PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8061	SOT-23-5	-40℃ to +125℃	SGM8061XN5/TR	8061	Tape and Reel, 3000
	SOIC-8	-40℃ to +125℃	SGM8061XS/TR	SGM8061XS XXXXX	Tape and Reel, 2500
SGM8062	MSOP-8	-40℃ to +125℃	SGM8062XMS/TR	SGM8062 XMS XXXXX	Tape and Reel, 3000
	SOIC-8	-40℃ to +125℃	SGM8062XS/TR	SGM8062XS XXXXX	Tape and Reel, 2500
SGM8063	SOT-23-6	-40℃ to +125℃	SGM8063XN6/TR	8063	Tape and Reel, 3000
	SOIC-8	-40℃ to +125℃	SGM8063XS/TR	SGM8063XS XXXXX	Tape and Reel, 2500

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

X X X X X
- 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, $+V_S$ to $-V_S$ 6V
Input Common Mode Voltage Range
.... $(-V_S) - 0.3V$ to $(+V_S) + 0.3V$
Package Thermal Resistance @ T_A = +25℃
SOT-23-5, θ_{JA} .... 190℃/W
SOT-23-6, θ_{JA} .... 190℃/W
SOIC-8, θ_{JA} .... 125℃/W
MSOP-8, θ_{JA} .... 155℃/W
Junction Temperature .... +150℃
Storage Temperature Range .... -65℃ to +150℃
Lead Temperature (Soldering, 10s) .... +260℃
ESD Susceptibility
HBM 1000V
MM 400V

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range .... 2.5V to 5.5V
Operating Temperature Range .... -40℃ to +125℃

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

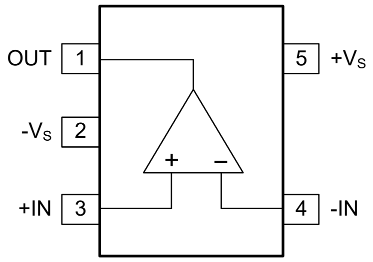
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

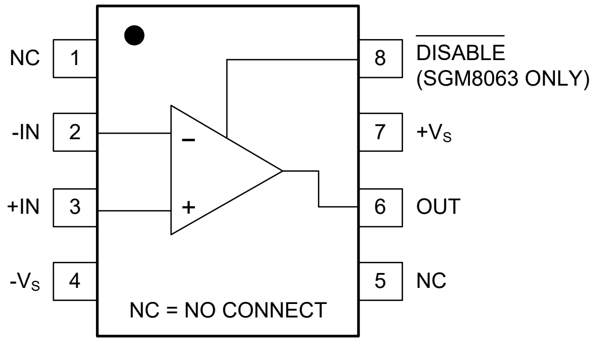
PIN CONFIGURATIONS

SGM8061 (TOP VIEW)



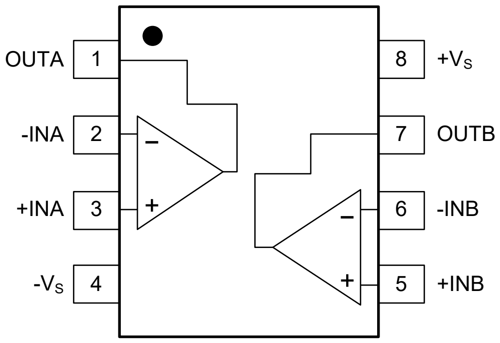
SOT-23-5

SGM8061/SGM8063 (TOP VIEW)



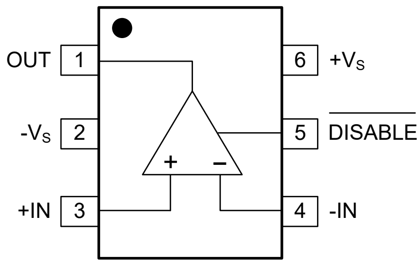
SOIC-8

SGM8062 (TOP VIEW)



SOIC-8/MSOP-8

SGM8063 (TOP VIEW)



SOT-23-6

ELECTRICAL CHARACTERISTICS

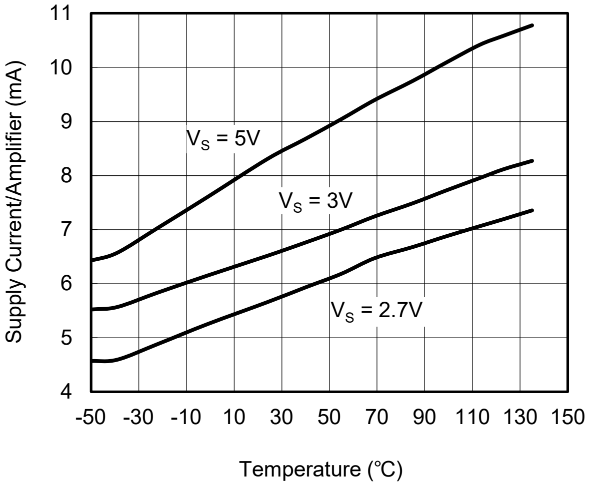
(G = +2, R_F = 402Ω, R_L = 150Ω, unless otherwise noted.)

