

# MAX809 Series, MAX810 Series

## Very Low Supply Current 3-Pin Microprocessor Reset Monitors

The MAX809 and MAX810 are cost-effective system supervisor circuits designed to monitor  $V_{CC}$  in digital systems and provide a reset signal to the host processor when necessary. No external components are required.

The reset output is driven active within 10  $\mu$ sec of  $V_{CC}$  falling through the reset voltage threshold. Reset is maintained active for a minimum of 140 msec after  $V_{CC}$  rises above the reset threshold. The MAX810 has an active-high RESET output while the MAX809 has an active-low  $\overline{\text{RESET}}$  output. Both devices are available in a SOT-23 package.

The MAX809/810 are optimized to reject fast transient glitches on the  $V_{CC}$  line. Low supply current of 1.0  $\mu$ A ( $V_{CC} = 3.2$  V) makes these devices suitable for battery powered applications.

### Features

- Precision  $V_{CC}$  Monitor for 2.5 V, 3.0 V, 3.3 V, and 5.0 V Supplies
- Precision Monitoring Voltages from 1.6 V to 4.9 V Available in 100 mV Steps
- 140 msec Guaranteed Minimum  $\overline{\text{RESET}}$  Output Duration
- Compatible with Hot Plug Applications
- Low Supply Current
- $V_{CC}$  Transient Immunity
- Small SOT-23 Package
- No External Components
- Wide Operating Temperature:  $-40^{\circ}\text{C}$  to  $105^{\circ}\text{C}$
- Pb-Free Packages are Available

### Typical Applications

- Computers
- Embedded Systems
- Battery Powered Equipment
- Critical Microprocessor Power Supply Monitoring

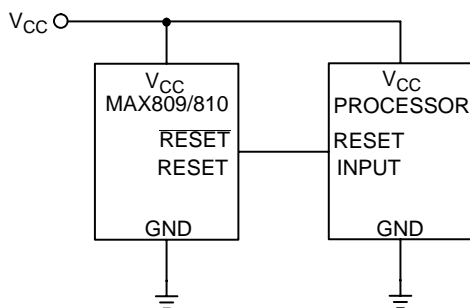


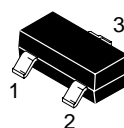
Figure 1. Typical Application Diagram



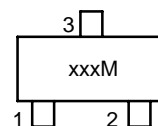
ON Semiconductor®

<http://onsemi.com>

### MARKING DIAGRAM

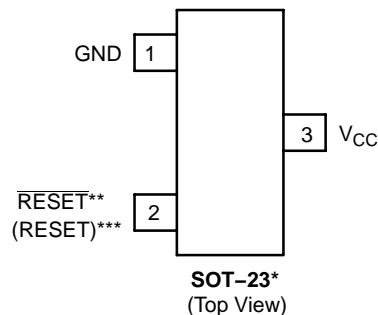


SOT-23  
(TO-236)  
CASE 318



xxx = Specific Device Code  
M = Date Code

### PIN CONFIGURATION



\*SOT-23 is equivalent to JEDEC (TO-236)  
\*\*RESET is for MAX809  
\*\*\*RESET is for MAX810

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 7 of this data sheet.

# MAX809 Series, MAX810 Series

## PIN DESCRIPTION

Pin No.	Symbol	Description
1	GND	Ground
2	RESET (MAX809)	RESET output remains low while V <sub>CC</sub> is below the reset voltage threshold, and for 240 msec (Typ) after V <sub>CC</sub> rises above reset threshold
2	RESET (MAX810)	RESET output remains high while V <sub>CC</sub> is below the reset voltage threshold, and for 240 msec (Typ) after V <sub>CC</sub> rises above reset threshold
3	V <sub>CC</sub>	Supply Voltage (Typ)

