SGM8270SH-4
Low Noise, Precision, High Voltage, Rail-to-Rail I/O Operational Amplifier

GENERAL DESCRIPTION

The SGM8270SH-4 is a quad, low noise, precision operational amplifier, optimized for high voltage operation from 3.3V to 33V single supply or ±1.65V to ±16.5V dual power supplies. It provides rail-to-rail input with a wide input common mode voltage range and rail-to-rail output voltage swing.

Furthermore, the SGM8270SH-4 provides high slew rate, low noise, low offset current and voltage, and low bias current.

The SGM8270SH-4 is available in a Green SOIC-14 package. It is specified over the extended -40℃ to +125℃ temperature range.

FEATURES

- **Rail-to-Rail Input and Output**
- **Wide Input Common Mode and Differential Voltage Ranges**
- **Low Input Offset Voltage: ±1.2mV (MAX)**
- **Low Input Bias Current**
- **Low Input Offset Current**
- **High Input Impedance**
- **Output Short-Circuit Protection**
- **Low Noise: 20nV/$\sqrt{Hz}$ at 1kHz**
- **Gain-Bandwidth Product: 2.7MHz**
- **High Slew Rate: 8V/μs**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOIC-14 Package**

APPLICATIONS

High Impedance Sensor

Photodiode Amplifier

High End, Professional Audio

DAC Output Amplifier

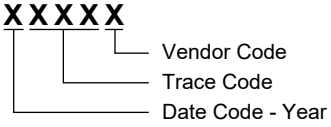
Medical Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8270SH-4	SOIC-14	-40℃ to +125℃	SGM8270SH-4XS14G/TR	08EXS14 XXXXX	Tape and Reel, 2500

MARKING INFORMATION

NOTE: XXXXX = Date Code, 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 $-V_S$ 36V
Differential Input Voltage, $|V_{ID}|$ ..... $(+V_S)$ - $(-V_S)$
Input/Output Voltage Range ..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Package Thermal Resistance
SOIC-14, θ_{JA} ..... 81℃/W
SOIC-14, θ_{JB} ..... 44℃/W
SOIC-14, θ_{JC} ..... 32℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility (1) (2)
HBM ..... ±6000V
CDM ..... ±1000V

NOTES:

1. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
2. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.
3. It is recommended that CMOS device adopts the proper power supply sequence. Always sort the V_S first, followed by the inputs and outputs.

RECOMMENDED OPERATING CONDITIONS

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

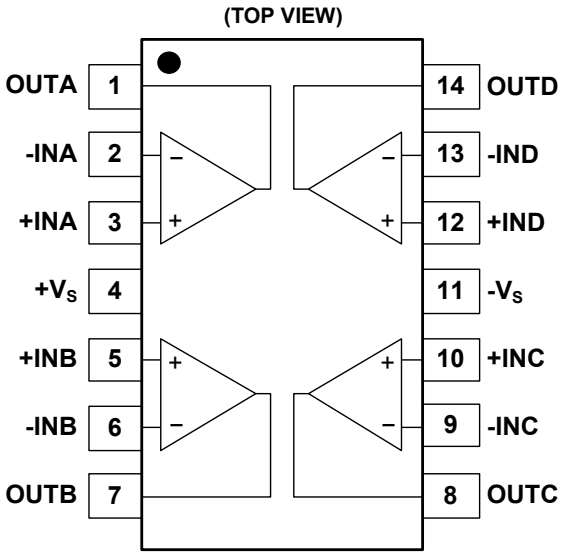
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

(TOP VIEW)



