SGM803B/SGM809B/SGM810B Low Power Microprocessor Supervisory Circuit

GENERAL DESCRIPTION

The SGM803B, SGM809B and SGM810B are integrated microprocessor supervisory devices which can be reset under power-up, power-down or even voltage reduction brownout conditions. When V_{CC} is as low as 1V, the reset output can still operate. On the power-on state, the internal timer maintains a 240ms reset assertion, which keeps the microprocessor in the reset state until the condition is stable.

The SGM803B has an active-low open-drain nRESET output. The SGM809B has an active-low push-pull nRESET output and the SGM810B has an active-high push-pull RESET output. These devices provide five reset threshold voltage options for 3V, 3.3V and 5V voltage monitoring.

The devices all have a low quiescent current of 300nA (TYP). And the glitch immunity within the reset comparator protects it from fast transients on V_{CC}.

The SGM803B, SGM809B and SGM810B are available in Green SOT-23-3 and SOT-23 packages. They operates over a junction temperature range of -40℃ to +125℃.

FEATURES

- **Superior Upgrade for MAX803/MAX809/MAX810 and ADM803/ADM809/ADM810**
- **High Accuracy Fixed Detection Options: 3V, 3.3V and 5V**
- **Low Supply Current: 300nA (TYP)**
- **Power-on Reset Pulse Width: 150ms (MIN)**
- **Reset Output Options:**
  - **Open-Drain nRESET Output (SGM803B)**
  - **Push-Pull nRESET Output (SGM809B)**
  - **Push-Pull RESET Output (SGM810B)**
- **Reset Valid Down to V_{CC} = 1V**
- **Fully Specified over Temperature**
- **V_{CC} Transient Immunity**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green SOT-23-3 and SOT-23 Packages**

APPLICATIONS

Battery-Powered Applications
Microprocessor Systems
Portable Equipment
Safety Systems
Intelligent Instruments

