

GENERAL DESCRIPTION

The SGM2020 is a low power and low dropout voltage RF linear regulator. It is capable of supplying 300mA output current with typical dropout voltage of only 270mV. The operating input voltage range is from 2.5V to 5.5V. The fixed output voltage range is from 1.2V to 3.3V.

Other features include logic-controlled shutdown mode, output current limit and thermal shutdown protection. The SGM2020 has automatic discharge function to quickly discharge V_{OUT} in the disabled status.

The SGM2020 is available in Green SOT-23-5 and SC70-5 packages. It operates over an operating temperature range of -40°C to $+85^{\circ}\text{C}$.

TYPICAL APPLICATION

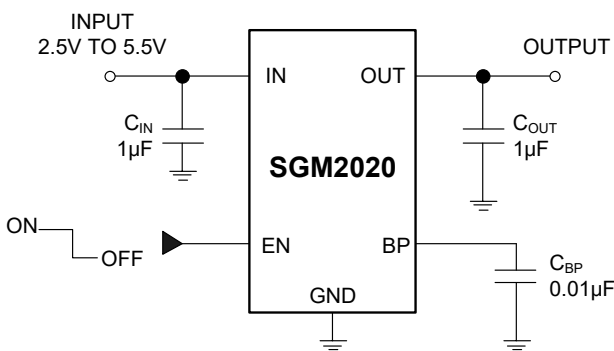


Figure 1. Typical Application Circuit

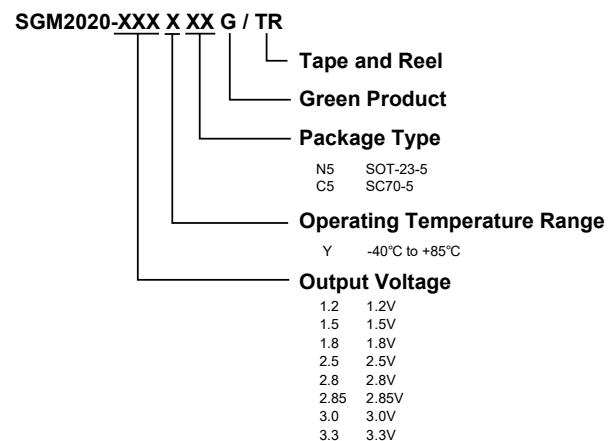
FEATURES

- **Operating Input Voltage Range: 2.5V to 5.5V**
- **Fixed Output Voltages:**
1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 2.85V, 3.0V, 3.3V
- **Output Voltage Accuracy: $\pm 2\%$ at $+25^{\circ}\text{C}$**
- **Low Output Noise: $30\mu\text{V}_{\text{RMS}}$ (TYP)**
- **Low Dropout Voltage: 270mV (TYP) at 300mA**
- **High PSRR: 67dB (TYP) at 1kHz**
- **Shutdown Current: $0.01\mu\text{A}$ (TYP)**
- **Low No Load Supply Current: $110\mu\text{A}$ (TYP)**
- **Quick Auto-Discharge in Shutdown Status**
- **Thermal Shutdown Protection**
- **Output Current Limit**
- **-40°C to $+85^{\circ}\text{C}$ Operating Temperature Range**
- **Available in Green SOT-23-5 and SC70-5 Packages**

APPLICATIONS

Modems
MP3 Players
Cellular Telephones
PCMCIA Cards
Palmtop Computers
Portable Electronics

