



# SGM803/SGM809/SGM810 Microprocessor Supervisory Circuit in 3-Pin SOT23

## GENERAL DESCRIPTION

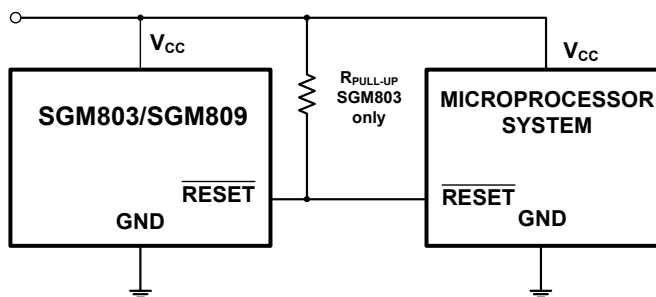
The SGM803/SGM809/SGM810 supervisory circuits monitor the power supply voltage in microprocessor and digital systems. They provide a reset output during power-up, power-down and brownout conditions. On power-up, an internal timer holds reset asserted for 240 ms. This holds the microprocessor in a reset state until conditions have stabilized. The  $\overline{\text{RESET}}$  output remains operational with  $V_{CC}$  as low as 1V. The SGM803/SGM809 provides an active low reset signal ( $\overline{\text{RESET}}$ ) while the SGM810 provides an active high signal (RESET) output. The SGM809/SGM810 has push-pull outputs, whereas the SGM803 has an open-drain output, which requires an external pull-up resistor.

Eight reset threshold voltage options are available suitable for monitoring 1.8V, 2.5V, 3V, 3.3V and 5V supply voltages.

The reset comparator features built-in glitch immunity, making it immune to fast transients on  $V_{CC}$ .

The low supply current of typically 13 $\mu\text{A}$  makes the SGM803/SGM809/SGM810 ideal for use in portable, battery operated equipment. All are specified over the extended  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range.

## TYPICAL OPERATION CIRCUIT



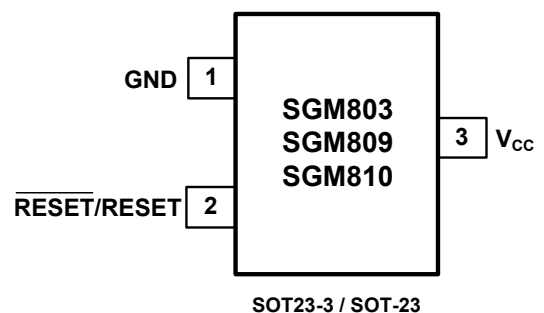
## FEATURES

- Precision Voltage Monitor: 1.8V, 2.5V, 3V, 3.3V, 5V Options
- Superior Upgrade for MAX803/MAX809/MAX810 and ADM803/ADM809/ADM810
- Fully Specified over Temperature
- Low Power Consumption (13 $\mu\text{A}$  TYP)
- Reset Assertion Down to 1V  $V_{CC}$
- 150ms Min Power-On Reset
  - Open-Drain  $\overline{\text{RESET}}$  Output (SGM803)
  - Push-Pull  $\overline{\text{RESET}}$  Output (SGM809)
  - Push-Pull RESET Output (SGM810)
- $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  Operating Temperature Range
- Small Packaging
  - SGM803 Available in SOT23-3 and SOT-23
  - SGM809 Available in SOT23-3 and SOT-23
  - SGM810 Available in SOT23-3 and SOT-23

## APPLICATIONS

Microprocessor Systems  
 Controllers  
 Intelligent Instruments  
 Automotive Systems  
 Safety Systems  
 Portable Instruments

