SGM708
Low-Cost, Microprocessor Supervisory Circuit

GENERAL DESCRIPTION

The SGM708 microprocessor supervisory circuit reduces the complexity and number of components required to monitor power-supply and monitor microprocessor activity. It significantly improves system reliability and accuracy compared to separate ICs or discrete components.

The SGM708 provides power-supply monitoring circuitry that generates a reset output during power-up, power-down and brownout conditions. The reset output remains operational with V_{CC} as low as 1V.

In addition, there is a 1.25V threshold detector for power-fail warning, low-battery detection, or monitoring an additional power supply. An active-low manual-reset input ($\overline{MR}$) is also included.

The SGM708 is available in Green SOP8 package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Precision Supply-Voltage Monitor**
  - **4.65V for SGM708-L**
  - **4.40V for SGM708-M**
  - **4.0V for SGM708-J**
  - **3.08V for SGM708-T**
  - **2.93V for SGM708-S**
  - **2.63V for SGM708-R**
- **Guaranteed $\overline{RESET}$ Valid at V_{CC} = 1V**
- **200ms Reset Pulse Width**
- **Debounced TTL/CMOS-Compatible Manual-Reset Input**
- **Voltage Monitor for Power-Fail or Low-Battery Warning**
- **Dual Reset Outputs (Active-low and Active-High)**
- **–40℃ to +85℃ Operating Temperature Range**
- **Green SOP8 Package**

APPLICATIONS

Computers
Controllers
Intelligent Instruments
Automotive Systems
Critical µP Power Monitoring

PACKAGE/ORDERING INFORMATION

MODEL	RESET THRESHOLD (V)	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM708	4.65	SOP8	SGM708-LYS8G/TR	SGM708-LYS8	Tape and Reel, 2500
	4.40	SOP8	SGM708-MYS8G/TR	SGM708-MYS8	Tape and Reel, 2500
	4.0	SOP8	SGM708-JYS8G/TR	SGM708-JYS8	Tape and Reel, 2500
	3.08	SOP8	SGM708-TYS8G/TR	SGM708-TYS8	Tape and Reel, 2500
	2.93	SOP8	SGM708-SYS8G/TR	SGM708-SYS8	Tape and Reel, 2500
	2.63	SOP8	SGM708-RYS8G/TR	SGM708-RYS8	Tape and Reel, 2500

NOTE: Order number is defined as the follow:

ORDER NUMBER

SGM 708- X Y X G / TR

- **Tape and Reel**
- **Green product**
- **Package Type**
  - S8 SOP8
- **Operating Temperature Range**
  - Y -40℃ to +85℃
- **RESET THRESHOLD**
  - L: 4.65V
  - M: 4.40V
  - J: 4.0V
  - T: 3.08V
  - S: 2.93V
  - R: 2.63V

ABSOLUTE MAXIMUM RATINGS

(Typical values are at T_A = 25℃, unless otherwise noted.)

Terminal Voltage (with respect to GND)

V_{CC} ..... – 0.3V to 6.0V

All Other Inputs ..... – 0.3V to (V_{CC} + 0.3V)

Input Current , V_{CC} 20mA

GND 20mA

Output Current , (all outputs) 20mA

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

Junction Temperature ..... 150℃

Storage Temperature ..... -65℃ to +150℃

Lead Temperature (soldering, 10sec) ..... 260℃

ESD Susceptibility

HBM 4000V

MM 300V

CAUTION

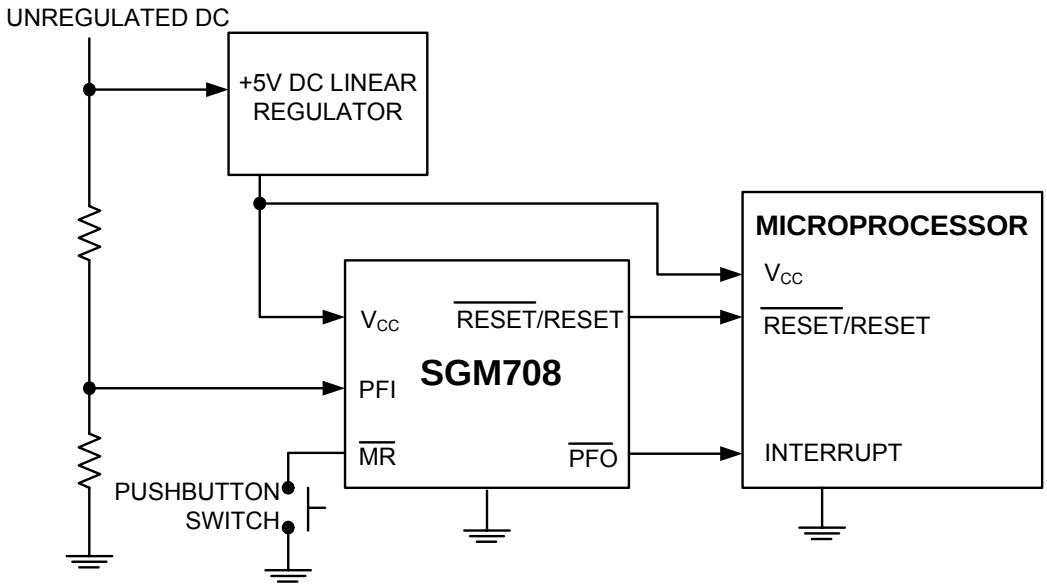
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

