



SGM8040-1/SGM8040-2

600nA, Rail-to-Rail I/O

High Precision Operational Amplifiers

GENERAL DESCRIPTION

The high precision single SGM8040-1 and dual SGM8040-2 operational amplifiers are guaranteed to operate with a single supply voltage as low as 1.4V, while drawing less than 600nA/Amplifier (TYP) of quiescent current. These devices are also designed to support rail-to-rail input and output operation. This combination of features supports battery-powered and portable applications.

The SGM8040-1/2 have a gain-bandwidth product of 12kHz (TYP) and are unity gain stable. These specifications make the operational amplifiers appropriate for low frequency applications, such as battery current monitoring and sensor conditioning.

The single SGM8040-1 is available in Green SOT-23-5 and SOIC-8 packages. The dual SGM8040-2 is available in Green SOIC-8 package. They operate over an ambient temperature range of -40°C to +85°C.

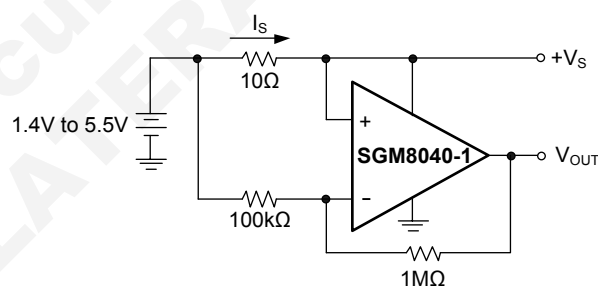
FEATURES

- **Low Quiescent Current:** 600nA/Amplifier (TYP)
- **Rail-to-Rail Input and Output**
- **Gain-Bandwidth Product:** 12kHz at $V_S = 5V$ (TYP)
- **Wide Supply Voltage Range:** 1.4V to 5.5V
- **Unity Gain Stable**
- **Low Offset Voltage:** 80μV (TYP)
- **-40°C to +85°C Operating Temperature Range**
- **Small Packages:**
SGM8040-1 Available in Green SOT-23-5 and SOIC-8 Packages
SGM8040-2 Available in Green SOIC-8 Package

APPLICATIONS

Toll Booth Tags
 Wearable Products
 Temperature Measurement
 Battery Powered System

TYPICAL APPLICATION



$$I_S = \frac{+V_S - V_{OUT}}{(10V/V) \cdot (10\Omega)}$$

High Side Battery Current Sensor

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8040-1	SOT-23-5	-40°C to +85°C	SGM8040-1YN5G/TR	GP0XX	Tape and Reel, 3000
	SOIC-8	-40°C to +85°C	SGM8040-1YS8G/TR	SGM 80401YS8 XXXXX	Tape and Reel, 4000
SGM8040-2	SOIC-8	-40°C to +85°C	SGM8040-2YS8G/TR	SGM 80402YS8 XXXXX	Tape and Reel, 4000

NOTE: XX = Date Code. 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.

MARKING INFORMATION

GP0 X X

└── Date code - Month ("A" = Jan. "B" = Feb. ... "L" = Dec.)
└── Date code - Year ("A" = 2010, "B" = 2011 ...)
└── Chip I.D.

For example: GP0HA (2017, January)

ABSOLUTE MAXIMUM RATINGS

Supply Voltage 6V
Analog Inputs (V_{IN+} , V_{IN-}) $(-V_S) - 0.3V$ to $(+V_S) + 0.3V$
Differential Input Voltage $|(-V_S) - (+V_S)|$
Storage Temperature Range -65°C to +150°C
Junction Temperature +150°C
Lead Temperature (Soldering 10sec) +260°C

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range -40°C to +85°C

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.

