SGM2019
Low Power, Low Dropout, RF Linear Regulator

GENERAL DESCRIPTION

The SGM2019 is a low power, low noise 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 and the adjustable output voltage range is from 1.2V to 5.0V.

Other features include logic-controlled shutdown mode, output current limit and thermal shutdown protection.

The SGM2019 is available in Green SOT-23-5 and SC70-5 packages. It operates over an operating temperature range of -40℃ to +85℃.

FEATURES

- **Operating Input Voltage Range: 2.5V to 5.5V**
- **Fixed Output Voltages:**
  1.2V, 1.5V, 1.8V, 2.5V, 2.6V, 2.8V, 2.85V, 3.0V, 3.3V
- **Adjustable Output Voltage Range: 1.2V to 5.0V**
- **Output Voltage Accuracy: ±2.5% at +25℃**
- **Low Output Noise: 30μV_{RMS} (TYP)**
- **Low Dropout Voltage: 270mV (TYP) at 300mA**
- **High PSRR: 74dB (TYP) at 1kHz**
- **Shutdown Current: 0.01μA (TYP)**
- **Thermal Shutdown Protection**
- **Output Current Limit**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green SC70-5 and SOT-23-5 Packages**

APPLICATIONS

Modems
MP3 Players
Cellular Telephones
PCMCIA Cards
Palmtop Computers
Portable Electronics

PRODUCT NAME STRUCTURE

SGM2019 - X X X G / TR

Tape and Reel

Green Product

Package Type

C5	SC70-5
N5	SOT-23-5

Operating Temperature Range

Y	-40℃ to +85℃

Output Voltages

1.2	1.2V
1.5	1.5V
1.8	1.8V
2.5	2.5V
2.6	2.6V
2.8	2.8V
2.85	2.85V
3.0	3.0V
3.3	3.3V
ADJ	Adjustable

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2019-1.2	SOT-23-5	-40℃ to +85℃	SGM2019-1.2YN5G/TR	YJ12	Tape and Reel, 3000
SGM2019-1.2	SC70-5	-40℃ to +85℃	SGM2019-1.2YC5G/TR	YJ12	Tape and Reel, 3000
SGM2019-1.5	SOT-23-5	-40℃ to +85℃	SGM2019-1.5YN5G/TR	YJ15	Tape and Reel, 3000
SGM2019-1.5	SC70-5	-40℃ to +85℃	SGM2019-1.5YC5G/TR	YJ15	Tape and Reel, 3000
SGM2019-1.8	SOT-23-5	-40℃ to +85℃	SGM2019-1.8YN5G/TR	YJ18	Tape and Reel, 3000
SGM2019-1.8	SC70-5	-40℃ to +85℃	SGM2019-1.8YC5G/TR	YJ18	Tape and Reel, 3000
SGM2019-2.5	SOT-23-5	-40℃ to +85℃	SGM2019-2.5YN5G/TR	YJ25	Tape and Reel, 3000
SGM2019-2.5	SC70-5	-40℃ to +85℃	SGM2019-2.5YC5G/TR	YJ25	Tape and Reel, 3000
SGM2019-2.6	SOT-23-5	-40℃ to +85℃	SGM2019-2.6YN5G/TR	YJ26	Tape and Reel, 3000
SGM2019-2.6	SC70-5	-40℃ to +85℃	SGM2019-2.6YC5G/TR	YJ26	Tape and Reel, 3000
SGM2019-2.8	SOT-23-5	-40℃ to +85℃	SGM2019-2.8YN5G/TR	YJ28	Tape and Reel, 3000
SGM2019-2.8	SC70-5	-40℃ to +85℃	SGM2019-2.8YC5G/TR	YJ28	Tape and Reel, 3000
SGM2019-2.85	SOT-23-5	-40℃ to +85℃	SGM2019-2.85YN5G/TR	YJ2J	Tape and Reel, 3000
SGM2019-2.85	SC70-5	-40℃ to +85℃	SGM2019-2.85YC5G/TR	YJ2J	Tape and Reel, 3000
SGM2019-3.0	SOT-23-5	-40℃ to +85℃	SGM2019-3.0YN5G/TR	YJ30	Tape and Reel, 3000
SGM2019-3.0	SC70-5	-40℃ to +85℃	SGM2019-3.0YC5G/TR	YJ30	Tape and Reel, 3000
SGM2019-3.3	SOT-23-5	-40℃ to +85℃	SGM2019-3.3YN5G/TR	YJ33	Tape and Reel, 3000
SGM2019-3.3	SC70-5	-40℃ to +85℃	SGM2019-3.3YC5G/TR	YJ33	Tape and Reel, 3000
SGM2019-ADJ	SOT-23-5	-40℃ to +85℃	SGM2019-ADJYN5G/TR	YJAA	Tape and Reel, 3000
SGM2019-ADJ	SC70-5	-40℃ to +85℃	SGM2019-ADJYC5G/TR	YJAA	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/FB to GND ..... -0.3V to (V_{IN} + 0.3V)
Power Dissipation, P_D @ T_A = +25℃
SOT-23-5 ..... 0.4W
SC70-5 ..... 0.3W
Package Thermal Resistance
SOT-23-5, θ_{JA} ..... 260℃/W
SC70-5, θ_{JA} ..... 330℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
MM 400V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +85℃

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.

