



# SGM8249-4

## 8MHz, High Voltage, High Precision, Low Noise, Rail-to-Rail Output Operational Amplifier

---

### GENERAL DESCRIPTION

The quad SGM8249-4 is a high voltage, low noise and high precision operational amplifier which can operate from 4.5V to 36V single supply or from  $\pm 2.25V$  to  $\pm 18V$  dual supplies. The device provides rail-to-rail output operation.

The SGM8249-4 offers a low offset voltage less than  $12\mu V$  and a low bias current. The combination of characteristics makes the SGM8249-4 a good choice for temperature measurements, pressure and position sensors, strain gauge amplifiers and medical instrumentation, or any other 4.5V to 36V applications requiring precision and long-term stability.

The SGM8249-4 is available in Green SOIC-14 and TSSOP-14 packages. It is specified over the extended  $-40^{\circ}C$  to  $+125^{\circ}C$  temperature range.

### FEATURES

- **Low Offset Voltage:**  $2\mu V$  (TYP),  $12\mu V$  (MAX)
- **Open-Loop Voltage Gain:** 150dB (TYP)
- **PSRR:** 150dB (TYP)
- **CMRR:** 140dB (TYP)
- **Input Voltage Noise Density:**  $12nV/\sqrt{Hz}$  at 1kHz
- **Gain-Bandwidth Product:** 8MHz
- **Overload Recovery Time:** 0.7 $\mu s$
- **Rail-to-Rail Output Swing**
- **Support Single or Dual Power Supplies:**  
4.5V to 36V or  $\pm 2.25V$  to  $\pm 18V$
- **Low Supply Current:** 3.2mA (TYP)
- **$-40^{\circ}C$  to  $+125^{\circ}C$  Operating Temperature Range**
- **Available in Green SOIC-14 and TSSOP-14 Packages**

### APPLICATIONS

Pressure Sensors  
Temperature Measurements  
Precision Current Sensing  
Electronic Scales  
Strain Gauge Amplifiers  
Handheld Test Equipment  
Thermocouple Amplifiers  
Medical Instrumentation

# 8MHz, High Voltage, High Precision, Low Noise, SGM8249-4 Rail-to-Rail Output Operational Amplifier

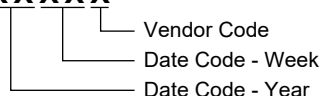
## PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8249-4	SOIC-14	-40°C to +125°C	SGM8249-4XS14G/TR	SGM82494XS14 XXXXX	Tape and Reel, 2500
	TSSOP-14	-40°C to +125°C	SGM8249-4XTS14G/TR	SGM82494 XTS14 XXXXX	Tape and Reel, 4000

## MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.

**XXXXX**



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage.....	40V
Input Voltage Range .....	$-V_s$ to $(+V_s) + 0.1V$
Differential Input Voltage Range .....	-1V to 1V
Junction Temperature .....	+150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	+260°C
ESD Susceptibility	
HBM.....	6000V
MM.....	300V
CDM .....	1000V

## RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range.....	4.5V to 36V
Operating Temperature Range .....	-40°C to +125°C

## OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

## ESD SENSITIVITY CAUTION

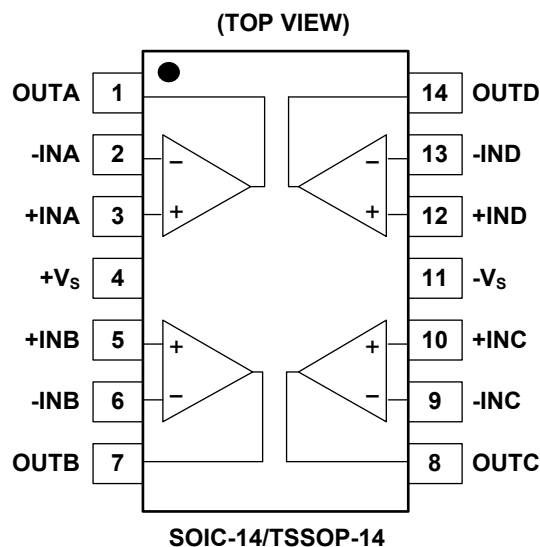
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle

performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

## DISCLAIMER

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

## PIN CONFIGURATIONS



# 8MHz, High Voltage, High Precision, Low Noise, SGM8249-4 Rail-to-Rail Output Operational Amplifier

## ELECTRICAL CHARACTERISTICS

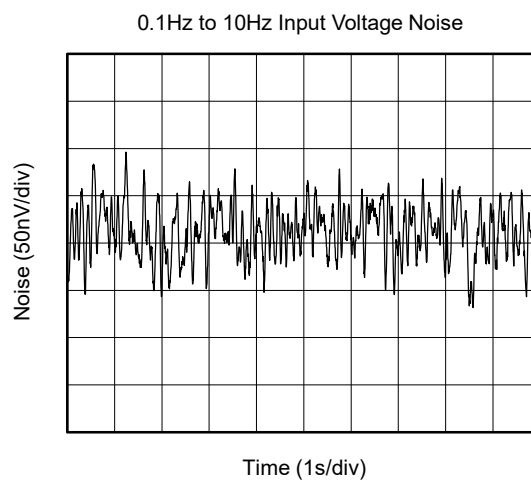
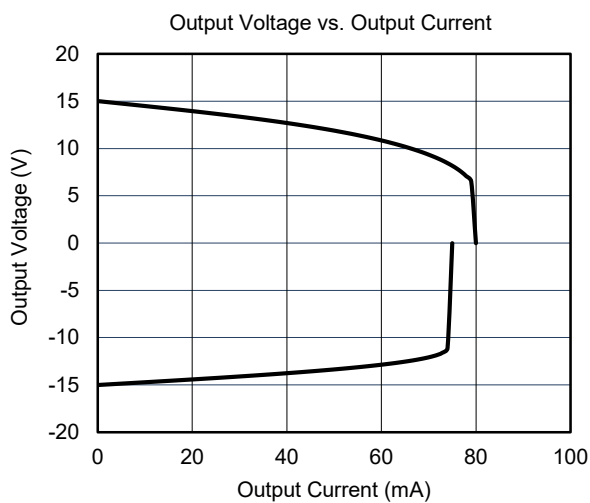
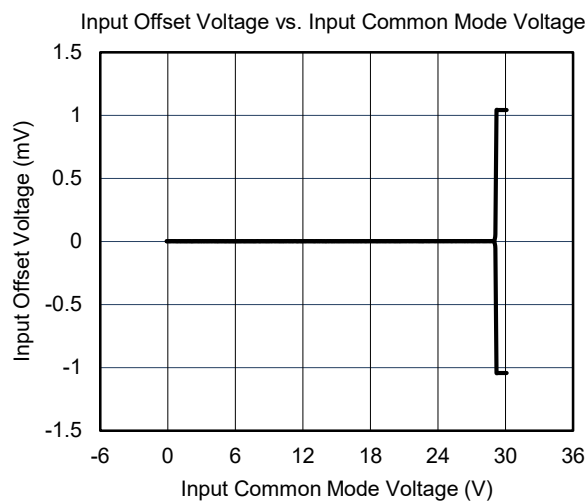
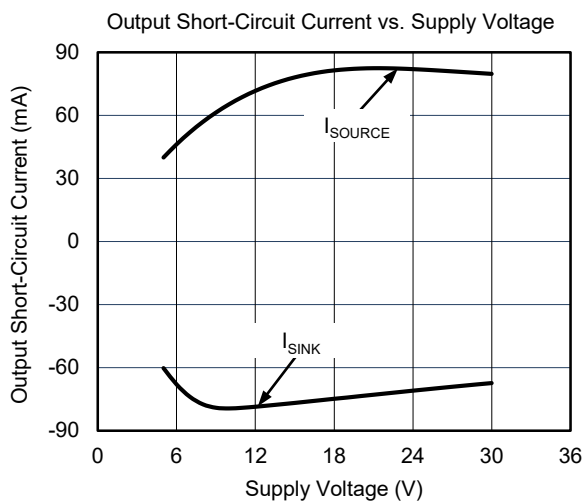
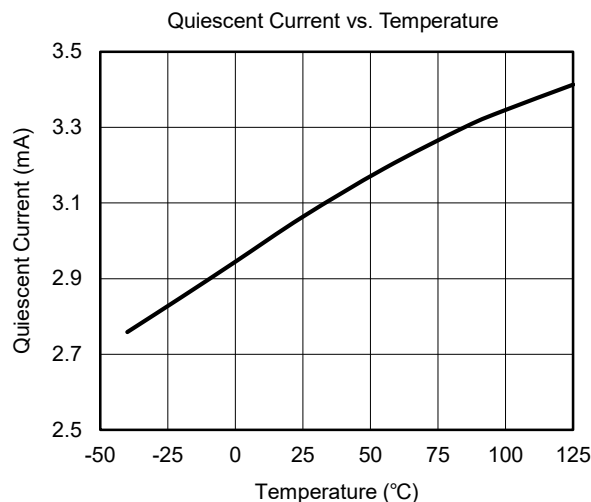
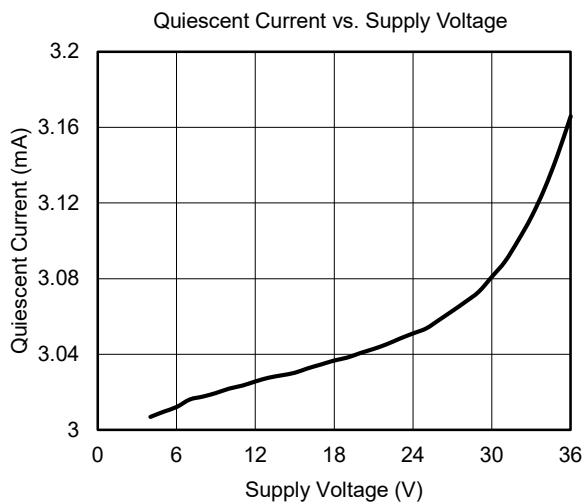
(At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 2.25\text{V}$  to  $\pm 18\text{V}$ ,  $V_{CM} = 0\text{V}$  and  $R_L$  connected to  $0\text{V}$ , Full =  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>Input Characteristics</b>							
Input Offset Voltage	$V_{OS}$		+25°C		2	12	$\mu\text{V}$
			Full			18	
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$		Full		14		$\text{nV}/^\circ\text{C}$
Input Bias Current	$I_B$		+25°C		$\pm 100$	$\pm 450$	$\text{pA}$
Input Offset Current	$I_{OS}$		+25°C		$\pm 200$	$\pm 650$	
Input Common Mode Voltage Range	$V_{CM}$		Full	$(-V_S)$		$(+V_S) - 1.5$	V
Common Mode Rejection Ratio	CMRR	$V_{CM} = (-V_S) \text{ to } (+V_S) - 1.5\text{V}$	+25°C	117	140		dB
			Full	114			
Open-Loop Voltage Gain	$A_{OL}$	$V_S = \pm 2.25\text{V}$ , $V_{OUT} = \pm 2.0\text{V}$ , $R_L = 10\text{k}\Omega$	+25°C	119	150		dB
			Full	116			
		$V_S = \pm 18\text{V}$ , $V_{OUT} = \pm 17.5\text{V}$ , $R_L = 10\text{k}\Omega$	+25°C	128	160		
			Full	125			
<b>Output Characteristics</b>							