PARAMETER	CONDITIONS	SGM8061/2/3						
		TYP	MIN/MAX OVER TEMPERATURE					
		+25℃	+25℃	0℃ to +70℃	-40℃ to +85℃	-40℃ to +125℃	UNITS	MIN /MAX
DYNAMIC PERFORMANCE								
-3dB Small-Signal Bandwidth	G = +1, V_{OUT} = 0.1V_{P-P}, R_F = 24Ω,	500					MHz	TYP
	G = +1, V_{OUT} = 0.1V_{P-P}, R_F = 24Ω, R_L = 1kΩ	550					MHz	TYP
	G = +2, V_{OUT} = 0.1V_{P-P}, R_L = 50Ω	130					MHz	TYP
	G = +2, V_{OUT} = 0.1V_{P-P}, R_L = 150Ω	210					MHz	TYP
	G = +2, V_{OUT} = 0.1V_{P-P}, R_L = 1kΩ	250					MHz	TYP
	G = +2, V_{OUT} = 0.1V_{P-P}, R_L = 10kΩ	420					MHz	TYP
Gain-Bandwidth Product	G = +10, R_L = 150Ω	200					MHz	TYP
	G = +10, R_L = 1kΩ	230					MHz	TYP
Bandwidth for 0.1dB Flatness	G = +1, V_{OUT} = 0.1V_{P-P}, R_F = 24Ω	130					MHz	TYP
	G = +2, V_{OUT} = 0.1V_{P-P}, R_F = 330Ω	80					MHz	TYP
Slew Rate	G = +1, 2V Output Step	320/-370					V/μs	TYP
	G = +2, 2V Output Step	350/-320					V/μs	TYP
	G = +2, 4V Output Step	420/-390					V/μs	TYP
Rise-and-Fall Time	G = +2, V_{OUT} = 0.2V_{P-P}, 10% to 90%	4					ns	TYP
	G = +2, V_{OUT} = 2V_{P-P}, 10% to 90%	4.5					ns	TYP
Settling Time to 0.1%	G = +2, 2V Output Step	16					ns	TYP
Overload Recovery Time	V_{IN}·G = +V_S	6.2					ns	TYP
NOISE/DISTORTION PERFORMANCE								
Input Voltage Noise Density	f = 1MHz	5.6					nV/$\sqrt{Hz}$	TYP
Differential Gain Error (NTSC)	G = +2, R_L = 150Ω	0.015					%	TYP
Differential Phase Error (NTSC)	G = +2, R_L = 150Ω	0.05					degree	TYP
DC PERFORMANCE								
Input Offset Voltage (V_{OS})		±2	±8	±8.5	±9	±9.3	mV	MAX
Input Offset Voltage Drift		3					μV/℃	TYP
Input Bias Current (I_B)		6					pA	TYP
Input Offset Current (I_{OS})		2					pA	TYP
Open-Loop Gain (A_{OL})	V_{OUT} = 0.3V to 4.7V, R_L = 150Ω	80	75	75	74	70	dB	MIN
	V_{OUT} = 0.2V to 4.8V, R_L = 1kΩ	104	90	90	89	80	dB	MIN
INPUT CHARACTERISTICS								
Input Common Mode Voltage Range (V_{CM})		-0.2 to 3.8					V	TYP
Common Mode Rejection Ratio (CMRR)	V_{CM} = -0.1V to 3.5V	80	66	65	64	62	dB	MIN
OUTPUT CHARACTERISTICS								
Output Voltage Swing from Rail	R_L = 150Ω	0.12					V	TYP
	R_L = 1kΩ	0.03					V	TYP
Output Current		120	100	98	93	87	mA	MIN
Closed-Loop Output Impedance	f < 100kHz	0.015					Ω	TYP
POWER-DOWN DISABLE (SGM8063 ONLY)								
Turn-On Time		50					ns	TYP
Turn-Off Time		44					ns	TYP
$\overline{DISABLE}$ Voltage-Off			0.8				V	MAX
$\overline{DISABLE}$ Voltage-On			2				V	MIN
POWER SUPPLY								
Operating Voltage Range			2.5	2.7	2.7	2.7	V	MIN
			5.5	5.5	5.5	5.5	V	MAX
Quiescent Current/Amplifier		8.2	10	10.3	10.5	11	mA	MAX
Supply Current when Disabled (SGM8063 only)		75	120	127	130	139	μA	MAX
Power Supply Rejection Ratio (PSRR)	ΔV_S = 2.7V to 5.5V, V_{CM} = (-V_S) + 0.5V	80	66	66	65	63	dB	MIN

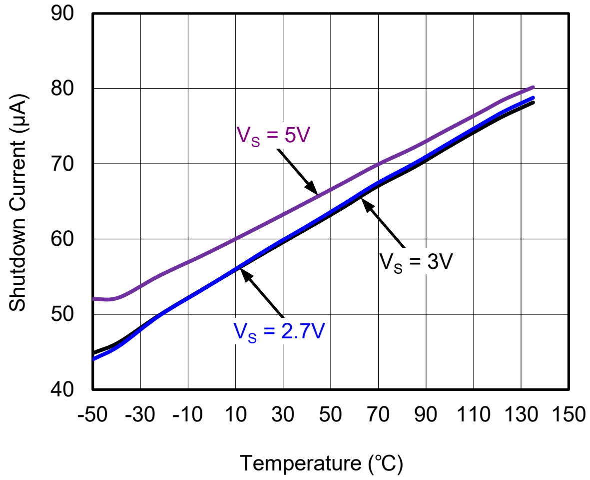
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = 5V, G = +2, R_F = 402Ω, R_G = 402Ω, and R_L=150Ω connected to V_S/2, unless otherwise noted.