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.

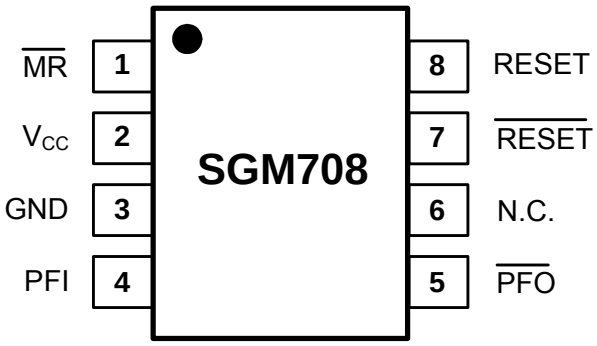
NOTE:

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.

TYPICAL OPERATION CIRCUIT



PIN CONFIGURATION (TOP VIEW)



SOP8

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	$\overline{MR}$	Manual-Reset Input triggers a reset pulse when pulled below 0.8V. This active-low input has an internal 250μA (V_{CC} = +5V) pull-up current. It can be driven from a TTL or CMOS logic line as well as shorted to ground with a switch.
2	V_{CC}	Power Supply Voltage that is monitored.
3	GND	0V Ground Reference for all signals
4	PFI	Power-Fail Voltage Monitor Input. When PFI is less than 1.25V, $\overline{PFO}$ goes low. Connect PFI to GND or V_{CC} when not used.
5	$\overline{PFO}$	Power-Fail Output goes low and sinks current when PFI is less than 1.25V; otherwise $\overline{PFO}$ stays high.
6	N.C.	No Connect.
7	$\overline{RESET}$	Active-Low Reset Output pulses low for 200ms when triggered, and stays low whenever V_{CC} is below the reset threshold (4.65V for SGM708-L, 4.40V for SGM708-M, 4.0V for SGM708-J, 3.08V for SGM708-T, 2.93V for SGM708-S and 2.63V for SGM708-R). It remains low for 200ms after V_{CC} rises above the reset threshold or $\overline{MR}$ goes from low to high.
8	RESET	Active-High Reset Output is the inverse of $\overline{RESET}$. Whenever $\overline{RESET}$ is high, RESET is low, and vice versa .