SOIC-14

ELECTRICAL CHARACTERISTICS

(V_S = ±1.65V to ±16.5V and R_L = 2kΩ connected to 0V, 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_{CM} = 0V	+25℃		±0.4	±1.2	mV
			Full			±1.4	
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$		Full		1.2		μV/℃
Input Bias Current	I_B	V_{CM} = 0V	+25℃		±5	±200	pA
			+85℃			±1	nA
			Full			±20	nA
Input Offset Current	I_{OS}	V_{CM} = 0V	+25℃		±5	±200	pA
			+85℃			±1	nA
			Full			±20	nA
Maximum Input Difference Bias Current	$I I_{ID} I$	V_S = ±16.5V, V_{ID} = ±16.5V	+25℃		0.01	0.5	μA
			Full			0.6	
Input Common Mode Voltage Range	V_{CM}		Full	$(-V_S)$ - 0.1		$(+V_S)$ + 0.1	V
Common Mode Rejection Ratio	CMRR	V_S = ±16.5V, $(-V_S)$ - 0.1V < V_{CM} < $(+V_S)$ -1.5V	+25℃	95	113		dB
			Full	92			
		V_S = ±16.5V, $(-V_S)$ - 0.1V < V_{CM} < $(+V_S)$ + 0.1V	+25℃	82	98		
			Full	79			
Open-Loop Voltage Gain	A_{OL}	$(-V_S)$ + 0.2V < V_{OUT} < $(+V_S)$ - 0.2V, R_L = 10kΩ	+25℃	100	127		dB
			Full	97			
		$(-V_S)$ + 0.5V < V_{OUT} < $(+V_S)$ - 0.5V, R_L = 2kΩ	+25℃	98	127		
			Full	95			
Output Characteristics							
Output Voltage Swing from Rail	V_{OUT}	V_S = ±16.5V, R_L = 10kΩ	+25℃		50	85	mV
			Full			110	
		V_S = ±16.5V, R_L = 2kΩ	+25℃		255	350	
			Full			470	
Output Short-Circuit Current	I_{SC}	V_S = ±16.5V	+25℃	±30	±45		mA
Power Supply							
Operating Voltage Range	V_S		Full	3.3		33	V
Quiescent Current	I_Q	I_{OUT} = 0A	+25℃		2.2	3	mA
			Full			3.6	
Power Supply Rejection Ratio	PSRR	V_S = 3.3V to 33V	+25℃	105	122		dB
			Full	102			

ELECTRICAL CHARACTERISTICS (continued)

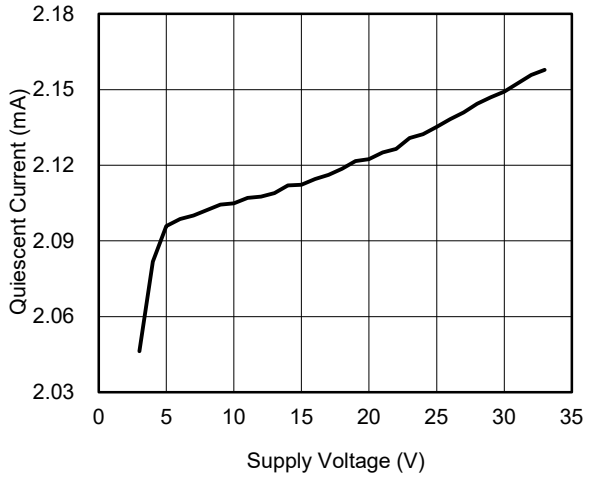
(V_S = ±1.65V to ±16.5V and R_L = 2kΩ connected to 0V, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Dynamic Performance							
Gain-Bandwidth Product	GBP	C_L = 50pF	+25℃		2.7		MHz
Phase Margin	φ_O	C_L = 50pF	+25℃		60		°
Slew Rate	SR	V_S = ±2.5V to ±16.5V, G = +1	+25℃		8		V/μs
Overload Recovery Time	ORT	$V_{IN} \times G > V_S$	+25℃		1		μs
Total Harmonic Distortion + Noise	THD+N	V_S = ±2.5V to ±16.5V, V_{OUT} = $2V_{P-P}$, f = 1kHz, G = +1, R_L = 600Ω	+25℃		0.003		%
		V_S = ±2.5V to ±16.5V, V_{OUT} = $2V_{P-P}$, f = 1kHz, G = +1, R_L = 2kΩ	+25℃		0.001		
Noise							
Input Voltage Noise		f = 0.1Hz to 10Hz	+25℃		3.5		μV_{P-P}
Input Voltage Noise Density	e_n	f = 10Hz	+25℃		100		$nV/\sqrt{Hz}$
		f = 1kHz	+25℃		20		
Input Current Noise Density	i_n	f = 1kHz	+25℃		100		$fA/\sqrt{Hz}$