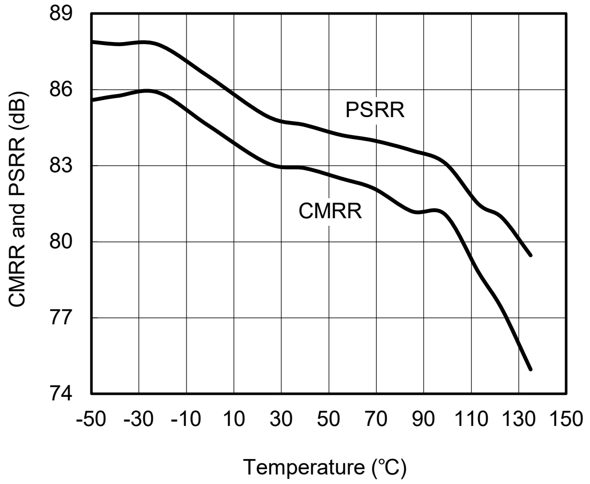
Supply Current vs. Temperature



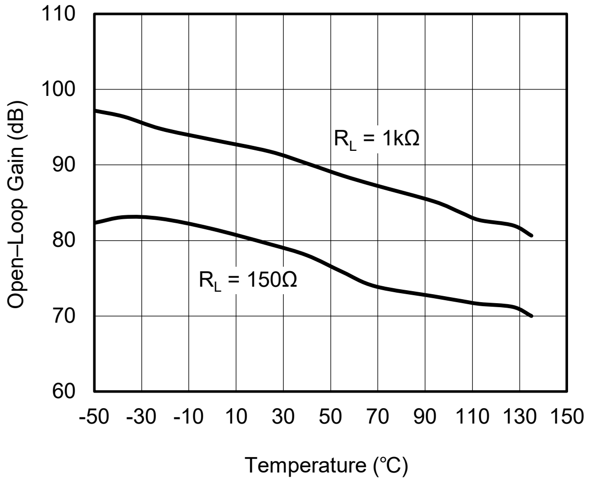
Shutdown Current vs. Temperature



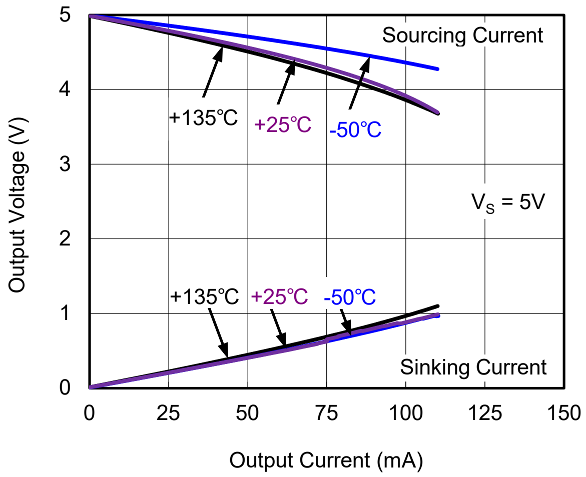
CMRR and PSRR vs. Temperature



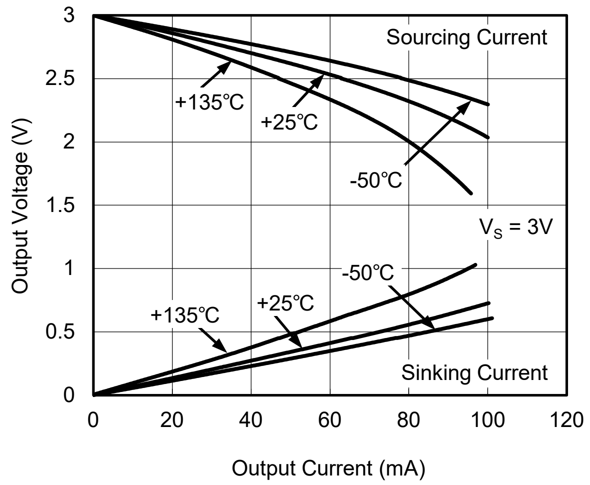
Open-Loop Gain vs. Temperature



Output Voltage Swing vs. Output Current

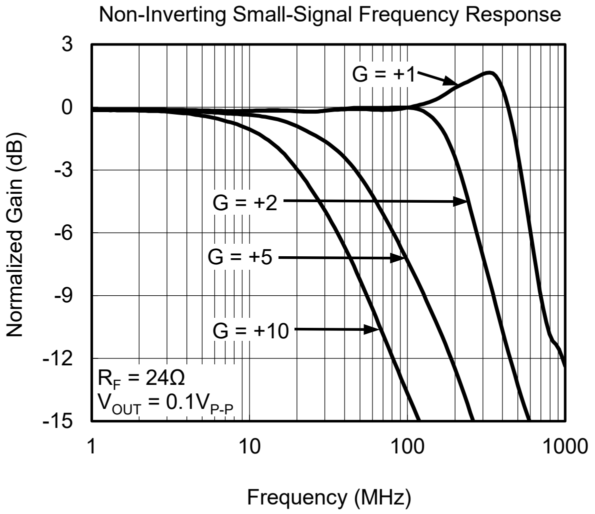


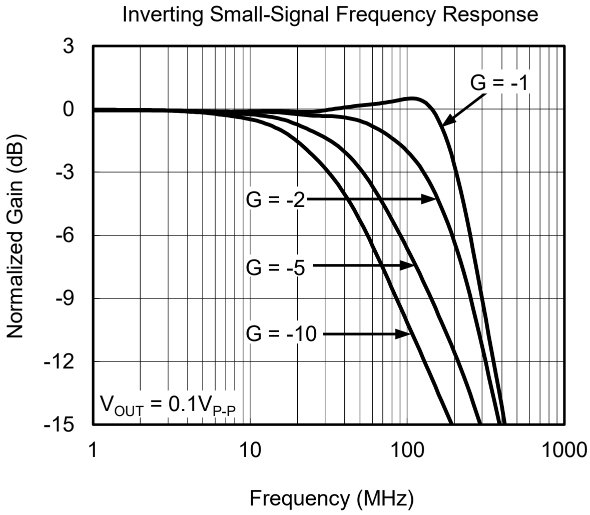
Output Voltage Swing vs. Output Current

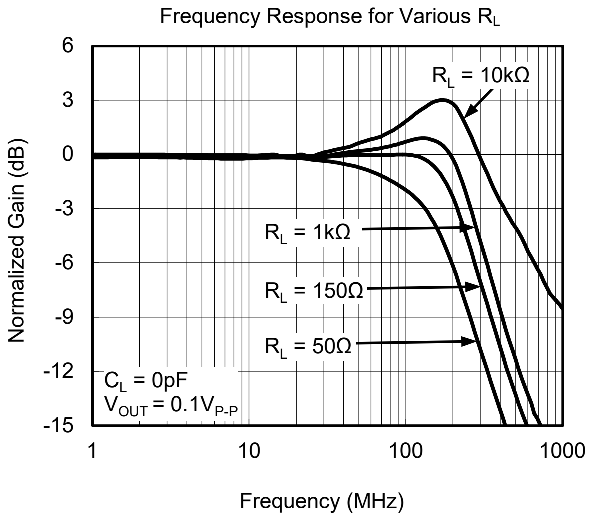


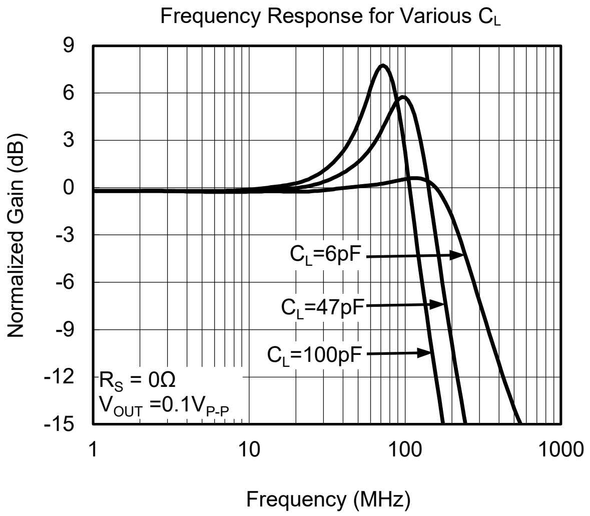
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

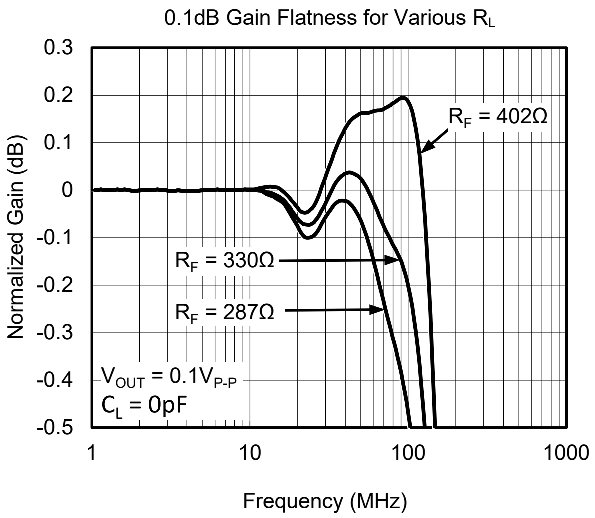
At T_A = +25°C, V_S = 5V, G = +2, R_F = 402Ω, R_G = 402Ω, and R_L=150Ω connected to V_S/2, unless otherwise noted.