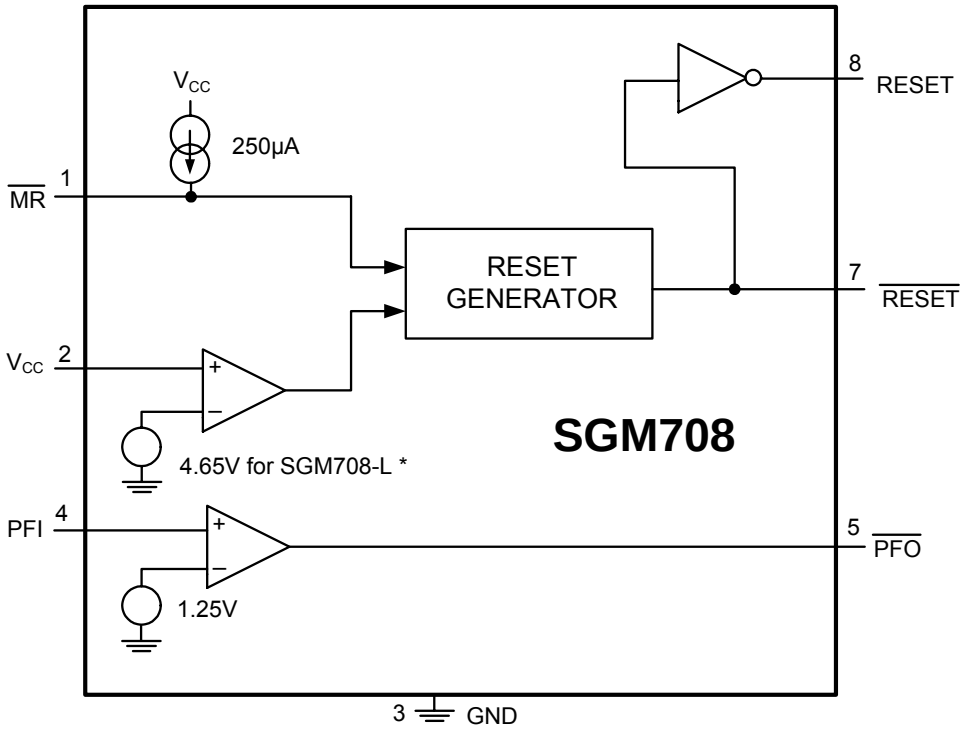
ELECTRICAL CHARACTERISTICS

(V_{CC} = 4.75V to 5.5V for SGM708-L; V_{CC} = 4.5V to 5.5V for SGM708-M; V_{CC} = 4.07V to 5.5V for SGM708-J; V_{CC} = 3.14V to 5.5V for SGM708-T; V_{CC} = 2.95V to 5.5V for SGM708-S; V_{CC} = 2.68V to 5.5V for SGM708-R; T_A = -40°C to +85°C, unless otherwise noted.)

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
Operating Voltage Range (V_{CC})			1.0		5.5	V
Supply Current (I_{SUPPLY})				20	60	μA
Reset Threshold (V_{RT})		SGM708-L	4.5	4.65	4.75	V
		SGM708-M	4.25	4.4	4.5	
		SGM708-J	3.91	4.0	4.07	
		SGM708-T	3.02	3.08	3.14	
		SGM708-S	2.85	2.93	2.95	
		SGM708-R	2.56	2.63	2.68	
Reset Threshold Hysteresis		SGM708-T, SGM708-S, SGM708-R		25		mV
		SGM708-J		35		
		SGM708-L, SGM708-M		40		
Reset Pulse Width (t_{RS})			120	200	290	ms
$\overline{RESET}$ Output Voltage		I_{SOURCE} = 800μA	V_{CC}-1.5			V
		I_{SINK} = 3.2mA			0.4	
		V_{CC} = 1V, I_{SINK} = 50μA			0.3	
RESET Output Voltage		I_{SOURCE} = 800μA	V_{CC}-1.5			V
		I_{SINK} = 1.2mA			0.4	V
$\overline{MR}$ Pull-Up Current		$\overline{MR}$ = 0V	100	250	600	μA
$\overline{MR}$ Pulse Width (t_{MR})			250			ns
$\overline{MR}$ Input Threshold	Low	T_A = +25°C			0.8	V
	High		2			
$\overline{MR}$ to Reset Out Delay (t_{MD})				100	350	ns
PFI Input Threshold		V_{CC} = 5V	1.17	1.25	1.3	V
PFI Input Current				0.2		nA
$\overline{PFO}$ Output Voltage		I_{SOURCE} = 800μA	V_{CC}-1.5			V
		I_{sink} = 3.2mA			0.4	

Specifications subject to changes without notice.

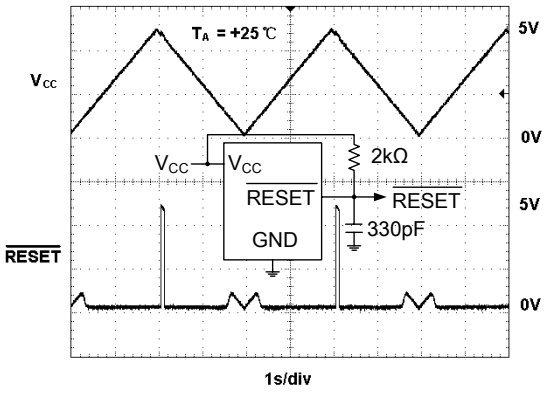
BLOCK DIAGRAM



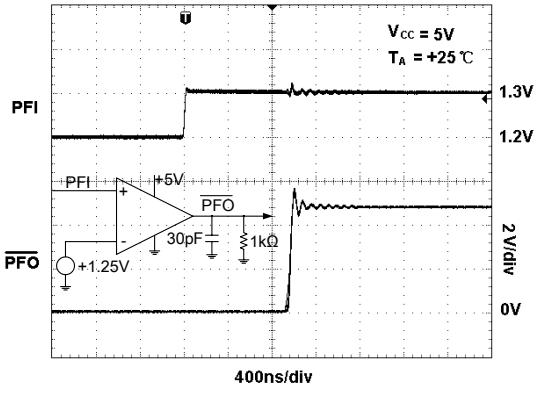
* 4.65V for SGM708-L
4.40V for SGM708-M
4.0V for SGM708-J
3.08V for SGM708-T
2.93V for SGM708-S
2.63V for SGM708-R