PRODUCT NAME STRUCTURE



PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2020-1.2	SOT-23-5	-40°C to +85°C	SGM2020-1.2YN5G/TR	YK12	Tape and Reel, 3000
SGM2020-1.5	SOT-23-5	-40°C to +85°C	SGM2020-1.5YN5G/TR	YK15	Tape and Reel, 3000
SGM2020-1.8	SOT-23-5	-40°C to +85°C	SGM2020-1.8YN5G/TR	YK18	Tape and Reel, 3000
SGM2020-1.8	SC70-5	-40°C to +85°C	SGM2020-1.8YC5G/TR	YK18	Tape and Reel, 3000
SGM2020-2.5	SOT-23-5	-40°C to +85°C	SGM2020-2.5YN5G/TR	YK25	Tape and Reel, 3000
SGM2020-2.8	SOT-23-5	-40°C to +85°C	SGM2020-2.8YN5G/TR	YK28	Tape and Reel, 3000
SGM2020-2.8	SC70-5	-40°C to +85°C	SGM2020-2.8YC5G/TR	YK28	Tape and Reel, 3000
SGM2020-2.85	SOT-23-5	-40°C to +85°C	SGM2020-2.85YN5G/TR	YK2J	Tape and Reel, 3000
SGM2020-3.0	SOT-23-5	-40°C to +85°C	SGM2020-3.0YN5G/TR	YK30	Tape and Reel, 3000
SGM2020-3.3	SOT-23-5	-40°C to +85°C	SGM2020-3.3YN5G/TR	YK33	Tape and Reel, 3000

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

IN to GND	-0.3V to 6V
Output Short-Circuit Duration.....	Infinite
EN to GND.....	-0.3V to V_{IN}
OUT, BP to GND	-0.3V to ($V_{IN} + 0.3V$)
Junction Temperature.....	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s).....	+260°C
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

RECOMMENDED OPERATING CONDITIONS

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

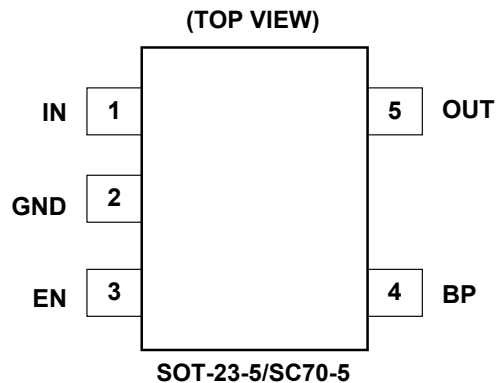
ESD SENSITIVITY CAUTION

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
SOT-23-5/SC70-5		
1	IN	Input Voltage Supply Pin. It is recommended to use a 1 μ F or larger ceramic capacitor from IN pin to ground to get good power supply decoupling. This ceramic capacitor should be placed as close as possible to IN pin.
2	GND	Ground.
3	EN	Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.
4	BP	Reference-Noise Bypass Pin. Bypass with an external capacitor C_{BP} can reduce output noise to very low level.
5	OUT	Regulator Output Pin.

ELECTRICAL CHARACTERISTICS(V_{IN} = V_{OUT (NOMINAL)} + 0.5V⁽¹⁾, Full = -40°C to +85°C, unless otherwise noted.)