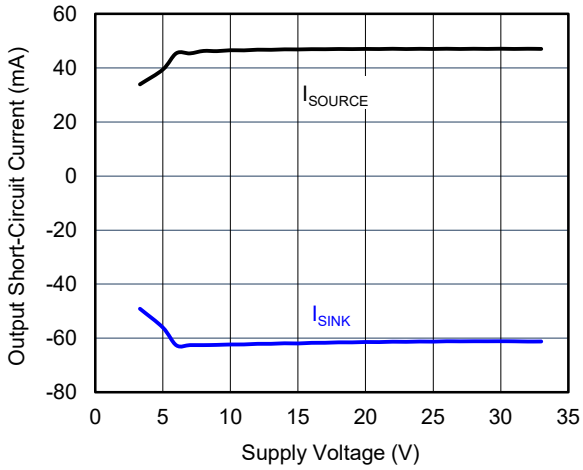
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = ±16.5V and R_L = 2kΩ connected to 0V, unless otherwise noted.

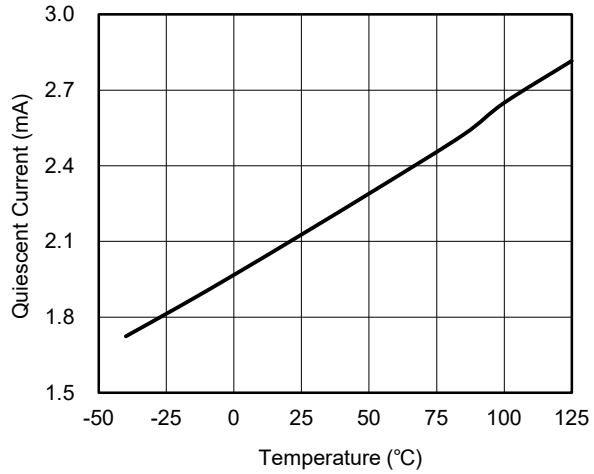
Quiescent Current vs. Supply Voltage



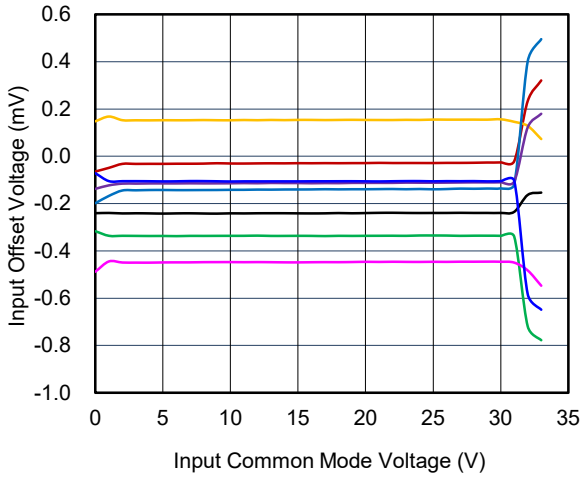
Output Short-Circuit Current vs. Supply Voltage