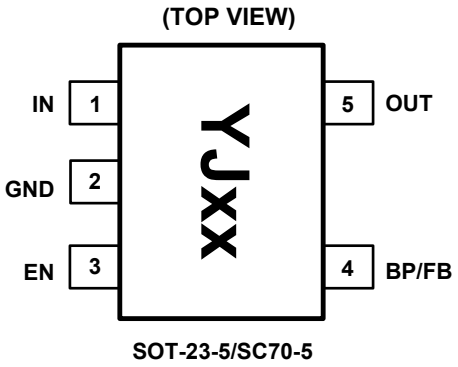
ESD SENSITIVITY CAUTION

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



NOTES:
1. The location of pin 1 on the YJxx is determined by orienting the package marking as shown.
2. “xx” is the output voltage code. (For Example: when the output voltage is 1.8V, it is expressed as 18.)

PIN DESCRIPTION

PIN SC70-5/ SOT-23-5	NAME	FUNCTION
1	IN	Input Voltage Supply Pin. It is recommended to use a 1μF or larger ceramic capacitor from IN pin to ground.
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 (fixed voltage version only). Bypass with an external capacitor C_{BP} can reduce output noise to very low level.
	FB	Feedback Voltage Input Pin (adjustable voltage version only). Connect this pin to the midpoint of an external resistor divider to adjust the output voltage.
5	OUT	Regulator Output Pin. It is recommended to use 1μF or larger ceramic output capacitor from OUT pin to ground. The capacitor should be located very close to this pin.

ELECTRICAL CHARACTERISTICS

(V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V [1], Full = -40℃ to +85℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			+25℃	2.5		5.5	V
Output Voltage Accuracy [1]		I_{OUT} = 0.1mA		+25℃	-2.5		2.5	%
Maximum Output Current [1]		SOT-23-5		+25℃	300			mA
		V_{OUT} = 1.2V, 1.5V, 1.8V, SC70-5			150			
		V_{OUT} > 2V, SC70-5			250			
Current Limit [1]	I_{LIM}			+25℃	310	500		mA
Ground Pin Current	I_Q	No load, EN = 2V		+25℃		100	200	μA
Dropout Voltage [2]		I_{OUT} = 1mA		+25℃		0.9		mV
		I_{OUT} = 300mA				270	400	
Line Regulation [1]	ΔV_{LNR}	V_{IN} = 2.5V or (V_{OUT} + 0.5V) to 5.5V, I_{OUT} = 1mA		+25℃		0.02	0.05	%/V
Load Regulation	ΔV_{LDR}	I_{OUT} =0.1mA to 300mA, C_{OUT} = 1μF, V_{OUT} > 2V		+25℃		0.002	0.005	%/mA
		I_{OUT} =0.1mA to 300mA, C_{OUT} = 1μF, V_{OUT} ≤ 2V				0.004	0.008	
Output Voltage Noise	e_n	f = 10Hz to 100kHz, C_{BP} = 0.01μF, C_{OUT} = 10μF		+25℃		30		μV_{RMS}
Power Supply Rejection Ratio	PSRR	C_{BP} = 0.1μF, I_{OUT} = 50mA, C_{OUT} = 1μF, V_{IN} = V_{OUT} + 1V	f = 217Hz	+25℃		77		dB
			f = 1kHz	+25℃		74		dB
SHUTDOWN [3]								
EN Input Threshold	V_{IH}	V_{IN} = 2.5V to 5.5V, V_{EN} = -0.3V to V_{IN}		Full	1.5			V
	V_{IL}			Full			0.3	
EN Input Bias Current	$I_{B(SHDN)}$	EN = 0V or EN = 5.5V		+25℃		0.01	1	μA
				Full		0.01		
Shutdown Supply Current	$I_{Q(SHDN)}$	EN = 0.4V		Full		0.01		μA
Shutdown Exit Delay [4]		C_{BP} = 0.01μF, C_{OUT} = 1μF, No Load		+25℃		30		μs
THERMAL PROTECTION								
Thermal Shutdown Temperature	T_{SHDN}					150		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}					15		℃

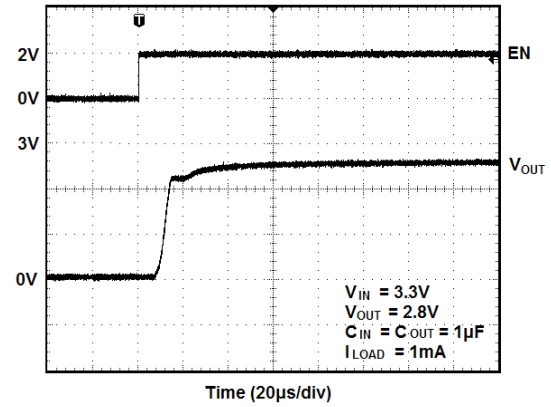
NOTES:

1. V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V or 2.5V, whichever is greater.
2. 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.)
3. V_{EN} = -0.3V to V_{IN}
4. Time needed for V_{OUT} to reach 90% of final value.

