SGM8198
High-side Current Shunt Monitor

GENERAL DESCRIPTION

The SGM8198 is a single, high-side, high speed, current shunt monitor that operates from 2.7V to 36V single supply, consuming only 65μA quiescent current. The device also features a wide common mode voltage range from 2.7V to 36V. Therefore, either side of the shunt current can be connected to the power supply, and the error is minimized.

The SGM8198 is designed to set any gain from 1 to 100 or more with one external resistor. Differential input voltage can be converted into output current, and the output current is converted back to voltage through load resistance. The device is very suitable for applications in many circuits requiring current shunt measurement or level shifting.

The SGM8198 is available in a Green SOT-23-5 package. It is specified for the -40℃ to +125℃ temperature range.

FEATURES

- **High-side Current Measurement**
- **Wide Supply Voltage Range: 2.7V to 36V**
- **Wide Input Common Mode Voltage: 2.7V to 36V**
- **Low Quiescent Current: 65μA (TYP)**
- **Set Gain with One External Resistor**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOT-23-5 Package**

APPLICATIONS

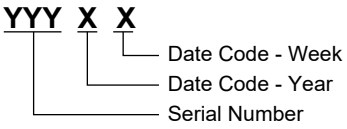
Current Shunt Measurements
Energy Managements
Battery Chargers
Portable Equipment
Servers

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8198	SOT-23-5	-40℃ to +125℃	SGM8198XN5G/TR	GMCXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date 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 Range ..... -0.3V to 40V
Analog Inputs (V_{IN+}, V_{IN-}) Common Mode Voltage Range
..... -0.3V to 40V
Analog Output Voltage Range, V_{OUT} ..... -0.3V to 40V
Input Current into Any Pin 10mA
Package Thermal Resistance
SOT-23-5, θ_{JA} ..... 199℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 2000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range ..... 2.7V to 36V
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

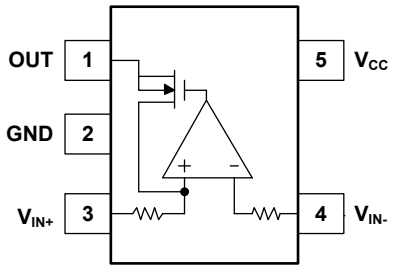
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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



SOT-23-5

ELECTRICAL CHARACTERISTICS

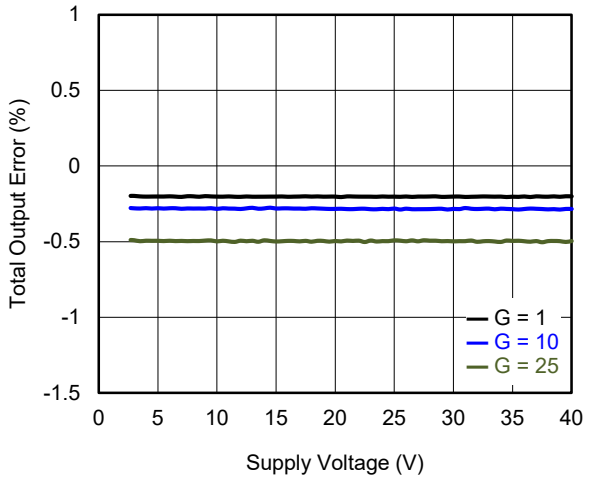
(At T_A = -40℃ to +125℃, V_{CC} = 5V, V_{IN+} = 12V and R_L = 1kΩ, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Characteristics						
Full-Scale Sense Voltage		$V_{SENSE} = V_{IN+} - V_{IN-}$		100	500	mV
Input Offset Voltage RTI	V_{OS}	V_{IN+} = 2.7V to 36V		±30	±550	μV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			1		μV/℃
Input Bias Current	I_B			16		μA
Input Common Mode Voltage Range	V_{CM}		2.7		36	V
Common Mode Rejection Ratio	CMRR	V_{IN+} = 2.7V to 36V, V_{SENSE} = 50mV	104	140		dB
Output Characteristics						
Transconductance	g_m	V_{SENSE} = 10mV to 150mV	990	1000	1010	μA/V
Transconductance vs. Temperature	$\Delta g_m/\Delta T$	V_{SENSE} = 10mV to 150mV		10		nA/℃
Nonlinearity Error	INL	V_{SENSE} = 10mV to 150mV		±0.01	±0.13	%
Total Output Error		V_{SENSE} = 100mV		±0.25	±1.8	%
Output Voltage		Swing to power supply, V_{CC}	V_{CC} - 1.85	V_{CC} - 1.6		V
		Swing to common mode, V_{CM}	V_{CM} - 1.25	V_{CM} - 1		
Power Supply						
Operating Voltage Range	V_{CC}		2.7		36	V
Quiescent Current	I_Q	V_{SENSE} = 0, I_{OUT} = 0		65	90	μA
Power Supply Rejection Ratio	PSRR	V_{CC} = 2.7V to 36V, V_{SENSE} = 50mV		0.1	5	μV/V
Frequency Response						
Bandwidth	BW	R_L = 10kΩ		480		kHz
		R_L = 20kΩ		270		
Settling Time to 0.1%		5V step, R_L = 10kΩ		15		μs
		5V step, R_L = 20kΩ		15		
Noise						
Total Output Current Noise		BW = 100kHz		6		nA_{RMS}
Output Current Noise Density				20		pA/$\sqrt{HZ}$