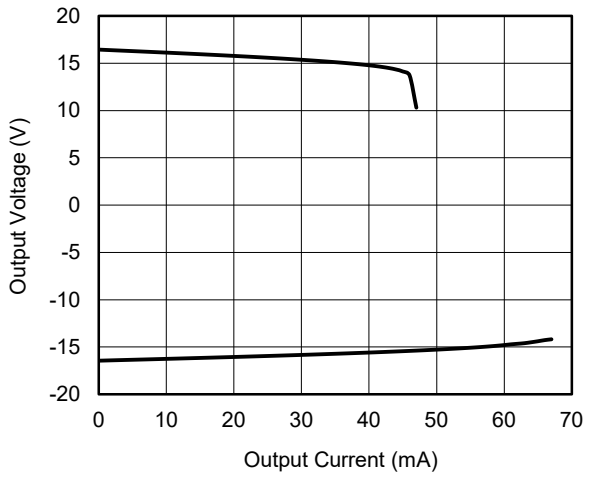
Quiescent Current vs. Temperature



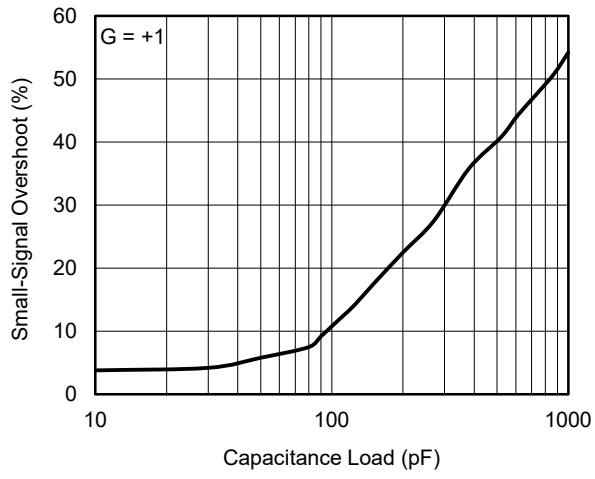
Input Offset Voltage vs. Input Common Mode Voltage



Output Voltage vs. Output Current



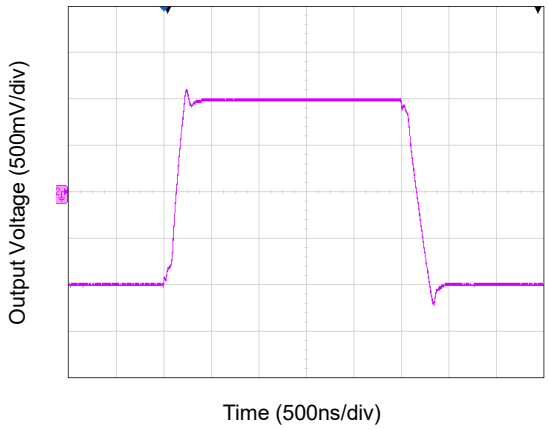
Small-Signal Overshoot vs. Capacitive Load



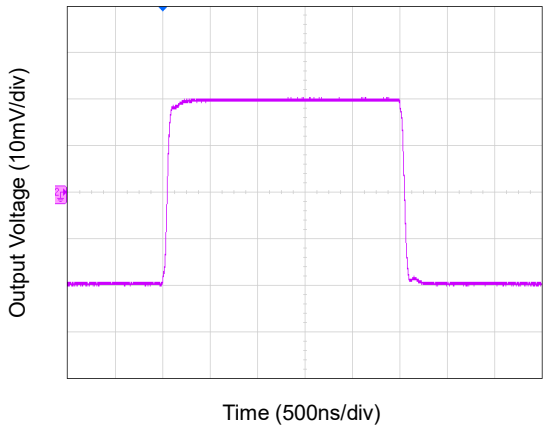
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = ±16.5V and R_L = 2kΩ connected to 0V, unless otherwise noted.

