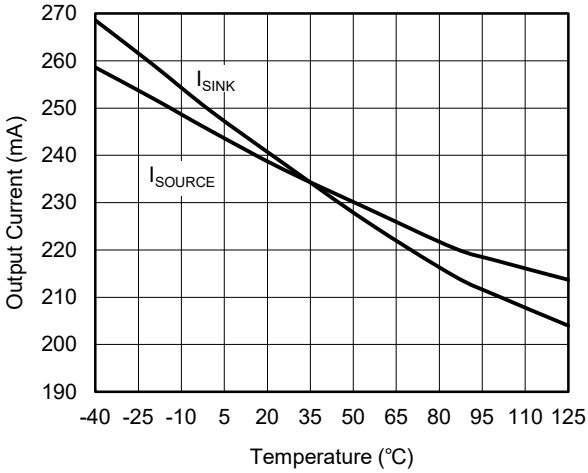
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = 5V, unless otherwise noted.

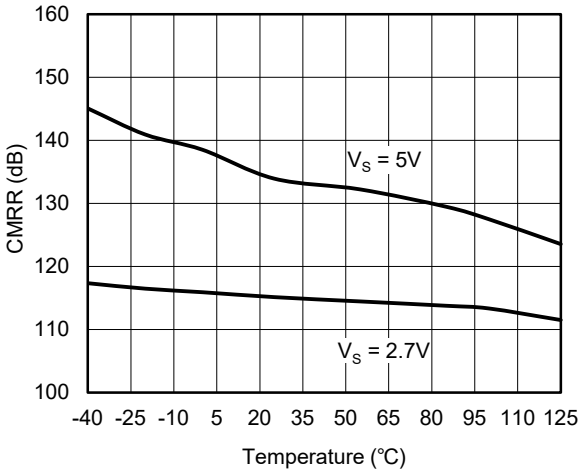
Quiescent Current vs. Temperature



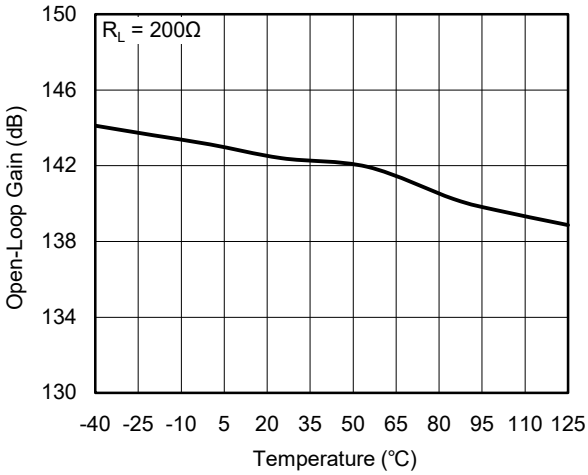
Output Current vs. Temperature



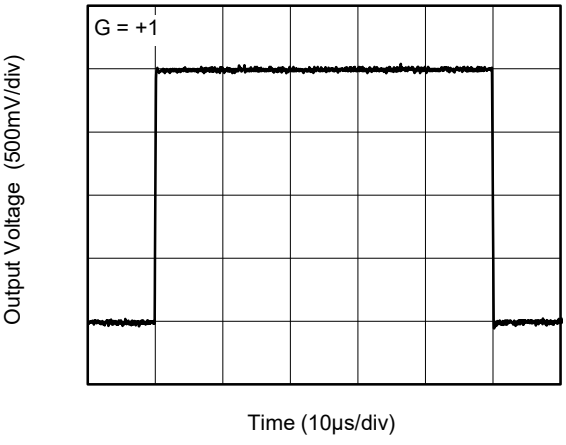
Common Mode Rejection Ratio vs. Temperature