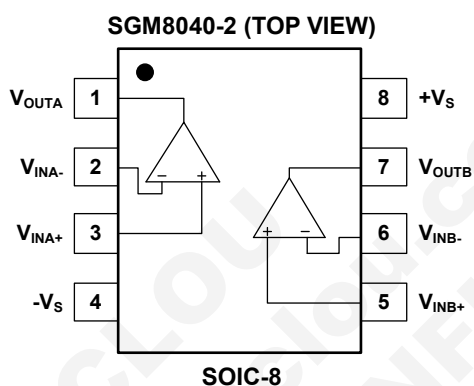
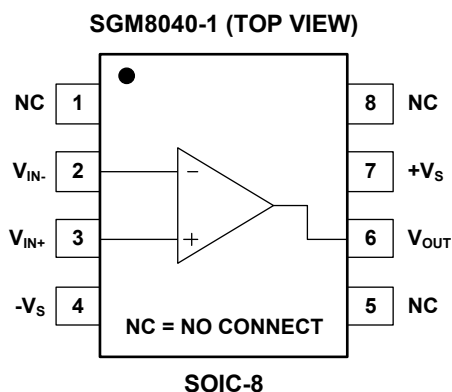
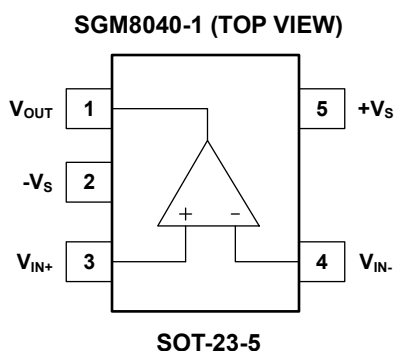
ESD SENSITIVITY CAUTION

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



ELECTRICAL CHARACTERISTICS

(T_A = +25°C, +V_S = 1.4V to 5.5V, -V_S = 0V, V_{CM} = +V_S/2, V_{OUT} = +V_S/2 and R_L = 1MΩ⁽¹⁾, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC ELECTRICAL CHARACTERISTICS						
Input Offset Voltage	V _{OS}			80		μV
Power Supply Rejection Ratio	PSRR	+V _S = 1.4V to 5.5V		5		μV/V
Input Common Mode Voltage Range	V _{CM}		(-V _S) - 0.1		(+V _S) + 0.1	V
Common Mode Rejection Ratio	CMRR	+V _S = 5V, V _{CM} = -0.1V to 5.1V		96		dB
		+V _S = 5V, V _{CM} = 2.5V to 5.1V		92		
		+V _S = 5V, V _{CM} = -0.1V to 2.5V		110		
Large Signal Voltage Gain	A _{VO}	+V _S = 1.4V, (-V _S) + 0.1V < V _{OUT} < (+V _S) - 0.1V, R _L = 50kΩ		100		dB
		+V _S = 2.5V, (-V _S) + 0.1V < V _{OUT} < (+V _S) - 0.1V, R _L = 50kΩ		120		
		+V _S = 5V, (-V _S) + 0.1V < V _{OUT} < (+V _S) - 0.1V, R _L = 50kΩ		120		
Input Bias Current	I _B			5		pA
Input Offset Current	I _{OS}			5		pA
Voltage Output Swing from Rail		R _L = 50kΩ		2		mV
Short-Circuit Current	I _{SC}	+V _S = 1.4V		2		mA
		+V _S = 5V		20		
Supply Voltage	V _S		1.4		5.5	V
Quiescent Current/Amplifier	I _Q			600		nA
AC ELECTRICAL CHARACTERISTICS (C_L = 60pF)						
Gain-Bandwidth Product	GBP	+V _S = 1.4V		11		kHz
		+V _S = 2.5V		11.5		
		+V _S = 5V		12		
Slew Rate	SR	+V _S = 1.4V, V _{OUT} = 1V Step		2		V/ms
		+V _S = 2.5V, V _{OUT} = 1V Step		3.5		
		+V _S = 5V, V _{OUT} = 2V Step		4		
Input Voltage Noise		f = 0.1Hz to 10Hz		5		μV _{P-P}
Input Voltage Noise Density	e _n	f = 1kHz		190		nV/√Hz

NOTE: 1. Refer to Figure 1 and Figure 2.

TEST CIRCUITS

The test circuits used for the DC and AC tests are shown in Figure 1 and Figure 2.