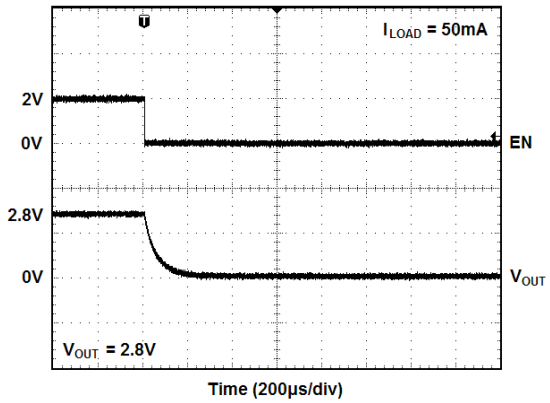
TYPICAL PERFORMANCE CHARACTERISTICS

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

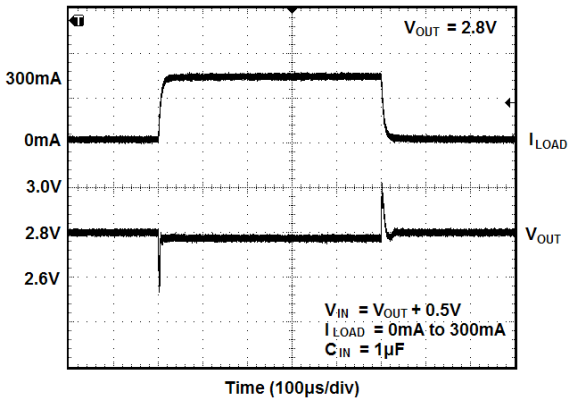
Start Up



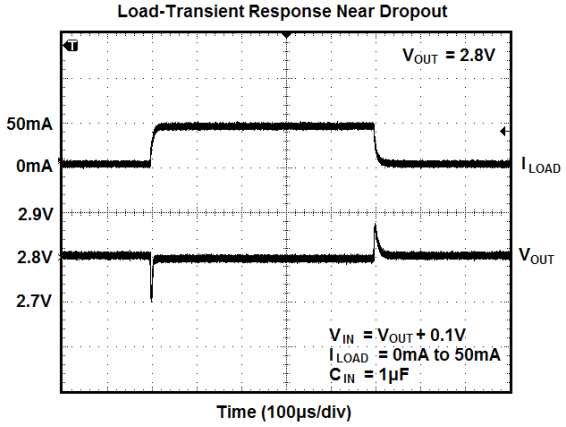
Entering Shutdown



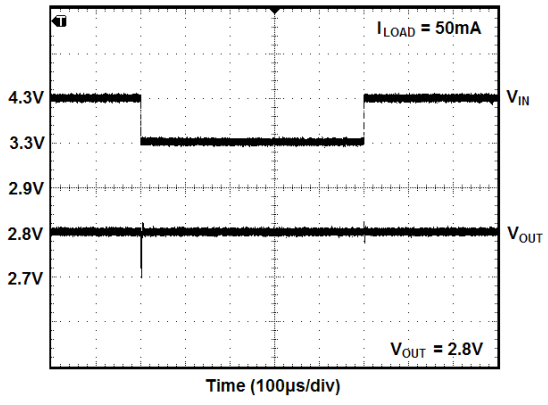
Load-Transient Response



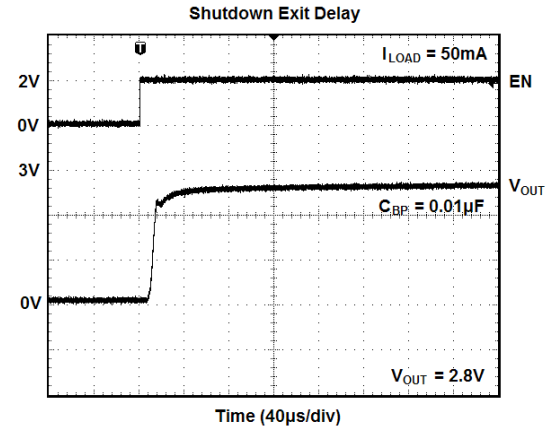
Load-Transient Response Near Dropout



Line-Transient Response



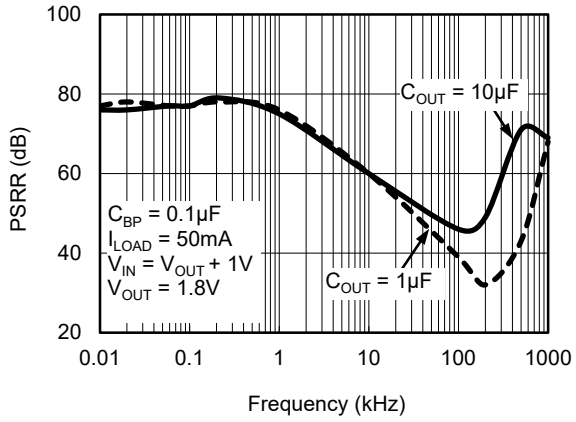
Shutdown Exit Delay



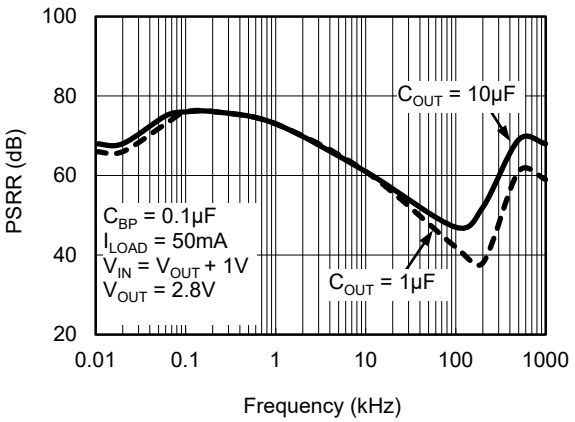
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

