

## General Description

The MIC809 and MIC810 are inexpensive microprocessor supervisory circuits that monitor power supplies in microprocessor based systems.

The function of these devices is to assert a reset if the power supply drops below a designated reset threshold level. Several different reset threshold levels are available to accommodate 3V, 3.3V or 5V powered systems.

The MIC809 has an active-low /RESET output, while the MIC810 offers an active-high RESET output. The reset output is guaranteed to remain asserted for a minimum of 140ms after  $V_{CC}$  has risen above the designated reset threshold level. Having a push-pull output stage, the MIC809/810 does not require a pull-up resistor at the output. The MIC809/810 comes in a 3-pin SOT-23 and SC-70 package.

The MIC809 is also available with a shorter reset timeout (30ms min.). See the MIC809-5.

All support documentation can be found on Micrel's web site at [www.micrel.com](http://www.micrel.com).

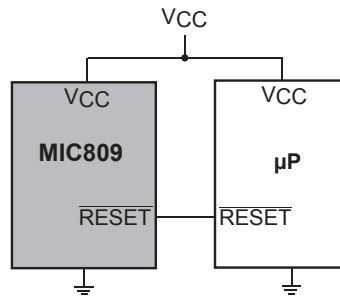
## Features

- Precision voltage monitor for 3V, 3.3V or 5V power supplies
- /RESET remains valid with  $V_{CC}$  as low as 1.4V for SOT-23 packaged part
- /RESET remains valid with  $V_{CC}$  as low as 1V for SC70 packaged part
- Typically less than 15 $\mu$ A supply current for SOT-23 packaged part
- 5 $\mu$  typical supply current for SC70 packaged part
- 140ms minimum reset pulse widths available
- Available in 3-pin SOT-23 and SC-70 package

## Applications

- Portable equipment
- Intelligent instruments
- Critical microprocessor power monitoring
- Printers/computers
- Controllers

## Typical Application

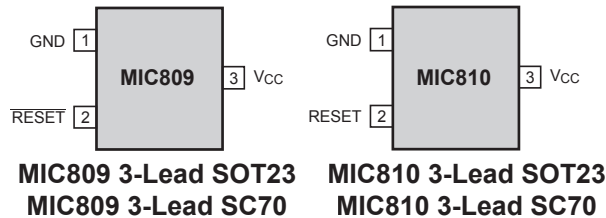


## Ordering Information

| Part Number           |                      | Marking   | Threshold Voltage | Operating Temp. Range | Lead Finish |
|-----------------------|----------------------|-----------|-------------------|-----------------------|-------------|
| 3-lead SOT-23 Package | 3-lead SC-70 Package |           |                   |                       |             |
| MIC809LU              | MIC809LBC3           | IL        | 4.63              | -40°C to +85°C        | Standard    |
| MIC809MU              | MIC809MBC3           | IM        | 4.38              | -40°C to +85°C        | Standard    |
| MIC809JU              | MIC809JBC3           | IJ        | 4.00              | -40°C to +85°C        | Standard    |
| MIC809TU              | MIC809TBC3           | IT        | 3.08              | -40°C to +85°C        | Standard    |
| MIC809SU              | MIC809SBC3           | IS        | 2.93              | -40°C to +85°C        | Standard    |
| MIC809RU              | MIC809RBC3           | IR        | 2.63              | -40°C to +85°C        | Standard    |
| MIC810LU              | MIC810LBC3           | JL        | 4.63              | -40°C to +85°C        | Standard    |
| MIC810MU              | MIC810MBC3           | JM        | 4.38              | -40°C to +85°C        | Standard    |
| MIC810JU              | MIC810JBC3           | JJ        | 4.00              | -40°C to +85°C        | Standard    |
| MIC810TU              | MIC810TBC3           | JT        | 3.08              | -40°C to +85°C        | Standard    |
| MIC810SU              | MIC810SBC3           | JS        | 2.93              | -40°C to +85°C        | Standard    |
| MIC810RU              | MIC810RBC3           | JR        | 2.63              | -40°C to +85°C        | Standard    |
| MIC809LUY             | MIC809LYC3           | <u>IL</u> | 4.63              | -40°C to +85°C        | Pb-Free     |
| MIC809MUY             | MIC809MYC3           | <u>IM</u> | 4.38              | -40°C to +85°C        | Pb-Free     |
| MIC809JUY             | MIC809JYC3           | <u>IJ</u> | 4.00              | -40°C to +85°C        | Pb-Free     |
| MIC809TUY             | MIC809TYC3           | <u>IT</u> | 3.08              | -40°C to +85°C        | Pb-Free     |
| MIC809SUY             | MIC809SYC3           | <u>IS</u> | 2.93              | -40°C to +85°C        | Pb-Free     |
| MIC809RUY             | MIC809RYC3           | <u>IR</u> | 2.63              | -40°C to +85°C        | Pb-Free     |
| MIC810LUY             | MIC810LYC3           | <u>JL</u> | 4.63              | -40°C to +85°C        | Pb-Free     |
| MIC810MUY             | MIC810MYC3           | <u>JM</u> | 4.38              | -40°C to +85°C        | Pb-Free     |
| MIC810JUY             | MIC810JYC3           | <u>JJ</u> | 4.00              | -40°C to +85°C        | Pb-Free     |
| MIC810TUY             | MIC810TYC3           | <u>JT</u> | 3.08              | -40°C to +85°C        | Pb-Free     |
| MIC810SUY             | MIC810SYC3           | <u>JS</u> | 2.93              | -40°C to +85°C        | Pb-Free     |
| MIC810RUY             | MIC810RYC3           | <u>JR</u> | 2.63              | -40°C to +85°C        | Pb-Free     |

