



# SGM8478-1C

## High Voltage, High Precision, Low Noise, Over the Rail Difference Amplifier

### GENERAL DESCRIPTION

The SGM8478-1C is a low noise, high precision difference amplifier which can operate from 4.5V to 36V single supply. The device provides rail-to-rail output operation. Its input common mode voltage range covers up to  $(+V_S) + 1V$ . The wide input voltage range makes this device suitable for current sensing applications.

The SGM8478-1C offers a  $16\mu V$  maximum input offset voltage. Meanwhile, the device features high linearity and high accuracy. The combination of these characteristics makes the SGM8478-1C 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 SGM8478-1C saves external components by integrated matched resistors in differential applications. The gain of SGM8478-1C is 50V/V.

The SGM8478-1C is available in Green SOIC-8 and TDFN-3×3-8L packages. It operates over an ambient temperature range of  $-40^{\circ}C$  to  $+125^{\circ}C$ .

### FEATURES

- **Low Offset Voltage:  $16\mu V$  (MAX)**
- **Input Signal Range:**  
 **$(-V_S) - 0.1V$  to  $(+V_S) + 1V$  for Dual Power Supplies**  
 **$GND - 0.1V$  to  $(+V_S) + 1V$  for Single Power Supply**
- **Gain: 50V/V**
- **PSRR:  $0.05\mu V/V$  (TYP)**
- **CMRR: 106dB (TYP)**
- **0.1Hz to 10Hz Noise:  $0.75\mu V_{P-P}$**
- **Input Voltage Noise Density:  $39nV/\sqrt{Hz}$  at 1kHz**
- **-3dB Bandwidth: 230kHz**
- **Rail-to-Rail Output**
- **Wide Supply Voltage Range: 4.5V to 36V**
- **Supply Current: 1.55mA (TYP)**
- **Integrated Matched Resistors for Differential Applications**
- **$-40^{\circ}C$  to  $+125^{\circ}C$  Operating Temperature Range**
- **Available in Green SOIC-8 and TDFN-3×3-8L Packages**

### APPLICATIONS

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

# High Voltage, High Precision, Low Noise, Over the Rail Difference Amplifier

## SGM8478-1C

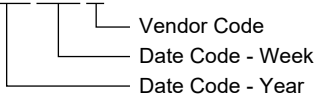
### PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8478-1C (Gain = 50)	SOIC-8	-40°C to +125°C	SGM8478-1CXS8G/TR	SGM 84781CXS8 XXXXX	Tape and Reel, 2500
	TDFN-3x3-8L	-40°C to +125°C	SGM8478-1CXTDB8G/TR	SGM 84781DB 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 ..... (-Vs) -0.3V to (+Vs) + 1V  
 Junction Temperature ..... +150°C  
 Storage Temperature Range ..... -65°C to +150°C  
 Lead Temperature (Soldering, 10s) ..... +260°C  
 ESD Susceptibility  
 HBM ..... 5000V  
 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.

