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

GENERAL DESCRIPTION

SGM8478-1C is a low noise, high precision difference amplifier with low input offset voltage. Its input common mode voltage range covers up to $+V_S$ + 1V. And this device is guaranteed to operate from 4.5V to 36V.

SGM8478-1C's wide input voltage range makes this device suitable for current sensing applications. Meanwhile, SGM8478-1C features high linearity and high accuracy. The combination of these characteristics makes the SGM8478-1C a good choice for temperature, position and pressure sensors, medical equipment and strain gauge amplifiers, or any other 4.5V to 36V applications requiring precision and long term stability.

Integrated matched resistors for differential applications save external components. 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℃ to +125℃.

FEATURES

- **Low Offset Voltage: 3μV (TYP)**
- **4.5V to 36V Single Supply Operation**
- **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
- **Rail-to-Rail Output**
- **Gain: 50V/V**
- **PSRR: 140dB (TYP)**
- **CMRR: 110dB (TYP)**
- **0.1Hz to 10Hz Noise: 0.75μV_{P-P}**
- **36nV/$\sqrt{Hz}$ Voltage Noise Density at 1kHz**
- **-3dB Bandwidth: 200kHz**
- **Integrated Matched Resistors for Differential Applications**
- **Supply Current: 1.5mA (TYP)**
- **Overload Recovery Time: 1μs**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green SOIC-8 and TDFN-3×3-8L Packages**

APPLICATIONS

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

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8478-1C (Gain = 50)	SOIC-8	-40℃ to +125℃	SGM8478-1CXS8G/TR	SGM 84781CXS8 XXXXX	Tape and Reel, 2500
	TDFN-3×3-8L	-40℃ to +125℃	SGM8478-1CXTDB8G/TR	SGM 84781DB XXXXX	Tape and Reel, 4000

NOTE: XXXXX = Date 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...40V
Input Voltage Range .... (-V_S) -0.3V to (+V_S) + 1V
Storage Temperature Range ....-65℃ to +150℃
Junction Temperature..+150℃
Lead Temperature (Soldering 10sec)
....+260℃

RECOMMENDED OPERATING CONDITIONS

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

OVERSTRESS CAUTION

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

ESD SENSITIVITY CAUTION

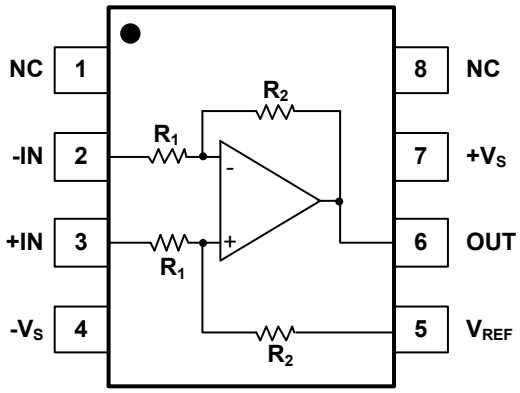
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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, specification or other related things if necessary without notice at any time.

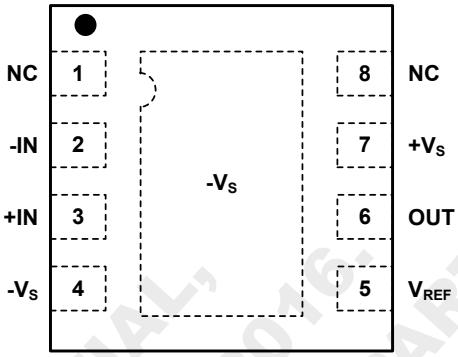
PIN CONFIGURATIONS

SGM8478-1C (TOP VIEW)



SOIC-8

SGM8478-1C (TOP VIEW)