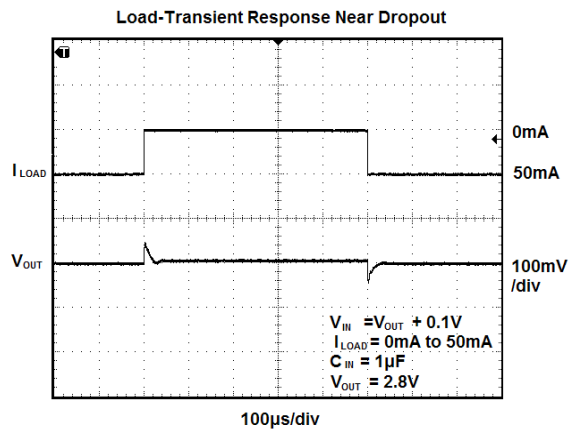
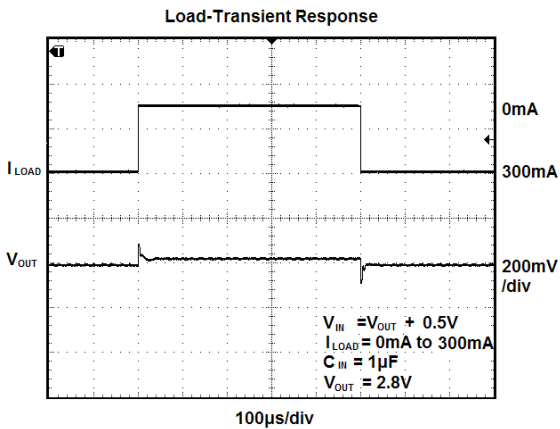
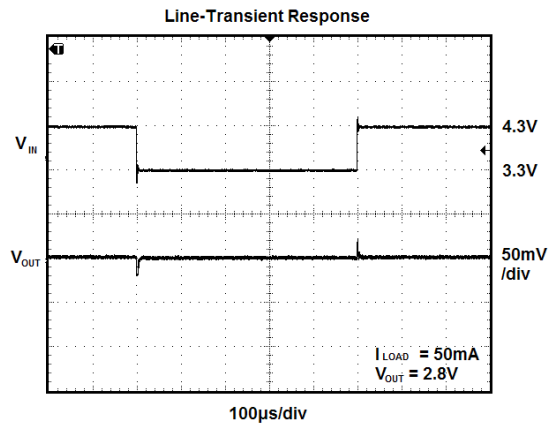
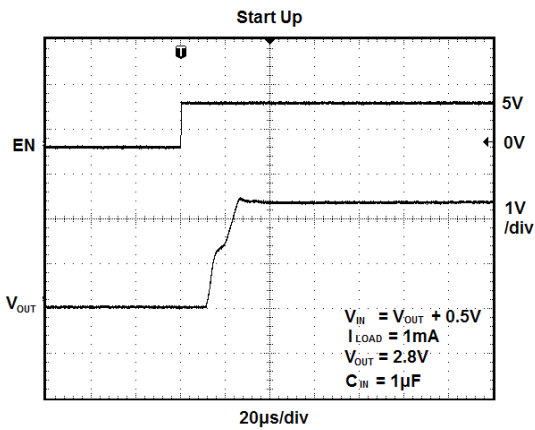
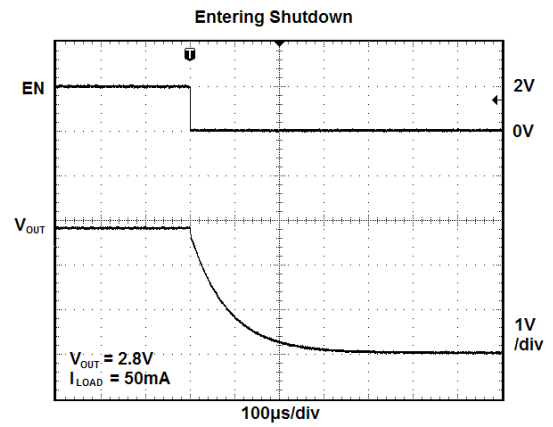
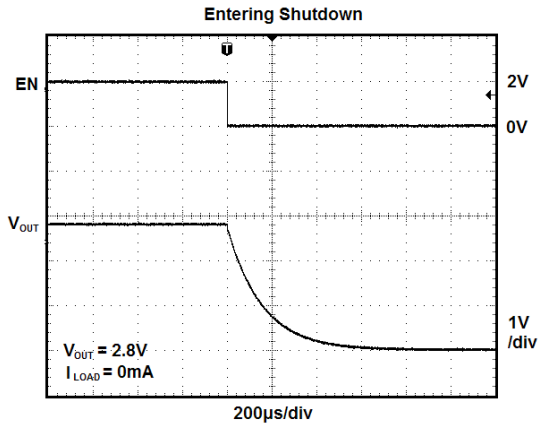
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
Input Voltage	V _{IN}		+25°C	2.5		5.5	V	
Output Voltage Accuracy ⁽¹⁾		I _{OUT} = 0.1mA	+25°C	-2		2	%	
Maximum Output Current		SOT-23-5	+25°C	300			mA	
		V _{OUT} = 1.8V, SC70-5 ⁽¹⁾		150				
		V _{OUT} > 2V, SC70-5 ⁽¹⁾		250				
Current Limit	I _{LIMIT}		+25°C	310	500		mA	
Ground Pin Current	I _Q	No load, EN = 2V	+25°C		110	220	μA	
Dropout Voltage ⁽²⁾		I _{OUT} = 1mA	+25°C		1		mV	
		I _{OUT} = 300mA			270	400		
On Resistance of Nch for Auto-Discharge	R _{DIS}	EN = 0V	+25°C		48		Ω	
Line Regulation ⁽¹⁾		V _{IN} = 2.5V or (V _{OUT} + 0.5V) to 5.5V, I _{OUT} = 1mA	+25°C		0.02	0.06	%/V	