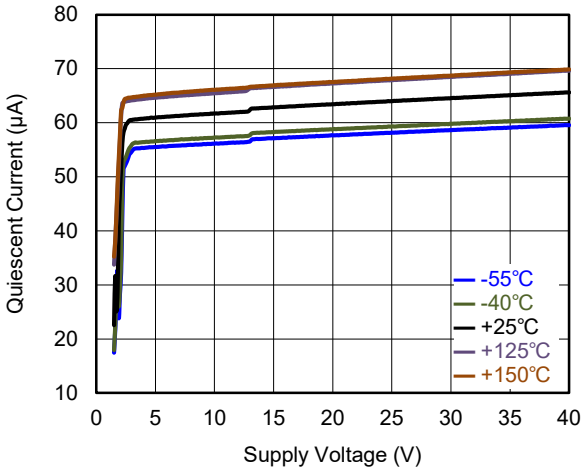
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_{CC} = 5V, V_{IN+} = 12V and R_L = 1kΩ, unless otherwise noted.

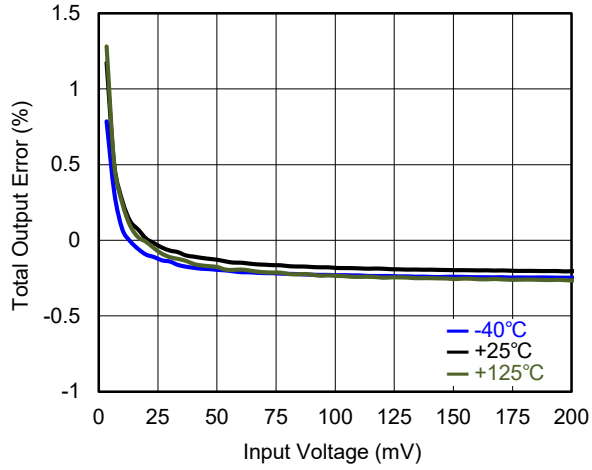
Total Output Error vs. Supply Voltage



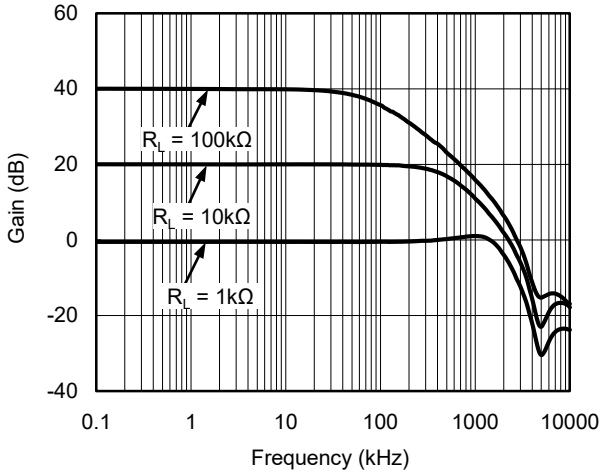
Quiescent Current vs. Supply Voltage



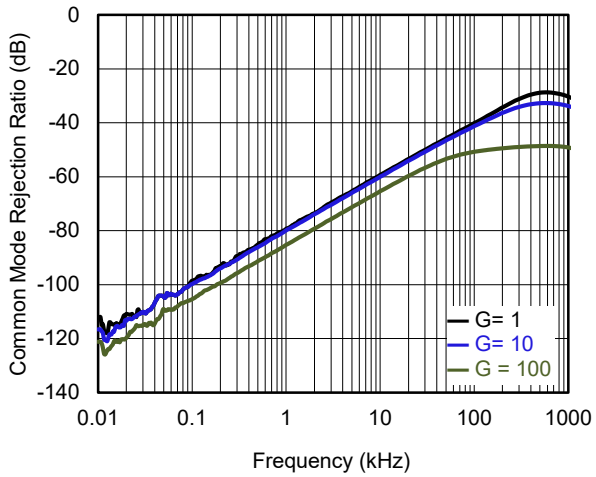