TYPICAL APPLICATION

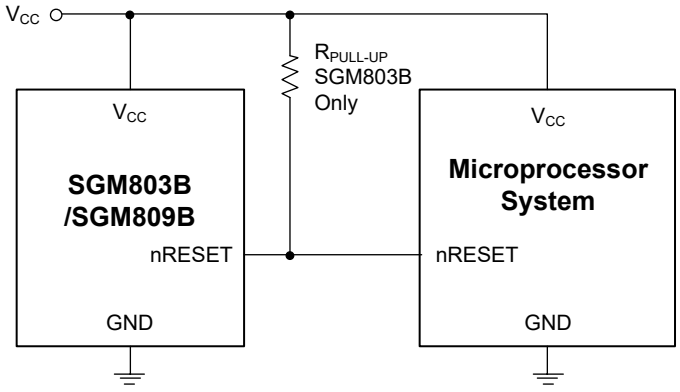


Figure 1. Typical Application Circuit

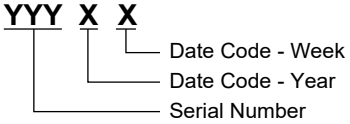
PACKAGE/ORDERING INFORMATION

MODEL	RESET THRESHOLD (V)	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM803B	4.38	SOT-23-3	SGM803B-MXN3G/TR	M18XX	Tape and Reel, 3000
	4.38	SOT-23	SGM803B-MXN3LG/TR	M19XX	Tape and Reel, 3000
	4.00	SOT-23-3	SGM803B-JXN3G/TR	M1AXX	Tape and Reel, 3000
	4.00	SOT-23	SGM803B-JXN3LG/TR	M1BXX	Tape and Reel, 3000
	3.08	SOT-23-3	SGM803B-TXN3G/TR	M1CXX	Tape and Reel, 3000
	3.08	SOT-23	SGM803B-TXN3LG/TR	M1DXX	Tape and Reel, 3000
	2.93	SOT-23-3	SGM803B-SXN3G/TR	M1EXX	Tape and Reel, 3000
	2.93	SOT-23	SGM803B-SXN3LG/TR	GZ5XX	Tape and Reel, 3000
	2.63	SOT-23-3	SGM803B-RXN3G/TR	M1FXX	Tape and Reel, 3000
	2.63	SOT-23	SGM803B-RXN3LG/TR	M20XX	Tape and Reel, 3000
SGM809B	4.38	SOT-23-3	SGM809B-MXN3G/TR	M21XX	Tape and Reel, 3000
	4.38	SOT-23	SGM809B-MXN3LG/TR	M22XX	Tape and Reel, 3000
	4.00	SOT-23-3	SGM809B-JXN3G/TR	M23XX	Tape and Reel, 3000
	4.00	SOT-23	SGM809B-JXN3LG/TR	M24XX	Tape and Reel, 3000
	3.08	SOT-23-3	SGM809B-TXN3G/TR	M25XX	Tape and Reel, 3000
	3.08	SOT-23	SGM809B-TXN3LG/TR	GZ4XX	Tape and Reel, 3000
	2.93	SOT-23-3	SGM809B-SXN3G/TR	GZ0XX	Tape and Reel, 3000
	2.93	SOT-23	SGM809B-SXN3LG/TR	GYEXX	Tape and Reel, 3000
	2.63	SOT-23-3	SGM809B-RXN3G/TR	GZ2XX	Tape and Reel, 3000
	2.63	SOT-23	SGM809B-RXN3LG/TR	GZ1XX	Tape and Reel, 3000
SGM810B	4.38	SOT-23-3	SGM810B-MXN3G/TR	M26XX	Tape and Reel, 3000
	4.38	SOT-23	SGM810B-MXN3LG/TR	M27XX	Tape and Reel, 3000
	4.00	SOT-23-3	SGM810B-JXN3G/TR	M28XX	Tape and Reel, 3000
	4.00	SOT-23	SGM810B-JXN3LG/TR	M29XX	Tape and Reel, 3000
	3.08	SOT-23-3	SGM810B-TXN3G/TR	M2AXX	Tape and Reel, 3000
	3.08	SOT-23	SGM810B-TXN3LG/TR	M2BXX	Tape and Reel, 3000
	2.93	SOT-23-3	SGM810B-SXN3G/TR	M2CXX	Tape and Reel, 3000
	2.93	SOT-23	SGM810B-SXN3LG/TR	GYFXX	Tape and Reel, 3000
	2.63	SOT-23-3	SGM810B-RXN3G/TR	M2DXX	Tape and Reel, 3000
	2.63	SOT-23	SGM810B-RXN3LG/TR	GZ3XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.

SOT-23-3/SOT-23



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

V_{CC} ..... -0.3V to 6V
RESET, nRESET ..... -0.3V to V_{CC} + 0.3V
Input Current, V_{CC} 20mA
Output Current, RESET, nRESET 20mA
Rate of Rise, V_{CC} 100V/μs
Power Dissipation, P_D @ T_A = +25℃
SOT-23-3 ..... 0.4W
Package Thermal Resistance
SOT-23-3, θ_{JA} ..... 250℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
MM 400V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

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.

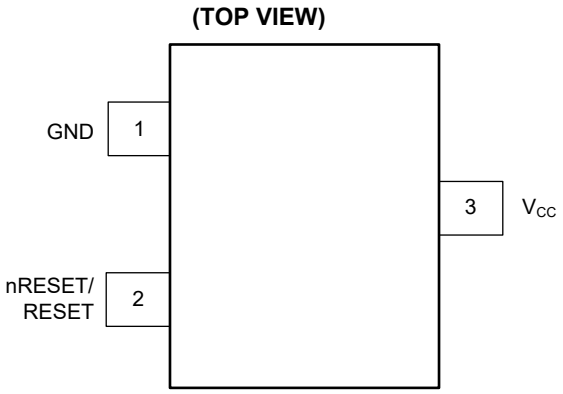
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



SOT-23-3/SOT-23

PIN DESCRIPTION

NAME	PIN NUMBER			FUNCTION
	SGM803B	SGM809B	SGM810B	
GND	1	1	1	Ground.
nRESET	2	2	—	Active-Low Reset Output Pin (SGM803B/SGM809B). nRESET will remain low if V_{CC} is below the reset threshold. It goes (or remains) low for 240ms after V_{CC} rises above the reset threshold.
RESET	—	—	2	Active-High Reset Output Pin (SGM810B). RESET will remain high if V_{CC} is below the reset threshold. It goes (or remains) high for 240ms after V_{CC} rises above the reset threshold.
V_{CC}	3	3	3	Supply Voltage Pin.

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5V for M/J Models, 3.3V for T/S Models, 3V for R Model, unless otherwise noted.)