## ABSOLUTE MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Supply Voltage (V <sub>CC</sub> to GND)	V <sub>CC</sub>	6.0	V
RESET		-0.3 to (V <sub>CC</sub> + 0.3)	V
Input Current, V <sub>CC</sub>		20	mA
Output Current, RESET		20	mA
dV/dt (V <sub>CC</sub> )		100	V/μsec
Thermal Resistance, Junction-to-Air	R <sub>θJA</sub>	491	°C/W
Operating Temperature Range	T <sub>A</sub>	-40 to +105	°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Lead Temperature (Soldering, 10 Seconds)	T <sub>sol</sub>	+260	°C
Latchup performance:	I <sub>Latchup</sub>	200 200	mA
	Positive		
	Negative		

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

- This device series contains ESD protection and exceeds the following tests:  
Human Body Model 2000 V per MIL-STD-883, Method 3015.  
Machine Model Method 350 V.
- The maximum package power dissipation limit must not be exceeded.

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}} \quad \text{with } T_{J(max)} = 150^\circ\text{C}$$

## ELECTRICAL CHARACTERISTICS T<sub>A</sub> = -40°C to +105°C unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C. (Note 3)

Characteristic	Symbol	Min	Typ	Max	Unit
V <sub>CC</sub> Range T <sub>A</sub> = 0°C to +70°C T <sub>A</sub> = -40°C to +105°C		1.0 1.2	- -	5.5 5.5	V
Supply Current V <sub>CC</sub> = 3.3 V T <sub>A</sub> = -40°C to +85°C T <sub>A</sub> = 85°C to +105°C V <sub>CC</sub> = 5.5 V T <sub>A</sub> = -40°C to +85°C T <sub>A</sub> = 85°C to +105°C	I <sub>CC</sub>	- - - -	0.5 - 0.8 -	1.2 2.0 1.8 2.5	μA

- Production testing done at T<sub>A</sub> = 25°C, over temperature limits guaranteed by design.

## MAX809 Series, MAX810 Series

**ELECTRICAL CHARACTERISTICS (continued)**  $T_A = -40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  unless otherwise noted. Typical values are at  $T_A = +25^{\circ}\text{C}$ . (Note 4)

Characteristic	Symbol	Min	Typ	Max	Unit
Reset Threshold (Note 5)	$V_{TH}$				V
MAX809SN490					
$T_A = +25^{\circ}\text{C}$		4.83	4.9	4.97	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		4.78	–	5.02	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		4.66	–	5.14	
MAX8xxLTR					
$T_A = +25^{\circ}\text{C}$		4.56	4.63	4.70	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		4.50	–	4.75	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		4.40	–	4.86	
MAX809HTR					
$T_A = +25^{\circ}\text{C}$		4.48	4.55	4.62	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		4.43	–	4.67	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		4.32	–	4.78	
MAX8xxMTR					
$T_A = +25^{\circ}\text{C}$		4.31	4.38	4.45	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		4.27	–	4.49	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		4.16	–	4.60	
MAX809JTR					
$T_A = +25^{\circ}\text{C}$		3.94	4.00	4.06	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		3.90	–	4.10	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		3.80	–	4.20	
MAX8xxTTR					
$T_A = +25^{\circ}\text{C}$		3.04	3.08	3.11	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		3.00	–	3.16	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		2.92	–	3.24	
MAX8xxSTR					
$T_A = +25^{\circ}\text{C}$		2.89	2.93	2.96	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		2.85	–	3.00	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		2.78	–	3.08	
MAX8xxRTR					
$T_A = +25^{\circ}\text{C}$		2.59	2.63	2.66	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		2.56	–	2.70	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		2.49	–	2.77	
MAX809SN232					
$T_A = +25^{\circ}\text{C}$		2.28	2.32	2.35	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		2.25	–	2.38	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		2.21	–	2.45	
MAX809SN160					
$T_A = +25^{\circ}\text{C}$		1.58	1.6	1.62	
$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$		1.56	–	1.64	
$T_A = +85^{\circ}\text{C}$ to $+105^{\circ}\text{C}$		1.52	–	1.68	
Reset Temperature Coefficient		–	30	–	ppm/ $^{\circ}\text{C}$
$V_{CC}$ to Reset Delay $V_{CC} = V_{TH}$ to $(V_{TH} - 100\text{ mV})$		–	10	–	$\mu\text{sec}$
Reset Active TimeOut Period		140	240	460	msec
RESET Output Voltage Low $V_{CC} = V_{TH} - 0.2\text{ V}$ $1.6\text{ V} \leq V_{TH} \leq 2.0\text{ V}$ , $I_{SINK} = 0.5\text{ mA}$ $2.1\text{ V} \leq V_{TH} \leq 4.0\text{ V}$ , $I_{SINK} = 1.2\text{ mA}$ $4.1\text{ V} \leq V_{TH} \leq 4.9\text{ V}$ , $I_{SINK} = 3.2\text{ mA}$	$V_{OL}$	–	–	0.3	V
RESET Output Voltage High $V_{CC} = V_{TH} + 0.2\text{ V}$ $1.6\text{ V} \leq V_{TH} \leq 2.4\text{ V}$ , $I_{SOURCE} = 200\text{ }\mu\text{A}$ $2.5\text{ V} \leq V_{TH} \leq 4.9\text{ V}$ , $I_{SOURCE} = 500\text{ }\mu\text{A}$	$V_{OH}$	$0.8 V_{CC}$	–	–	V