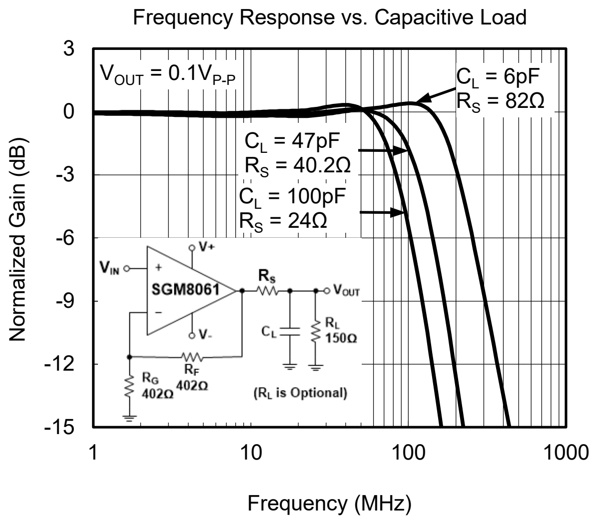








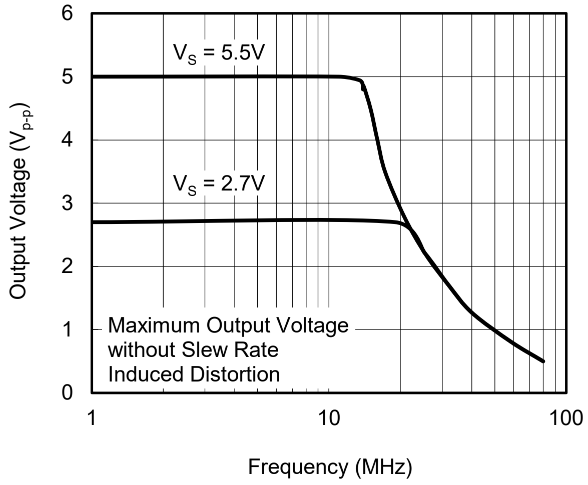




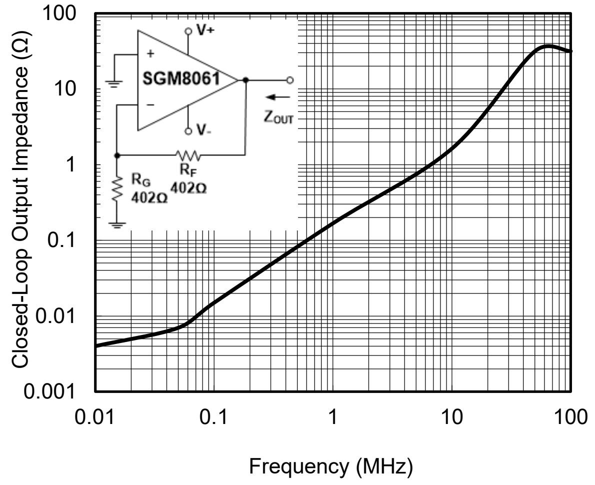
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25°C, V_S = 5V, G = +2, R_F = 402Ω, R_G = 402Ω, and R_L=150Ω connected to V_S/2, unless otherwise noted.

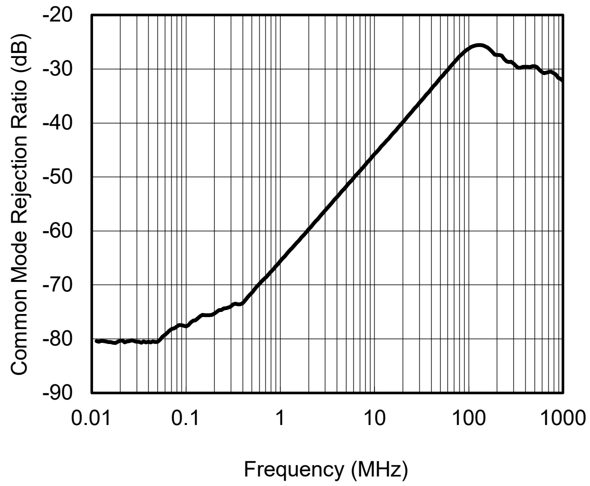
Maximum Output Voltage vs. Frequency



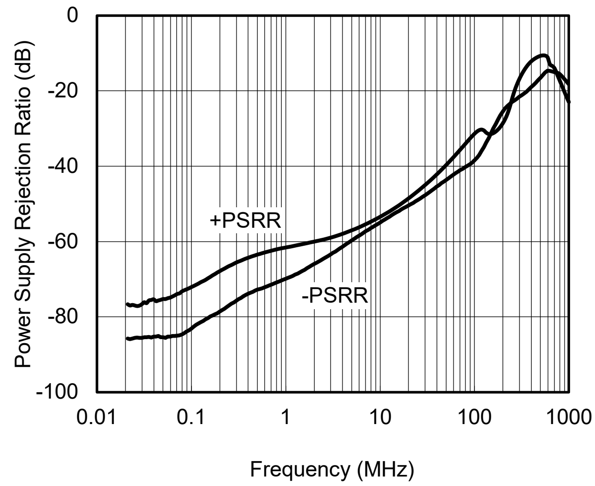
Closed-Loop Output Impedance vs. Frequency