## PIN CONFIGURATIONS (TOP VIEW)



## PACKAGE/ORDERING INFORMATION

MODEL	RESET THRESHOLD (V)	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM803	4.63	SOT23-3	SGM803-LXN3/TR	803L	Tape and Reel, 3000
	4.63	SOT-23	SGM803-LXN3L/TR	803LL	Tape and Reel, 3000
	4.38	SOT23-3	SGM803-MXN3/TR	803M	Tape and Reel, 3000
	4.38	SOT-23	SGM803-MXN3L/TR	803ML	Tape and Reel, 3000
	4.00	SOT23-3	SGM803-JXN3/TR	803J	Tape and Reel, 3000
	4.00	SOT-23	SGM803-JXN3L/TR	803JL	Tape and Reel, 3000
	3.08	SOT23-3	SGM803-TXN3/TR	803T	Tape and Reel, 3000
	3.08	SOT-23	SGM803-TXN3L/TR	803TL	Tape and Reel, 3000
	2.93	SOT23-3	SGM803-SXN3/TR	803S	Tape and Reel, 3000
	2.93	SOT-23	SGM803-SXN3L/TR	803SL	Tape and Reel, 3000
	2.63	SOT23-3	SGM803-RXN3/TR	803R	Tape and Reel, 3000
	2.63	SOT-23	SGM803-RXN3L/TR	803RL	Tape and Reel, 3000
	2.32	SOT23-3	SGM803-ZXN3/TR	803Z	Tape and Reel, 3000
	2.32	SOT-23	SGM803-ZXN3L/TR	803ZL	Tape and Reel, 3000
	1.63	SOT23-3	SGM803-XXN3/TR	803X	Tape and Reel, 3000
	1.63	SOT-23	SGM803-XXN3L/TR	803XL	Tape and Reel, 3000
SGM809	4.63	SOT23-3	SGM809-LXN3/TR	809L	Tape and Reel, 3000
	4.63	SOT-23	SGM809-LXN3L/TR	809LL	Tape and Reel, 3000
	4.38	SOT23-3	SGM809-MXN3/TR	809M	Tape and Reel, 3000
	4.38	SOT-23	SGM809-MXN3L/TR	809ML	Tape and Reel, 3000
	4.00	SOT23-3	SGM809-JXN3/TR	809J	Tape and Reel, 3000
	4.00	SOT-23	SGM809-JXN3L/TR	809JL	Tape and Reel, 3000
	3.08	SOT23-3	SGM809-TXN3/TR	809T	Tape and Reel, 3000
	3.08	SOT-23	SGM809-TXN3L/TR	809TL	Tape and Reel, 3000
	2.93	SOT23-3	SGM809-SXN3/TR	809S	Tape and Reel, 3000
	2.93	SOT-23	SGM809-SXN3L/TR	809SL	Tape and Reel, 3000
	2.63	SOT23-3	SGM809-RXN3/TR	809R	Tape and Reel, 3000
	2.63	SOT-23	SGM809-RXN3L/TR	809RL	Tape and Reel, 3000
	2.32	SOT23-3	SGM809-ZXN3/TR	809Z	Tape and Reel, 3000
	2.32	SOT-23	SGM809-ZXN3L/TR	809ZL	Tape and Reel, 3000
	1.63	SOT23-3	SGM809-XXN3/TR	809X	Tape and Reel, 3000
	1.63	SOT-23	SGM809-XXN3L/TR	809XL	Tape and Reel, 3000