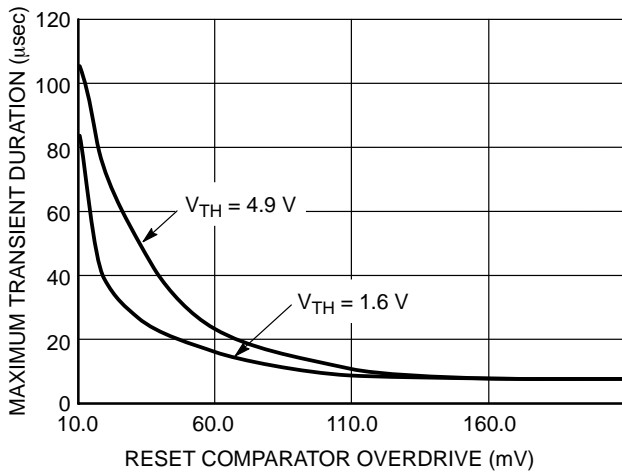
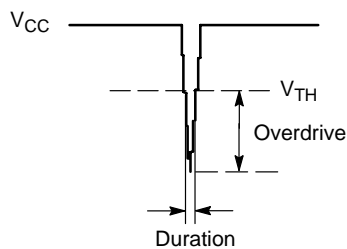
4. Production testing done at  $T_A = 25^{\circ}\text{C}$ , over temperature limits guaranteed by design.

5. Contact your ON Semiconductor sales representative for other threshold voltage options.

## APPLICATIONS INFORMATION

### V<sub>CC</sub> Transient Rejection

The MAX809 provides accurate V<sub>CC</sub> monitoring and reset timing during power-up, power-down, and brownout/sag conditions, and rejects negative-going transients (glitches) on the power supply line. Figure 2 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive which lies **under** the curve will **not** generate a reset signal. Combinations above the curve are detected as a brownout or power-down. Typically, transient that goes 100 mV below the reset threshold and lasts 5.0 μs or less will not cause a reset pulse. Transient immunity can be improved by adding a capacitor in close proximity to the V<sub>CC</sub> pin of the MAX809.

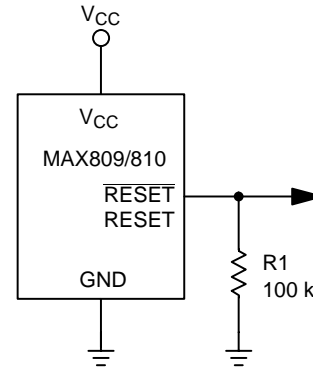


**Figure 2. Maximum Transient Duration vs. Overdrive for Glitch Rejection at 25°C**

### RESET Signal Integrity During Power-Down

The MAX809 RESET output is valid to V<sub>CC</sub> = 1.0 V. Below this voltage the output becomes an “open circuit” and does not sink current. This means CMOS logic inputs to the Microprocessor will be floating at an undetermined voltage. Most digital systems are completely shutdown well above this voltage. However, in situations where RESET must be