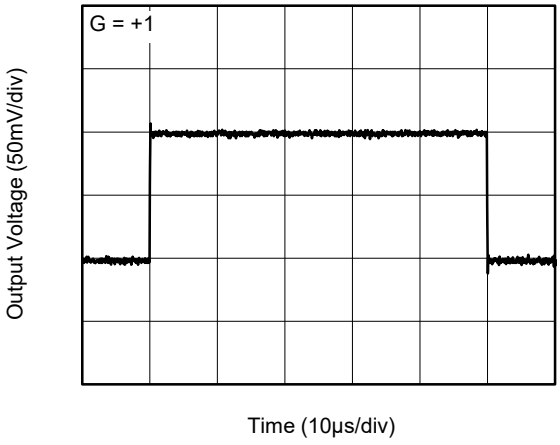
Open-Loop Gain vs. Temperature



Large-Signal Step Response



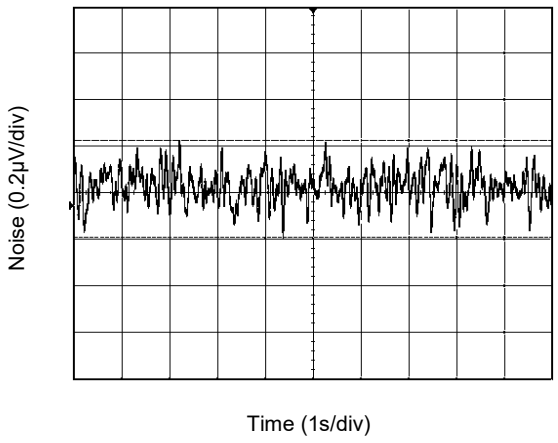
Small-Signal Step Response



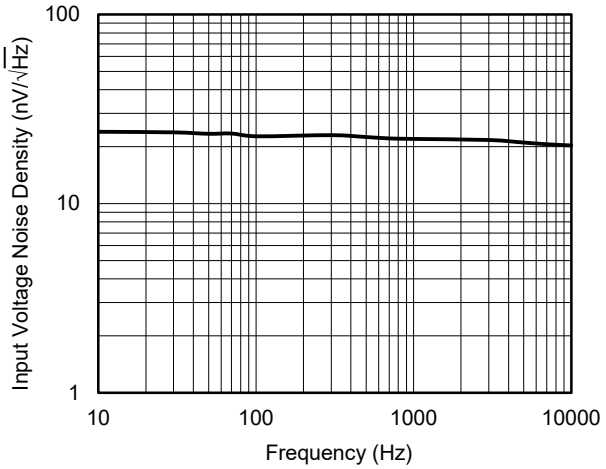
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, unless otherwise noted.

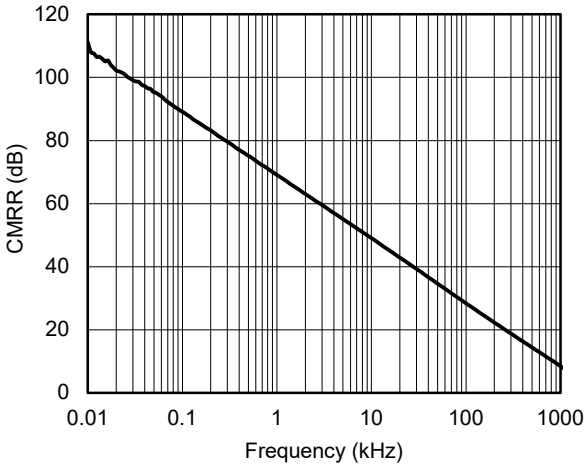
0.1Hz to 10Hz Noise



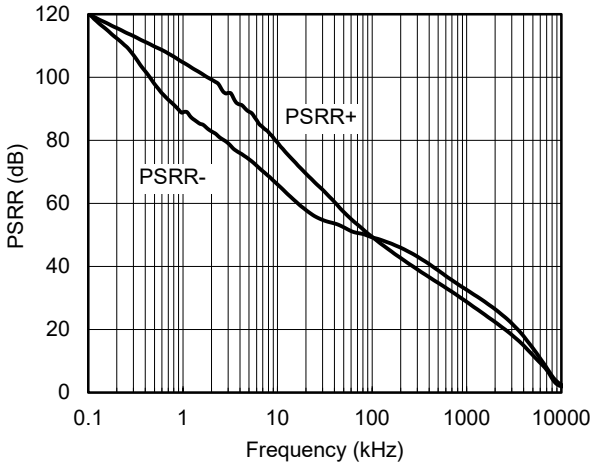
Input Voltage Noise Density vs. Frequency



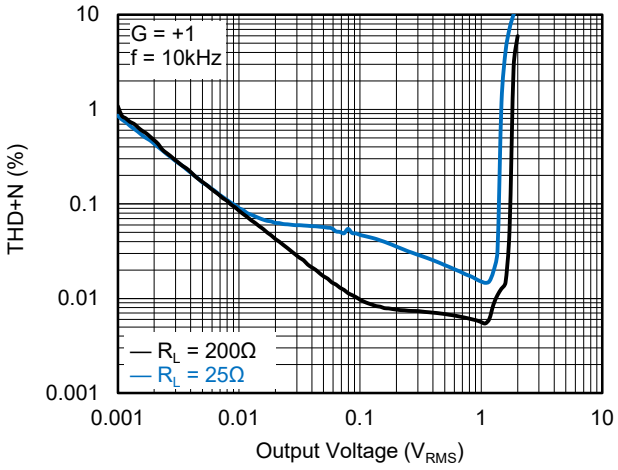
Common Mode Rejection Ratio vs. Frequency