**PACKAGE/ORDERING INFORMATION (Cont.)**

MODEL	RESET THRESHOLD (V)	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM810	4.63	SOT23-3	SGM810-LXN3/TR	810L	Tape and Reel, 3000
	4.63	SOT-23	SGM810-LXN3L/TR	810LL	Tape and Reel, 3000
	4.38	SOT23-3	SGM810-MXN3/TR	810M	Tape and Reel, 3000
	4.38	SOT-23	SGM810-MXN3L/TR	810ML	Tape and Reel, 3000
	4.00	SOT23-3	SGM810-JXN3/TR	810J	Tape and Reel, 3000
	4.00	SOT-23	SGM810-JXN3L/TR	810JL	Tape and Reel, 3000
	3.08	SOT23-3	SGM810-TXN3/TR	810T	Tape and Reel, 3000
	3.08	SOT-23	SGM810-TXN3L/TR	810TL	Tape and Reel, 3000
	2.93	SOT23-3	SGM810-SXN3/TR	810S	Tape and Reel, 3000
	2.93	SOT-23	SGM810-SXN3L/TR	810SL	Tape and Reel, 3000
	2.63	SOT23-3	SGM810-RXN3/TR	810R	Tape and Reel, 3000
	2.63	SOT-23	SGM810-RXN3L/TR	810RL	Tape and Reel, 3000
	2.32	SOT23-3	SGM810-ZXN3/TR	810Z	Tape and Reel, 3000
	2.32	SOT-23	SGM810-ZXN3L/TR	810ZL	Tape and Reel, 3000
	1.63	SOT23-3	SGM810-XXN3/TR	810X	Tape and Reel, 3000
	1.63	SOT-23	SGM810-XXN3L/TR	810XL	Tape and Reel, 3000

**ABSOLUTE MAXIMUM RATINGS**

(Typical values are at T<sub>A</sub> = 25°C, unless otherwise noted.)

V <sub>CC</sub> .....	-0.3V to 6V
RESET, $\overline{\text{RESET}}$ .....	-0.3V to V <sub>CC</sub> +0.3V
Input Current, V <sub>CC</sub> .....	20mA
Output Current, RESET, $\overline{\text{RESET}}$ .....	20mA
Rate of Rise, V <sub>CC</sub> .....	100V/μs
Power Dissipation, P <sub>D</sub> @ T <sub>A</sub> = 25°C	
SOT23-3.....	0.4W

Package Thermal Resistance	
SOT23-3, θ <sub>JA</sub> .....	250°C/W
Operating Temperature Range.....	- 40°C to +125°C
Junction Temperature.....	150°C
Storage Temperature.....	- 65°C to +150°C
Lead Temperature (soldering, 10s).....	260°C
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

**NOTE:**

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**CAUTION**

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all 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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the last datasheet.