Total Output Error vs. Input Voltage



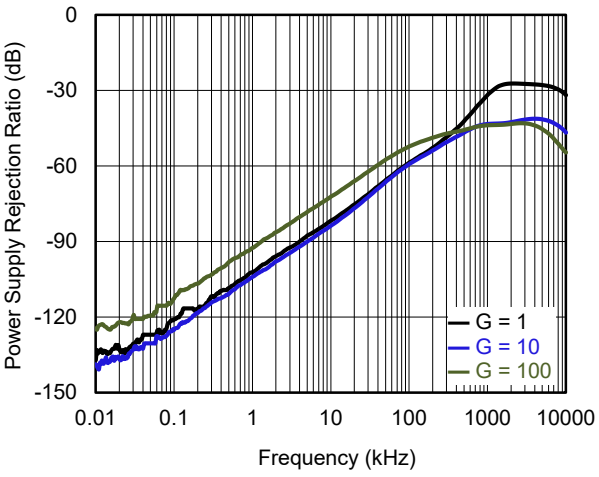
Gain vs. Frequency



CMRR vs. Frequency



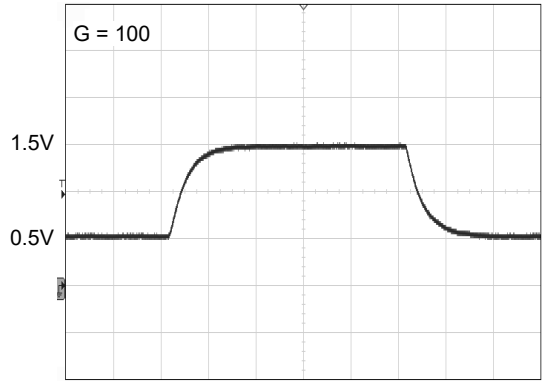
PSRR vs. Frequency



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

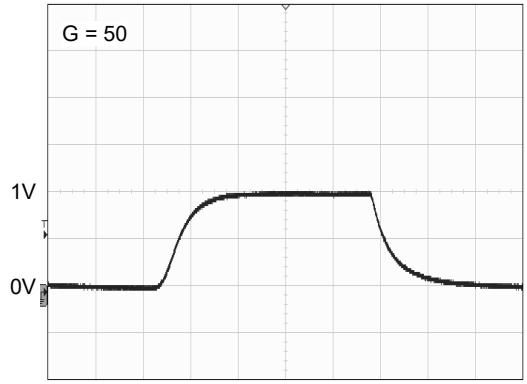
At T_A = +25℃, V_{CC} = 5V, V_{IN+} = 12V and R_L = 1kΩ, unless otherwise noted.