Load Regulation		I _{OUT} = 0.1mA to 300mA, C _{OUT} = 1μF, V _{OUT} > 2V	+25°C		0.002	0.006	%/mA	
		I _{OUT} = 0.1mA to 300mA, C _{OUT} = 1μF, V _{OUT} ≤ 2V			0.004	0.01		
Output Voltage Noise	e _n	f = 10Hz to 100kHz, C _{BP} = 0.01μF, C _{OUT} = 10μF	+25°C		30		μV _{RMS}	
Power Supply Rejection Ratio	PSRR	C _{BP} = 0.1μF, I _{LOAD} = 50mA, C _{OUT} = 1μF, V _{IN} = V _{OUT} + 1V	f = 217Hz	+25°C		73		dB
			f = 1kHz	+25°C		67		dB
Shutdown⁽³⁾								
EN Input Threshold	V _{IH}	V _{IN} = 2.5V to 5.5V	Full	1.5			V	
	V _{IL}		Full			0.3		
EN Input Bias Current	I _{B(SHDN)}	EN = 0V and EN = 5.5V	+25°C		0.01	1	μA	
			Full		0.01			
Shutdown Supply Current	I _{Q(SHDN)}	EN = 0.4V	+25°C		0.01	1	μA	
			Full		0.01			
Shutdown Exit Delay ⁽⁴⁾		C _{BP} = 0.01μF, C _{OUT} = 1μF, No Load	+25°C		30		μs	
Thermal Protection								
Thermal Shutdown Temperature	T _{SHDN}				150		°C	
Thermal Shutdown Hysteresis	ΔT _{SHDN}				15		°C	