Output Voltage Swing from Rail		$V_S = \pm 2.25\text{V}$ , $R_L = 10\text{k}\Omega$	+25°C		22	33	$\text{mV}$
			Full			45	
		$V_S = \pm 18\text{V}$ , $R_L = 10\text{k}\Omega$	+25°C		185	250	
			Full			350	
Output Short-Circuit Current	$I_{SC}$	$V_S = \pm 2.25\text{V}$	+25°C	$\pm 24$	$\pm 34$		$\text{mA}$
			Full	$\pm 13$			
		$V_S = \pm 18\text{V}$	+25°C	$\pm 52$	$\pm 70$		
			Full	$\pm 38$			
<b>Power Supply</b>							
Operating Voltage Range	$V_S$		Full	4.5		36	V
Quiescent Current	$I_Q$	$I_{OUT} = 0$	+25°C		3.2	4.2	$\text{mA}$
			Full			4.5	
Power Supply Rejection Ratio	PSRR	$V_S = 4.5\text{V}$ to $36\text{V}$	+25°C	128	150		dB
			Full	124			
<b>Dynamic Performance</b>							
Gain-Bandwidth Product	GBP	$V_{OUT} = 100\text{mV}_{P-P}$ , $R_L = 10\text{k}\Omega$ , $C_L = 10\text{pF}$	+25°C		8		MHz
Slew Rate	SR	$R_L = 10\text{k}\Omega$	+25°C		5		$\text{V}/\mu\text{s}$
Settling Time to 0.1%	$t_s$	$V_{IN} = 1\text{V}$ Step, $R_L = 10\text{k}\Omega$ , $A_V = +1$	+25°C		0.8		$\mu\text{s}$
Overload Recovery Time		$R_L = 10\text{k}\Omega$ , $V_{IN} \times A_V > V_S$	+25°C		0.7		$\mu\text{s}$
Total Harmonic Distortion + Noise	THD+N	$V_{IN} = 2\text{V}_{P-P}$ , $A_V = +1$ , $R_L = 10\text{k}\Omega$ , $f = 1\text{kHz}$	+25°C		0.0003		%
<b>Noise</b>							
Input Voltage Noise		$f = 0.1\text{Hz}$ to $10\text{Hz}$	+25°C		0.2		$\mu\text{V}_{P-P}$
Input Voltage Noise Density	$e_n$	$f = 0.1\text{kHz}$ , $V_{CM} = V_S/2$	+25°C		12		$\text{nV}/\sqrt{\text{Hz}}$
		$f = 1\text{kHz}$ , $V_{CM} = V_S/2$			12		
		$f = 10\text{kHz}$ , $V_{CM} = V_S/2$			13		