Note: Contact factory for SC70 packaged Pb-free options..

## Pin Configuration



## Pin Description

| Pin Number<br>MIC809 | Pin Number<br>MIC810 | Pin Name | Pin Function   |
|----------------------|----------------------|----------|--|
| 1                    | 1                    | GND      | IC Ground Pin.   |
| 2                    | N/A                  | /RESET   | /RESET goes low if $V_{CC}$ falls below the reset threshold and remains asserted for one reset timeout period (140ms min.) after $V_{CC}$ exceeds the reset threshold. |
| N/A                  | 2                    | RESET    | RESET goes high if $V_{CC}$ falls below the reset threshold and remains asserted for one reset timeout period (140ms min.) after $V_{CC}$ exceeds the reset threshold. |
| 3                    | 3                    | VCC      | Power Supply Input.  |

**Absolute Maximum Ratings<sup>(1)</sup>**

|  |                    |
|--|--------------------|
| Terminal Voltage ( $V_{CC}$ ).....         | -0.3V to 6.0V      |
| Input Current ( $V_{CC}$ ).....            | 20mA               |
| Output Current (RESET, /RESET).....        | 20mA               |
| Lead Temperature (soldering, 10 sec.)..... | 300°C              |
| Storage Temperature ( $T_S$ ).....         | -65°C to 150°C     |
| Rate of Rise ( $V_{CC}$ ).....             | 100V/ $\mu$ s      |
| ESD Rating <sup>(3)</sup> .....            | 3kV (SC70 Package) |

**Operating Ratings<sup>(2)</sup>**

|  |               |
|--|---------------|
| Operating Temperature Range                          |               |
| MIC809.....  | -40°C to 85°C |
| MIC810.....  | -40°C to 85°C |
| Power Dissipation ( $T_A = +70^\circ\text{C}$ )..... | 320mW         |

**Electrical Characteristics<sup>(4)</sup>**

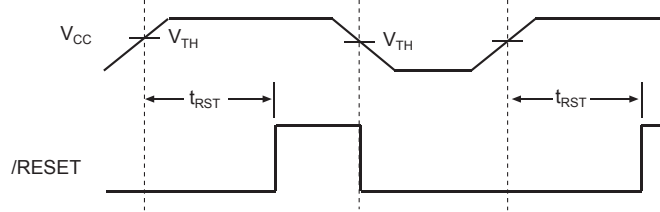
For typical values,  $V_{CC} = 5\text{V}$  for MIC8\_L/M/J,  $V_{CC} = 3.3\text{V}$  for MIC8\_S/T,  $V_{CC} = 3\text{V}$  for MIC8\_R;  $T_A = 25^\circ\text{C}$ , **bold** values indicate  $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ ; unless noted.