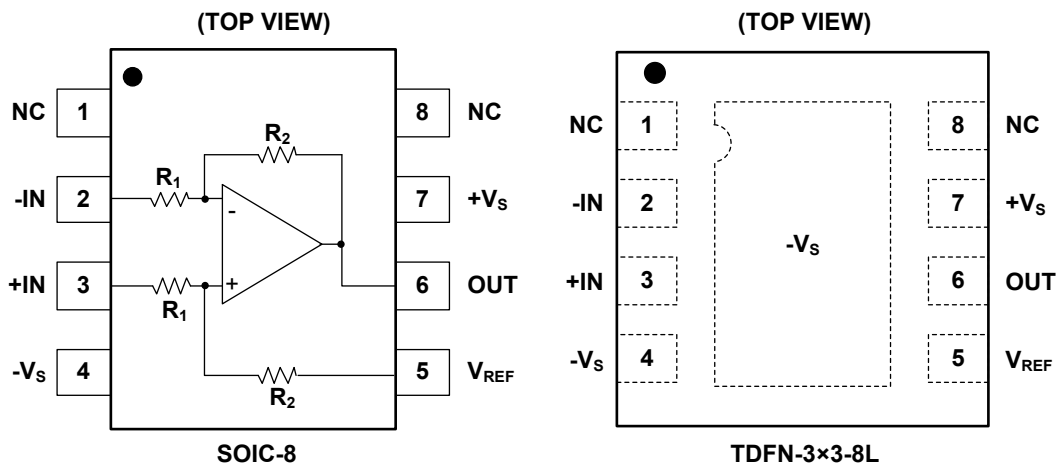
### ESD SENSITIVITY CAUTION

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



PIN DESCRIPTION

PIN		NAME	FUNCTION
SOIC-8	TDFN-3x3-8L		
1, 8	1, 8	NC	No Connection.
2	2	-IN	Inverting Input.
3	3	+IN	Non-Inverting Input.
4	4	-Vs	Negative Power Supply.
5	5	VREF	Reference Voltage Terminal.
6	6	OUT	Output of Amplifier.
7	7	+Vs	Positive Power Supply.
-	Exposed Pad	-Vs	Exposed pad should be soldered to PCB board and connected to -Vs.

# SGM8478-1C High Voltage, High Precision, Low Noise, Over the Rail Difference Amplifier

## ELECTRICAL CHARACTERISTICS

(At  $T_A = +25^\circ\text{C}$ ,  $+V_S = 4.5\text{V}$  to  $36\text{V}$ ,  $-V_S = 0\text{V}$ ,  $V_{CM} = V_{REF} = +V_S/2$  and  $R_L = 10\text{k}\Omega$ , Full =  $-40^\circ\text{C}$  to  $+125^\circ\text{C}$ , unless otherwise noted.)