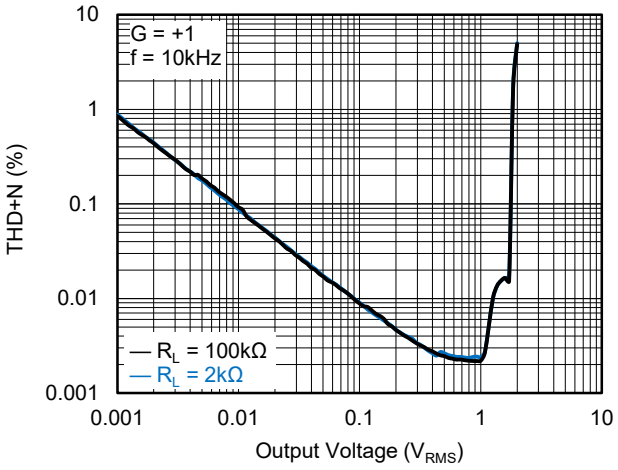
Power Supply Rejection Ratio vs. Frequency



THD+N vs. Output Voltage



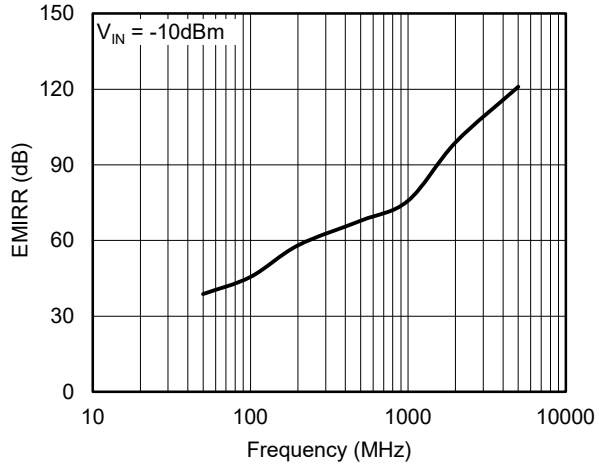
THD+N vs. Output Voltage



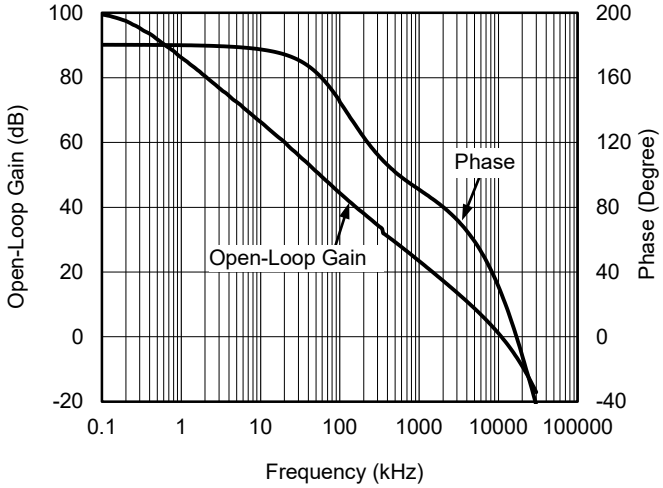
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, unless otherwise noted.

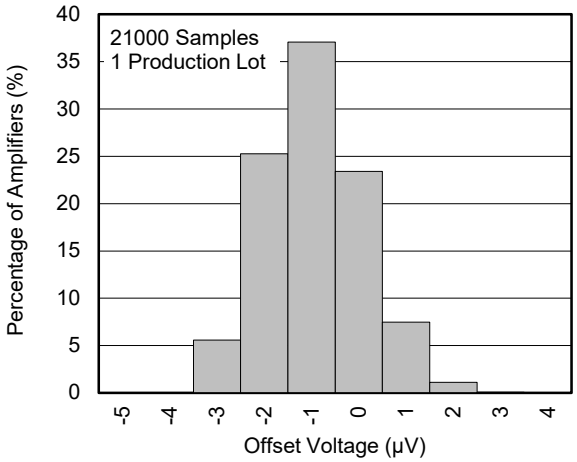
EMIRR vs. Frequency



Open-Loop Gain and Phase vs. Frequency



Offset Voltage Production Distribution



APPLICATION INFORMATION

Single-Supply Stereo Headphone Driver

A single-supply stereo headphone driver is shown in Figure 1 as an example to explain the simplified design procedure.

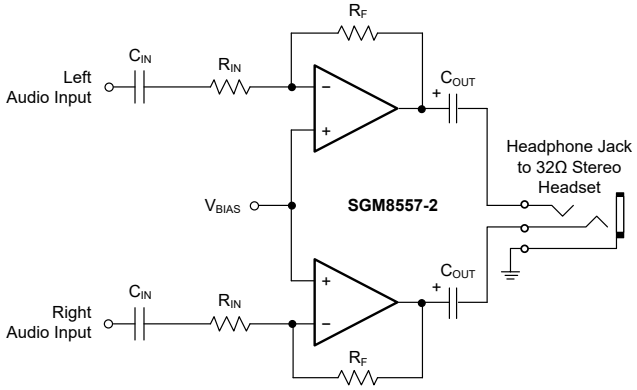


Figure 1. Stereo Headphone Driver

In this circuit, C_{IN} and R_{IN} form a high-pass filter, the DC bias is removed from the incoming signal. The -3dB point of the high-pass filter is using Equation 1:

$$f_{-3dB} = \frac{1}{2\pi R_{IN} C_{IN}} \quad (1)$$

The gain of driver is $-R_F/R_{IN}$. The C_{OUT} and the load impedance form a high-pass filter with the -3dB point determined by Equation 2:

$$f_{-3dB} = \frac{1}{2\pi R_L C_{OUT}} \quad (2)$$

Bridge Amplifier

A bridge amplifier circuit which can provide 200mW at 3V is shown in Figure 2. Due to differential output, this structure eliminates the large coupling capacitors in Figure 1. The voltage gain is 10V/V and the gain can be changed by changing R_2.