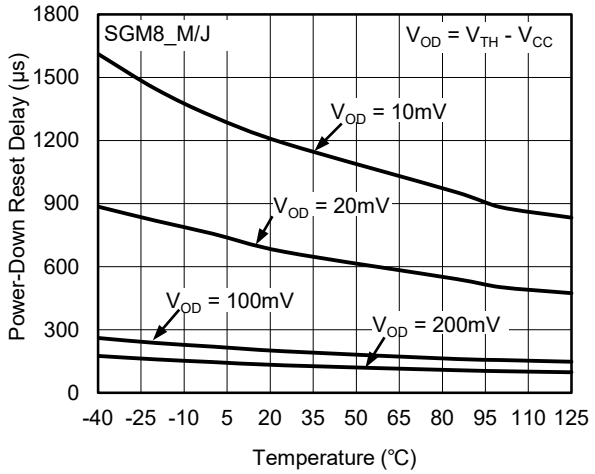
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply					
Voltage	T_A = +25℃	1		5.5	V
	T_A = -40℃ to +125℃	1.1		5.5	
Current	V_{CC} < 5.5V, SGM8_M/J, T_A = +25℃		420	560	nA
	V_{CC} < 5.5V, SGM8_M/J, T_A = -40℃ to +125℃			730	
	V_{CC} < 3.6V, SGM8_R/S/T, T_A = +25℃		300	430	nA
	V_{CC} < 3.6V, SGM8_R/S/T, T_A = -40℃ to +125℃			590	
Reset Voltage Threshold					
SGM8_M	V_{CC} falling, T_A = +25℃	4.247	4.38	4.452	V
	V_{CC} falling, T_A = -40℃ to +125℃	4.217		4.482	
SGM8_J	V_{CC} falling, T_A = +25℃	3.883	4.00	4.072	V
	V_{CC} falling, T_A = -40℃ to +125℃	3.859		4.101	
SGM8_T	V_{CC} falling, T_A = +25℃	3.001	3.08	3.151	V
	V_{CC} falling, T_A = -40℃ to +125℃	2.966		3.181	
SGM8_S	V_{CC} falling, T_A = +25℃	2.860	2.93	2.998	V
	V_{CC} falling, T_A = -40℃ to +125℃	2.841		3.018	
SGM8_R	V_{CC} falling, T_A = +25℃	2.571	2.63	2.698	V
	V_{CC} falling, T_A = -40℃ to +125℃	2.525		2.745	
Hysteresis Voltage Ratio	V_{CC} rising		0.5%		
Reset Threshold Temperature Coefficient			35		ppm/℃
V_{CC} to RESET/nRESET Delay	V_{CC} falling from (V_{TH} + V_{HYS}) × (1 + 5%) to V_{TH} × (1 - 5%) (1)		110		μs
Reset Active Timeout Period	T_A = +25℃	150	240	370	ms
	T_A = -40℃ to +125℃	120		400	
RESET/nRESET Output Voltage					
Low (SGM803B-R/S/T) Low (SGM809B-R/S/T)	V_{CC} = $V_{TH(MIN)}$, I_{SINK} = 1.2mA			0.3	V
Low (SGM803B-M/J) Low (SGM809B-M/J)	V_{CC} = $V_{TH(MIN)}$, I_{SINK} = 3.2mA			0.4	V
Low (SGM803B-R/S/T/M/J) Low (SGM809B-R/S/T/M/J)	V_{CC} > 1V, I_{SINK} = 50μA			0.3	V
High (SGM809B-R/S/T)	V_{CC} > $V_{TH(MAX)}$, I_{SOURCE} = 500μA	0.8 × V_{CC}			V
High (SGM809B-M/J)	V_{CC} > $V_{TH(MAX)}$, I_{SOURCE} = 800μA	V_{CC} - 1.5			V
Low (SGM810B-R/S/T)	V_{CC} = $V_{TH(MAX)}$, I_{SINK} = 1.2mA			0.3	V
Low (SGM810B-M/J)	V_{CC} = $V_{TH(MAX)}$, I_{SINK} = 3.2mA			0.4	V
High (SGM810B-R/S/T/M/J)	1.8V < V_{CC} < $V_{TH(MIN)}$, I_{SOURCE} = 150μA	0.8 × V_{CC}			V
nRESET Open-Drain Output Leakage Current (SGM803B)	V_{CC} > V_{TH}, reset de-asserted			1	μA

NOTE:

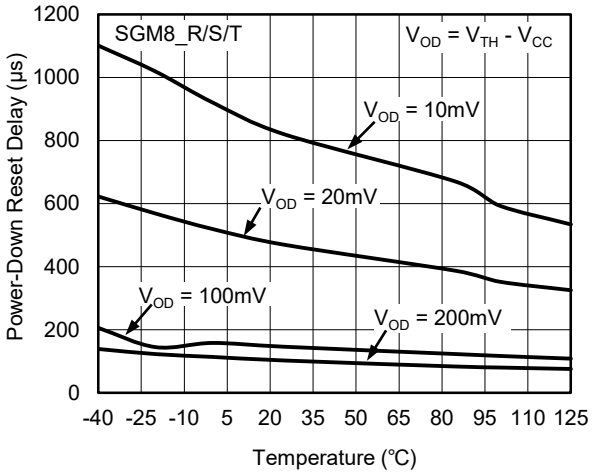
1. V_{TH} stands for reset voltage threshold and V_{HYS} stands for hysteresis voltage.

TYPICAL PERFORMANCE CHARACTERISTICS

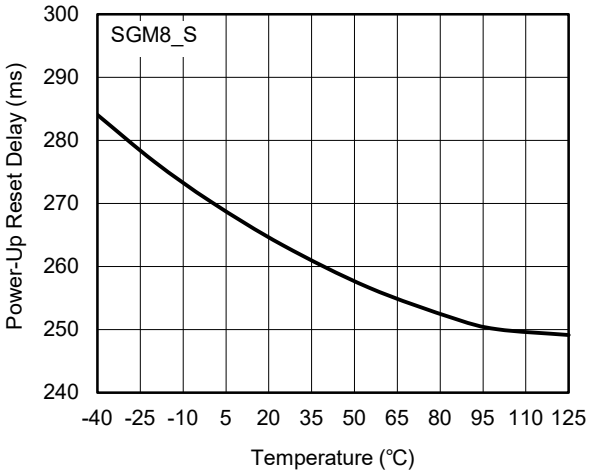
Power-Down Reset Delay vs. Temperature



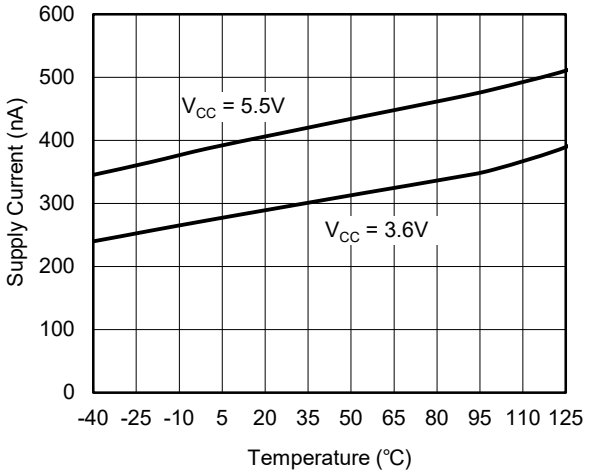
Power-Down Reset Delay vs. Temperature



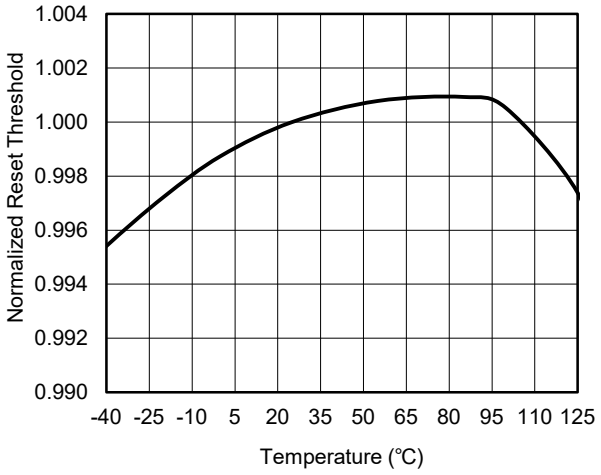
Power-Up Reset Delay vs. Temperature



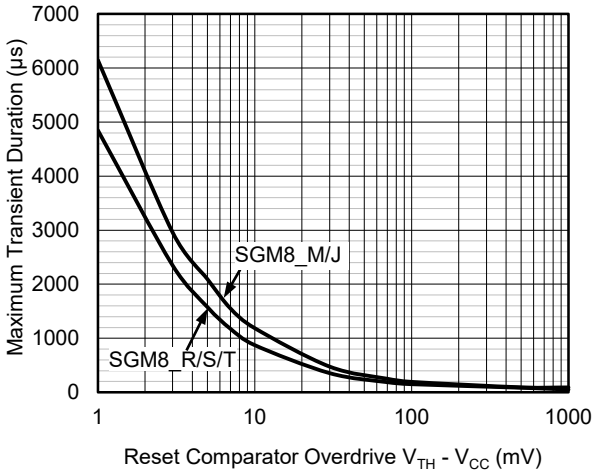
Supply Current vs. Temperature (No Load)