NOTES:

- V_{IN} = (V_{OUT (NOMINAL)} + 0.5V) or 2.5V, whichever is greater.
- The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} is 100mV below the value of V_{OUT} for V_{IN} = V_{OUT} + 0.5V (only applicable for V_{OUT} = 2.5V to 5.0V).
- V_{EN} = -0.3V to V_{IN}.
- Time needed for V_{OUT} to reach 90% of final value.

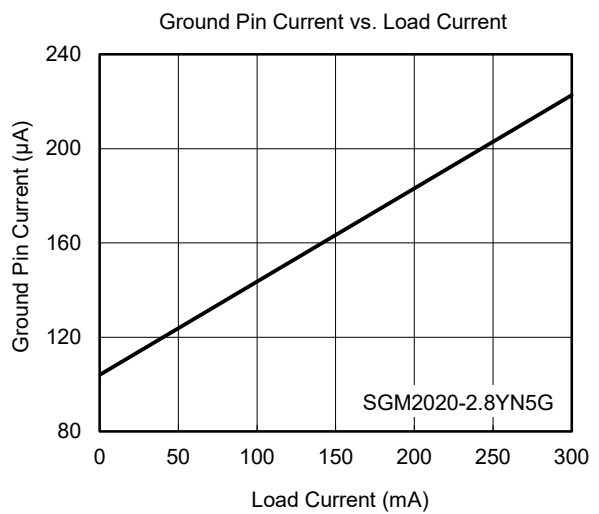
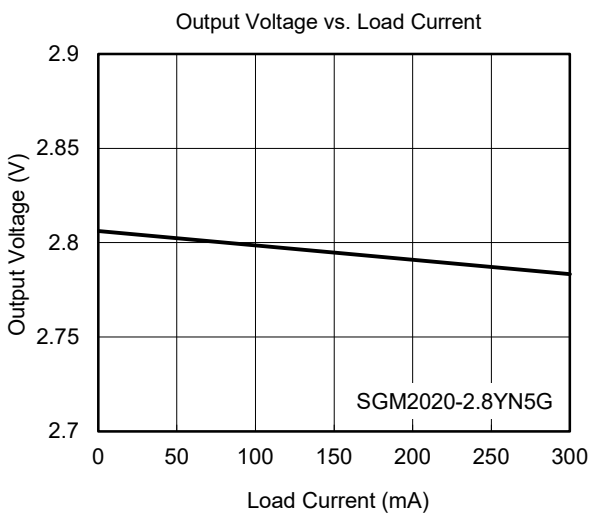
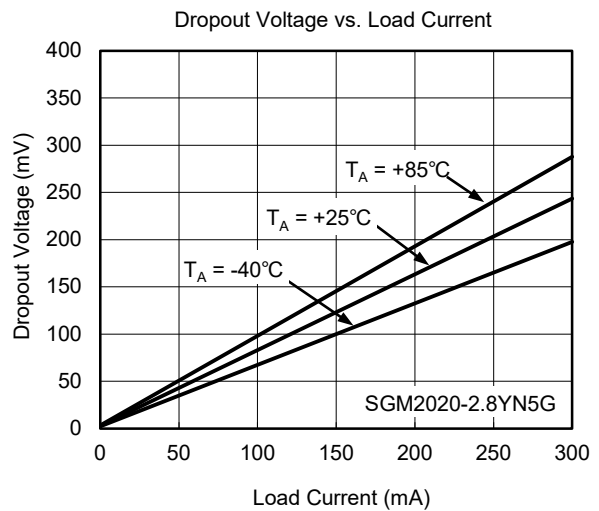
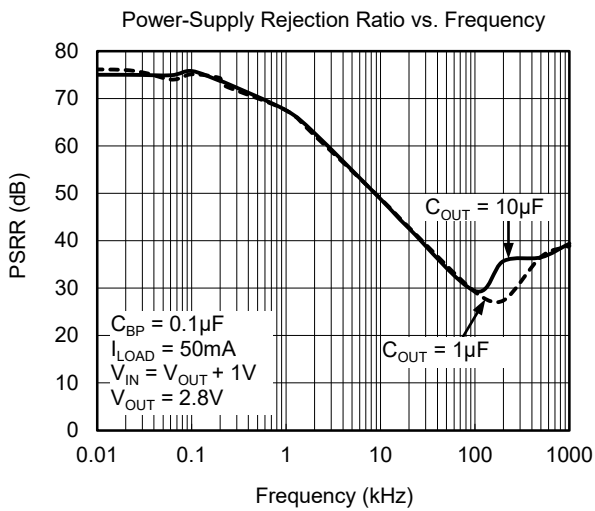
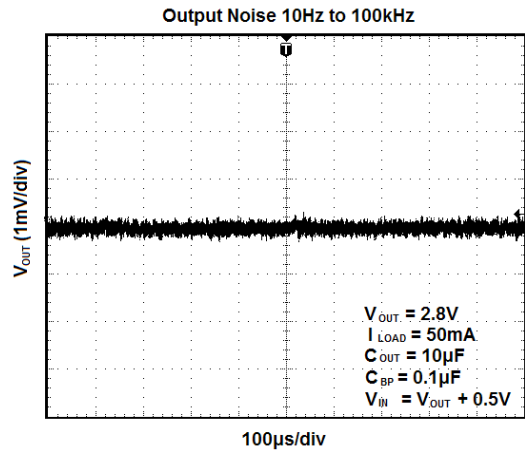
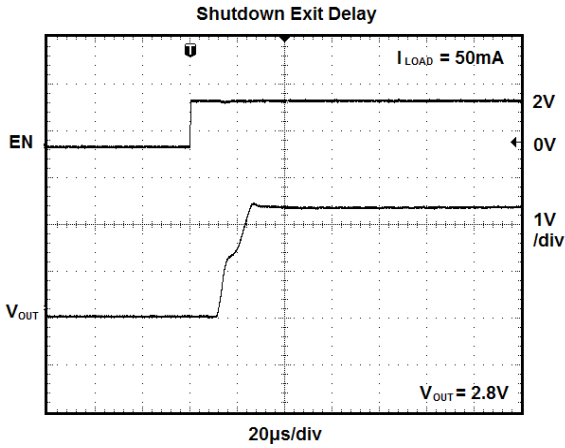
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or $2.5V$ (whichever is greater), $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0.01\mu F$, $T_A = +25^\circ C$, unless otherwise noted.