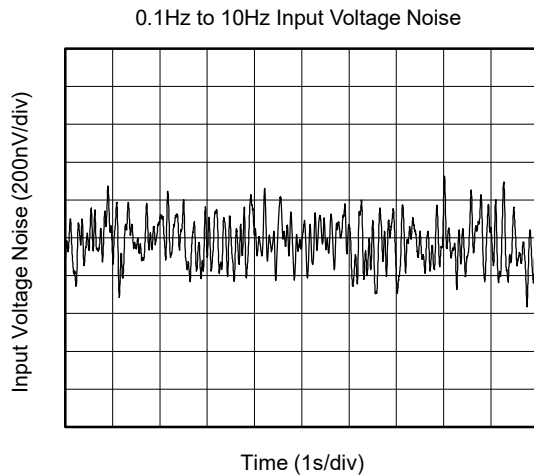
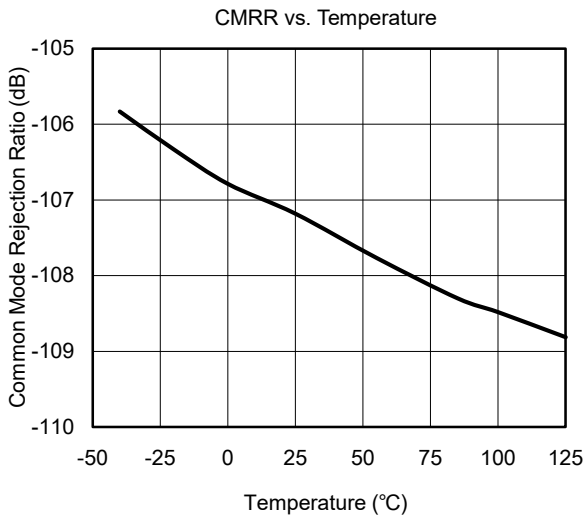
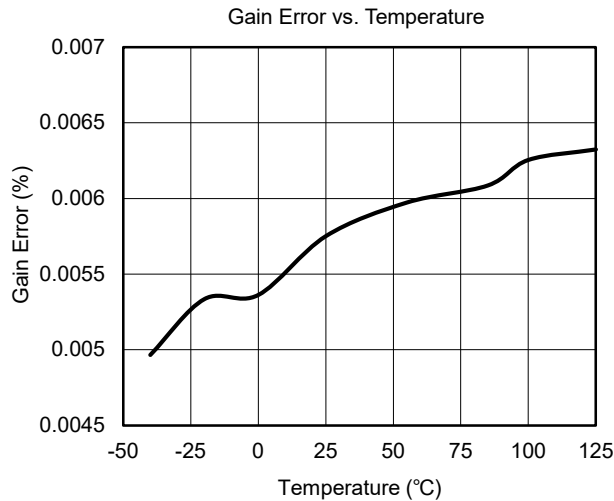
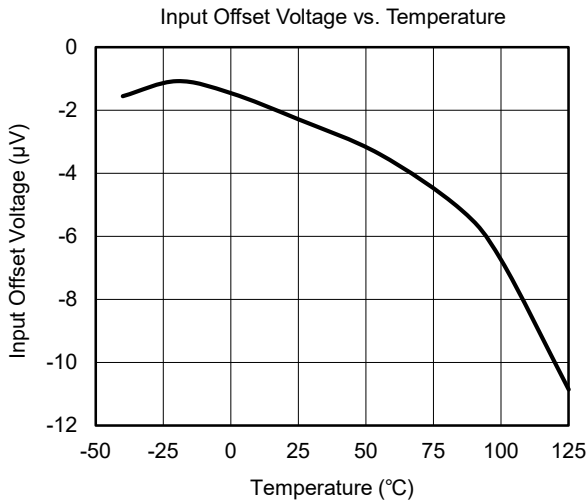
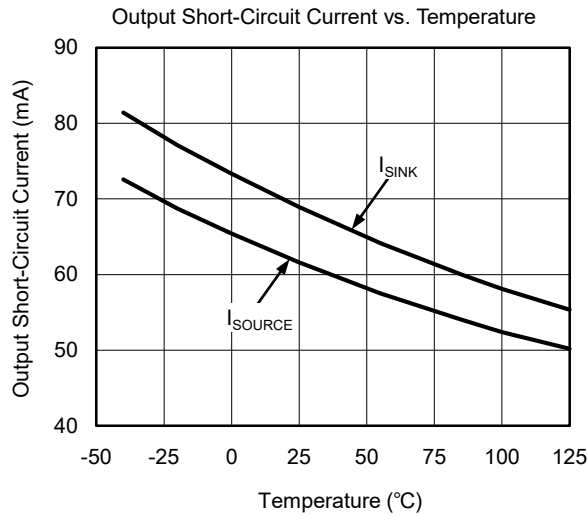
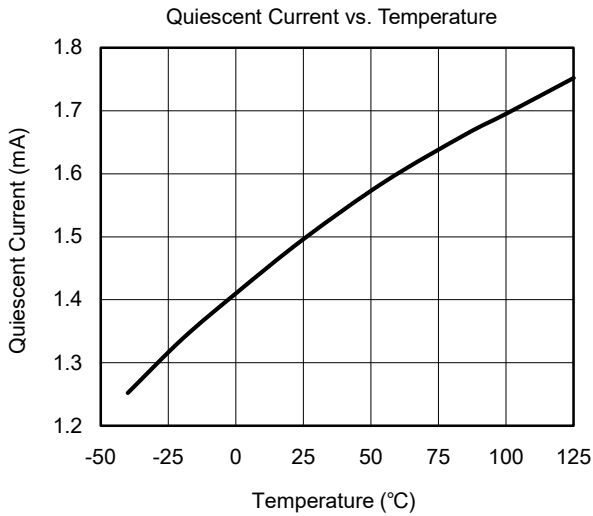
PARAMETER	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>Input Characteristics</b>						
Input Offset Voltage ( $V_{OS}$ )	$V_S = 4.5\text{V}$ to $36\text{V}$	+25°C		5	16	$\mu\text{V}$
		Full			40	
Input Offset Voltage Drift ( $\Delta V_{OS}/\Delta T$ )		Full		0.14		$\mu\text{V}/^\circ\text{C}$
Input Common Mode Voltage Range ( $V_{CM}$ )		Full	$(-V_S) - 0.1$		$(+V_S) + 1$	V
Common Mode Rejection Ratio (CMRR) <sup>(1)</sup>	$(-V_S) - 0.1\text{V} < V_{CM} < (+V_S) + 1\text{V}$	+25°C	92	106		dB
		Full	89			
<b>Output Characteristics</b>						
Output Voltage Swing from Rail	$V_S = 36\text{V}$ , $R_L = 10\text{k}\Omega$	+25°C		195	270	mV
		Full			320	
Output Short-Circuit Current ( $I_{SC}$ )	$V_S = 4.5\text{V}$	Full	9	19		mA