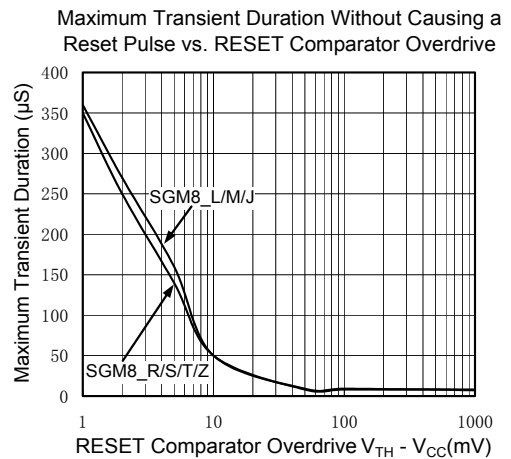
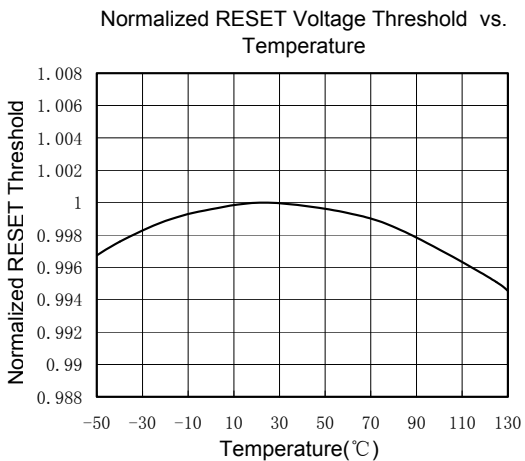
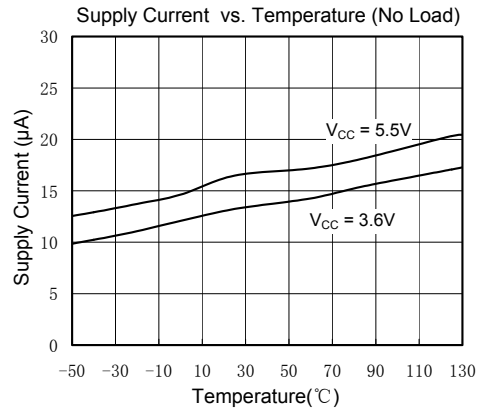
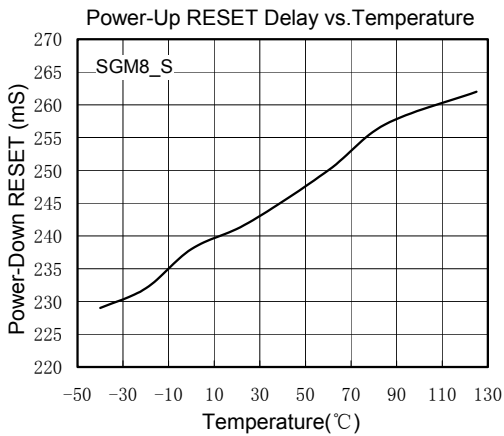
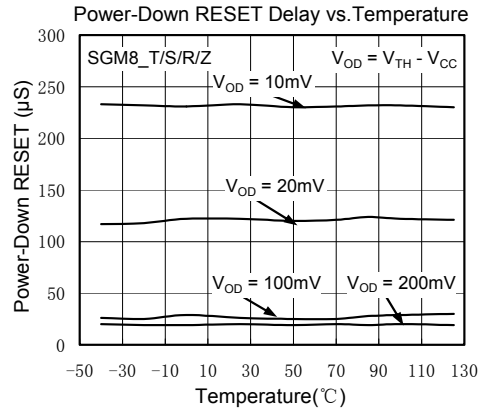
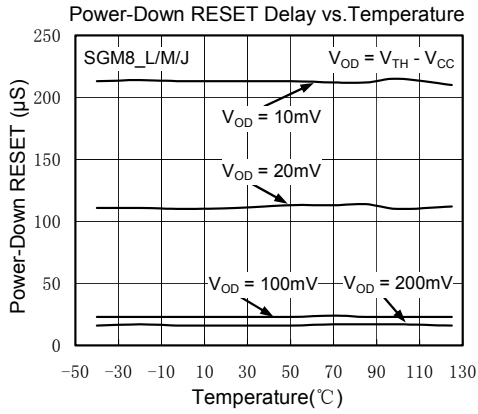
**PIN DESCRIPTION**

NAME	Pin Number			FUNCTION
	SGM803	SGM809	SGM810	
GND	1	1	1	Ground
$\overline{\text{RESET}}$	2	2	—	Active Low reset. $\overline{\text{RESET}}$ remains low while V <sub>CC</sub> is below the reset threshold, and remains low for 240ms (TYP) after V <sub>CC</sub> rises above the reset threshold.
RESET	—	—	2	Active High reset. RESET remains high while V <sub>CC</sub> is below the reset threshold, and remains high for 240ms (TYP) after V <sub>CC</sub> rises above the reset threshold.
V <sub>CC</sub>	3	3	3	Power supply voltage that is monitored.