Normalized Reset Voltage Threshold vs. Temperature

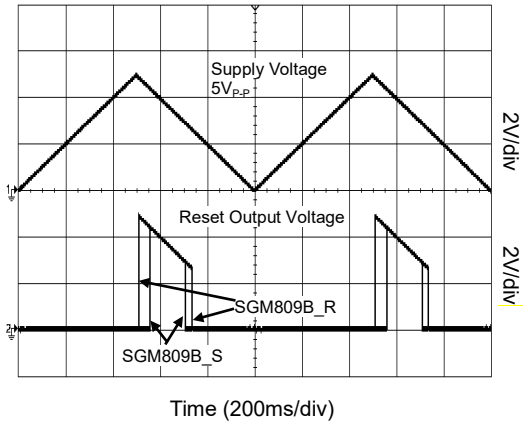


Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

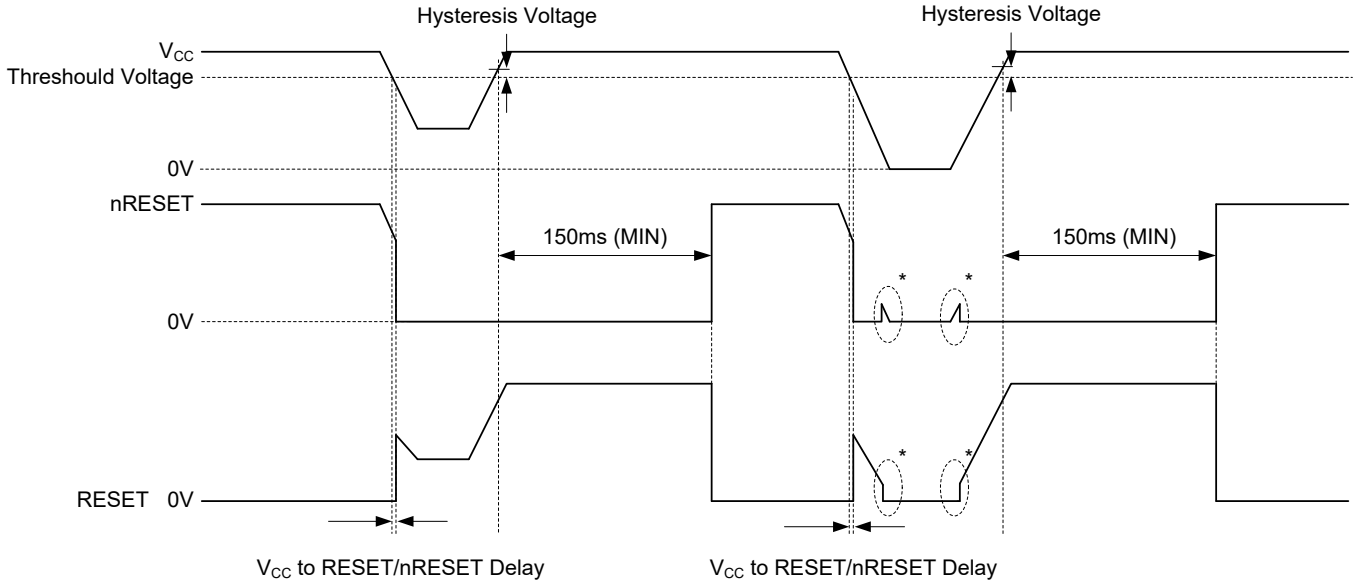
Reset Output Voltage vs. Supply Voltage



DETAILED DESCRIPTION

Reset Timing

The reset signal is asserted low for the SGM809B and high for the SGM810B when the power supply voltage falls below the threshold trip voltage and remains asserted for at least 150ms after the power supply voltage has risen above the threshold.