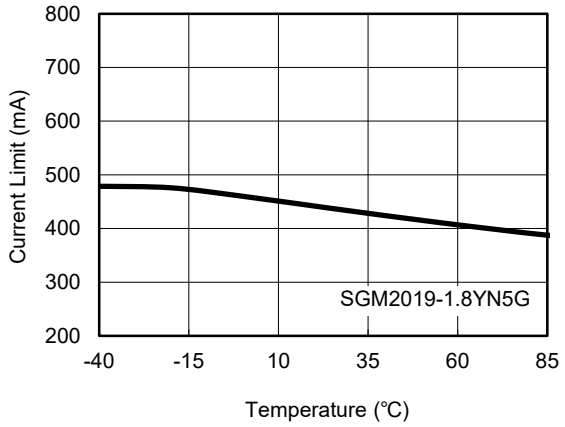
Power Supply Rejection Ratio vs. Frequency



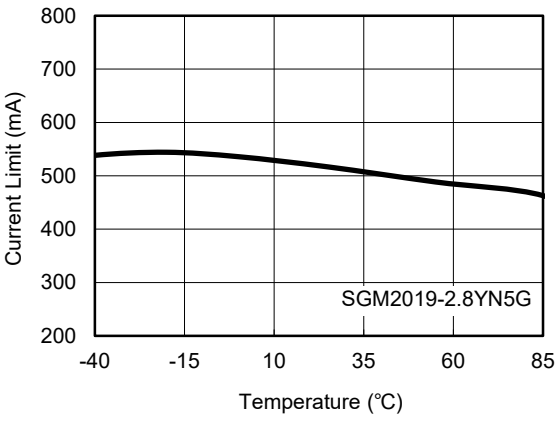
Power Supply Rejection Ratio vs. Frequency



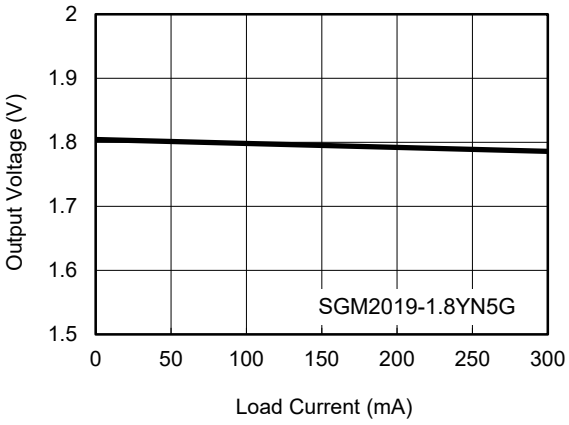
Current Limit vs. Temperature



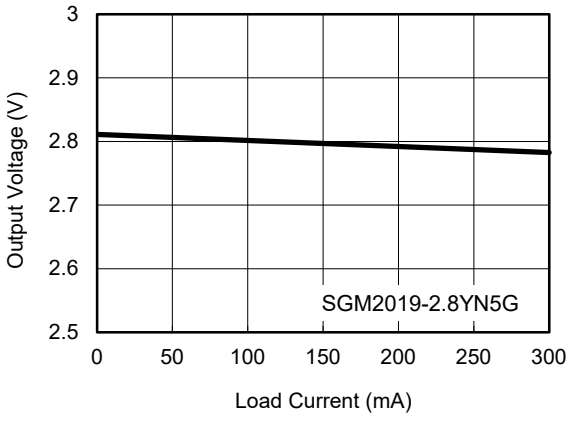
Current Limit vs. Temperature



Output Voltage vs. Load Current



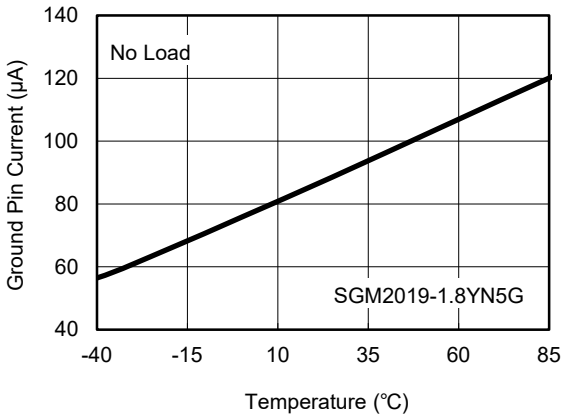
Output Voltage vs. Load Current



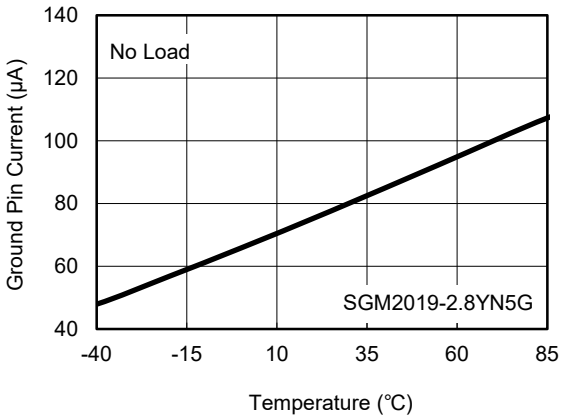
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