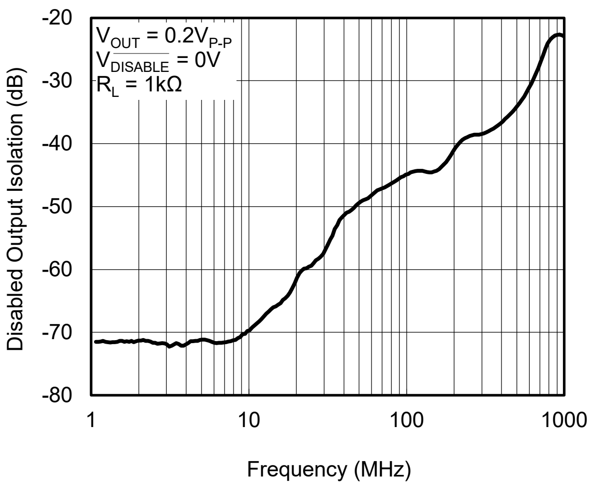
CMRR vs. Frequency



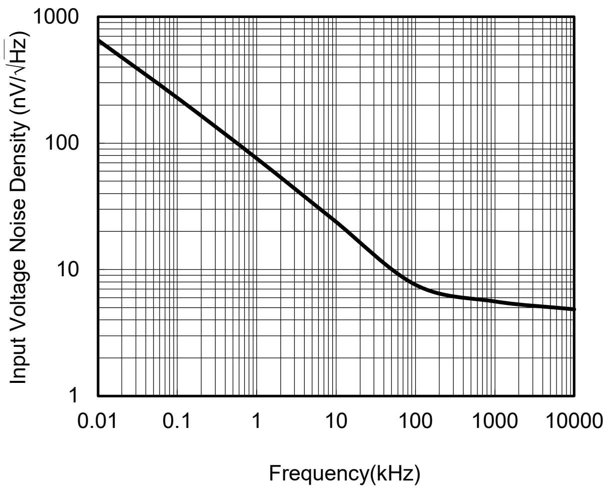
PSRR vs. Frequency



Disabled Output Isolation Frequency Response



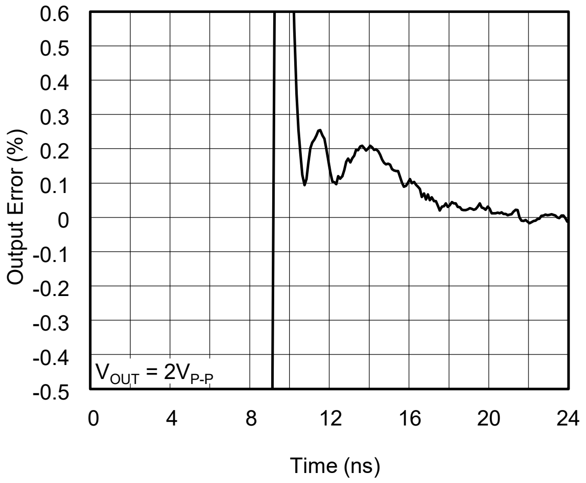
Input Voltage Noise Density vs. Frequency



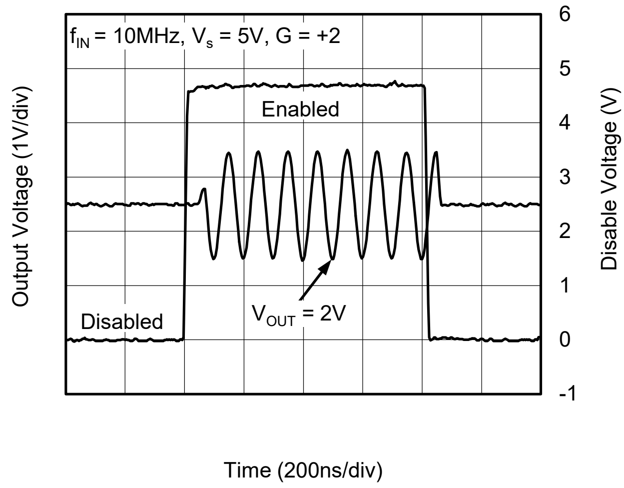
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25°C, V_S = 5V, G = +2, R_F = 402Ω, R_G = 402Ω, and R_L=150Ω connected to V_S/2, unless otherwise noted.

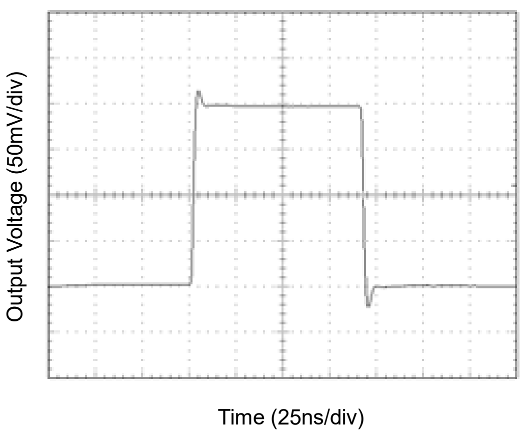
Output Settling Time to 0.1%



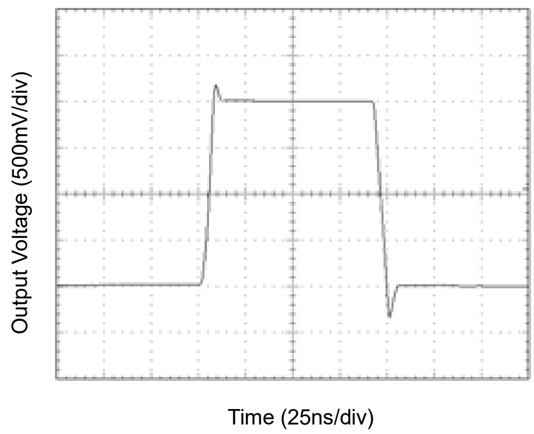
Large-Signal Disable/Enable Response



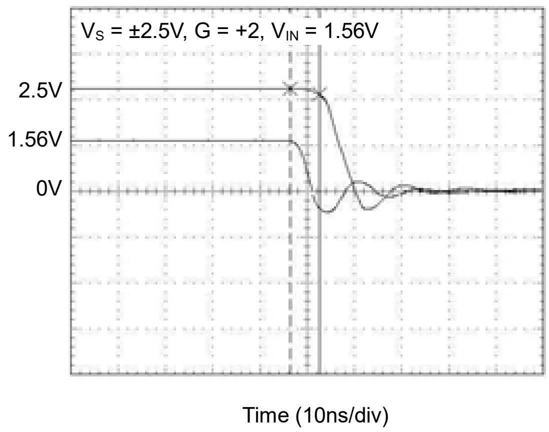
Non-Inverting Small-Signal Step Response



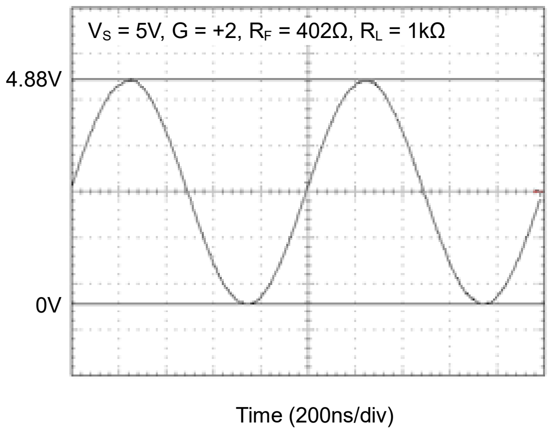
Non-Inverting Large-Signal Step Response