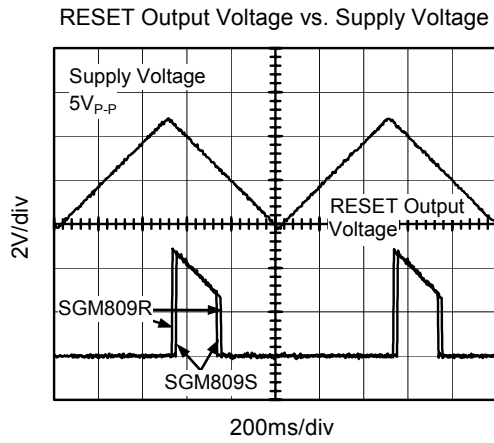
**ELECTRICAL CHARACTERISTICS**(V<sub>CC</sub> TYP = 5V for L/M/J Models, 3.3V for T/S Models, 3V for R Models, 2.5V for Z Models, 1.8V for X Models; unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>SUPPLY</b>					
Voltage	T <sub>A</sub> = 0°C to 70°C	1.0		5.5	V
	T <sub>A</sub> = -40°C to +125°C	1.2		5.5	V
Current	V <sub>CC</sub> < 5.5 V, SGM8_L/M/J, T <sub>A</sub> = 25°C		17	30	μA
	V <sub>CC</sub> < 5.5 V, SGM8_L/M/J, T <sub>A</sub> = -40°C to +125°C			50	μA
	V <sub>CC</sub> < 3.6 V, SGM8_R/S/T/Z/X, T <sub>A</sub> = 25°C		13	25	μA
	V <sub>CC</sub> < 3.6 V, SGM8_R/S/T/Z/X, T <sub>A</sub> = -40°C to +125°C			45	μA
<b>RESET VOLTAGE THRESHOLD</b>					
SGM8_L	T <sub>A</sub> = 25°C	4.537	4.63	4.723	V
	T <sub>A</sub> = -40°C to +125°C	4.40		4.86	V
SGM8_M	T <sub>A</sub> = 25°C	4.292	4.38	4.468	V
	T <sub>A</sub> = -40°C to +125°C	4.16		4.56	V
SGM8_J	T <sub>A</sub> = 25°C	3.92	4.00	4.08	V
	T <sub>A</sub> = -40°C to +125°C	3.8		4.2	V
SGM8_T	T <sub>A</sub> = 25°C	3.003	3.08	3.157	V
	T <sub>A</sub> = -40°C to +125°C	2.92		3.23	V
SGM8_S	T <sub>A</sub> = 25°C	2.857	2.93	3.003	V
	T <sub>A</sub> = -40°C to +125°C	2.78		3.08	V
SGM8_R	T <sub>A</sub> = 25°C	2.564	2.63	2.696	V
	T <sub>A</sub> = -40°C to +125°C	2.50		2.76	V
SGM8_Z	T <sub>A</sub> = 25°C	2.262	2.32	2.378	V
	T <sub>A</sub> = -40°C to +125°C	2.22		2.42	V
SGM8_X	T <sub>A</sub> = 25°C	1.589	1.63	1.671	V
	T <sub>A</sub> = -40°C to +125°C	1.55		1.71	V
Reset Threshold Temperature Coefficient			30		ppm/°C
V <sub>CC</sub> to RESET/RESET Delay	V <sub>CC</sub> = V <sub>TH</sub> to (V <sub>TH</sub> - 100 mV)		20		μs
Reset Active Timeout Period	T <sub>A</sub> = -40°C to +85°C	150	240	560	ms
	T <sub>A</sub> = -40°C to +125°C	100		840	ms
<b>RESET/RESET OUTPUT VOLTAGE</b>					
Low (SGM803R/S/T/Z/X) Low (SGM809R/S/T/Z/X)	V <sub>CC</sub> = V <sub>TH(MIN)</sub> , I <sub>SINK</sub> = 1.2mA			0.3	V
Low (SGM803L/M/J) Low (SGM809L/M/J)	V <sub>CC</sub> = V <sub>TH(MIN)</sub> , I <sub>SINK</sub> = 3.2mA			0.4	V
Low (SGM803R/S/T/L/M/J/Z/X) Low (SGM809R/S/T/L/M/J/Z/X)	V <sub>CC</sub> > 1.0 V, I <sub>SINK</sub> = 50μA			0.3	V
High (SGM809R/S/T/Z/X)	V <sub>CC</sub> > V <sub>TH(MAX)</sub> , I <sub>SOURCE</sub> = 500μA	0.8×V <sub>CC</sub>			V
High (SGM809L/M/J)	V <sub>CC</sub> > V <sub>TH(MAX)</sub> , I <sub>SOURCE</sub> = 800μA	V <sub>CC</sub> -1.5			V
Low (SGM810R/S/T/Z/X)	V <sub>CC</sub> = V <sub>TH(MAX)</sub> , I <sub>SINK</sub> = 1.2mA			0.3	V
Low (SGM810L/M/J)	V <sub>CC</sub> = V <sub>TH(MAX)</sub> , I <sub>SINK</sub> = 3.2mA			0.4	V
High (SGM810 R/S/T/L/M/J)	1.8 V < V <sub>CC</sub> < V <sub>TH(MIN)</sub> , I <sub>SOURCE</sub> = 150μA	0.8×V <sub>CC</sub>			V
RESET Open-Drain Output Leakage Current (SGM803)	V <sub>CC</sub> > V <sub>TH</sub> , reset de-asserted			1	μA

TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS



APPLICATION NOTES

BENEFITS OF AN ACCURATE RESET THRESHOLD

In other microprocessor supervisory circuits, tolerances in supply voltages lead to an overall increase in reset tolerance levels due to the deterioration of the microprocessor reset circuit's power supply. The possibility of a malfunction during a power failure is greatly reduced because the SGM803/SGM809/SGM810 series can operate effectively even when there are large degradations of the supply voltages. Another advantage of the SGM803/SGM809/SGM810 series is its very accurate internal voltage reference circuit. These benefits combine to produce an exceptionally reliable voltage monitor circuit.

INTERFACING TO MICROPROCESSORS WITH MULTIPLE INTERRUPTS

In a number of cases, it is necessary to interface many interrupts from different devices (for example, thermal, altitude, and velocity sensors). The SGM803/SGM809/SGM810 can easily be integrated into existing interrupt-handling circuits, as shown in Figure 1, or can be used as a standalone device.

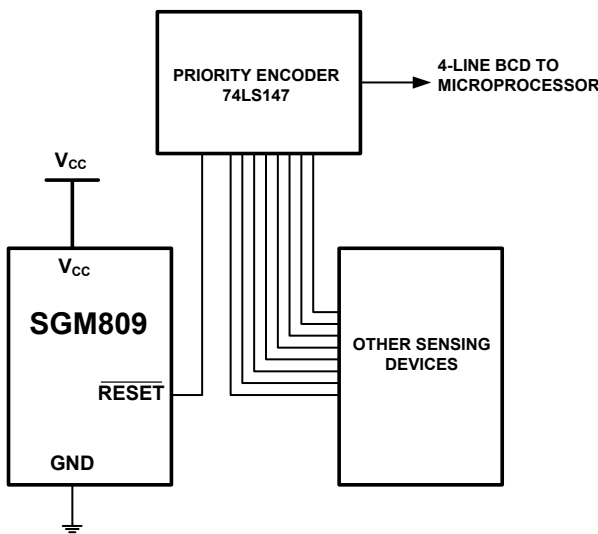


Figure 1. Interfacing to Microprocessors with Multiple Interrupts

INTERFACING TO OTHER DEVICES' OUTPUT

The SGM803/SGM809/SGM810 series is designed to integrate with as many devices as possible and, therefore, has a standard output dependent on V<sub>CC</sub>. This enables the parts to be used in both 3V and 5V, or any nominal voltage within the minimum and maximum specifications for V<sub>CC</sub>. This design simplifies interfacing this device to other devices.

ENSURING A VALID RESET OUTPUT DOWN TO V<sub>CC</sub> = 0V

When V<sub>CC</sub> falls below 1.0V, the SGM803/SGM809  $\overline{\text{RESET}}$  no longer sinks current. A high impedance CMOS logic input connected to  $\overline{\text{RESET}}$  may, therefore, drift to undetermined logic levels. To eliminate this problem, a 100kΩ resistor should be connected from  $\overline{\text{RESET}}$  to ground.