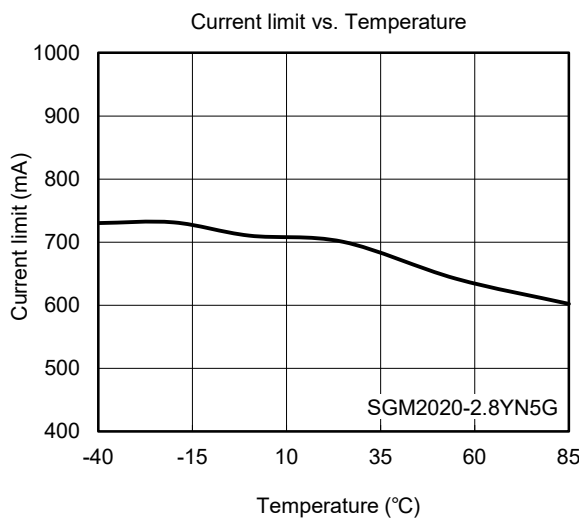
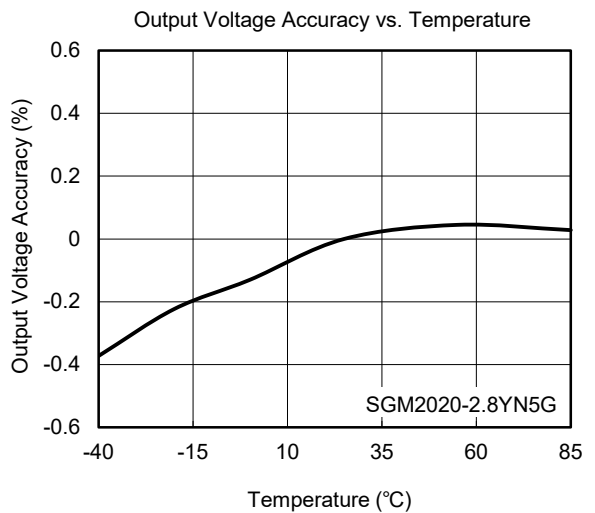
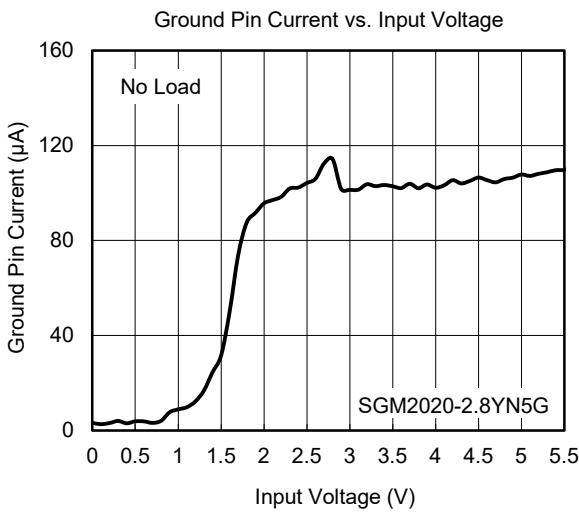
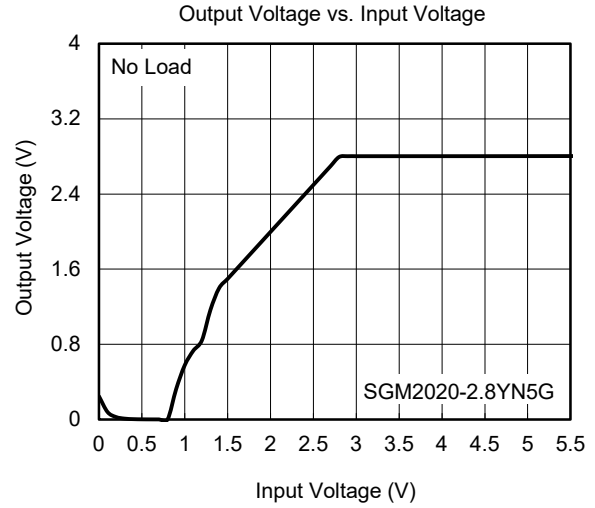
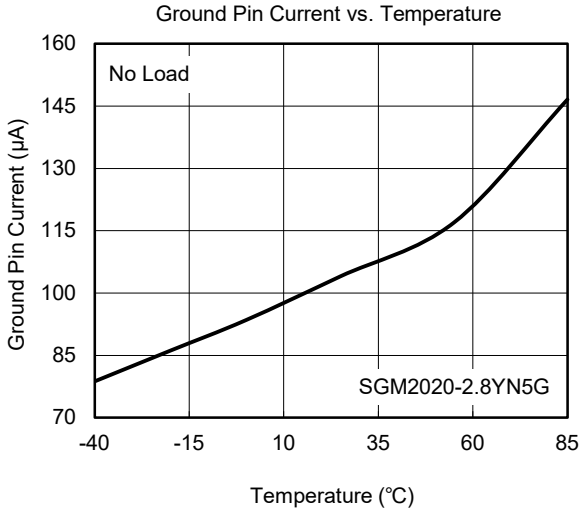
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or $2.5V$ (whichever is greater), $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0.01\mu F$, $T_A = +25^\circ C$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or $2.5V$ (whichever is greater), $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0.01\mu F$, $T_A = +25^\circ C$, unless otherwise noted.