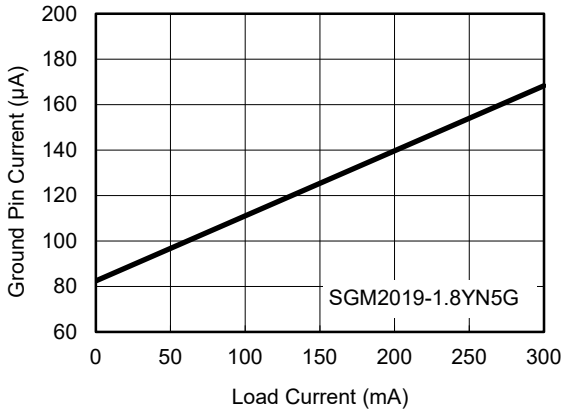
Ground Pin Current vs.Temperature



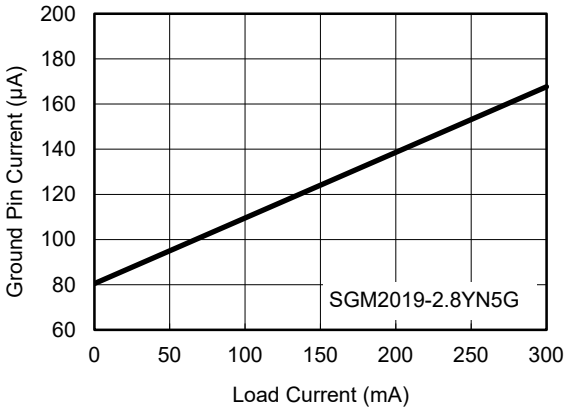
Ground Pin Current vs.Temperature



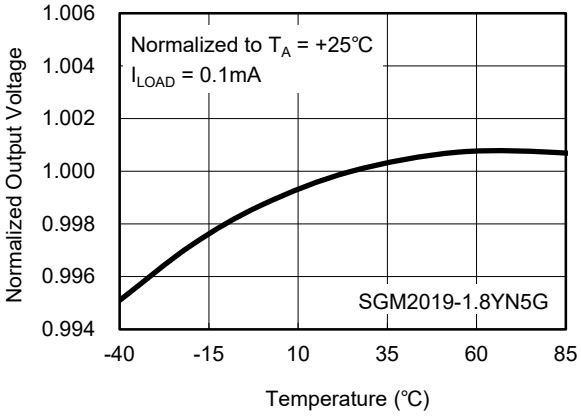
Ground Pin Current vs. Load Current



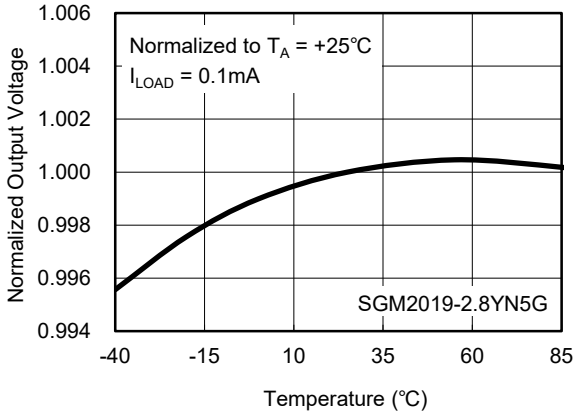
Ground Pin Current vs. Load Current



Normalized Output Voltage vs. Temperature



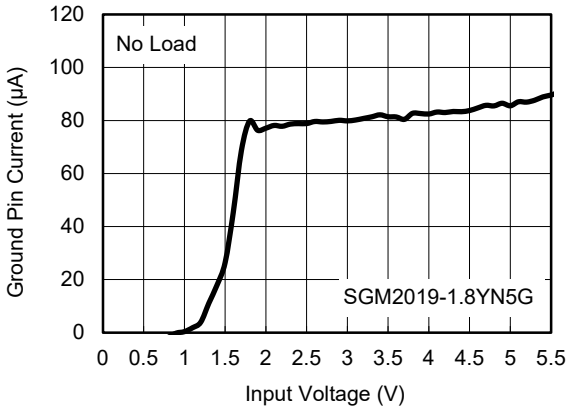
Normalized Output Voltage vs. Temperature



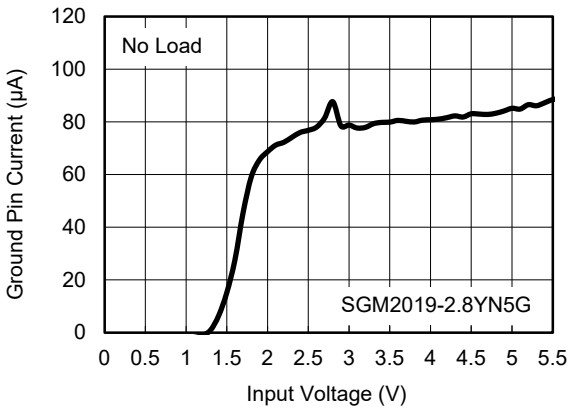
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