NOTE *: Undefined below minimum operating voltage.

Figure 2. Reset Timing Diagram

APPLICATION INFORMATION

Precise Reset Threshold

When the supply voltage drops significantly for the power supply fault, the SGM803B/SGM809B/SGM810B series can even operate normally, which greatly reduces the possibility of system failure. In addition, the internal reference voltage accuracy of the SGM803B/SGM809B/SGM810B series is very high, which provides high reliability of the devices.

Interfacing to Microprocessors with Multiple Interrupts

In various applications, it is essential to interface many interrupts from different devices, such as thermal, velocity and altitude sensors. The SGM803B/SGM809B/SGM810B can be used either as standalone devices or integrated into an existing interrupt circuit (See Figure 3).

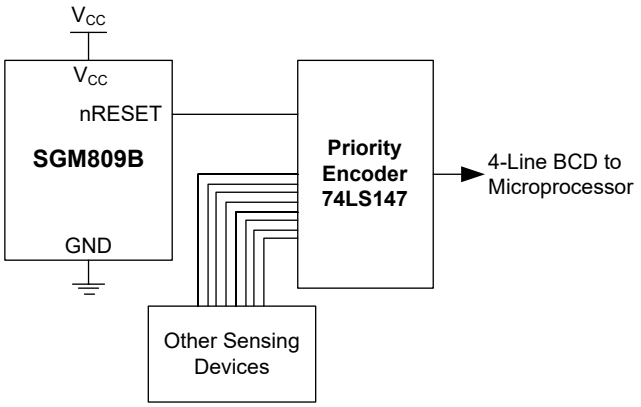


Figure 3. Interfacing to Microprocessors with Multiple Interrupts

Interfacing to Other Devices Output

In order to allow the SGM803B/SGM809B/SGM810B series to be integrated with a variety of devices, it is guaranteed that the reset output is proportional to the V_{CC} when the V_{CC} is more than 1V. This allows the device to be used with any supply voltage between the minimum and maximum of the V_{CC}, including 3V and 3.3V. This design makes it easier to connect this device with others.

Reset Valid to V_{CC} = 0V

The nRESET of SGM803B/SGM809B will stop sinking current and become open circuit if V_{CC} is below 1.0V. And if a high impedance CMOS logic input is connected to the nRESET, the logic level of the CMOS input is undetermined. To solve the problem, it is recommended to use a 100kΩ resistor between nRESET and GND.

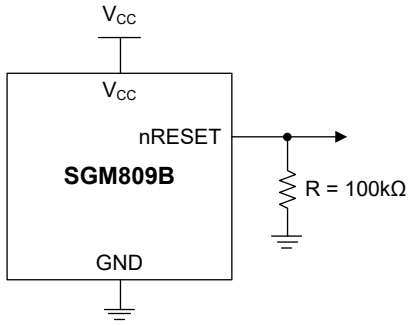


Figure 4. Reset Valid to V_{CC} = 0V Circuit

Preventing the High Voltage Spike

To prevent the high voltage spike damage or to limit input V_{CC} current, it is recommended to connect a resistor R_1 (0Ω to 1kΩ) in series to V_{CC}, and one capacitor C_1 (0.1μF to 4.7μF) should be connected between V_{CC} pin and GND. The schematic is shown in Figure 5. It must be noted that, the input resistor will affect output driving capability.

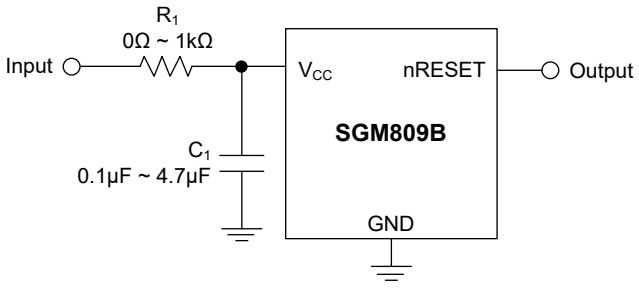


Figure 5. Preventing the High Voltage Spike

REVISION HISTORY

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

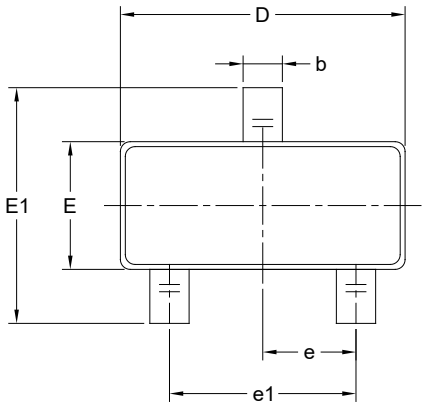
OCTOBER 2024 – REV.A.1 to REV.A.2	Page
Updated Application Information section	7
Updated Package Outline Dimensions section	9, 10
Updated Tape and Reel Information section	11