	$V_S = 36\text{V}$		37	64		
<b>Power Supply</b>						
Specified Voltage Range ( $V_S$ )		Full	4.5		36	V
Power Supply Rejection Ratio (PSRR) <sup>(1)</sup>	$V_S = 4.5\text{V}$ to $36\text{V}$	+25°C		0.05	0.3	$\mu\text{V}/\text{V}$
		Full			0.45	
Quiescent Current ( $I_Q$ )	$V_S = 4.5\text{V}$ to $36\text{V}$	+25°C		1.55	2.1	mA
		Full			2.4	
<b>Dynamic Performance</b>						
-3dB Bandwidth	$C_L = 25\text{pF}$	+25°C		230		kHz
Slew Rate (SR)	$V_S = 30\text{V}$ , $V_{OUT} = 4\text{V}_{P-P}$	+25°C		2.1		$\text{V}/\mu\text{s}$
<b>Noise</b>						
Input Voltage Noise <sup>(1)</sup>	$f = 0.1\text{Hz}$ to $10\text{Hz}$	+25°C		0.75		$\mu\text{V}_{P-P}$
Input Voltage Noise Density ( $e_n$ ) <sup>(1)</sup>	$f = 1\text{kHz}$	+25°C		39		$\text{nV}/\sqrt{\text{Hz}}$
<b>Gain</b>						
Gain Error	$V_S = 30\text{V}$ , $-9\text{V} \leq V_{OUT} \leq 9\text{V}$	+25°C		0.01	0.1	%
Gain Temperature Coefficient	$V_S = 30\text{V}$ , $-9\text{V} \leq V_{OUT} \leq 9\text{V}$	+25°C		0.15		$\text{ppm}/^\circ\text{C}$