# SGM8249-4 8MHz, High Voltage, High Precision, Low Noise, Rail-to-Rail Output Operational Amplifier

## TYPICAL PERFORMANCE CHARACTERISTICS

At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $C_L = 10\text{pF}$  and  $R_L = 5\text{k}\Omega$ , unless otherwise noted.

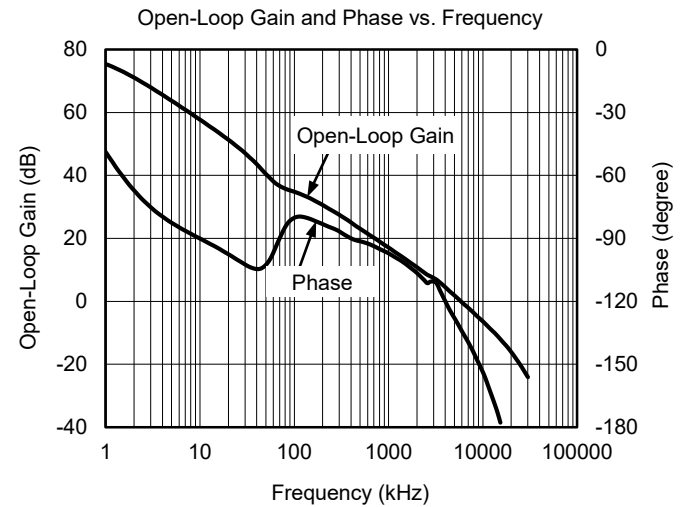
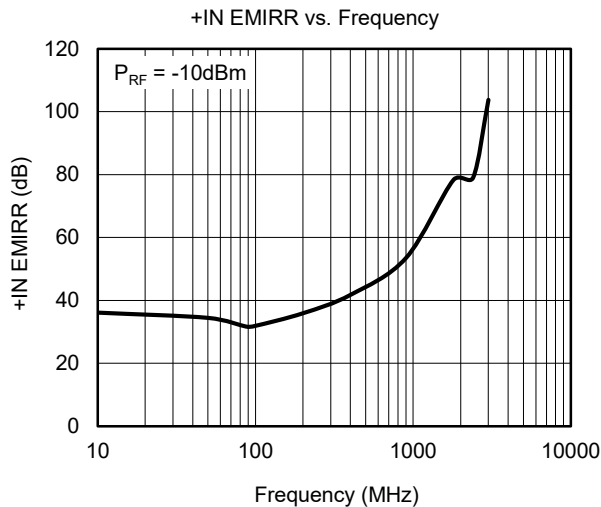
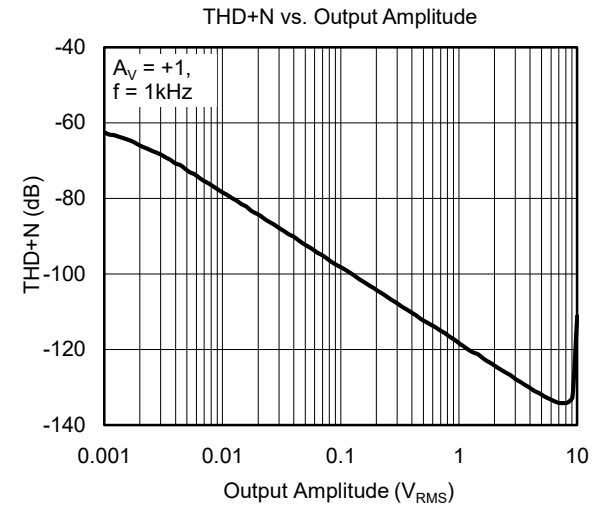
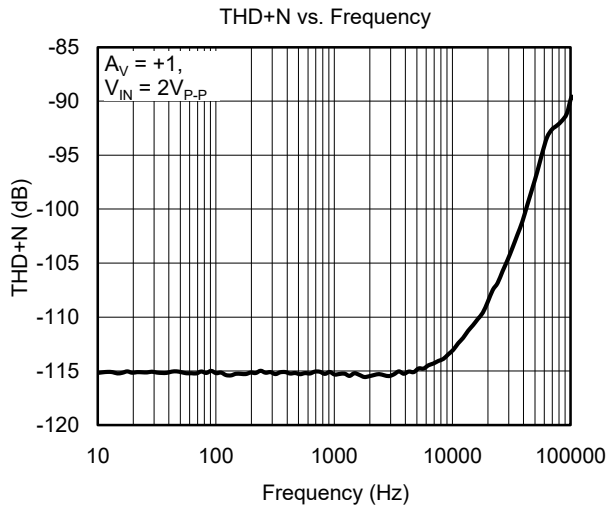
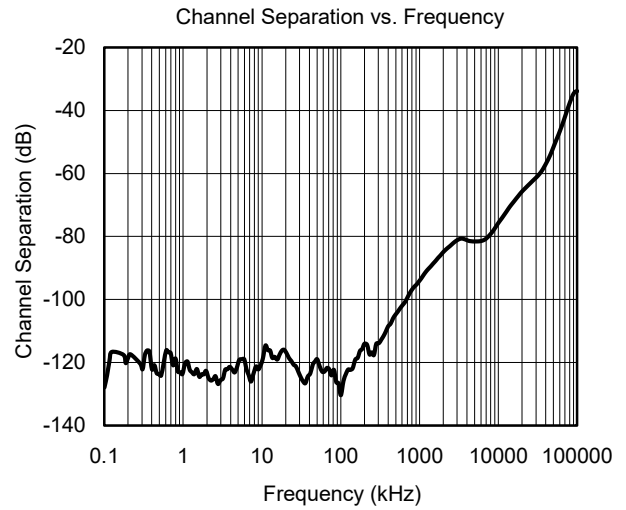
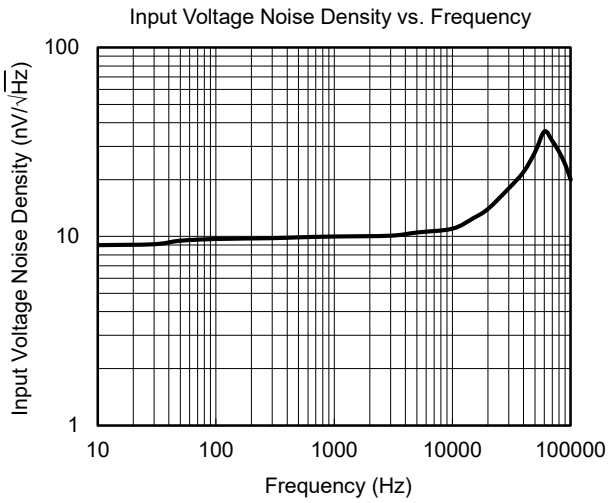