Overload Recovery Time

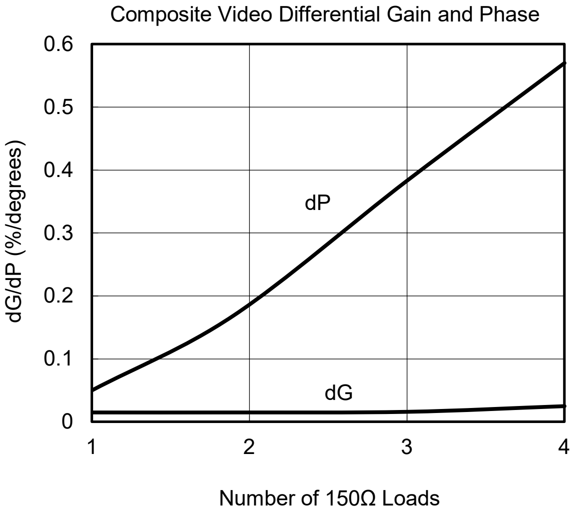


Rail-to-Rail



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, G = +2, R_F = 402Ω, R_G = 402Ω, and R_L=150Ω connected to V_S/2, unless otherwise noted.



APPLICATION NOTES

Driving Capacitive Loads

The unity-gain follower (buffer) is the most sensitive configuration to capacitive loading. Direct capacitive loading reduces the phase margin of amplifiers and this results in ringing or even oscillation. Applications that require greater capacitive driving capability should use an isolation resistor between the output and the capacitive load like the circuit in Figure 1. The isolation resistor R_{ISO} and the load capacitor C_L form a zero to increase stability. The bigger the R_{ISO} resistor value, the more stable V_{OUT} will be. Note that this method results in a loss of gain accuracy because R_{ISO} forms a voltage divider with the R_{LOAD}.

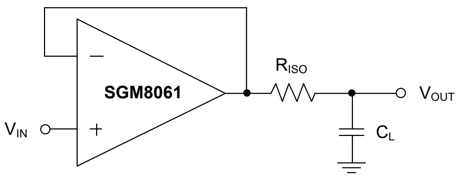


Figure 1. Series Resistor Isolating Capacitive Load

An improved circuit is shown in Figure 2. It provides DC accuracy as well as AC stability. R_F provides the DC accuracy by connecting the inverting input with the output. C_F and R_{ISO} serve to counteract the loss of phase margin by feeding the high frequency component of the output signal back to the amplifier's inverting input, thereby preserving phase margin in the overall feedback loop.

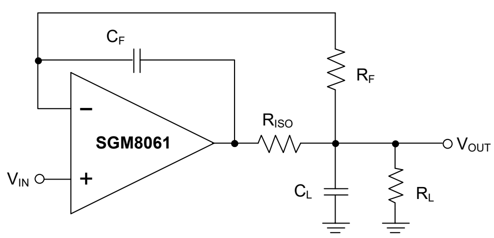


Figure 2. Indirectly Driving Heavy Capacitive Load with DC Accuracy

For non-buffer configuration, there are two other ways to increase the phase margin: (a) by increasing the amplifier's closed-loop gain or (b) by placing a capacitor in parallel with the feedback resistor to counteract the parasitic capacitance associated with inverting node.

Power Supply Bypassing and Layout

The SGM806x family operates from either a single 2.7V to 5.5V supply or dual ±1.35V to ±2.75V supplies. For single-supply operation, bypass the power supply $+V_S$ with a 0.1μF ceramic capacitor which should be placed close to the $+V_S$ pin. For dual-supply operation, both the $+V_S$ and the $-V_S$ supplies should be bypassed to ground with separate 0.1μF ceramic capacitors. 2.2μF tantalum capacitor can be added for better performance.

Good PC board layout techniques optimize performance by decreasing the amount of stray capacitance at the operational amplifier's inputs and output. To decrease stray capacitance, minimize trace lengths and widths by placing external components as close to the device as possible. Use surface-mount components whenever possible.

For the operational amplifier, soldering the part to the board directly is strongly recommended. Try to keep the high frequency current loop area small to minimize the EMI (electromagnetic interference).

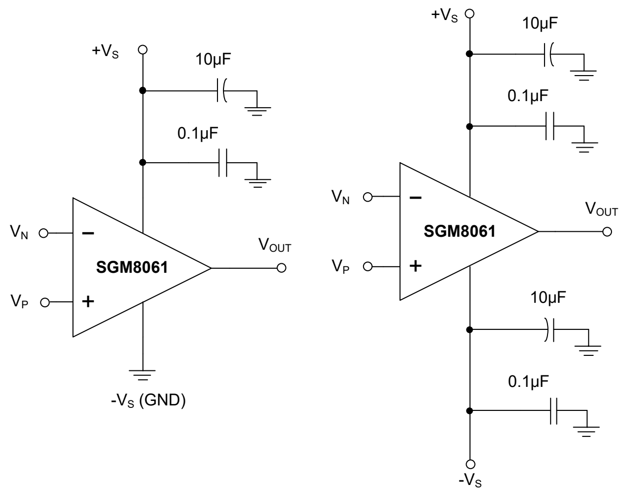


Figure 3. Amplifier with Bypass Capacitors

Grounding

A ground plane layer is important for circuit design. The length of the current path in an inductive ground return will create an unwanted voltage noise. Broad ground plane areas will reduce the parasitic inductance.

Input-to-Output Coupling

To minimize capacitive coupling, the input and output signal traces should not be in parallel. This helps reduce unwanted positive feedback.

TYPICAL APPLICATION CIRCUITS

Differential Amplifier

The circuit shown in Figure 4 performs the difference function. If the resistor ratios are equal ($R_4/R_3 = R_2/R_1$), then $V_{OUT} = (V_P - V_N) \times R_2/R_1 + V_{REF}$.

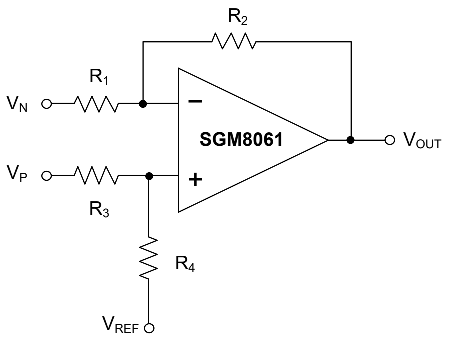


Figure 4. Differential Amplifier

Active Low-Pass Filter

The low-pass filter shown in Figure 5 has a DC gain of ($-R_2/R_1$) and the -3dB corner frequency is $1/2\pi R_2C$. Make sure the filter bandwidth is within the bandwidth of the amplifier. Feedback resistors with large values can couple with parasitic capacitance and cause undesired effects such as ringing or oscillation in high-speed amplifiers. Keep resistor values as low as possible and consistent with output loading consideration.