NOTE: 1. Referred to input.

# SGM8478-1C High Voltage, High Precision, Low Noise, Over the Rail Difference Amplifier

## TYPICAL PERFORMANCE CHARACTERISTICS

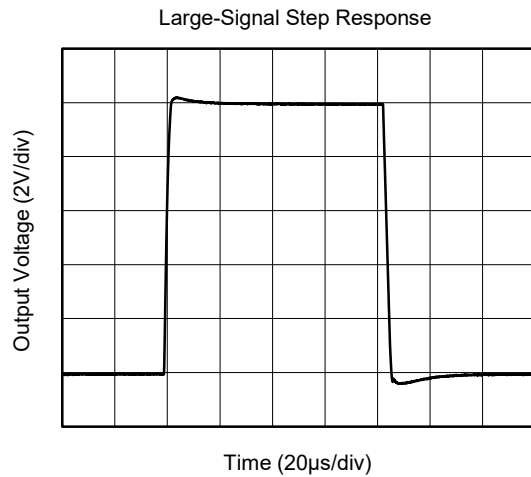
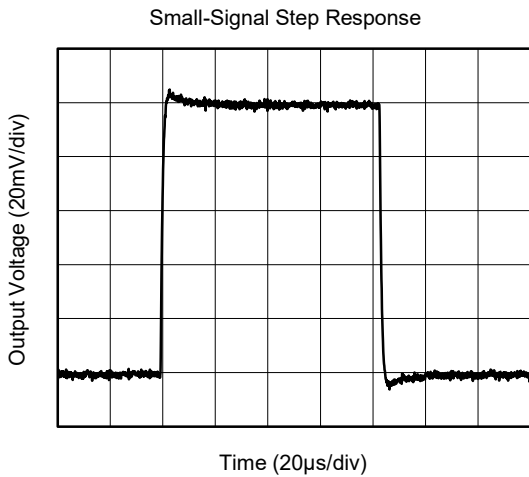
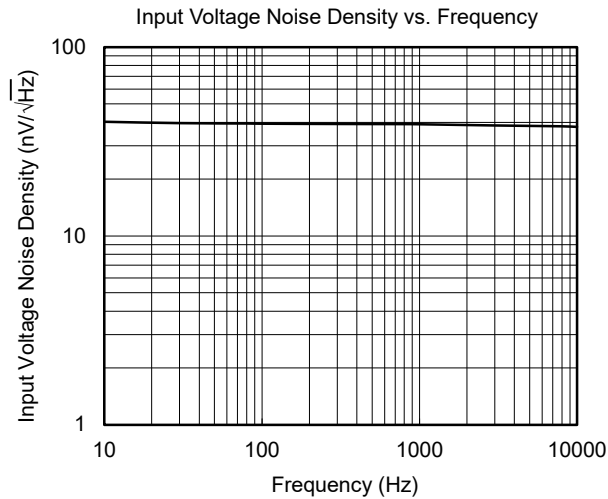
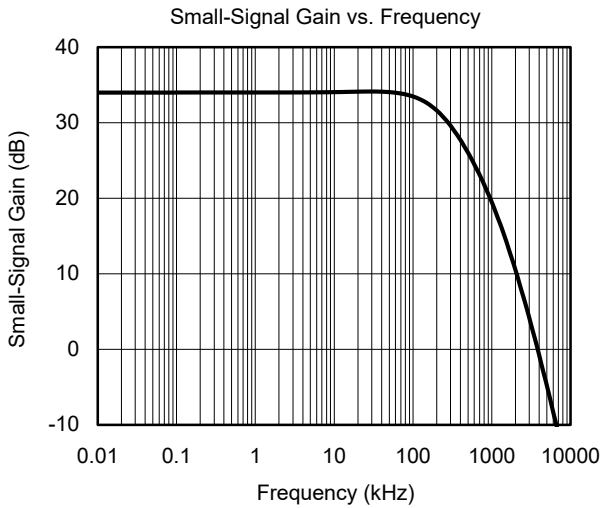
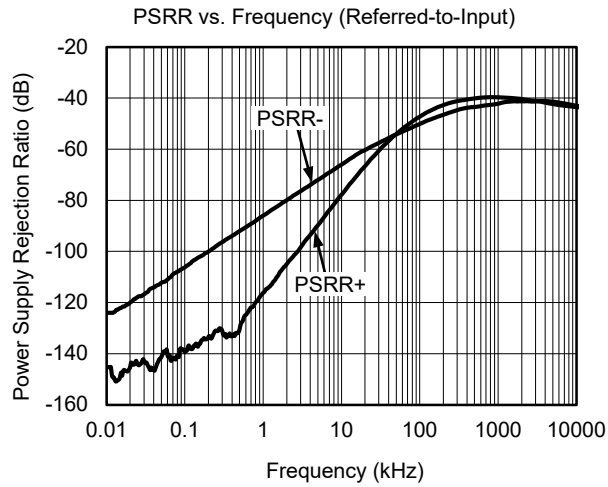
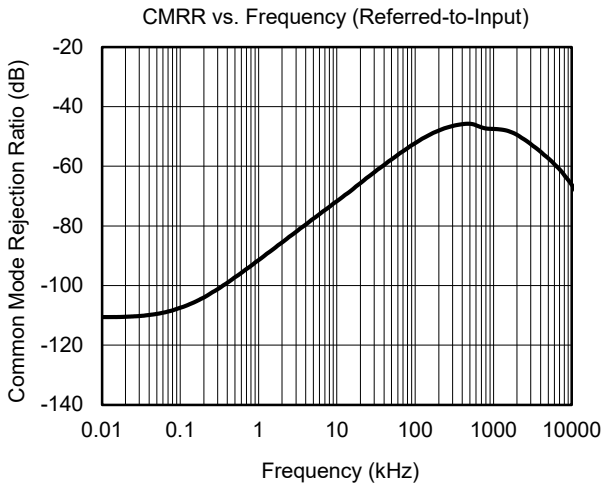
At  $T_A = +25^\circ\text{C}$ ,  $V_S = 30\text{V}$ , unless otherwise noted.