Step Response



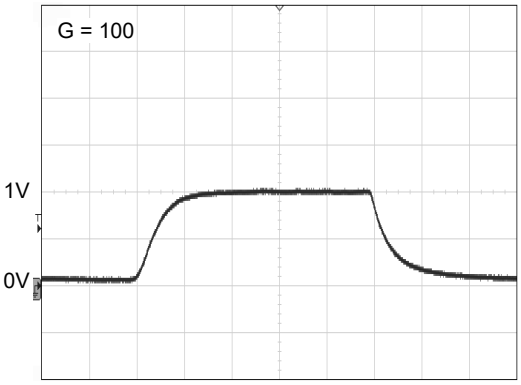
Time (20μs/div)

Step Response



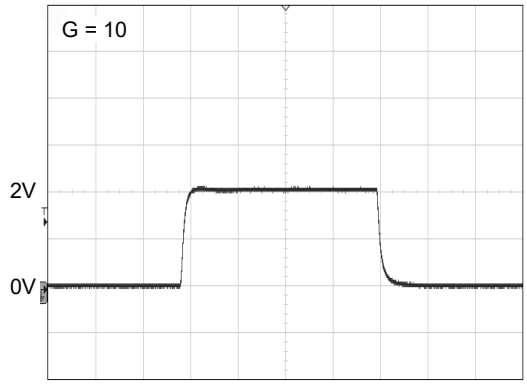
Time (10μs/div)

Step Response



Time (20μs/div)

Step Response



Time (10μs/div)

REVISION HISTORY

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

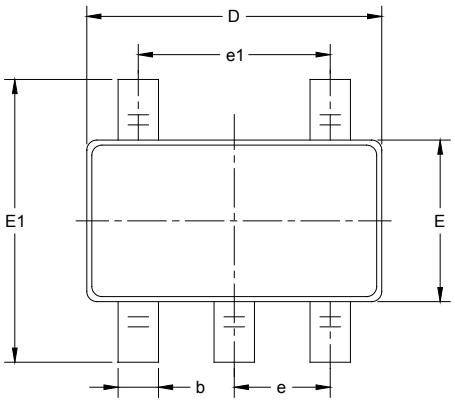
JANUARY 2021 – REV.A.1 to REV.A.2	Page
Updated Absolute Maximum Ratings section	2

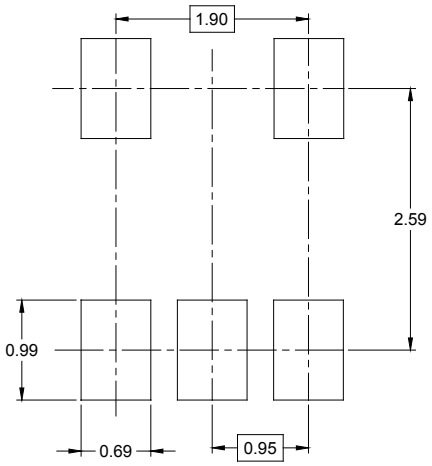
AUGUST 2019 – REV.A to REV.A.1	Page
Updated Electrical Characteristics section	3

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

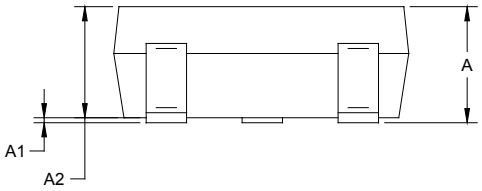
PACKAGE OUTLINE DIMENSIONS

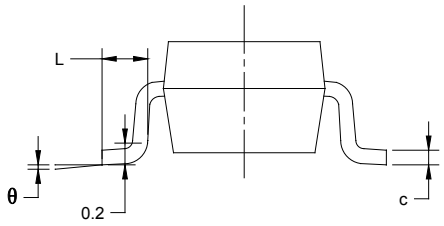
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