# 8MHz, High Voltage, High Precision, Low Noise, Rail-to-Rail Output Operational Amplifier

## SGM8249-4

### TYPICAL PERFORMANCE CHARACTERISTICS (continued)

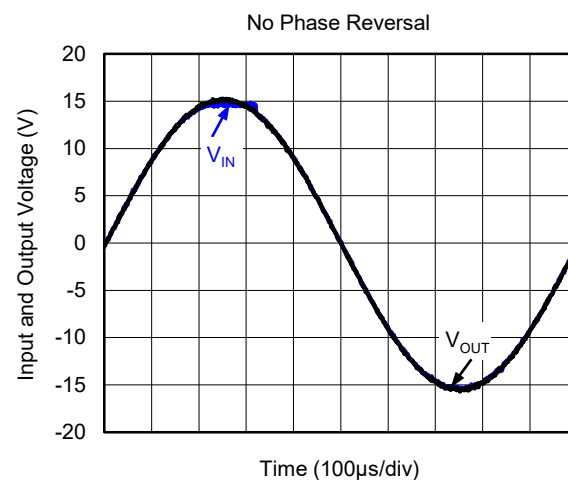
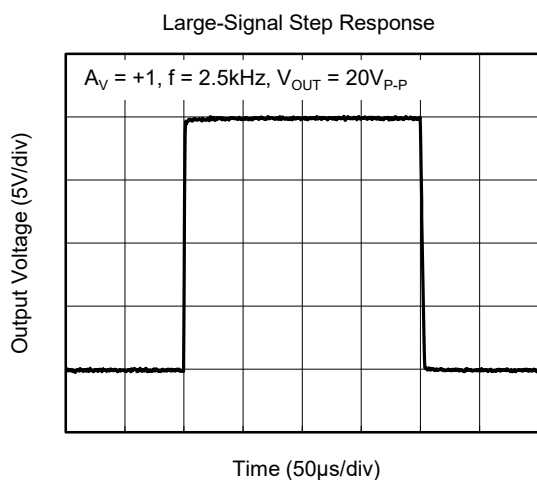
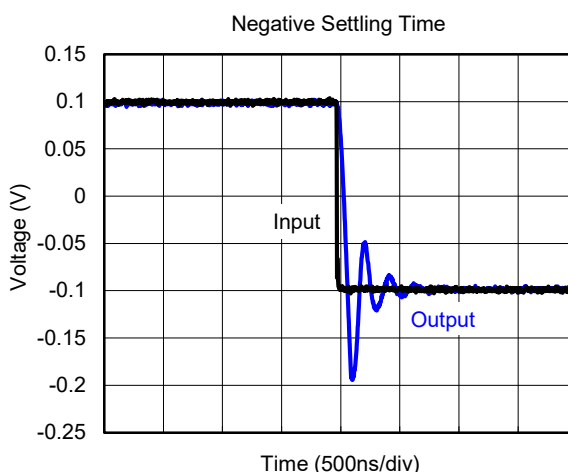
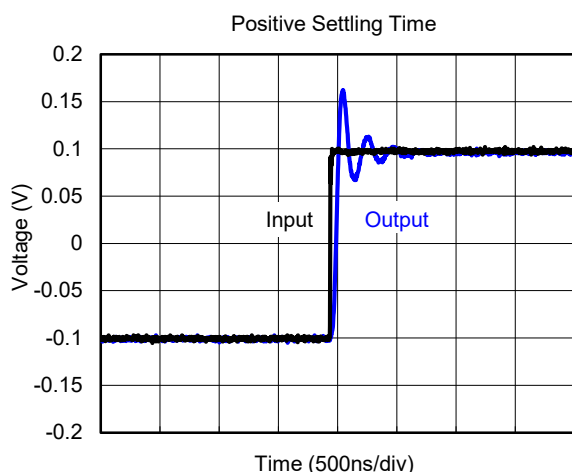
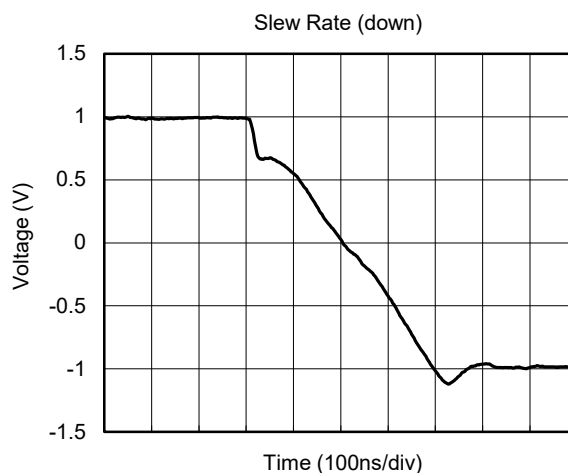
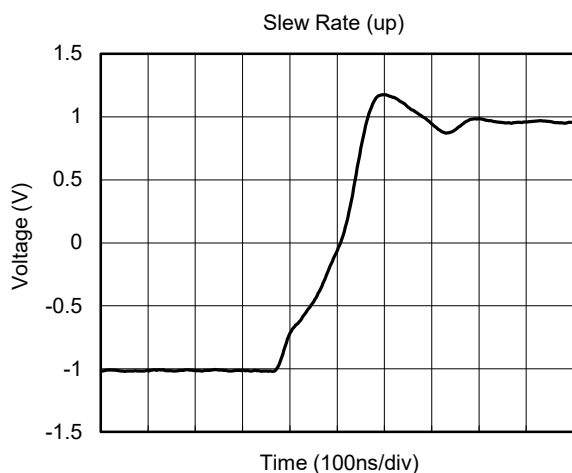
At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $C_L = 10\text{pF}$  and  $R_L = 5\text{k}\Omega$ , unless otherwise noted.