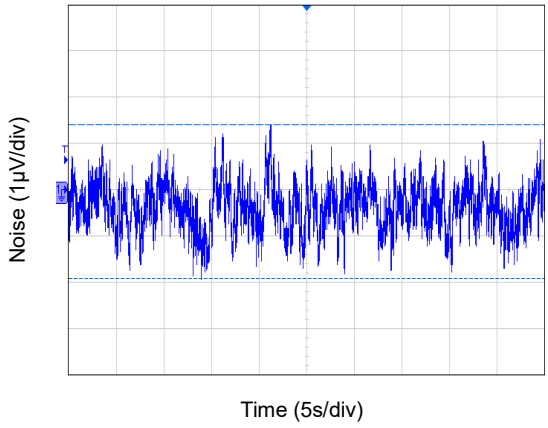
Large-Signal Step Response



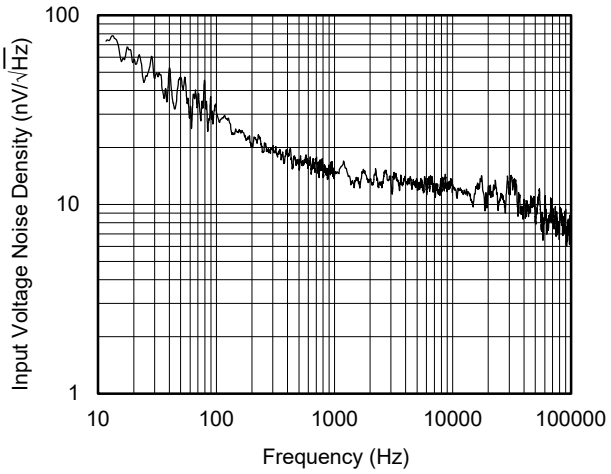
Small-Signal Step Response



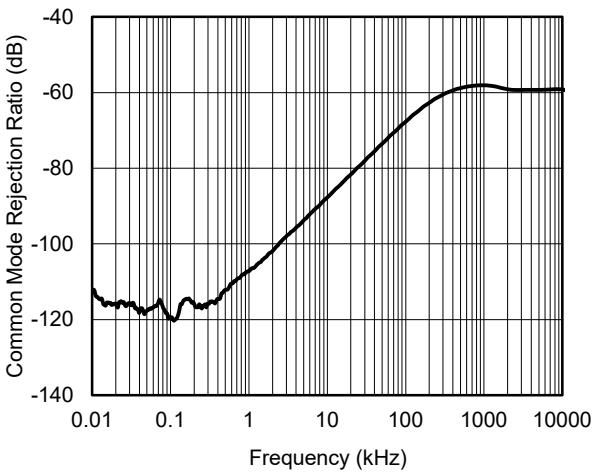
0.1Hz to 10Hz Input Voltage Noise



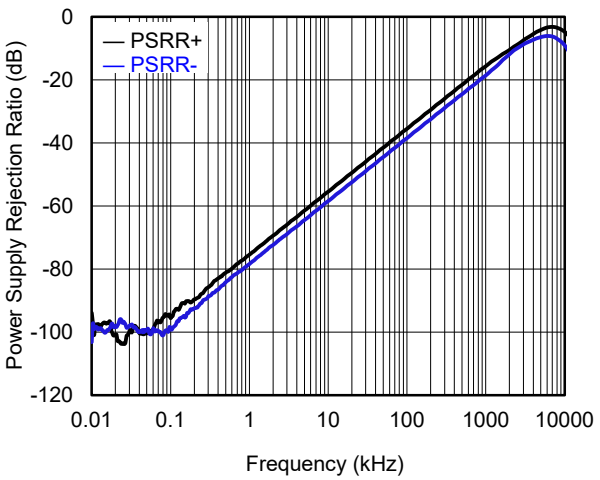
Input Voltage Noise Density vs. Frequency