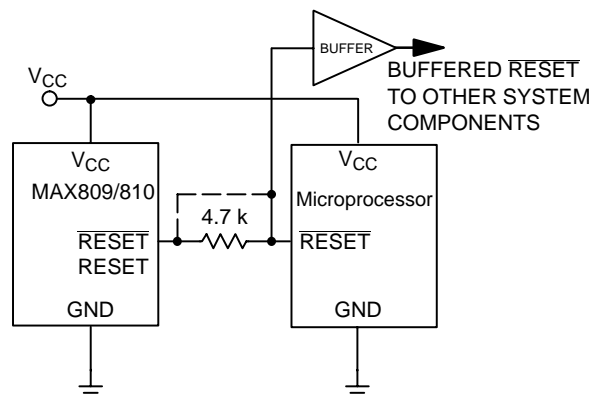
maintained valid to V<sub>CC</sub> = 0 V, a pull-down resistor must be connected from RESET to ground to discharge stray capacitances and hold the output low (Figure 3). This resistor value, though not critical, should be chosen such that it does not appreciably load RESET under normal operation (100 kΩ will be suitable for most applications).



**Figure 3. Ensuring RESET Valid to V<sub>CC</sub> = 0 V**

### Processors With Bidirectional I/O Pins

Some Microprocessor's have bidirectional reset pins. Depending on the current drive capability of the processor pin, an indeterminate logic level may result if there is a logic conflict. This can be avoided by adding a 4.7 kΩ resistor in series with the output of the MAX809 (Figure 4). If there are other components in the system which require a reset signal, they should be buffered so as not to load the reset line. If the other components are required to follow the reset I/O of the Microprocessor, the buffer should be connected as shown with the solid line.



**Figure 4. Interfacing to Bidirectional Reset I/O**

# MAX809 Series, MAX810 Series

## TYPICAL CHARACTERISTICS

The following data is given for MAX809 threshold levels: 1.60 V, 2.32 V, 2.93 V, 4.63 V and 4.90 V.