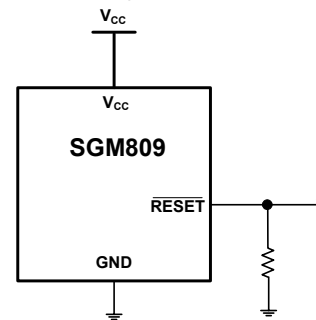


Figure 2. Ensuring a Valid Reset Output Down to V<sub>CC</sub> = 0V

PREVENTING THE HIGH VOLTAGE SPIKE AND LOW POWER DESIGN

To prevent the high voltage spike damage or input V<sub>CC</sub> current limitation low power design, It is always to connect a resistor R1(0Ω to 1kΩ) in series to V<sub>CC</sub>, for such application, one capacitance C1(0.1μF to 4.7μF) should be connected between V<sub>CC</sub> Pin and GND. the schematic is shown in Figure 3. The input resistor will affect output driving capability.

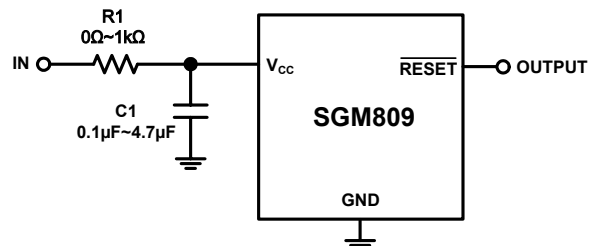


Figure 3. Preventing the High Voltage Spike and Low Power Design

DETAILED DESCRIPTIONS

RESET TIMING

The reset signal is asserted LOW for the SGM809 and HIGH for the SGM810 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.

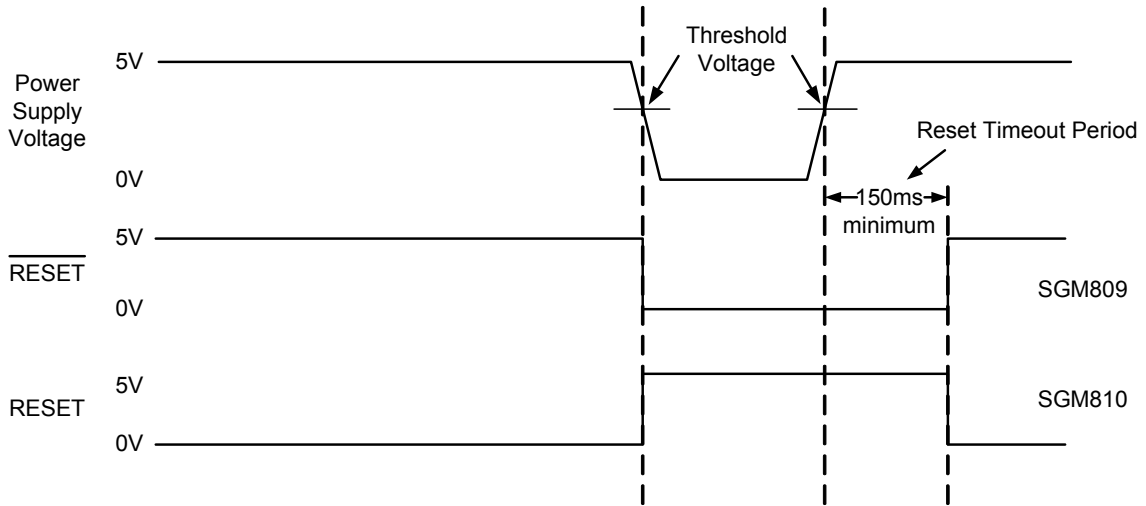
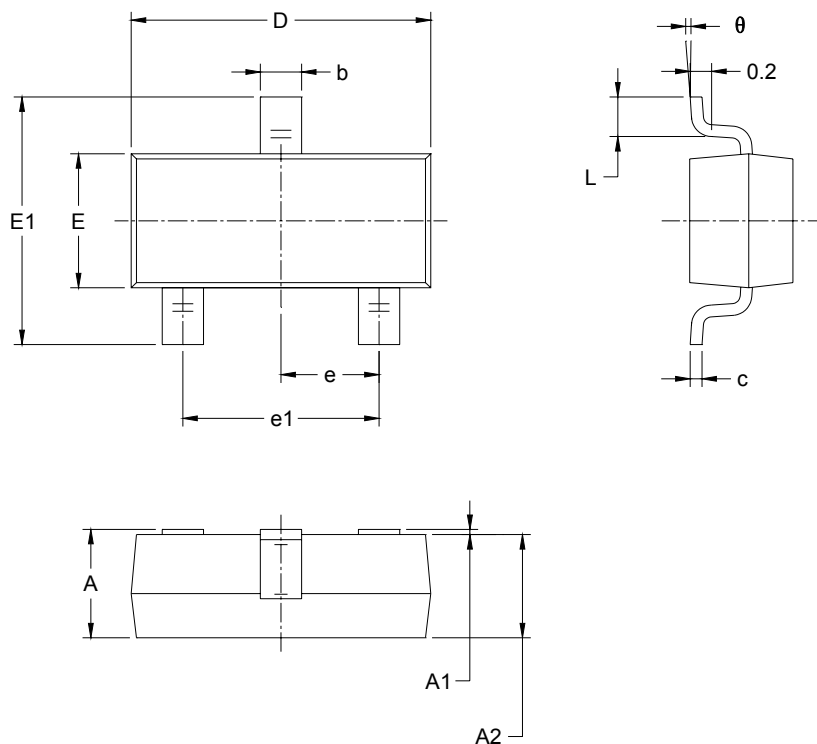