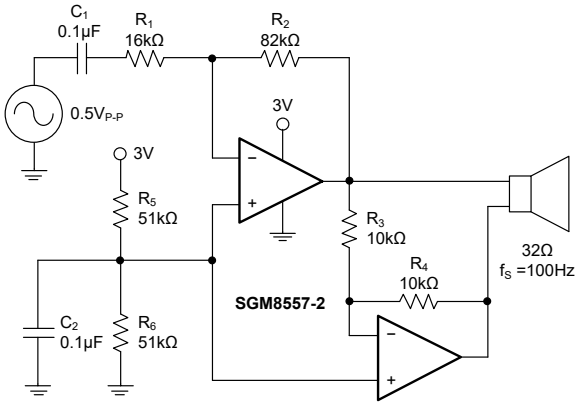


Figure 2. 200mW Bridge Amplifier at 3V

Cancel Input Capacitance

The C_{IN} (20pF TYP) at inverting input pin will generate a pole at frequency $(2\pi R'C_{IN})^{-1}$, where R′ is the parallel combination of the gain-setting resistor for the inverting or non-inverting amplifier in Figure 3. If the pole-frequency is less than or comparable to the unity-gain bandwidth (15MHz), the phase margin will be reduced, ringing in the step response or sustained oscillation will be generated. To cancel this pole, C_F is used to compensate C_{IN} in Figure 3. Equation 3 gives the C_F feedback capacitance.

$$C_F = 8\times(R/R_F)\ pF \quad (3)$$

where:

R_F is the feedback resistor.
R is the gain-setting resistor.

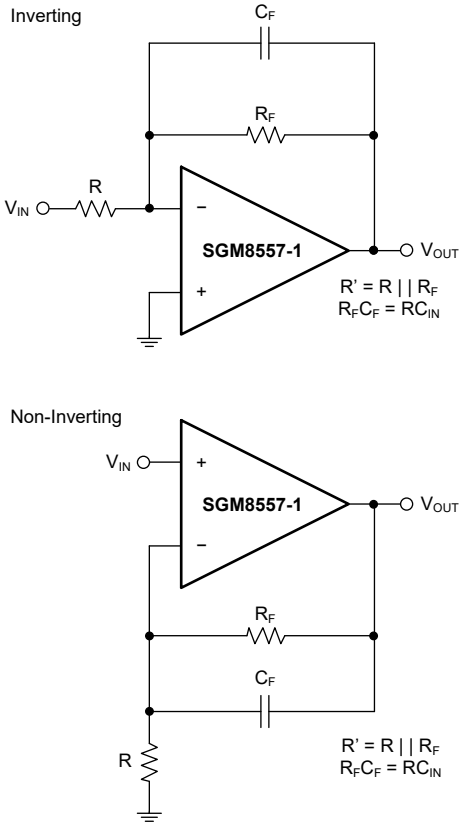


Figure 3. Inverting and Non-Inverting Amplifiers with C_F to Compensate C_{IN}

APPLICATIONS INFORMATION (continued)

Input Current-Limit Protection

For ESD diode clamping protection, when the current flowing through ESD diode exceeds the maximum rating value, the ESD diode and amplifier will be damaged, so current-limit protection will be added in some applications. One resistor is selected to limit the current not to exceed the maximum rating value. In Figure 4, a series input resistor is used to limit the input current to less than 10mA, but the drawback of this current-limit resistor is to contribute thermal noise at the amplifier input. If this resistor must be added, its value must be selected as small as possible.

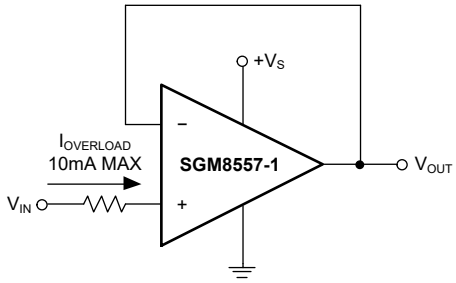


Figure 4. Input Current-Limit Protection

Rail-to-Rail Output

The SGM8557-1/2/3/5 support rail-to-rail output operation. In single power supply application, for example, when $+V_S$ = 5V, $-V_S$ = GND, 2kΩ load resistor is tied from OUT pin to $V_S/2$, the typical output swing range is from 0.008V to 4.992V.