APPLICATION INFORMATION

The SGM2020 is a low power and low dropout LDO and provides 300mA output current. These features make the SGM2020 useful in a variety of applications. The SGM2020 provides protection functions for output overload and overheating.

Input Capacitor Selection (C_{IN})

The input decoupling capacitor is necessary to be connected as close as possible to the IN pin for ensuring the device stability. 1 μ F or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance.

When V_{IN} is required to provide large current instantaneously, a large effective input capacitor is required. Multiple input capacitors can limit the input tracking inductance. Adding more input capacitors is available to restrict the ringing and to keep it below the device absolute maximum ratings.

Output Capacitor Selection (C_{OUT})

The output decoupling capacitor should be located as close as possible to the OUT pin. 1 μ F or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance.

Enable Control

The SGM2020 uses the EN pin to enable/disable its device and to deactivate/activate the output automatic

discharge function.

When the EN pin voltage is lower than 0.3V, the device is in shutdown state. There is no current flowing from IN pin to OUT pin. In this state, the automatic discharge transistor is active to discharge the output voltage through a 48 Ω (TYP) resistor.

When the EN pin voltage is higher than 1.5V, the device is in active state. The output voltage is regulated to the expected value and the automatic discharge transistor is turned off.

Output Current Limit

When overload events happen, the output current is internally limited to 500mA (TYP).

Thermal Shutdown

The SGM2020 can detect the temperature of die. When the die temperature exceeds the threshold value of thermal shutdown, the SGM2020 will be in shutdown state and it will remain in this state until the die temperature decreases to +135 $^{\circ}$ C.

Layout Guidelines

To get good PSRR, low output noise and high transient response performance, the input and output bypass capacitors must be placed as close as possible to the IN pin and OUT pin separately.