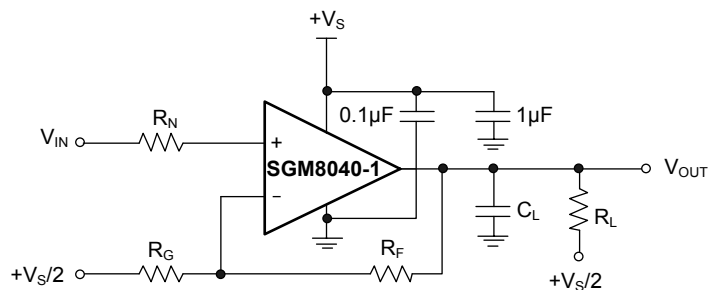


Figure 1. AC and DC Test Circuit for Most Non-Inverting Gain Configurations

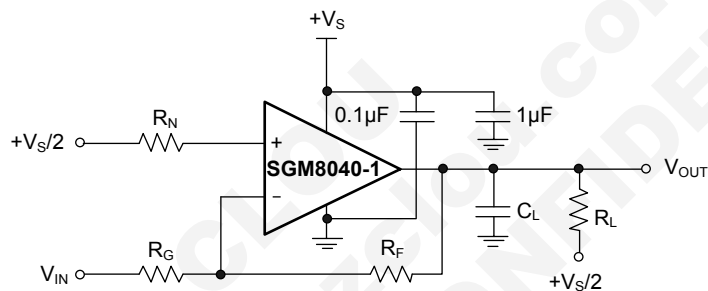
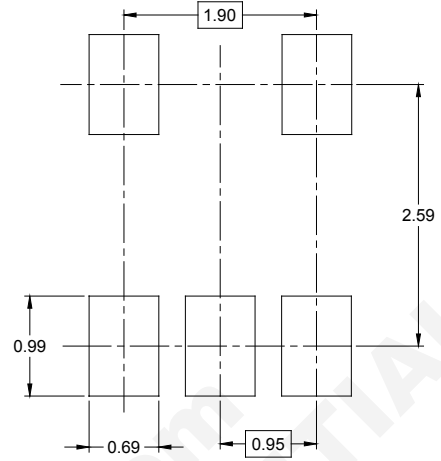
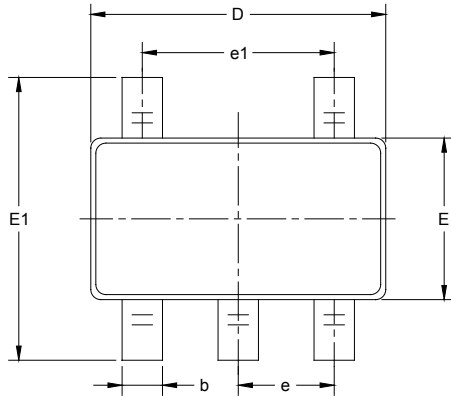


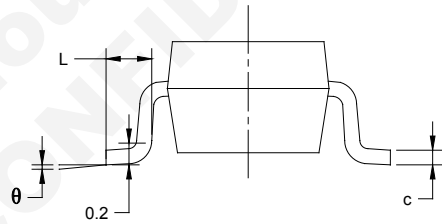
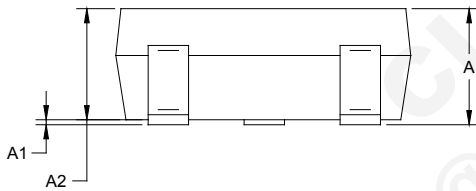
Figure 2. AC and DC Test Circuit for Most Inverting Gain Configurations

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



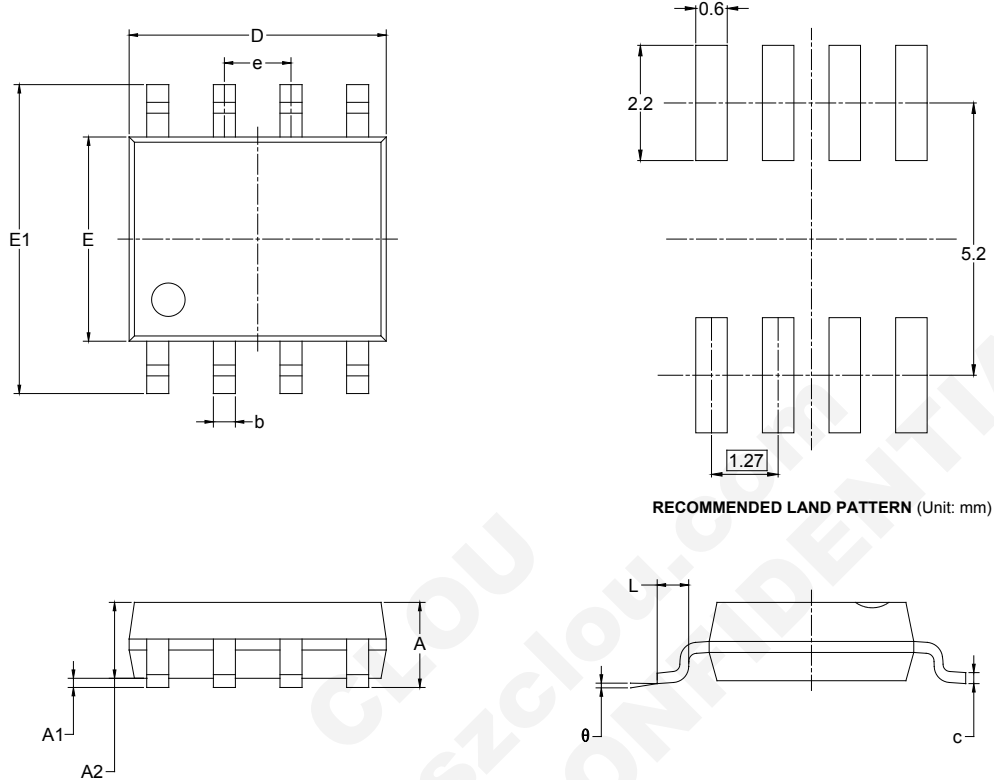
RECOMMENDED LAND PATTERN (Unit: mm)