# SGM8478-1C High Voltage, High Precision, Low Noise, Over the Rail Difference Amplifier

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

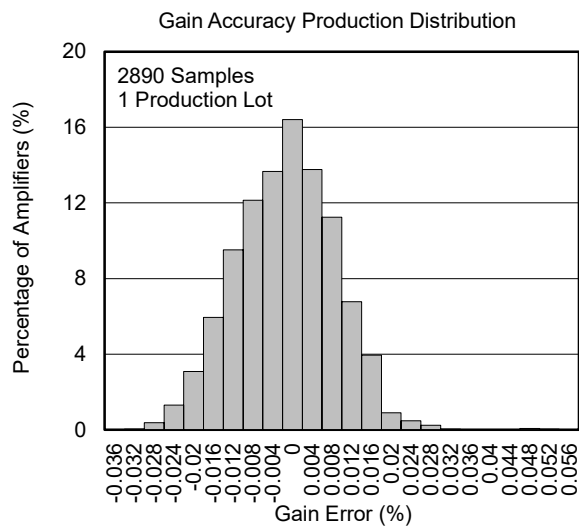
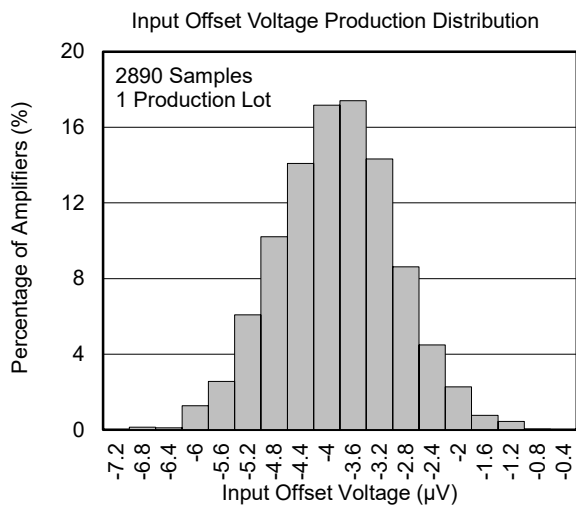
At  $T_A = +25^\circ\text{C}$ ,  $V_S = 30\text{V}$ , unless otherwise noted.



# SGM8478-1C High Voltage, High Precision, Low Noise, Over the Rail Difference Amplifier

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = 30\text{V}$ , unless otherwise noted.