REVISION HISTORY

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

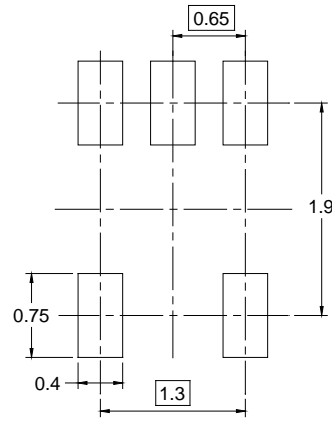
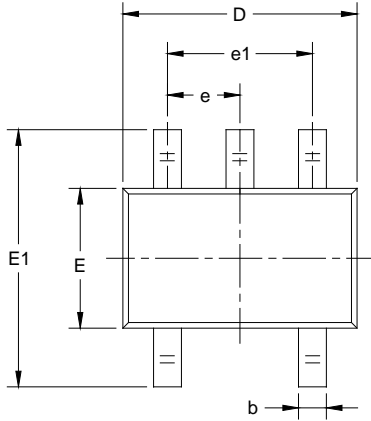
MAY 2023 – REV.B to REV.B.1

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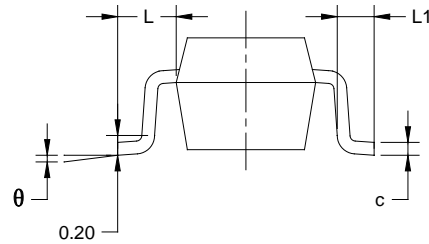
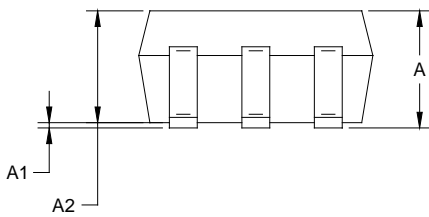
Updated Package Outline Dimensions.....9

PACKAGE OUTLINE DIMENSIONS

SC70-5



RECOMMENDED LAND PATTERN (Unit: mm)



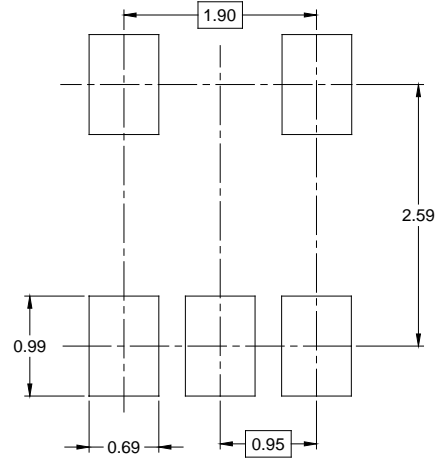
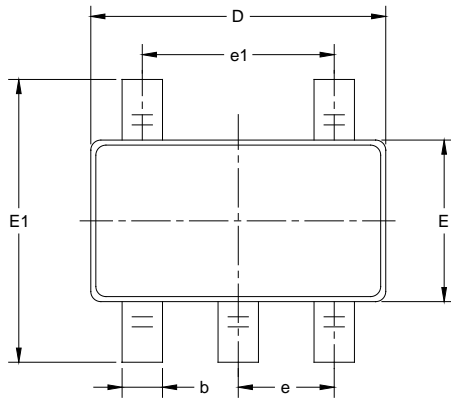
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.220	0.003	0.009
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 TYP	
e1	1.300 BSC		0.051 BSC	
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

NOTES:

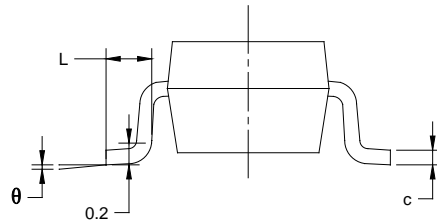
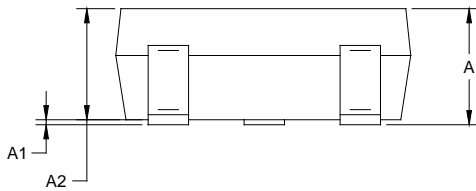
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

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°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

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
SC70-5	7"	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

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

DD0002