Driving Capacitive Loads

The SGM8557-1/2/3/5 are designed for unity-gain stable for capacitive load up to 780pF. In Figure 5, it shows the transient response with capacitive load (C_L). If greater capacitive load must be driven in application, the circuit in Figure 6 can be used. In this circuit, the IR drop voltage generated by R_{ISO} is compensated by feedback loop.

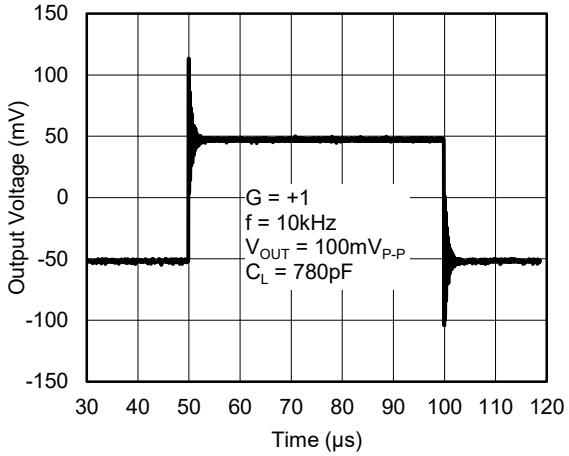


Figure 5. Small-Signal Transient Response (Capacitive Load)

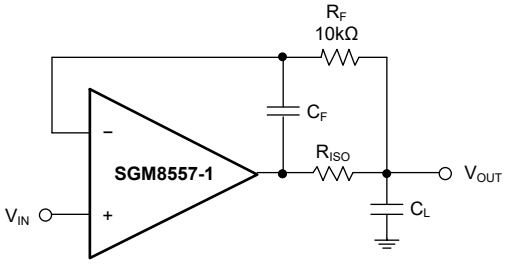


Figure 6. Circuit to Drive Capacitive Load

APPLICATIONS INFORMATION (continued)

Shutdown Mode and Power-Up

The SGM8557-3 and SGM8557-5 are disabled when the shutdown pin is pulled low. To disable the amplifier, the shutdown supply current drops to 0.3μA (TYP) per amplifier. When in shutdown mode the operational amplifier output is driven to $-V_S$. Pull the shutdown pin high to enable the amplifier. Figure 7 shows the output voltage to a shutdown pulse. The SGM8557-1/2/3/5 typically settle within 5μs after power-up.

When exiting shutdown mode, a 10μs delay-time can be added before the amplifier's output become active (Figure 7).

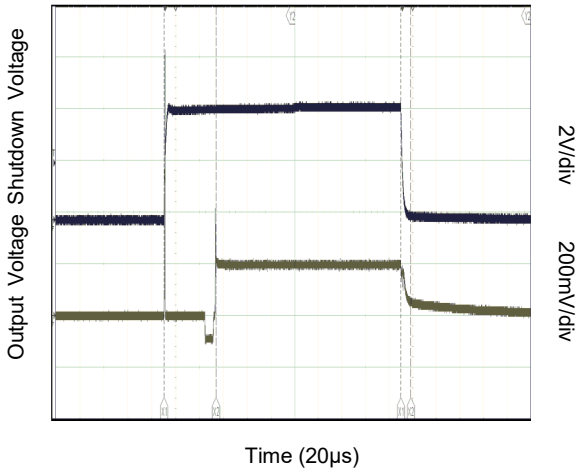


Figure 7. Enable or Disable the Output Voltage

Power Supply Decoupling and Layout

A clean and low noise power supply is very important in amplifier circuit design, besides of input signal noise, the power supply is one of important source of noise to the amplifiers through $+V_S$ and $-V_S$ pins. Power supply bypassing is an effective method to clear up the noise at power supply, and the low impedance path to ground of decoupling capacitor will bypass the noise to GND. In application, 10μF ceramic capacitor paralleled with 0.1μF or 0.01μF ceramic capacitor is used in Figure 8. The ceramic capacitors should be placed as close as possible to $+V_S$ and $-V_S$ power supply pins.

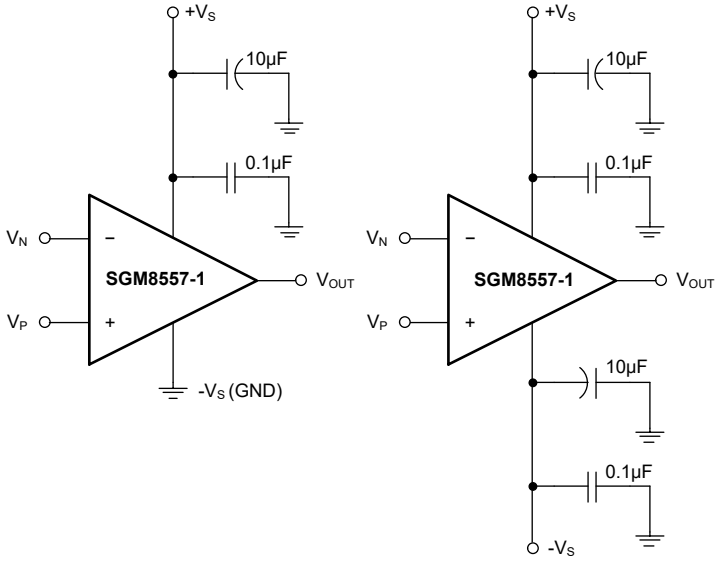


Figure 8. Amplifier Power Supply Bypassing

REVISION HISTORY

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

SEPTEMBER 2021 – REV.A.4 to REV.B	Page
Updated Marking Information section	2
Updated Absolute Maximum Ratings section	3
Updated Electrical Characteristics section	5, 6
Updated Typical Performance Characteristics section	7 ~ 9
Updated Application Information section	10