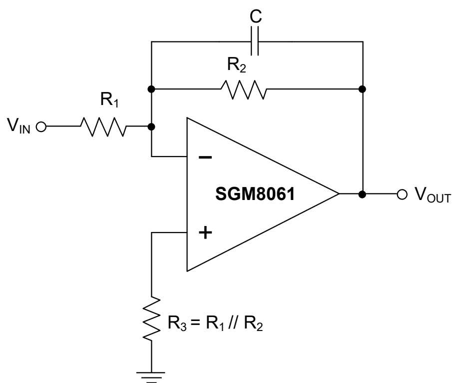


Figure 5. Active Low-Pass Filter

Driving Video

The SGM806x can be used in video applications like in Figure 6.

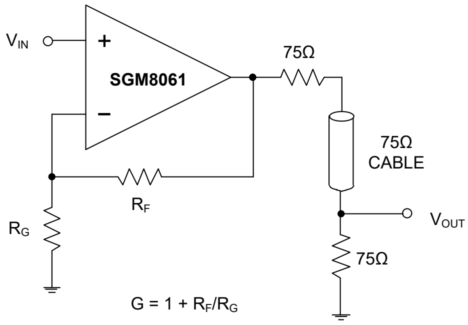


Figure 6. Typical Video Driving

REVISION HISTORY

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

JANUARY 2019 – REV.A.1 to REV.A.2

Added MSOP-8 Package..All
Changed Absolute Maximum Ratings section..2
Changed Driving Capacitive Loads section..10

MAY 2011 – REV.A to REV.A.1

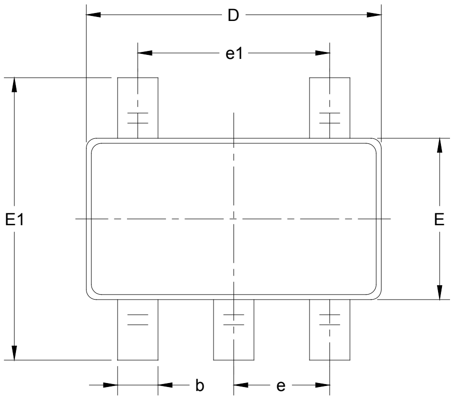
Changed Package name ....All

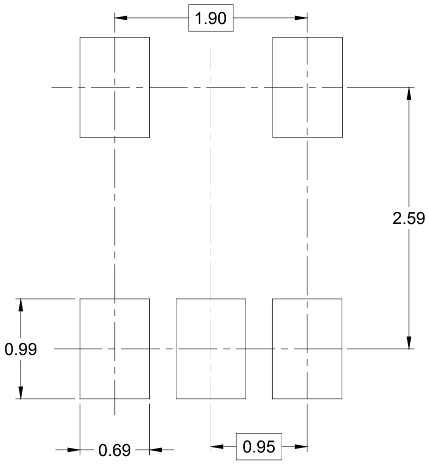
Changes from Original (NOVEMBER 2006) to REV.A

Changed from product preview to production data..All

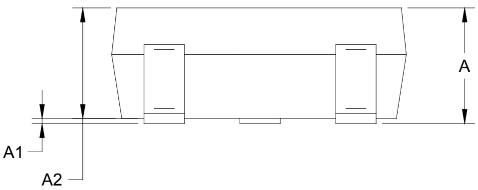
PACKAGE OUTLINE DIMENSIONS

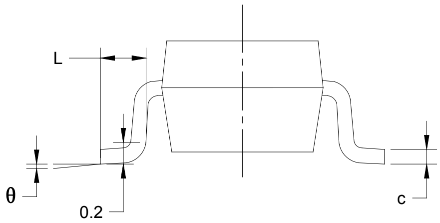
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

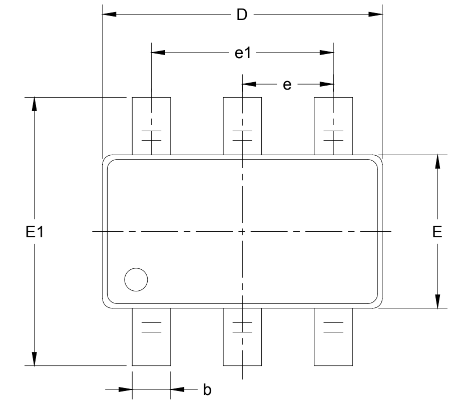


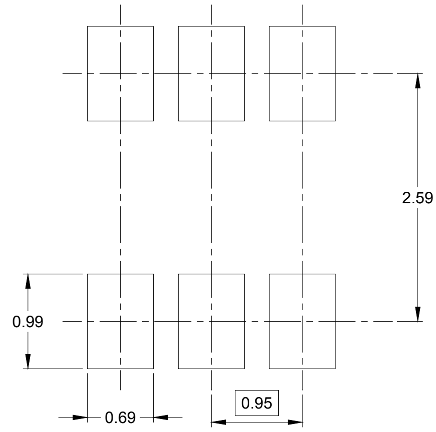


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

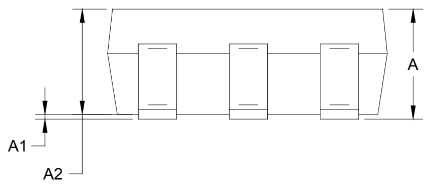
PACKAGE OUTLINE DIMENSIONS

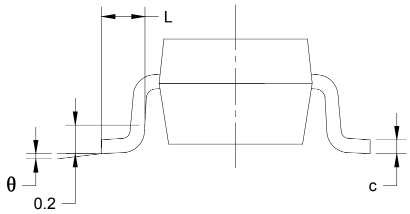
SOT-23-6





RECOMMENDED LAND PATTERN (Unit: mm)