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

SOIC-8

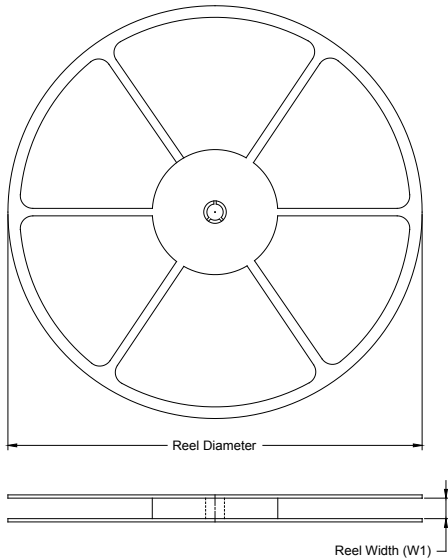


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

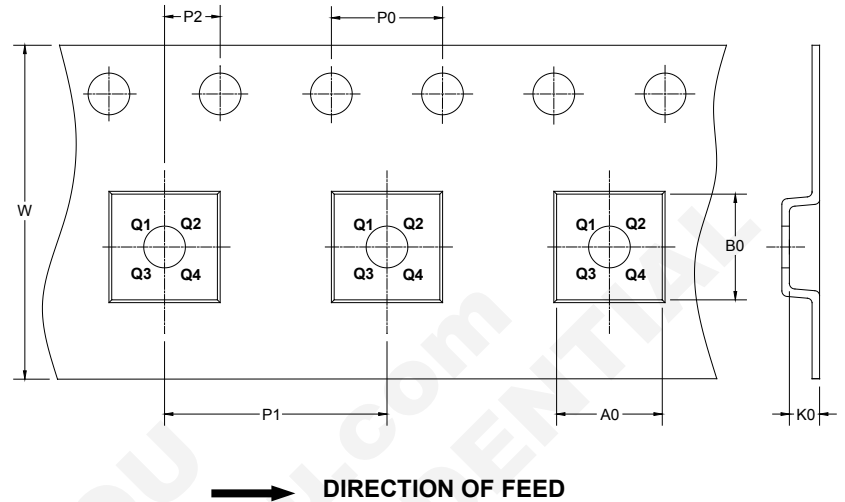
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

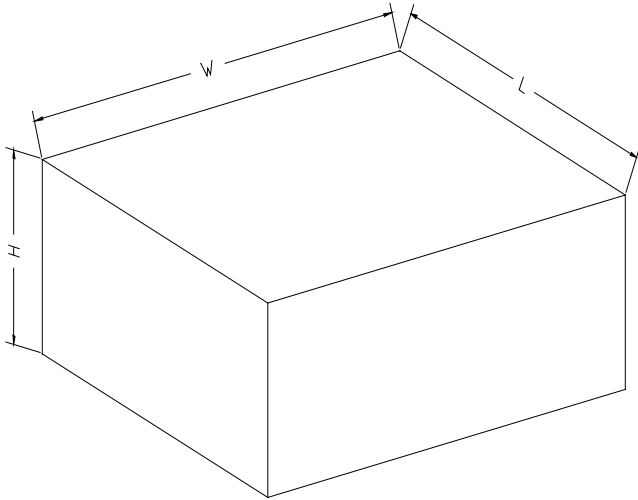
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SOIC-8	13"	12.4	6.40	5.40	2.10	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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002