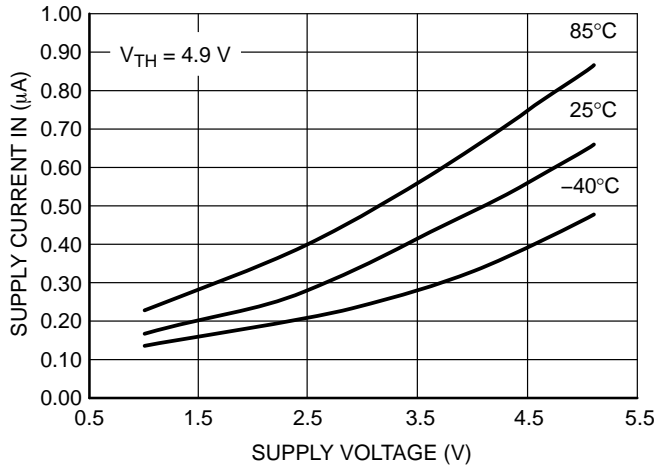


Figure 5. Supply Current vs. Supply Voltage

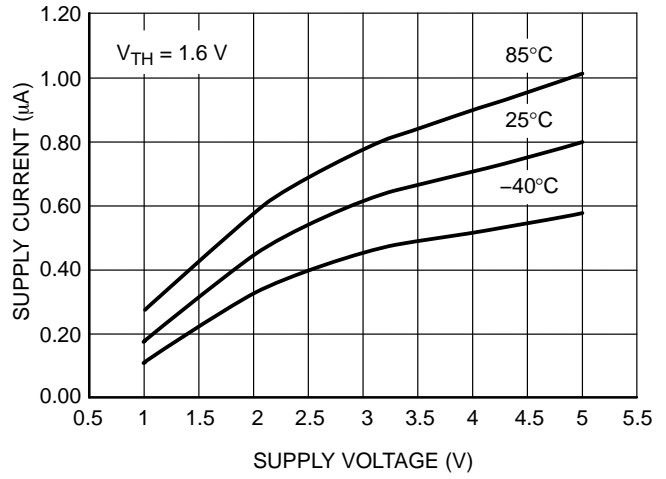


Figure 6. Supply Current vs. Supply Voltage

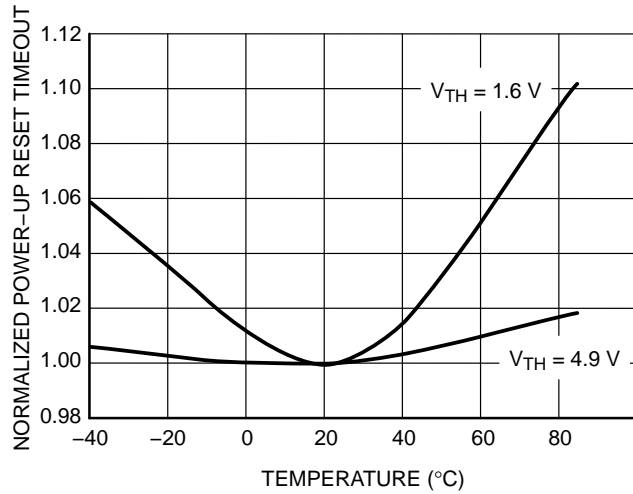


Figure 7. Normalized Power-Up Reset vs. Temperature

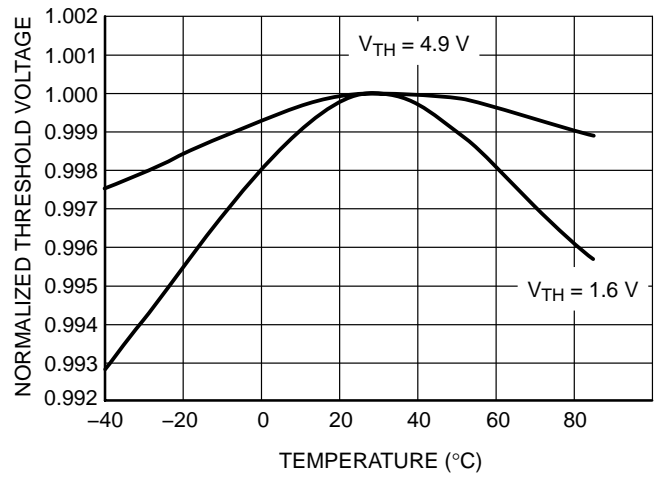


Figure 8. Normalized Reset Threshold Voltage vs. Temperature

# MAX809 Series, MAX810 Series

## TYPICAL CHARACTERISTICS

The following data is given for MAX809 threshold levels: 2.63 V, 3.08 V, 4.00 V and 4.38 V;  
MAX810 threshold levels: 2.63 V, 2.93 V, 3.08 V, 4.38 V and 4.63 V.

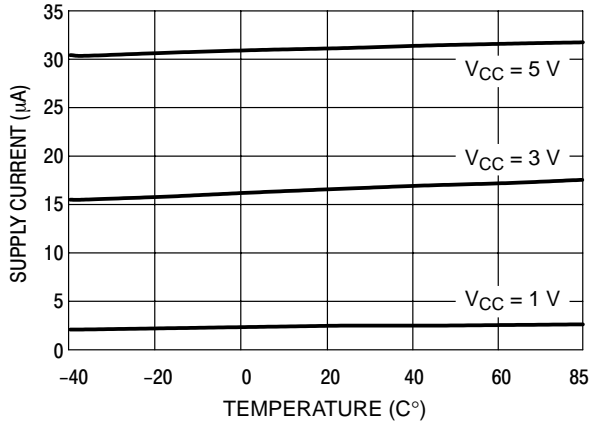


Figure 9. Supply Current vs. Temperature (No Load, MAX8xxR/T, MAX810S)