CMRR vs. Frequency



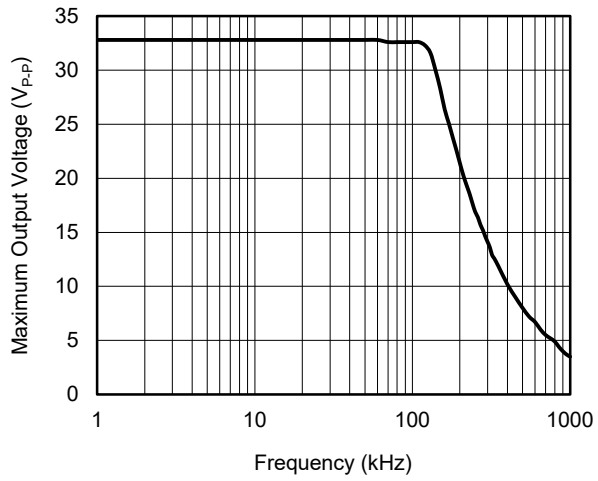
PSRR vs. Frequency



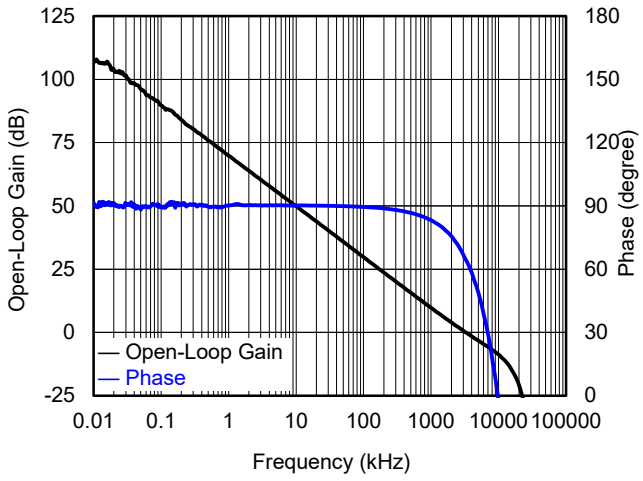
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = ±16.5V and R_L = 2kΩ connected to 0V, unless otherwise noted.