TYPICAL PERFORMANCE CHARACTERISTICS

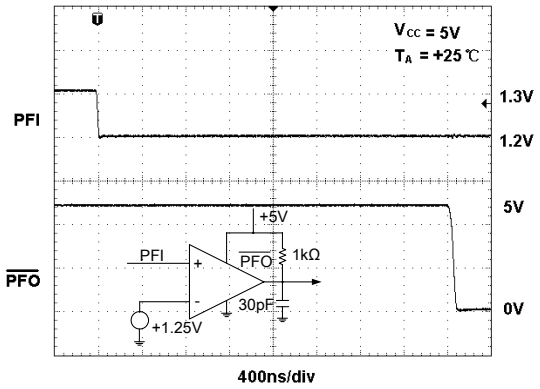
$\overline{RESET}$ Output Voltage vs. Supply Voltage



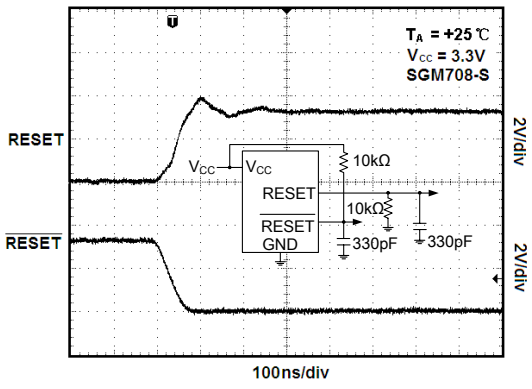
Power-Fall Comparator De-assertion Response Time



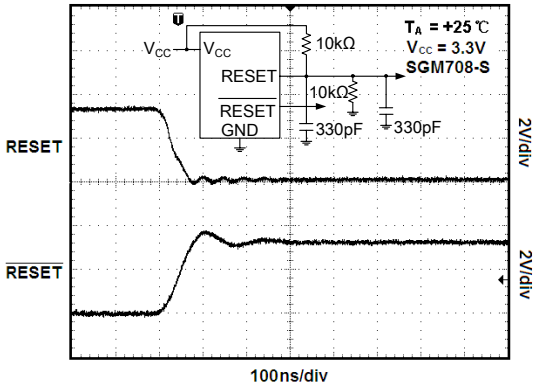
Power-Fall Comparator Assertion Response Time