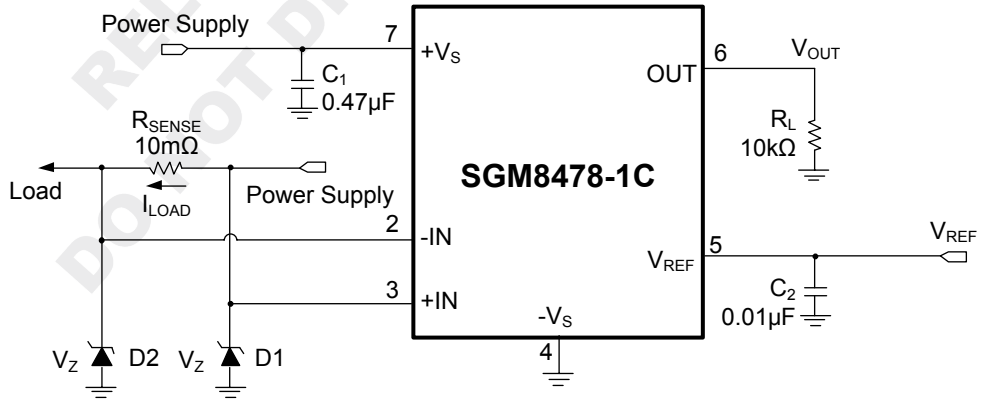


TDFN-3×3-8L

PIN DESCRIPTION

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

APPLICATION CIRCUIT



$$V_{OUT} - V_{REF} = Gain \times I_{LOAD} \times R_{SENSE}$$

ELECTRICAL CHARACTERISTICS

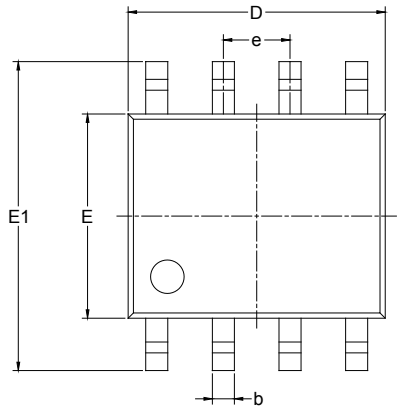
(T_A = +25℃, $+V_S$ = 36V, $-V_S$ = 0V, V_{CM} = V_{REF} = $+V_S$/2, unless otherwise noted.)

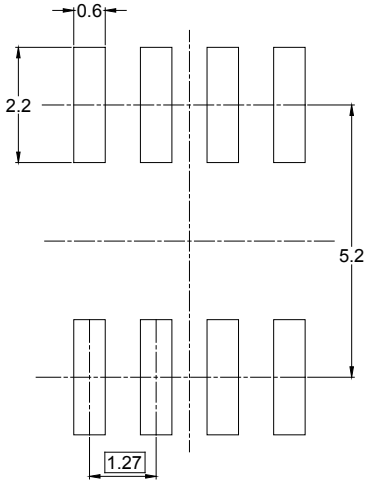
PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
INPUT CHARACTERISTICS						
Input Offset Voltage (V_{OS})				3		μV
Input Bias Current (I_B)		V_{CM} = $+V_S$ + 1V, V_{-IN} = V_{+IN}		80		μA
Input Offset Current (I_{OS})		V_{CM} = $+V_S$ + 1V, V_{-IN} = V_{+IN}		0.1		μA
Input Voltage Range (V_{CM})			-0.1		$+V_S$ + 1V	V
Common Mode Rejection Ratio (CMRR) (1)		V_{CM} = ($-V_S$) - 0.1V to ($+V_S$) + 1V, V_{-IN} = V_{+IN}		110		dB
Gain				50		V/V
Gain Error				0.015		%
OUTPUT CHARACTERISTICS						
Output Voltage Swing from Rail	V_{OH}	R_L = 10kΩ		220		mV
	V_{OL}	R_L = 10kΩ		55		mV
Short-Circuit Current (I_{SC})				55		mA
POWER SUPPLY						
Supply Voltage Range			4.5		36	V
Power Supply Rejection Ratio (PSRR) (1)		V_S = 4.5V to 36V		140		dB
Quiescent Current (I_Q)		I_O = 0A		1.5		mA
DYNAMIC PERFORMANCE						
-3dB Bandwidth				200		kHz
Slew Rate (SR)		R_L = 10kΩ, 10V Output Step		3.5		V/μs
Overload Recovery Time		V_{IN} × G > V_S		0.5		μs
NOISE PERFORMANCE						
Input Voltage Noise (1)		0.1Hz to 10Hz		0.75		μV_{P-P}
Input Voltage Noise Density (e_n) (1)		f = 1kHz		36		$nV/\sqrt{Hz}$

NOTE: 1. Referred to input.

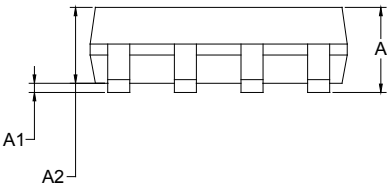
PACKAGE OUTLINE DIMENSIONS

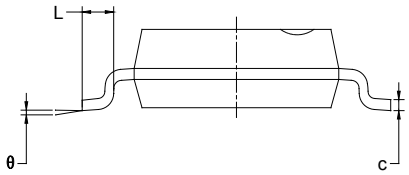
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

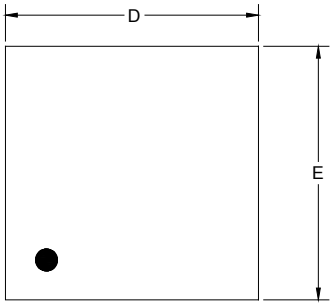




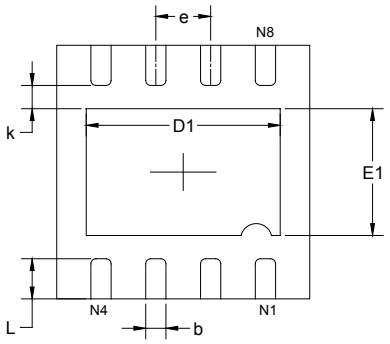
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