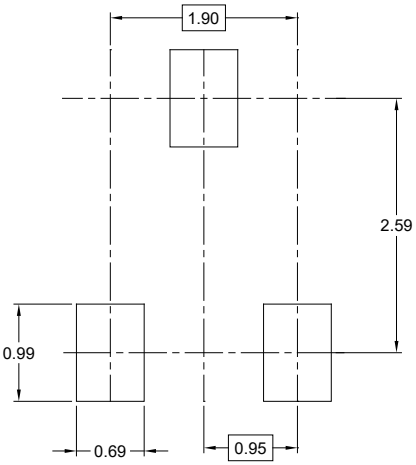
NOVEMBER 2019 – REV.A to REV.A.1	Page
Changed Marking Information section	2

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

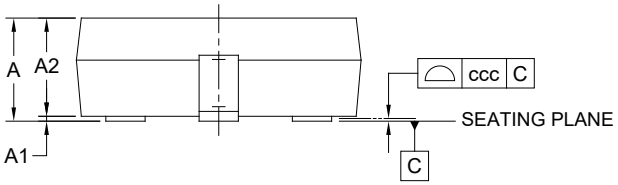
PACKAGE OUTLINE DIMENSIONS

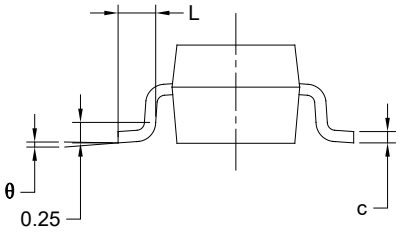
SOT-23-3





RECOMMENDED LAND PATTERN (Unit: mm)



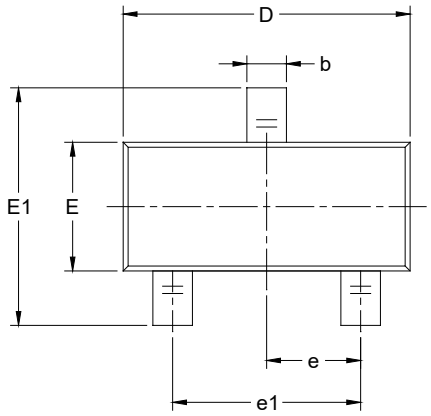


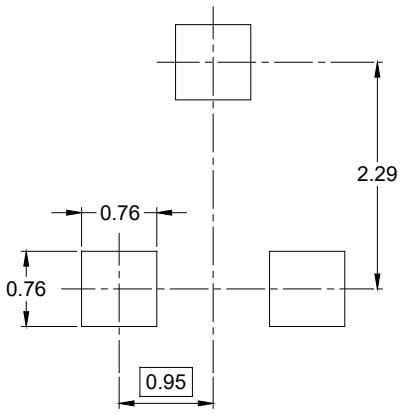
Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	1.450
A1	0.000	-	0.150
A2	0.900	-	1.300
b	0.300	-	0.500
c	0.080	-	0.220
D	2.750	-	3.050
E	1.450	-	1.750
E1	2.600	-	3.000
e	0.950 BSC		
e1	1.900 BSC		
L	0.300	-	0.600
θ	0°	-	8°
ccc	0.100		

NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

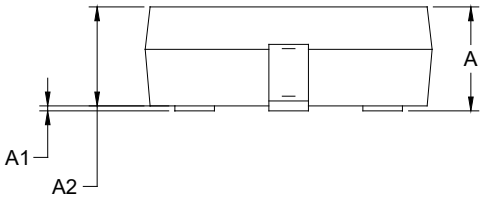
PACKAGE OUTLINE DIMENSIONS

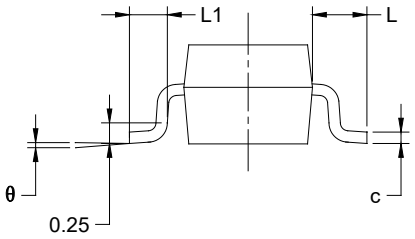
SOT-23





RECOMMENDED LAND PATTERN (Unit: mm)