OCTOBER 2019 – REV.A.3 to REV.A.4	Page
Updated Marking Information section	2

JANUARY 2019 – REV.A.2 to REV.A.3	Page
Changed Figure 2	9

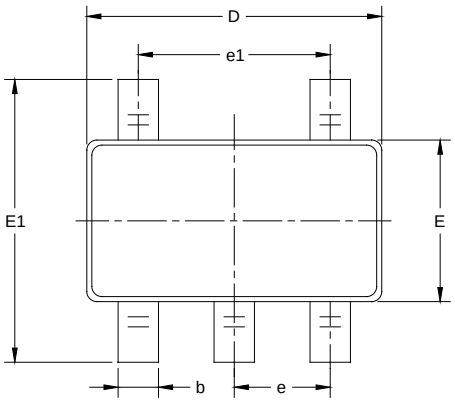
DECEMBER 2017 – REV.A.1 to REV.A.2	Page
Added Typical Performance Characteristics	8

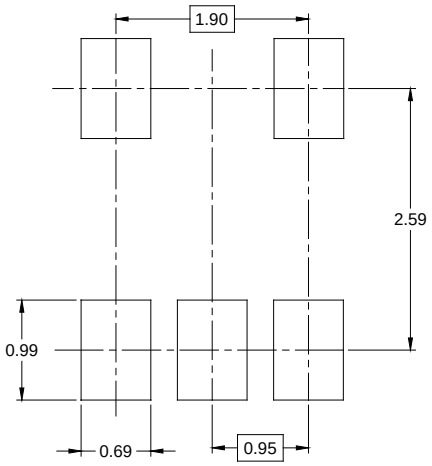
NOVEMBER 2017 – REV.A to REV.A.1	Page
Changed Electrical Characteristics section	4
Changed Typical Performance Characteristics section	7, 8

Changes from Original (DECEMBER 2016) to REV.A	Page
Changed from product preview to production data	All

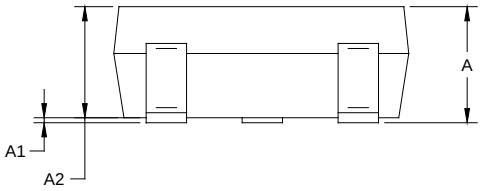
PACKAGE OUTLINE DIMENSIONS

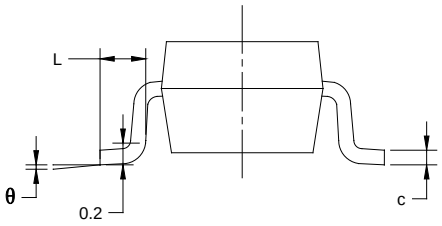
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)



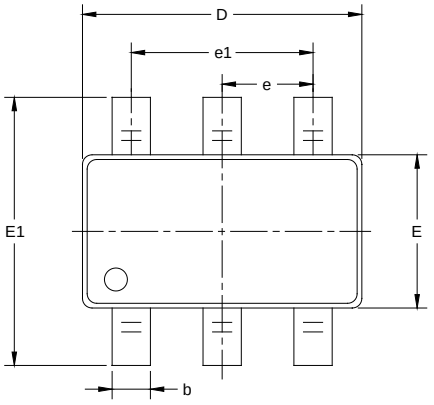


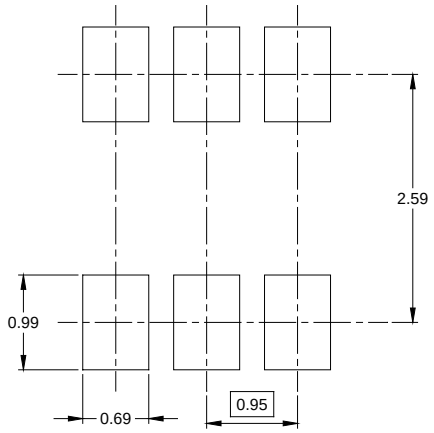
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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