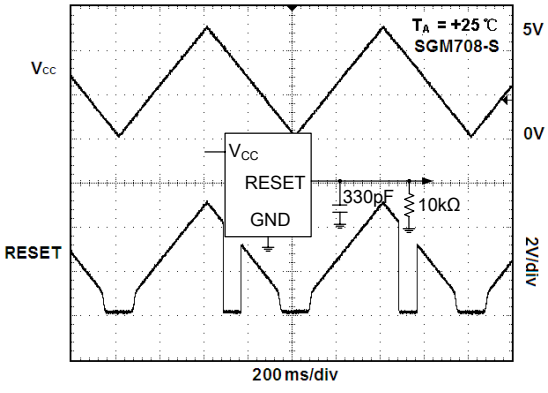
RESET , $\overline{RESET}$ Assertion



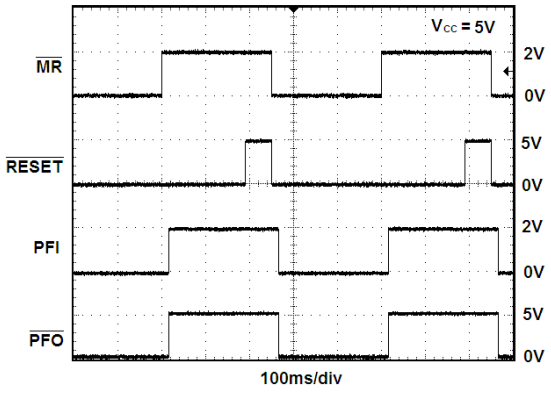
RESET , $\overline{RESET}$ De-Assertion

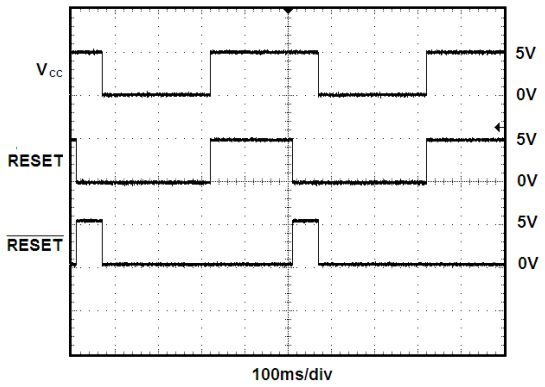


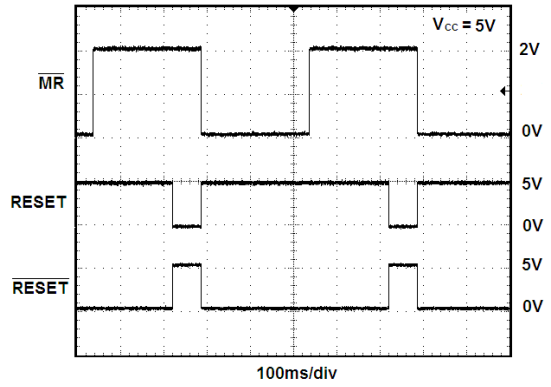
RESET Output Voltage vs. Supply Voltage



TYPICAL PERFORMANCE CHARACTERISTICS







APPLICATION NOTES

Ensuring a Valid $\overline{\text{RESET}}$ Output Down to V_{CC} = 0V

When V_{CC} falls below 1V, the SGM708 $\overline{\text{RESET}}$ output no longer sinks current—it becomes an open circuit. High-impedance CMOS logic inputs can drift to undetermined voltages if left undriven. If a pull-down resistor is added to the $\overline{\text{RESET}}$ pin as shown in Figure 1, any stray charge or leakage currents will be drained to ground, holding $\overline{\text{RESET}}$ low. Resistor value (R1) is not critical. It should be about 100kΩ, large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground.

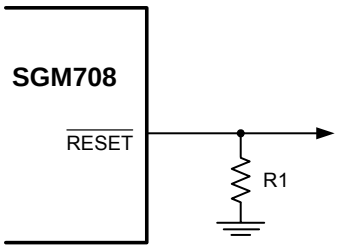


Figure 1. $\overline{\text{RESET}}$ Valid to Ground Circuit

Monitoring Voltages Other Than the Unregulated DC Input

Monitor voltages other than the unregulated DC by connecting a voltage divider to PFI and adjusting the ratio appropriately. If required, add hysteresis by connecting a resistor (with a value approximately 10 times the sum of the two resistors in the potential divider network) between PFI and $\overline{\text{PFO}}$. A capacitor between PFI and GND will reduce the power-fail circuit's sensitivity to high-frequency noise on the line being monitored. $\overline{\text{RESET}}$ can be asserted on other voltages in addition to the +5V V_{CC} line. Connect $\overline{\text{PFO}}$ to $\overline{\text{MR}}$ to initiate a $\overline{\text{RESET}}$ pulse when PFI drops below 1.25V. Figure 2 shows the SGM708 configured to assert $\overline{\text{RESET}}$ when the +5V supply falls below the reset threshold, or when the +12V supply falls below approximately 11V.

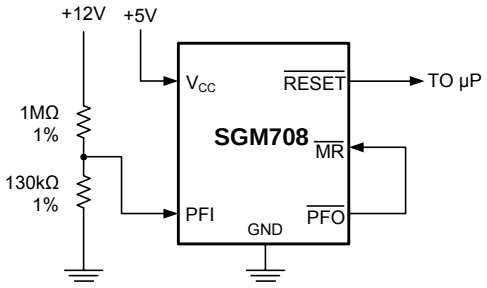


Figure 2. Monitoring Both +5V and +12V

Monitoring a Negative Voltage

The power-fail comparator can also monitor a negative supply rail (Figure 3). When the negative rail is good (a negative voltage of large magnitude), $\overline{\text{PFO}}$ is low, and when the negative rail is degraded (a negative voltage of lesser magnitude), $\overline{\text{PFO}}$ is high. By adding the resistors and transistor as shown, a high $\overline{\text{PFO}}$ triggers reset. As long as $\overline{\text{PFO}}$ remains high, the SGM708 will keep reset asserted ($\overline{\text{RESET}}$ = low, RESET = high). Note that this circuit's accuracy depends on the PFI threshold tolerance, the V_{CC} line, and the resistors.