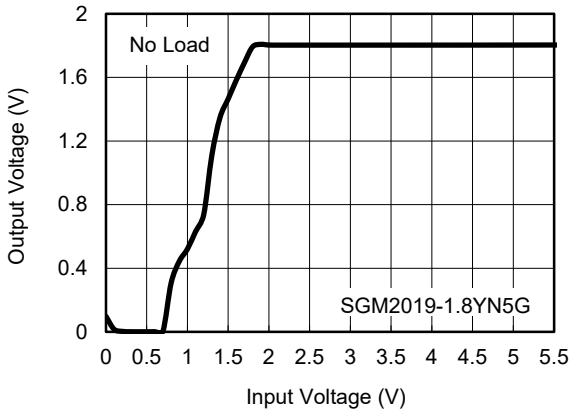
Ground Pin Current vs.Input Voltage



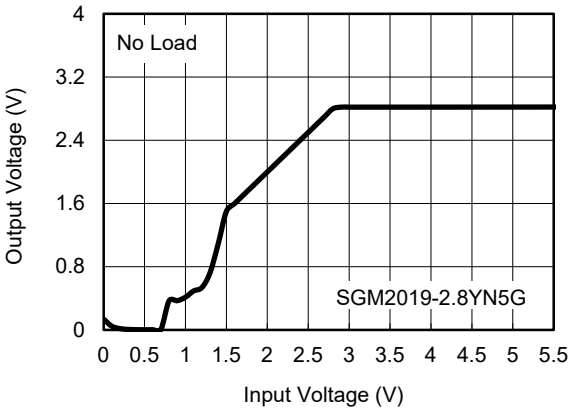
Ground Pin Current vs.Input Voltage



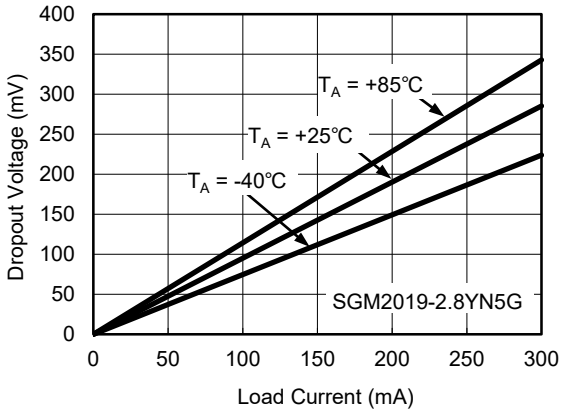
Output Voltage vs. Input Voltage



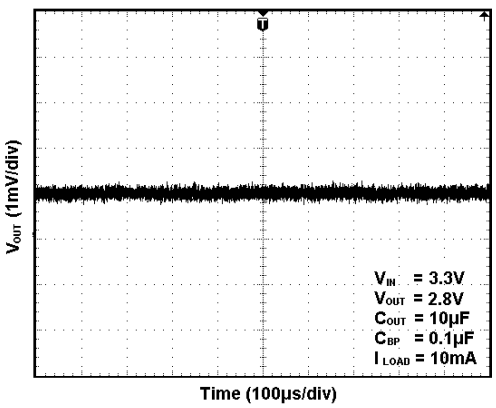
Output Voltage vs. Input Voltage



Dropout Voltage vs. Load Current



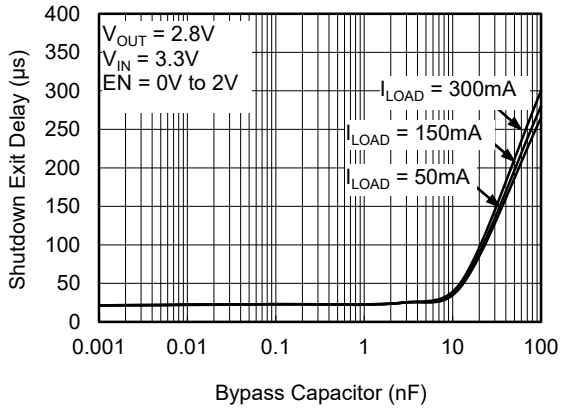
Output Noise 10Hz to 100kHz



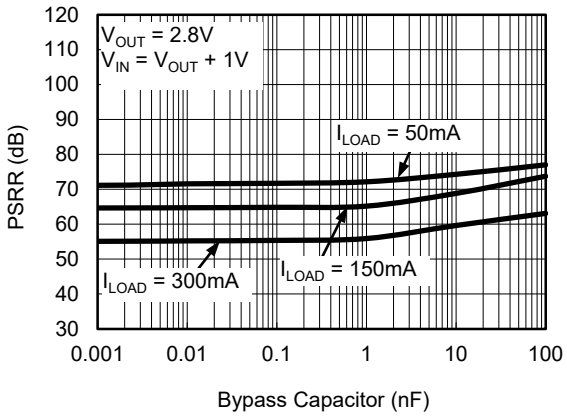
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

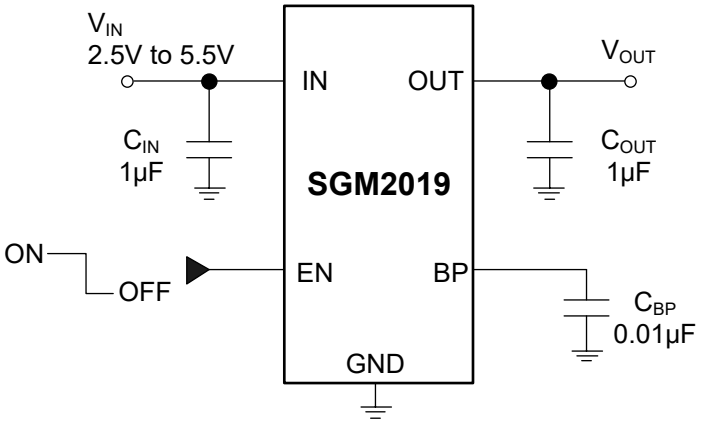
Shutdown Exit Delay vs. Bypass Capacitor