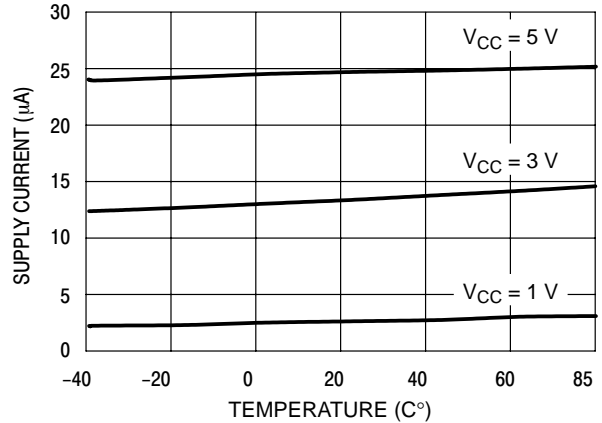


Figure 10. Supply Current vs. Temperature (No Load, MAX8xxM/MAX809J, MAX810L)

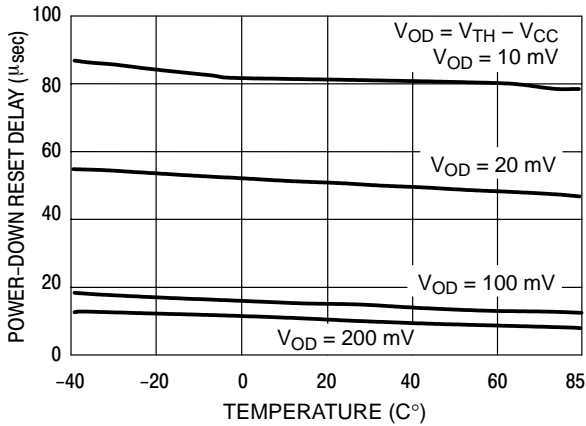


Figure 11. Power-Down Reset Delay vs. Temperature and Overdrive (MAX8xxR/T, MAX810S)

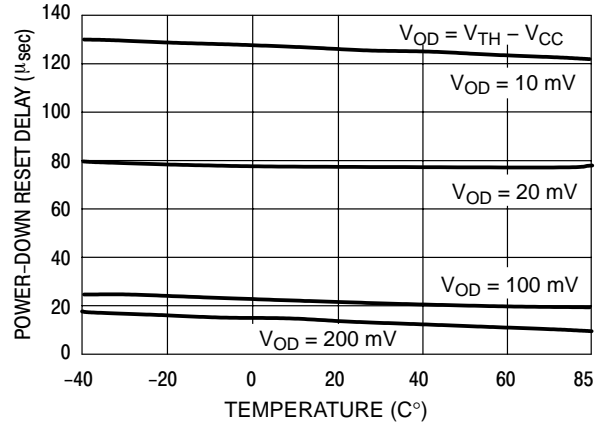


Figure 12. Power-Down Reset Delay vs. Temperature and Overdrive (MAX8xxM/MAX809J, MAX810L)