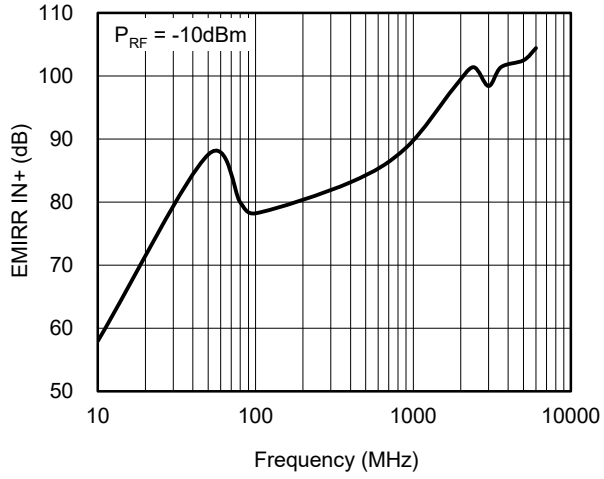
Maximum Output Voltage vs. Frequency



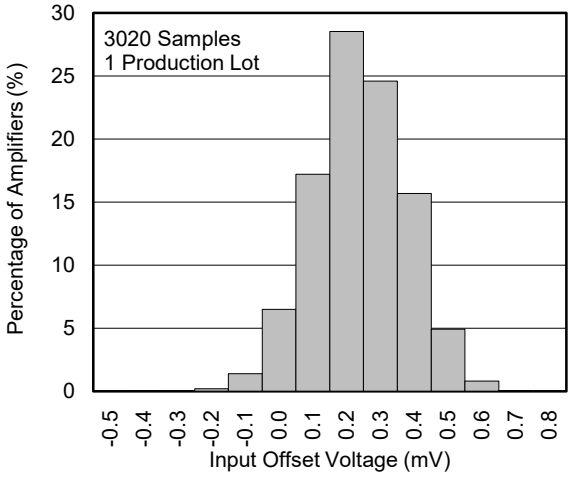
Open-Loop Gain and Phase vs. Frequency



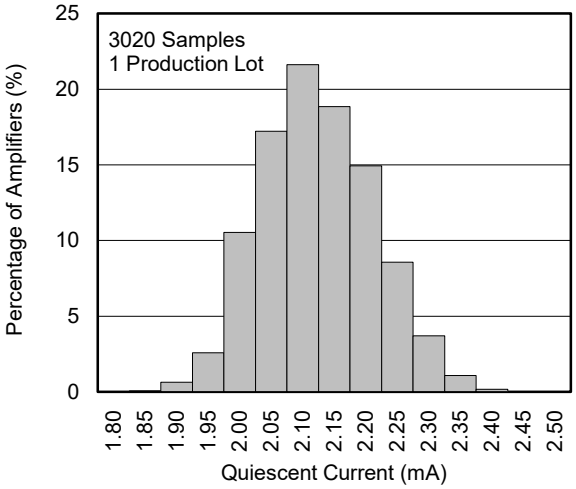
EMIRR IN+ vs. Frequency



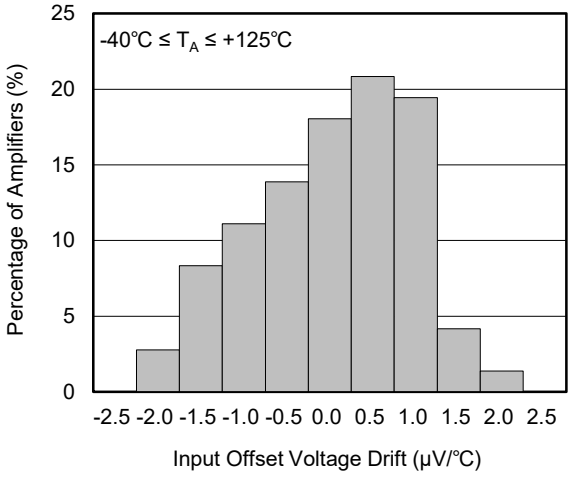
Input Offset Voltage Production Distribution



Quiescent Current Production Distribution



Input Offset Voltage Drift Distribution



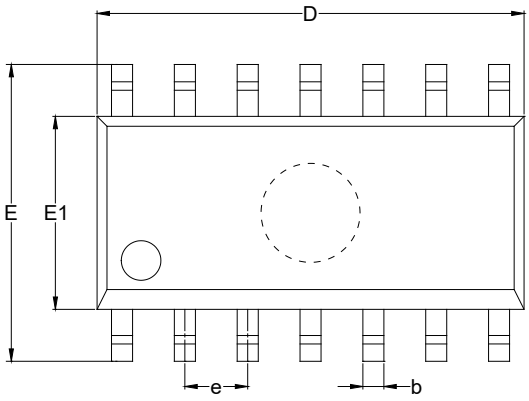
REVISION HISTORY

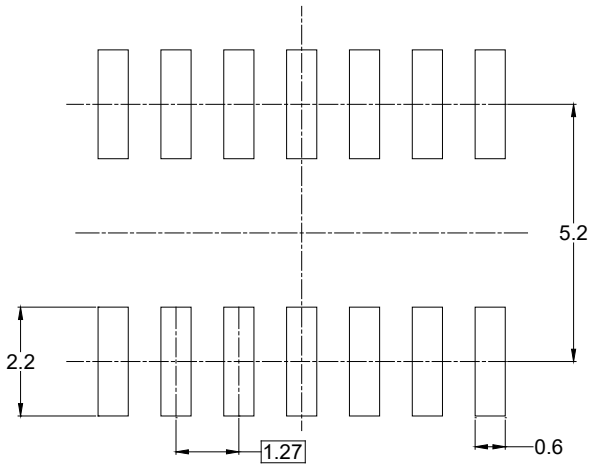
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (OCTOBER 2024) to REV.A	Page
Changed from product preview to production data	All

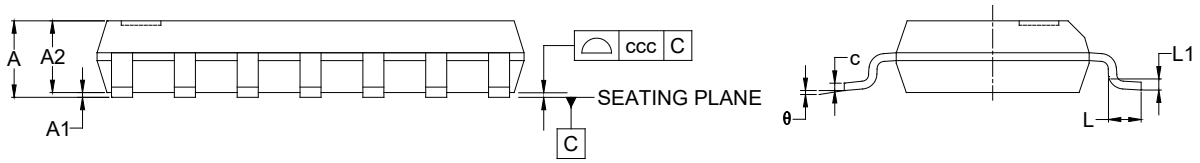
PACKAGE OUTLINE DIMENSIONS

SOIC-14





RECOMMENDED LAND PATTERN (Unit: mm)