PSRR (217Hz) vs. Bypass Capacitor

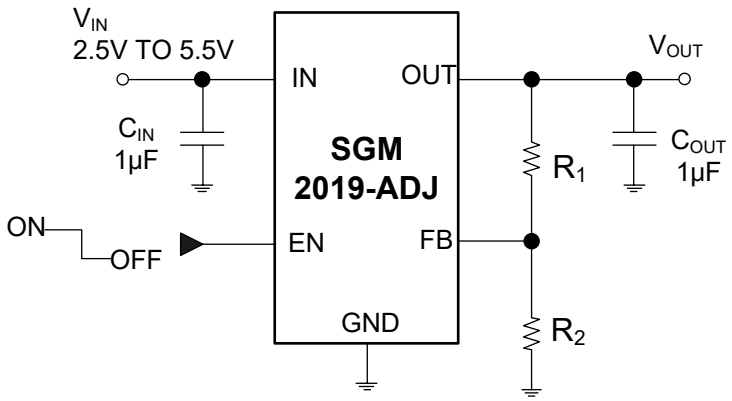


TYPICAL APPLICATION CIRCUITS



C_{BP} (nF)	Shutdown Exit Delay (μs) V_{OUT} = 2.8V, V_{IN} = 3.3V, EN = 0V to 2V			PSRR (dB) at 217Hz V_{OUT} = 2.8V, V_{IN} = V_{OUT} + 1V		
	I_{LOAD} = 50mA	I_{LOAD} = 150mA	I_{LOAD} = 300mA	I_{LOAD} = 50mA	I_{LOAD} = 150mA	I_{LOAD} = 300mA
None	21.5	21.5	21	71.1	64.4	55.0
0.001	21.5	21.5	22	71.1	64.6	55.1
0.01	22	22.5	22.5	71.6	64.7	55.2
0.1	22.5	23	23	71.7	64.8	55.4
1	25	27	28.5	72.1	65.2	55.9
10	30	35	39	74.3	68.8	59.6
100	265	280	300	77.0	73.7	63.1

TYPICAL APPLICATION CIRCUITS (continued)



Standard 1% Resistor Values for Common Output Voltages of Adjustable Voltage Version

V_{OUT} (V)	R_1 (kΩ)	R_2 (kΩ)
1.2	0	63.4
1.5	10.5	42.2
1.8	34	63.4
2.8	84.5	63.4
3.0	63.4	42.2
3.3	73.2	42.2
3.6	84.5	42.2
4.2	105	42.2

NOTE: $V_{OUT} = (R_1 + R_2)/ R_2 \times 1.207$

APPLICATION INFORMATION

The SGM2019 is a low power and low dropout LDO and provides 300mA output current. These features make the device a reliable solution to solve many challenging problems in the generation of clean and accurate power supply. The high performance also makes the SGM2019 useful in a variety of applications. The SGM2019 provides protection functions for output overload, output short-circuit condition 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. 1μF 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. 1μF or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance. The minimum effective capacitance of C_{OUT} that SGM2019 can remain stable is 0.5μF. For ceramic capacitor, temperature, DC bias and package size will change the effective capacitance, so enough margin of C_{OUT} must be considered in design. Larger capacitance and lower ESR C_{OUT} will help improve the load transient response and increase the high frequency PSRR.

Enable Control

The SGM2019 uses the EN pin to enable/disable its device.

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.

When the EN pin voltage is higher than 1.5V, the device is in active state. The output voltage is regulated to expected value.

Output Current Limit and Short-Circuit Protection

When overload events happen, the output current is internally limited to 500mA (TYP). When the OUT pin is shorted to ground, the short-circuit protection will limit the output current.

Thermal Shutdown

The SGM2019 can detect the temperature of die. When the die temperature exceeds the threshold value of thermal shutdown, the SGM2019 will be in shutdown state and it will remain in this state until the die temperature decreases to +135℃.

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. V_{IN} and V_{OUT} had better use separate ground planes and these ground planes are single point connected to the GND pin.

REVISION HISTORY

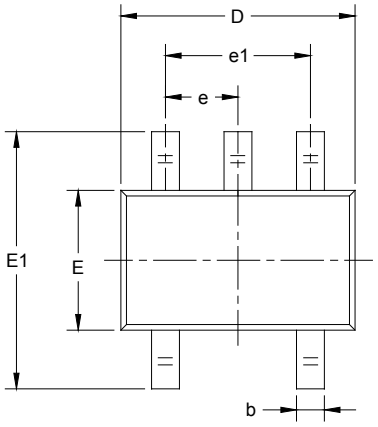
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

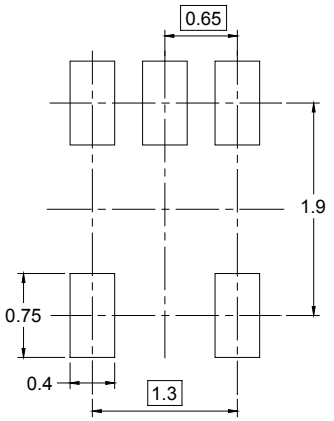
APRIL 2016 – REV.C to REV.C.1	Page
Changed the Normalized Output Voltage vs. Temperature curves	8

MAY 2012 – REV.B.4 to REV.C	Page
Added SGM2019-2.6YC5G version	All

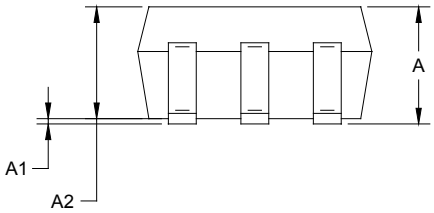
PACKAGE OUTLINE DIMENSIONS

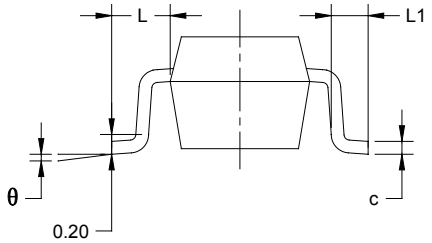
SC70-5





RECOMMENDED LAND PATTERN (Unit: mm)