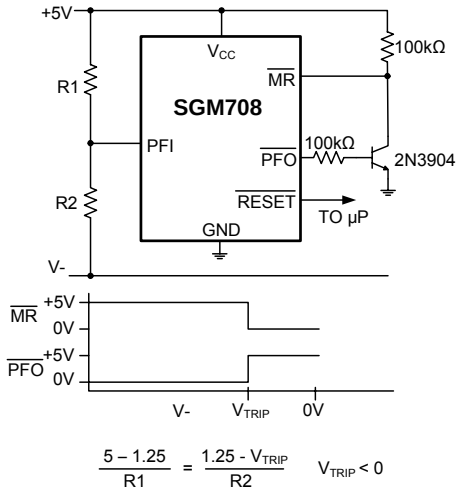


Figure 3. Monitoring a Negative Voltage

Interfacing to µPs with Bidirectional Reset Pins

µPs with bidirectional reset pins, such as the Motorola 68HC11 series, can contend with the SGM708 $\overline{\text{RESET}}$ output. If, for example, the $\overline{\text{RESET}}$ output is driven high and the Microprocessor wants to pull it low, indeterminate logic levels may result. To correct this, connect a 4.7kΩ resistor between the $\overline{\text{RESET}}$ output and the µP reset I/O, as in Figure 4. Buffer the $\overline{\text{RESET}}$ output to other system components.

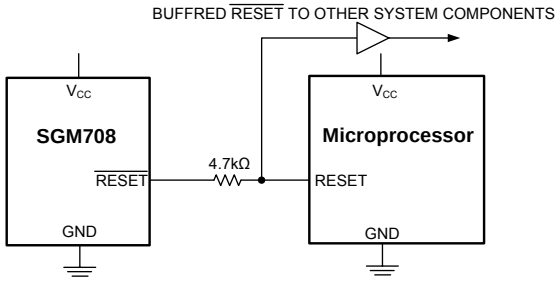
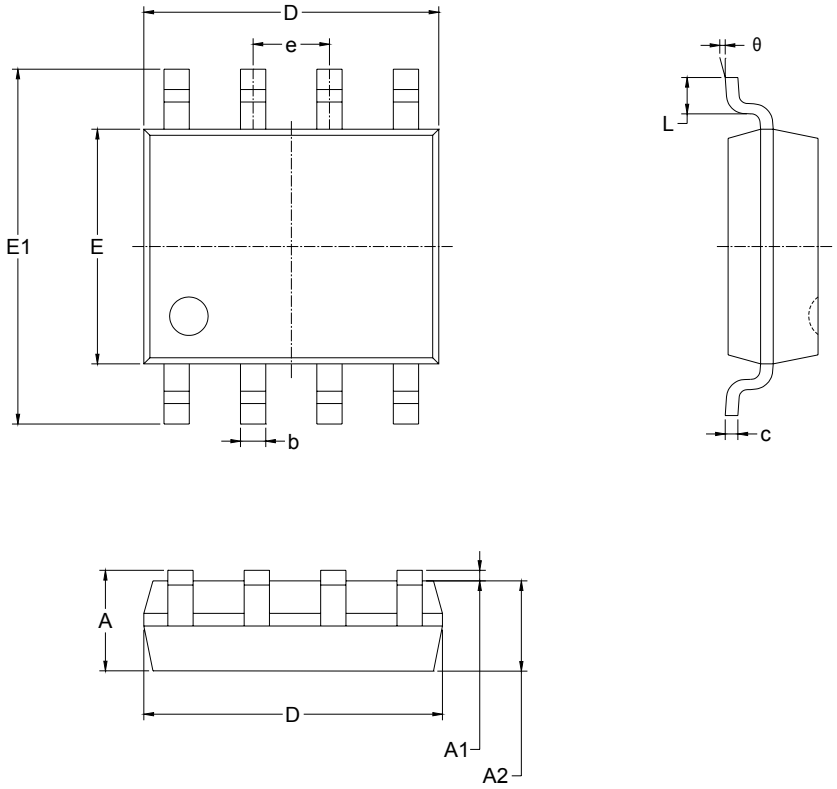


Figure 4. Interfacing to Microprocessors with Bidirectional Reset I/O

PACKAGE OUTLINE DIMENSIONS

SOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°