PACKAGE OUTLINE DIMENSIONS

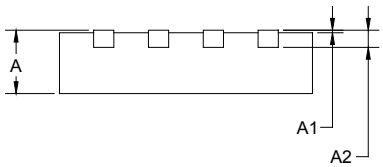
TDFN-3×3-8L



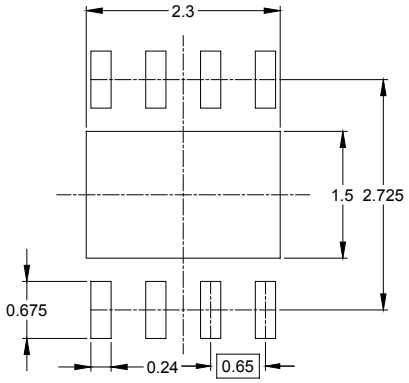
TOP VIEW



BOTTOM VIEW



SIDE VIEW

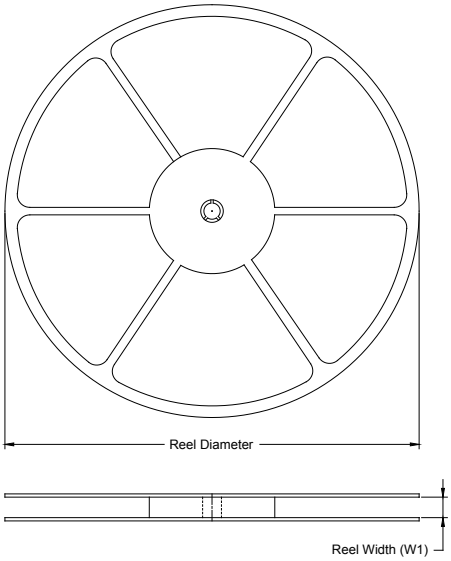


RECOMMENDED LAND PATTERN (Unit: mm)

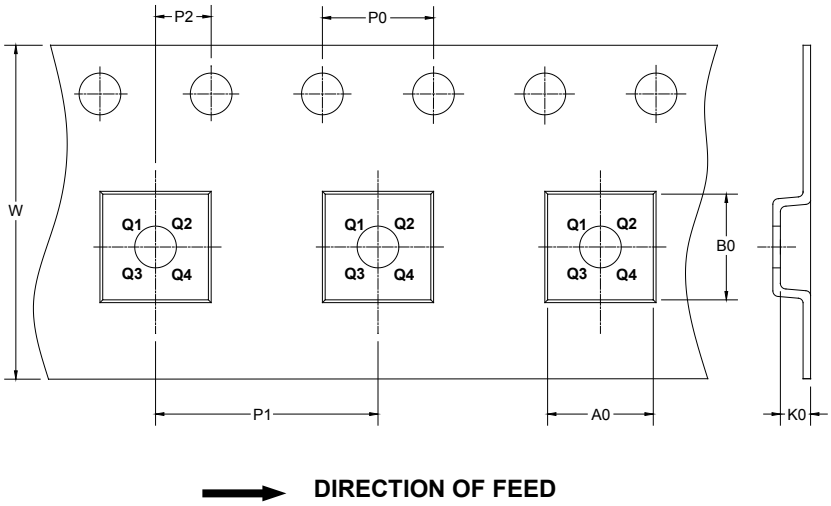
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.200	2.400	0.087	0.094
E	2.900	3.100	0.114	0.122
E1	1.400	1.600	0.055	0.063
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	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



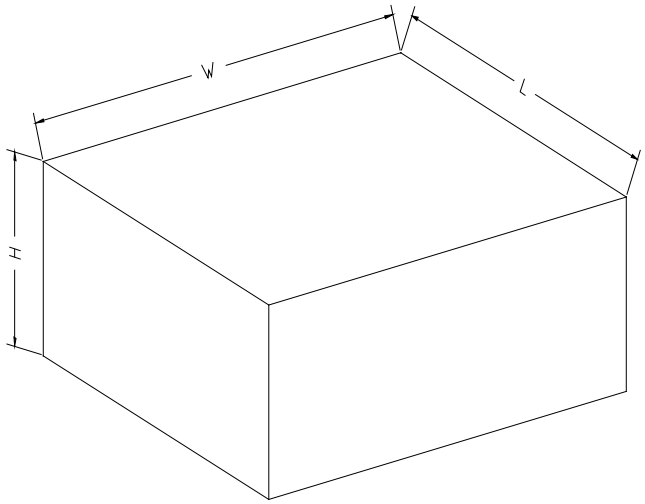
NOTE: The picture is only for reference. Please make the object as the standard.

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	6.4	5.4	2.1	4.0	8.0	2.0	12.0	Q1
TDFN-3×3-8L	13″	12.4	3.35	3.35	1.13	4.00	8.00	2.00	12.00	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