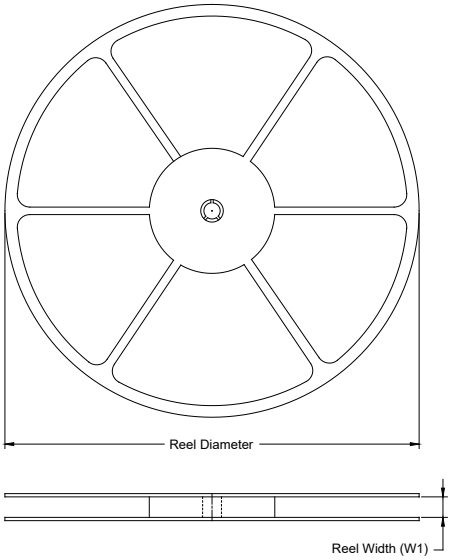


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.89	1.12	0.035	0.044
A1	0.01	0.10	0.000	0.004
A2	0.88	1.02	0.035	0.040
b	0.30	0.50	0.012	0.020
c	0.08	0.20	0.003	0.008
D	2.80	3.04	0.110	0.120
E	1.20	1.40	0.047	0.055
E1	2.10	2.64	0.083	0.104
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.54 REF		0.021 REF	
L1	0.40	0.60	0.016	0.024
θ	0°	8°	0°	8°

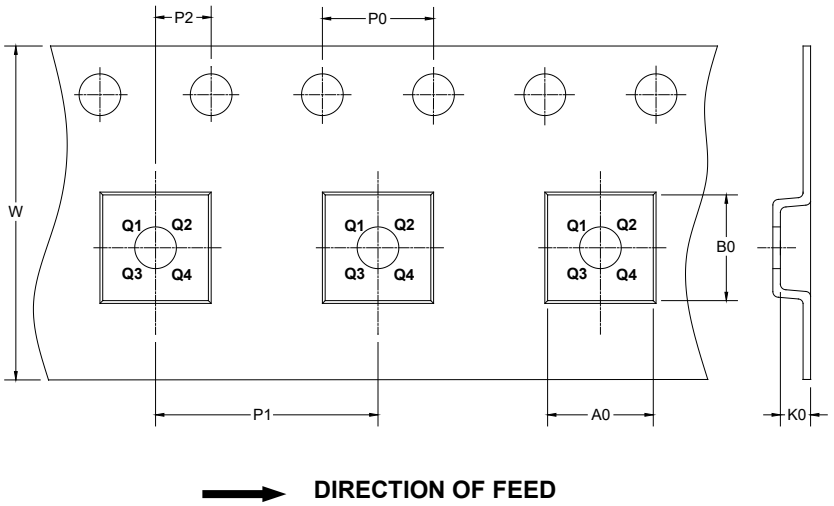
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



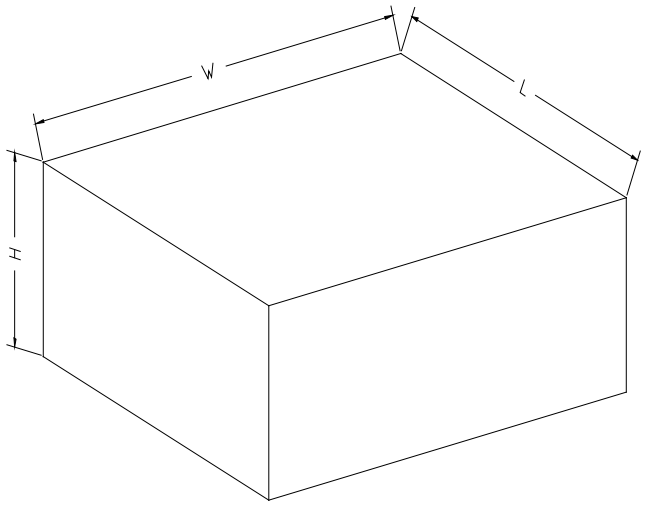
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOT-23-3	7″	9.5	3.18	3.28	1.32	4.0	4.0	2.0	8.0	Q3
SOT-23	7″	9.5	3.15	2.77	1.22	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