**REVISION HISTORY**

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

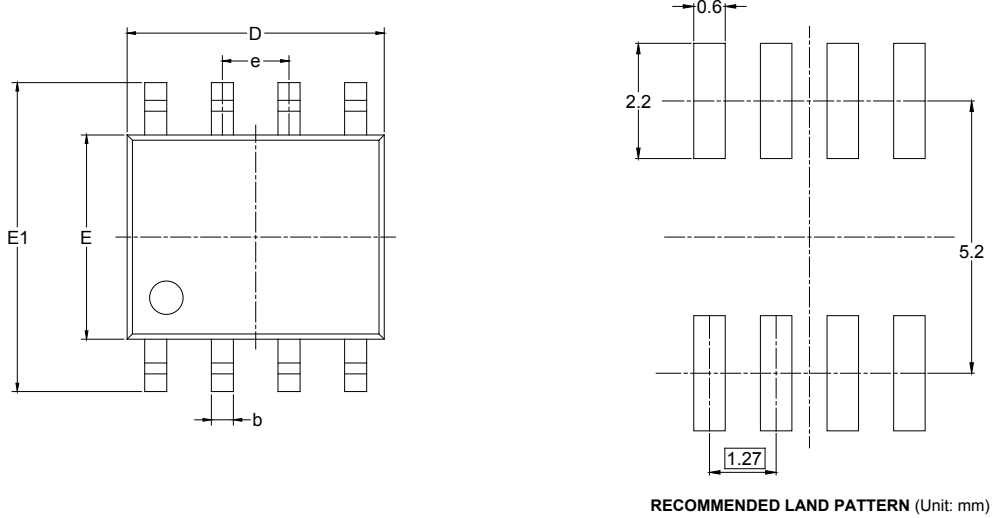
<b>Changes from Original (JUNE 2019) to REV.A</b>	<b>Page</b>
Changed from product preview to production data.....	All

---



PACKAGE OUTLINE DIMENSIONS

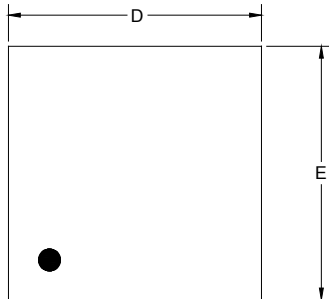
SOIC-8



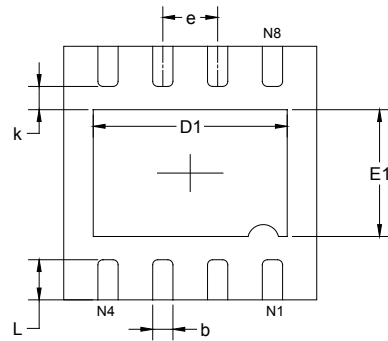
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

PACKAGE OUTLINE DIMENSIONS

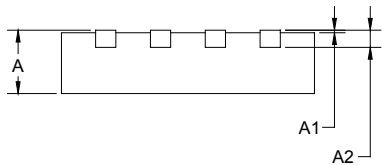
TDFN-3x3-8L



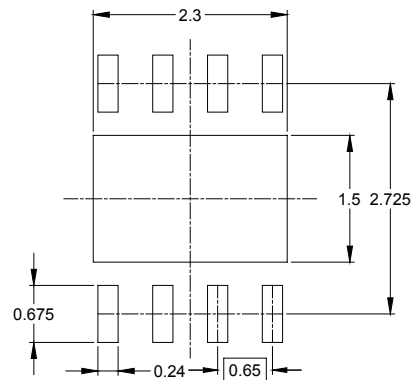
TOP VIEW



BOTTOM VIEW



SIDE VIEW

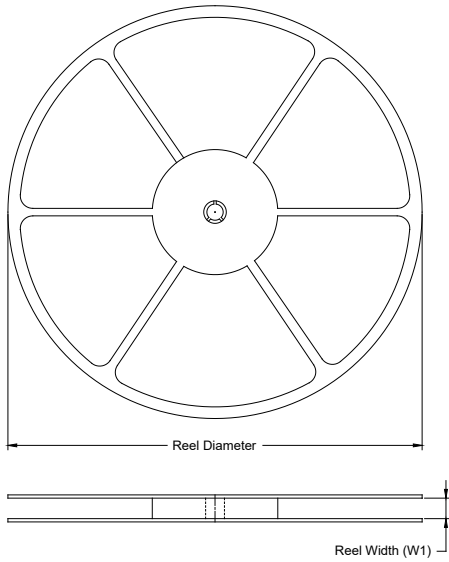


RECOMMENDED LAND PATTERN (Unit: mm)

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	2.200	2.400	0.087	0.094
E	2.900	3.100	0.114	0.122
E1	1.400	1.600	0.055	0.063
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.375	0.575	0.015	0.023

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-8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
TDFN-3×3-8L	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD0001

# 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

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)