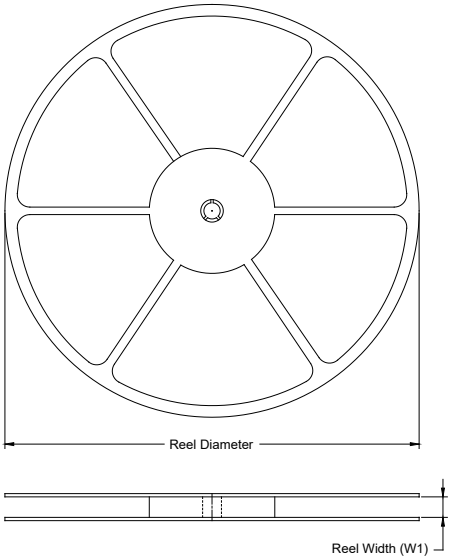


Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	1.750
A1	0.100	-	0.250
A2	1.250	-	-
b	0.310	-	0.510
c	0.100	-	0.250
D	8.450	-	8.850
E	5.800	-	6.200
E1	3.800	-	4.000
e	1.270 BSC		
L	0.400	-	1.270
L1	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

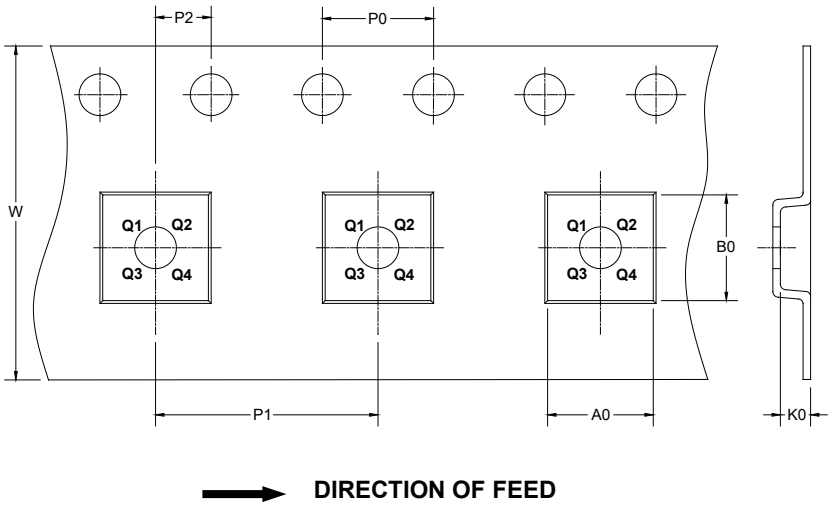
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MS-012.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



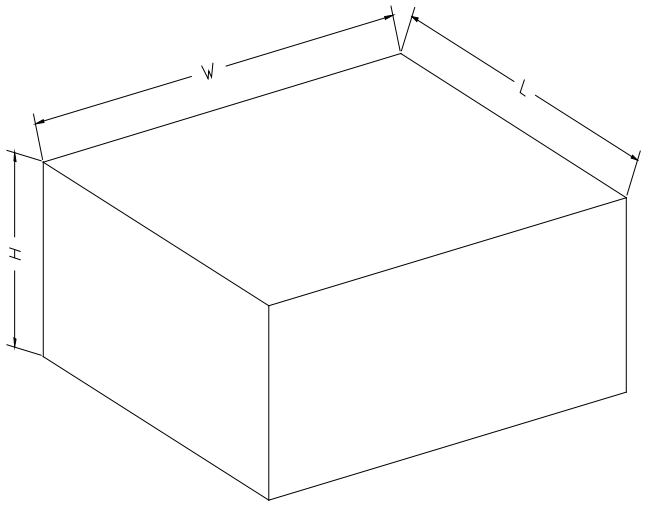
NOTE: The picture is only for reference. Please make the object as the standard.

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

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