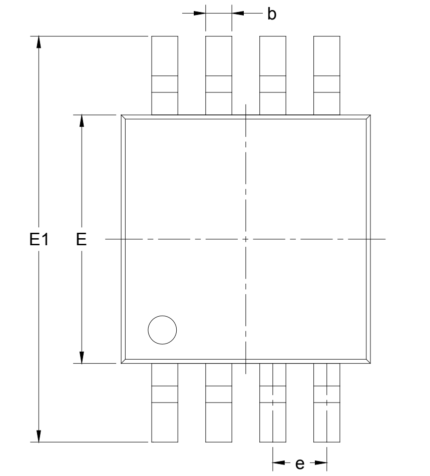


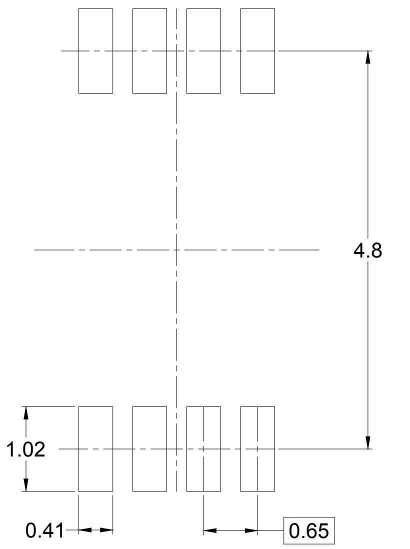


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

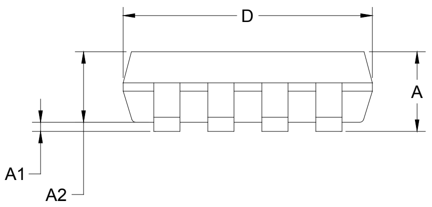
PACKAGE OUTLINE DIMENSIONS

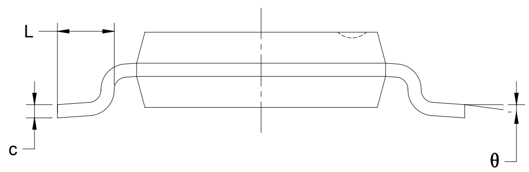
MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)

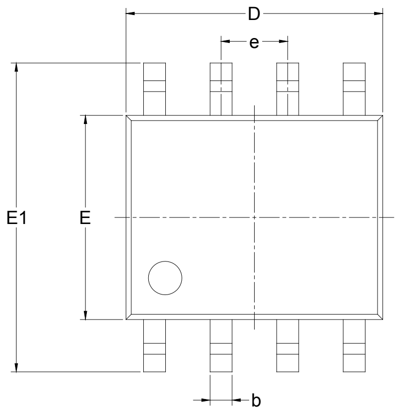


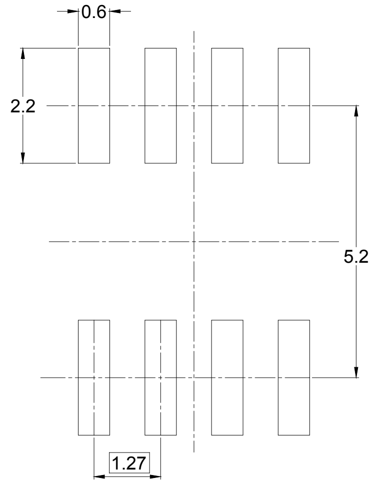


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

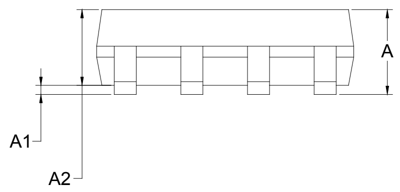
PACKAGE OUTLINE DIMENSIONS

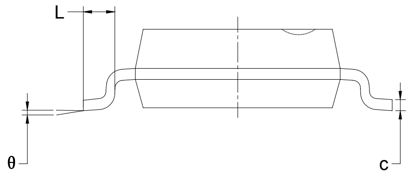
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

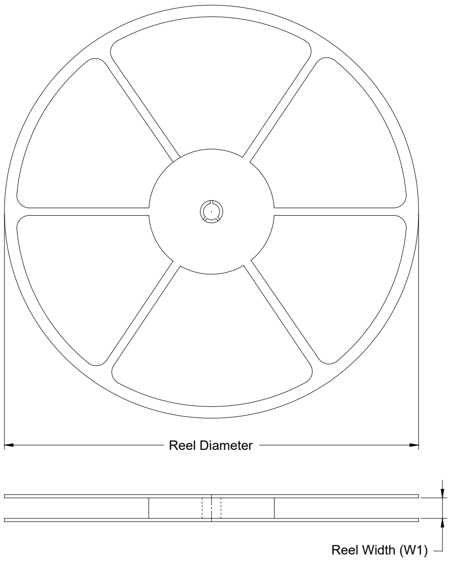




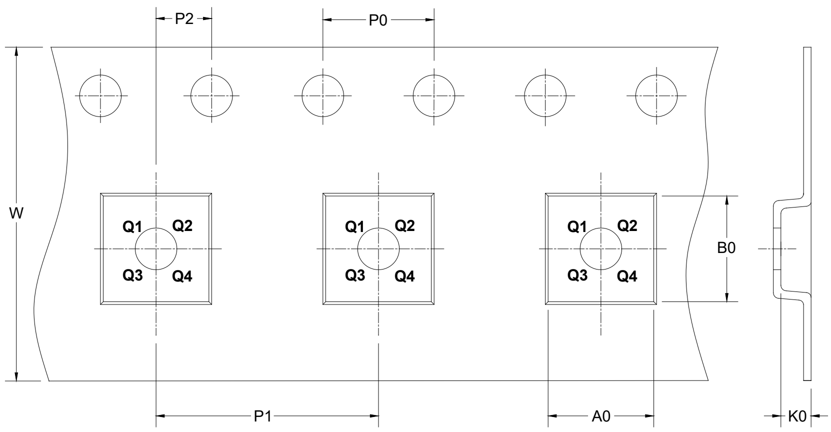
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

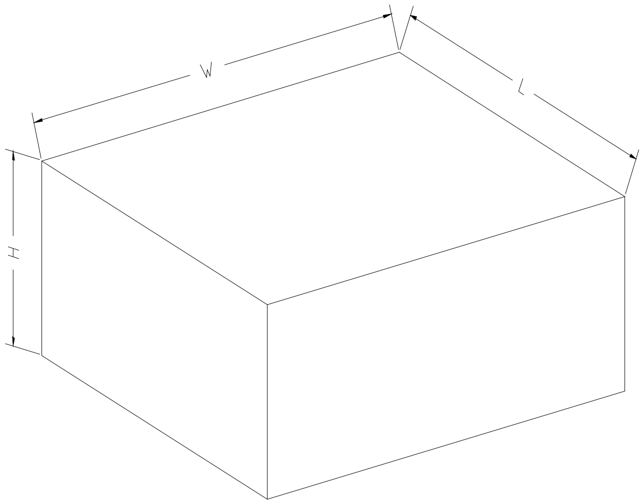
NOTE: The picture is only for reference. Please make the object as the standard.

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
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
MSOP-8	13″	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1
SOIC-8	13″	12.4	6.40	5.40	2.10	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