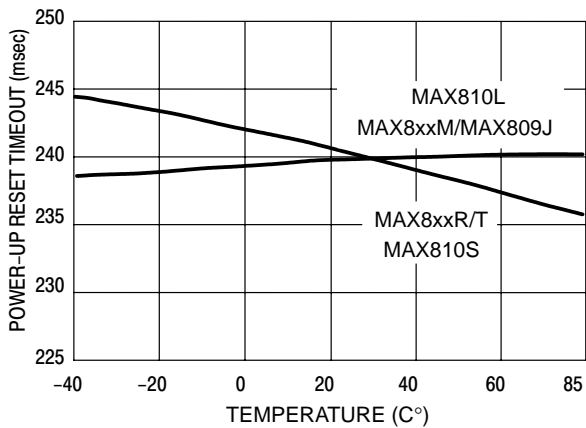


Figure 13. Power-Up Reset TimeOut vs. Temperature

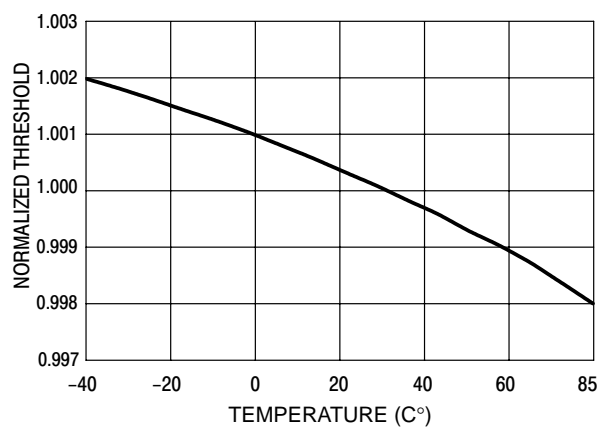


Figure 14. Normalized Reset Threshold vs. Temperature

## MAX809 Series, MAX810 Series

### ORDERING, MARKING AND THRESHOLD INFORMATION

Device	V <sub>TH</sub> *	Description	Marking	Package	Shipping†
MAX809SN160T1	1.60	Push-Pull RESET	SAA	SOT-23	3000 Tape/Reel
MAX809SN232T1	2.32		SQP	SOT-23	
MAX809SN232T1G	2.32		SQP	SOT-23 (Pb-Free)	
MAX809STR	2.93		SPT	SOT-23	
MAX809STRG	2.93		SPT	SOT-23 (Pb-Free)	
MAX809LTR	4.63		SPW	SOT-23	
MAX809LTRG	4.63		SPW	SOT-23 (Pb-Free)	
MAX809HTR	4.55		SBD	SOT-23	
MAX809SN490T1	4.90		SBH	SOT-23	
MAX809MTR	4.38		SPV	SOT-23	
MAX809MTRG	4.38		SPV	SOT-23 (Pb-Free)	
MAX809TTR	3.08		SPU	SOT-23	
MAX809TTRG	3.08		SPU	SOT-23 (Pb-Free)	
MAX809RTR	2.63		SPS	SOT-23	
MAX809RTRG	2.63		SPS	SOT-23 (Pb-Free)	
MAX809JTR	4.00		SPR	SOT-23	
MAX810MTR	4.38		Push-Pull RESET	SQA	
MAX810MTRG	4.38	SQA		SOT-23 (Pb-Free)	
MAX810TTR	3.08	SPZ		SOT-23	
MAX810RTR	2.63	SPX		SOT-23	
MAX810LTR	4.63	SQB		SOT-23	
MAX810LTRG	4.63	SQB		SOT-23 (Pb-Free)	
MAX810STR	2.93	SPY		SOT-23	
MAX810STRG	2.93	SPY		SOT-23 (Pb-Free)	

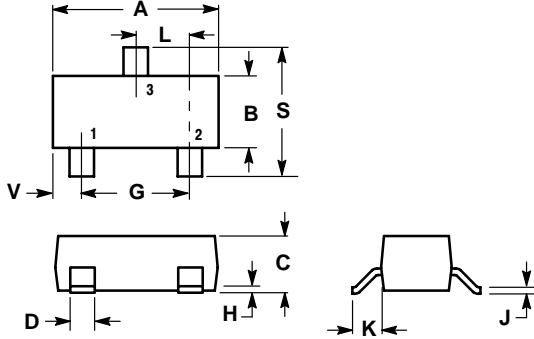
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*Contact your ON Semiconductor sales representative for other threshold voltage options.

# MAX809 Series, MAX810 Series

## PACKAGE DIMENSIONS

SOT-23 (TO236)  
PLASTIC PACKAGE  
CASE 318-08  
ISSUE AK

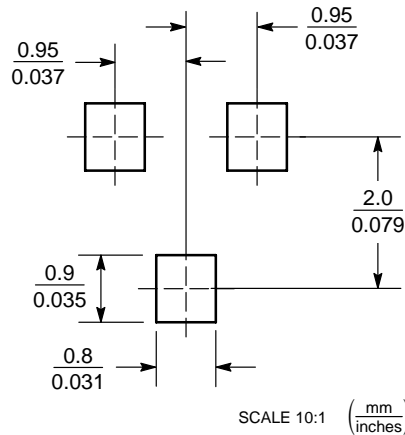


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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