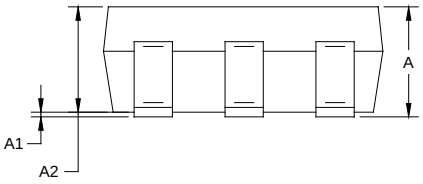
PACKAGE OUTLINE DIMENSIONS

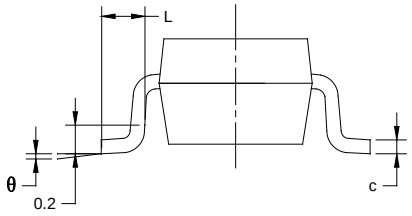
SOT-23-6





RECOMMENDED LAND PATTERN (Unit: mm)



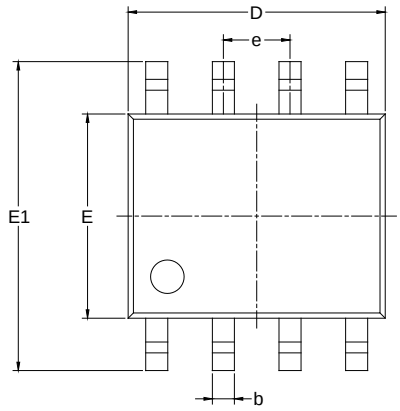


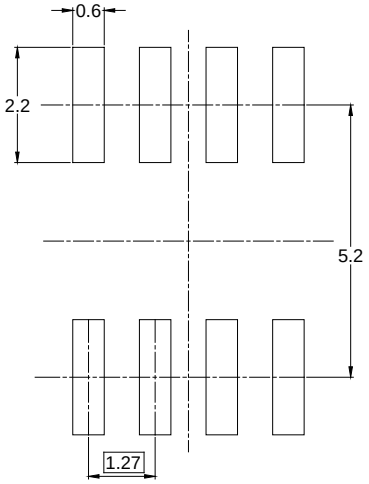
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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

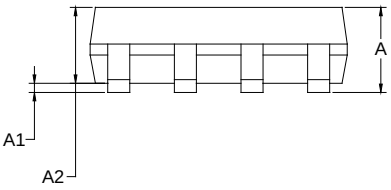
PACKAGE OUTLINE DIMENSIONS

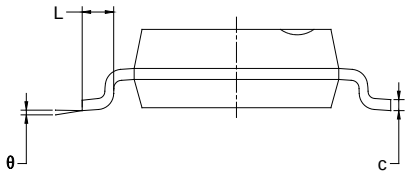
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)



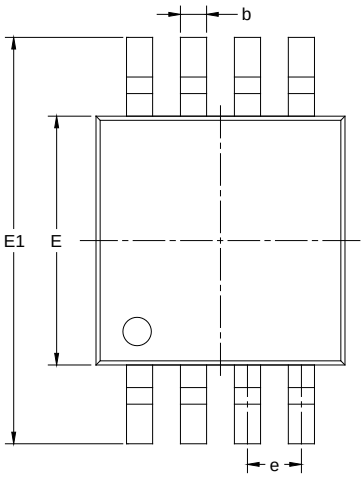


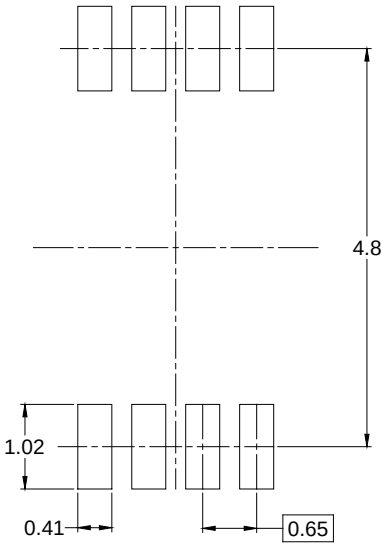
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

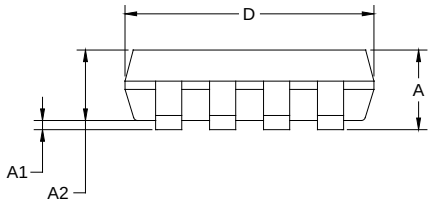
PACKAGE OUTLINE DIMENSIONS

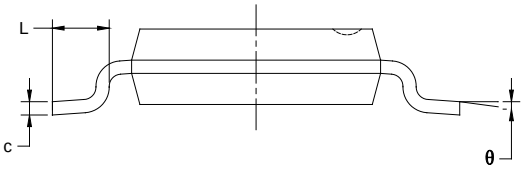
MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)



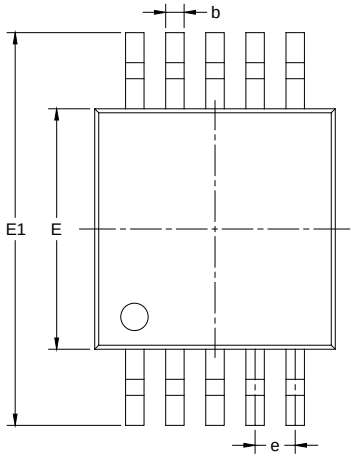


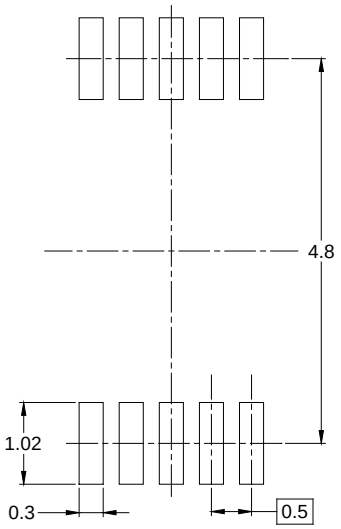
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