# SGM8249-4 8MHz, High Voltage, High Precision, Low Noise, Rail-to-Rail Output Operational Amplifier

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

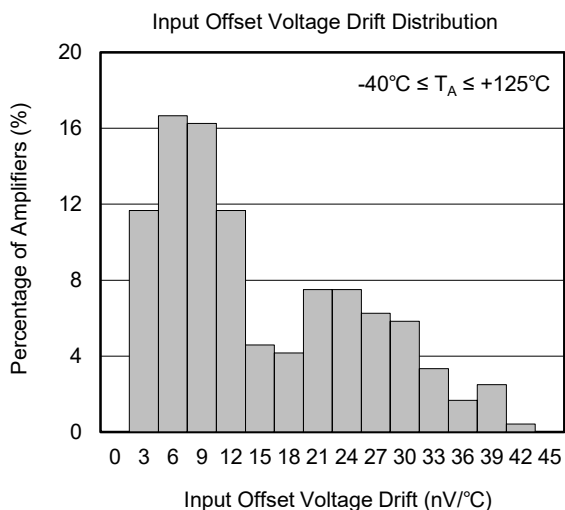
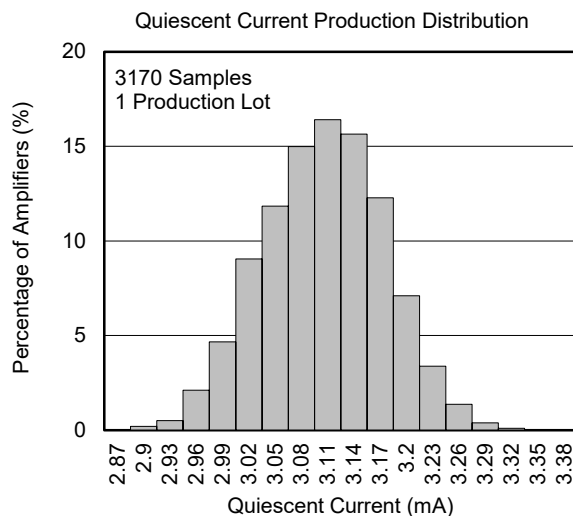
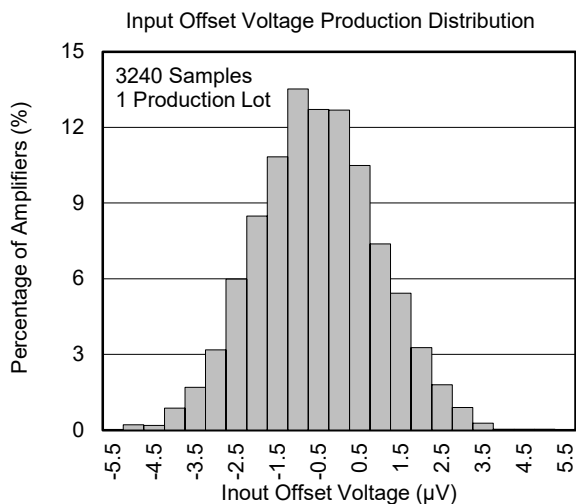
At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $C_L = 10\text{pF}$  and  $R_L = 5\text{k}\Omega$ , unless otherwise noted.



# SGM8249-4 8MHz, High Voltage, High Precision, Low Noise, Rail-to-Rail Output Operational Amplifier

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $C_L = 10\text{pF}$  and  $R_L = 5\text{k}\Omega$ , unless otherwise noted.



**REVISION HISTORY**

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

<b>Changes from Original (DECEMBER 2018) to REV.A</b>	<b>Page</b>
Changed from product preview to production data.....	All