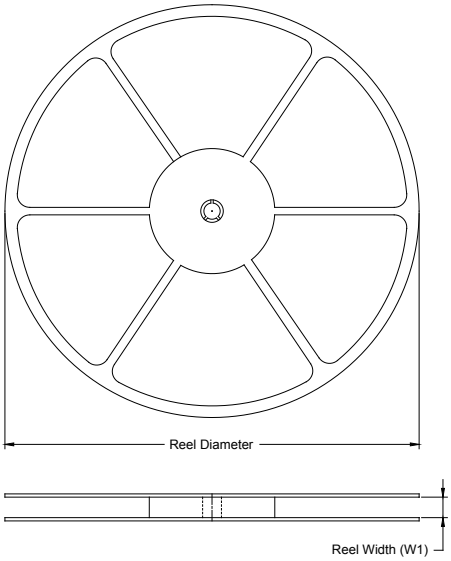




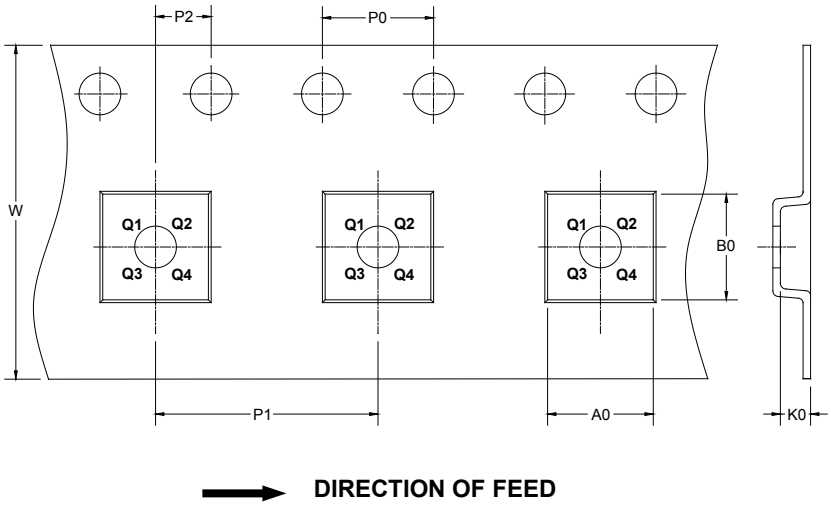
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



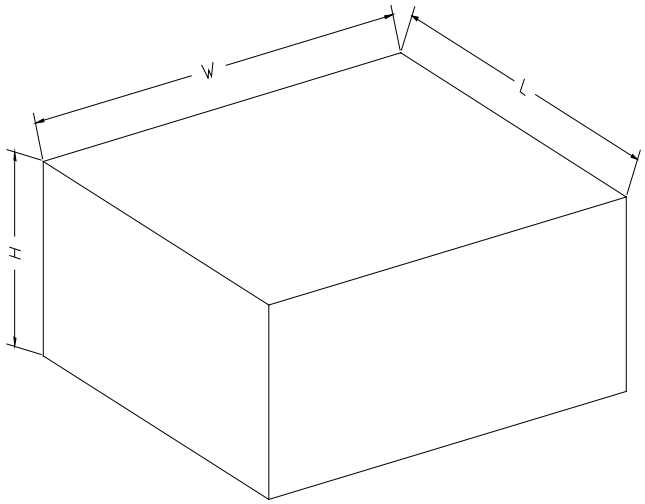
NOTE: The picture is only for reference. Please make the object as the standard.

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

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
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002