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

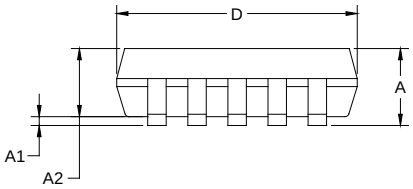
PACKAGE OUTLINE DIMENSIONS

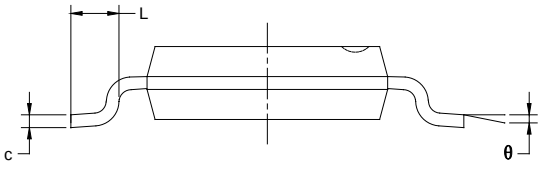
MSOP-10





RECOMMENDED LAND PATTERN (Unit: mm)



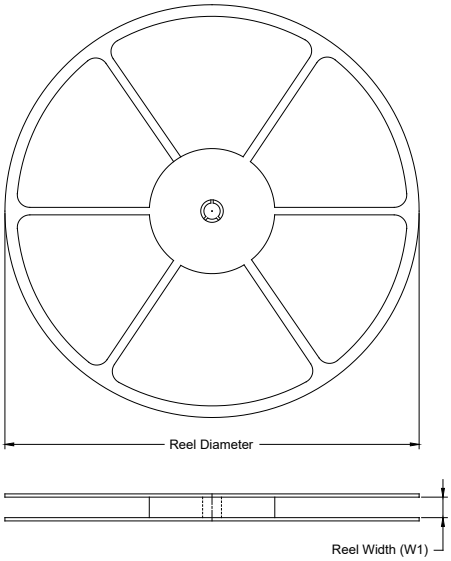


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

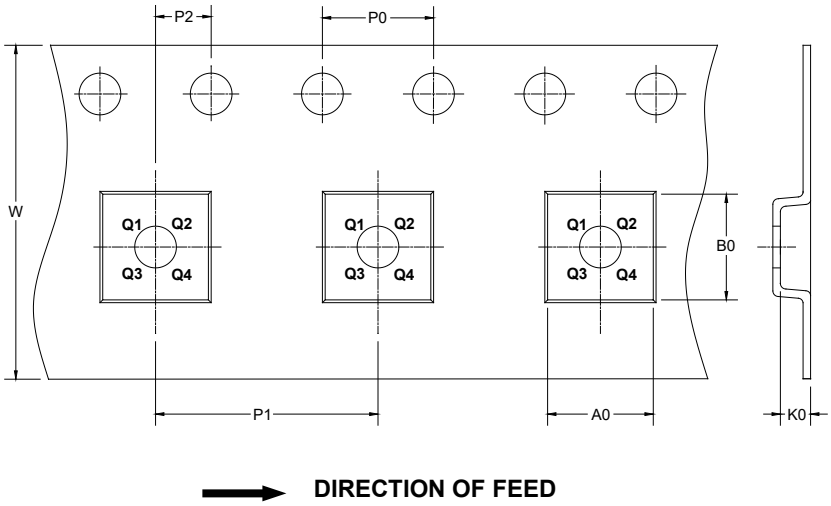
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



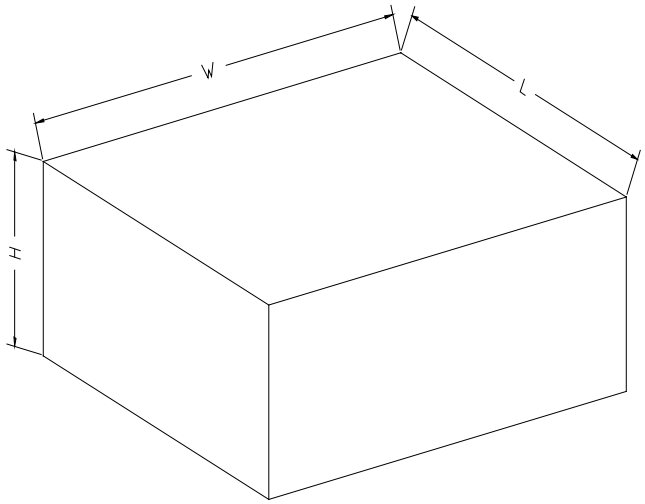
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOT-23-6	7″	9.5	3.17	3.23	1.37	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
MSOP-10	13″	12.4	5.20	3.30	1.20	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
7″ (Option)	368	227	224	8
7″	442	410	224	18
13″	386	280	370	5

DD0002