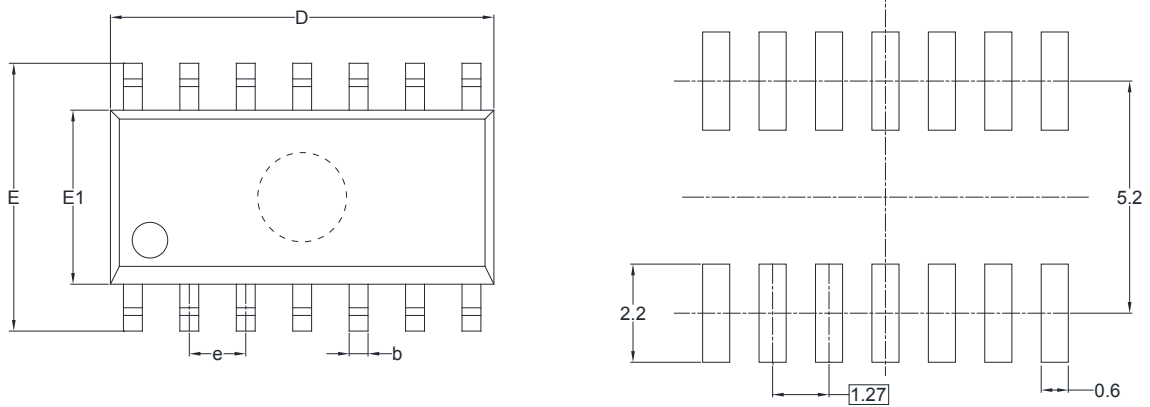
---



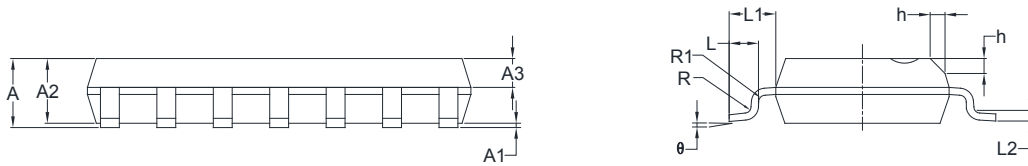
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOIC-14



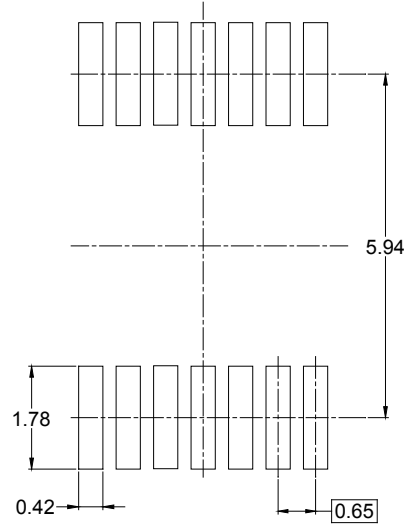
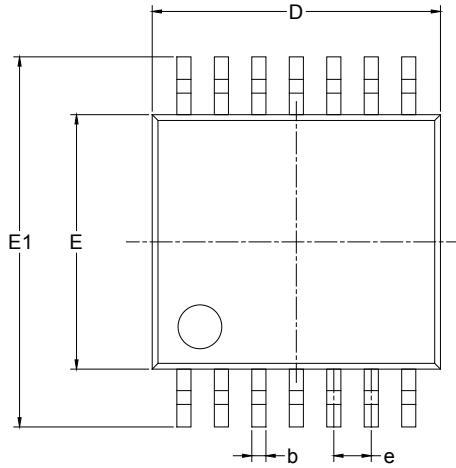
RECOMMENDED LAND PATTERN (Unit: mm)



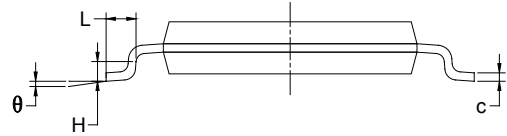
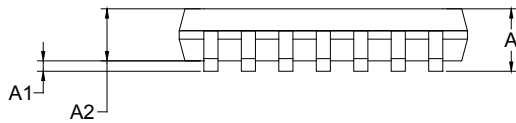
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
A3	0.55	0.75	0.022	0.030
b	0.36	0.49	0.014	0.019
D	8.53	8.73	0.336	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
L	0.45	0.80	0.018	0.032
L1	1.04 REF		0.040 REF	
L2	0.25 BSC		0.01 BSC	
R	0.07		0.003	
R1	0.07		0.003	
h	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

TSSOP-14



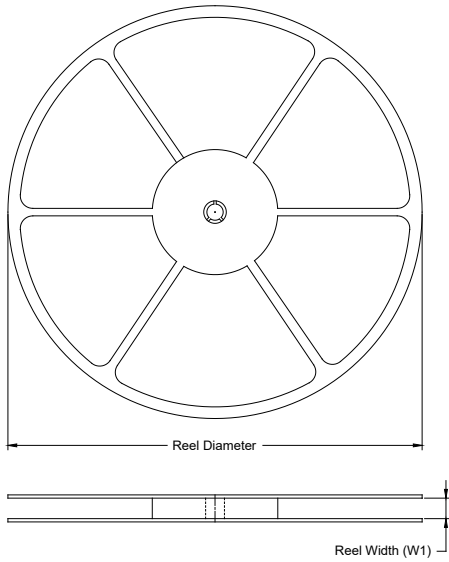
RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

## 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-14	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	Q1
TSSOP-14	13"	12.4	6.95	5.60	1.20	4.0	8.0	2.0	12.0	Q1

000001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



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

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13"	386	280	370	5

DD0002