Figure 4. Reset Timing Diagram

PACKAGE OUTLINE DIMENSIONS

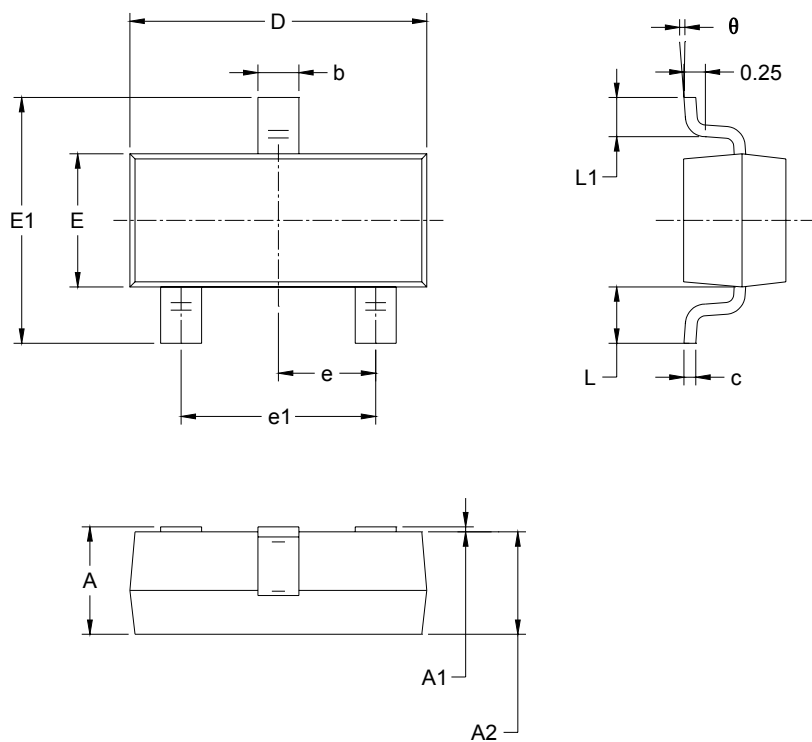
SOT23-3



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
$\theta$	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°