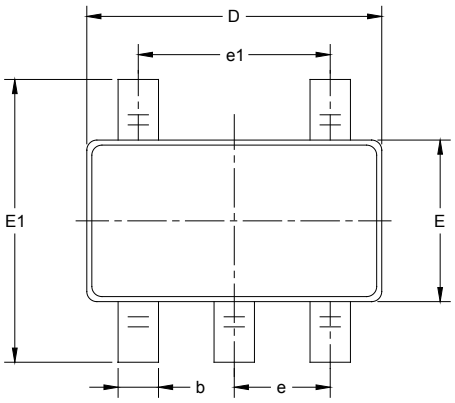


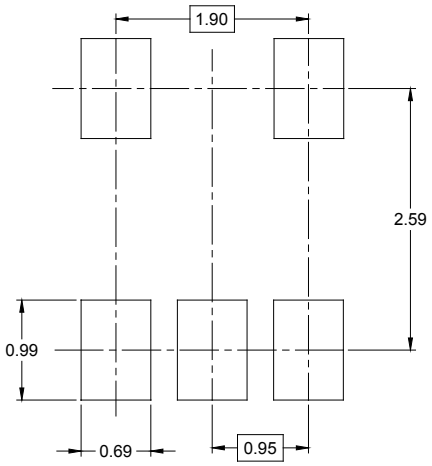


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 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°

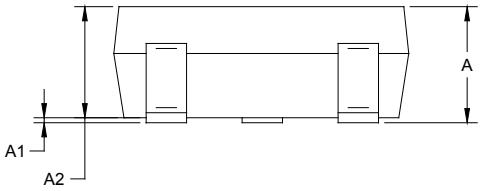
PACKAGE OUTLINE DIMENSIONS

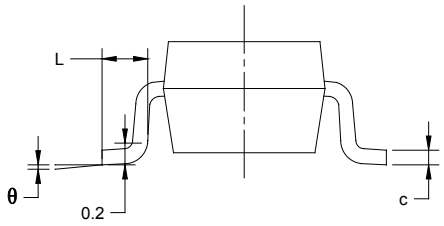
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

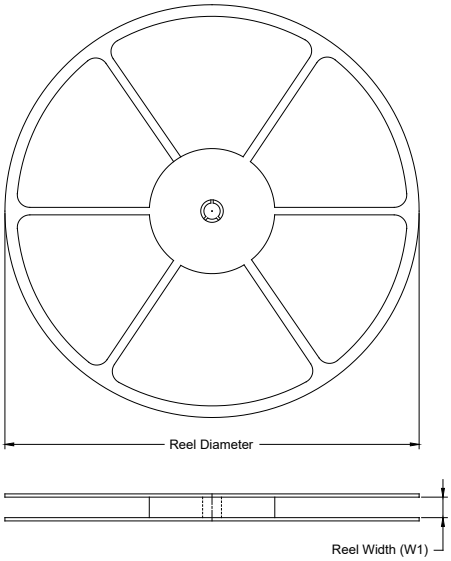




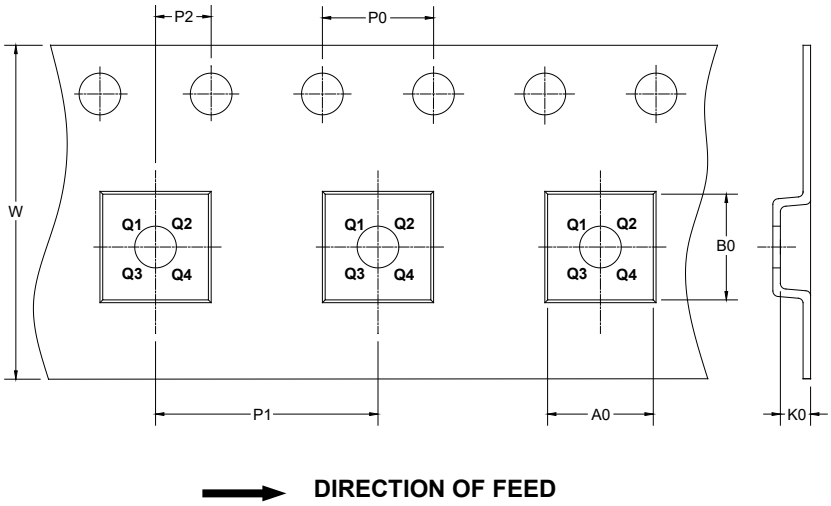
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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



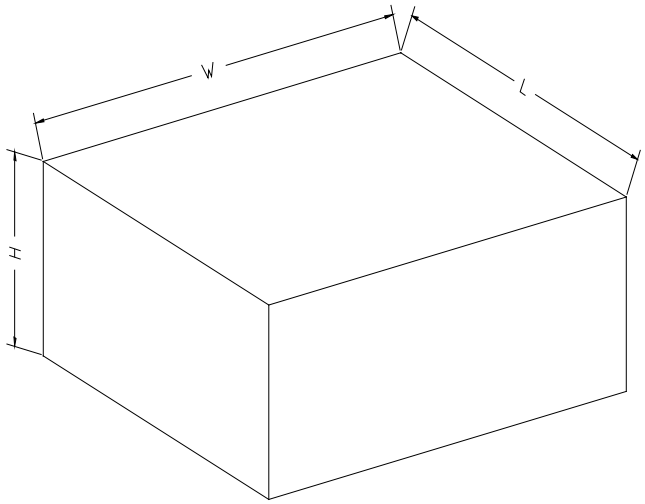
NOTE: The picture is only for reference. Please make the object as the standard.

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
SC70-5	7″	9.5	2.25	2.55	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

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