| Symbol    | Parameter                       | Condition  | Min                                      | Typ  | Max         | Units         |
|-----------|---------------------------------|--|--|------|-------------|---------------|
| $V_{CC}$  | Operating Voltage Range         | $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$ SOT-23 package   | <b>1.4</b>                               |      | <b>5.5</b>  | V             |
|           |                                 | $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ SOT-23 package   | <b>1.6</b>                               |      | <b>5.5</b>  | V             |
|           |                                 | $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ SC70 package   | <b>1</b>                                 |      | <b>5.5</b>  | V             |
| $I_{CC}$  | Supply Current                  | MIC809L/M/J, MIC810L/M/J SOT-23 Package  |  | 9    | <b>15</b>   | $\mu\text{A}$ |
|           |                                 | For SC-70 Package: MIC809L/M/J, MIC810L/M/J  |  | 5    | <b>15</b>   | $\mu\text{A}$ |
|           |                                 | $V_{CC} < 3.6\text{V}$ , MIC809R/S/T, MIC810R/S/T SOT-23 package   |  | 6    | <b>10</b>   | $\mu\text{A}$ |
|           |                                 | For SC-70 Package: $V_{CC} < 3.6\text{V}$ , MIC809R/S/T, MIC810R/S/T   |  | 5    | <b>10</b>   | $\mu\text{A}$ |
| $V_{TH}$  | Reset Voltage Threshold         | MIC809L, MIC810L   | <b>4.50</b>                              | 4.63 | <b>4.75</b> | V             |
|           |                                 | MIC809M, MIC810M   | <b>4.25</b>                              | 4.38 | <b>4.50</b> | V             |
|           |                                 | MIC809J, MIC810J   | <b>3.89</b>                              | 4.00 | <b>4.10</b> | V             |
|           |                                 | MIC809T, MIC810T   | <b>3.00</b>                              | 3.08 | <b>3.15</b> | V             |
|           |                                 | MIC809S, MIC810S   | <b>2.85</b>                              | 2.93 | <b>3.00</b> | V             |
|           |                                 | MIC809R, MIC810R   | <b>2.55</b>                              | 2.63 | <b>2.70</b> | V             |
| $t_{RST}$ | Reset Timeout Period            |  | <b>140</b>                               | 240  | <b>560</b>  | ms            |
| $V_{OH}$  | /RESET Output Voltage<br>MIC809 | $I_{SOURCE} = 800\mu\text{A}$ , MIC809L/M/J  | <b><math>V_{CC} - 1.5\text{V}</math></b> |      |             | V             |
|           |                                 | $I_{SOURCE} = 500\mu\text{A}$ , MIC809R/S/T  | <b><math>0.8 \times V_{CC}</math></b>    |      |             | V             |
| $V_{OL}$  | /RESET Output Voltage<br>MIC809 | $V_{CC} = V_{TH}$ min., $I_{SINK} = 3.2\text{mA}$ , MIC809L/M/J  |  |      | <b>0.4</b>  | V             |
|           |                                 | $V_{CC} = V_{TH}$ min., $I_{SINK} = 1.2\text{mA}$ , MIC809R/S/T  |  |      | <b>0.3</b>  | V             |
|           |                                 | $V_{CC} > 1.4\text{V}$ , $I_{SINK} = 50\mu\text{A}$ , $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$                   |  |      | <b>0.3</b>  | V             |
|           |                                 | For SC-70 Package: $V_{CC} = 1\text{V}$ , $I_{SINK} = 50\mu\text{A}$ , $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ |  |      | <b>0.3</b>  | V             |
|           |                                 | $V_{CC} > 1.6\text{V}$ , $I_{SINK} = 50\mu\text{A}$ , $T_A = -40^\circ$ to $+85^\circ\text{C}$                         |  |      | <b>0.3</b>  | V             |
| $V_{OH}$  | RESET Output Voltage<br>MIC810  | $1.8\text{V} < V_{CC} < V_{TH}$ min., $I_{SOURCE} = 150\mu\text{A}$  | <b><math>0.8 \times V_{CC}</math></b>    |      |             | V             |
| $V_{OL}$  | RESET Output Voltage<br>MIC810  | $I_{SINK} = 3.2\text{mA}$ , MIC810L/M/J  |  |      | <b>0.4</b>  | V             |
|           |                                 | $I_{SINK} = 1.2\text{mA}$ , MIC810R/S/T  |  |      | <b>0.3</b>  | V             |

**Notes:**

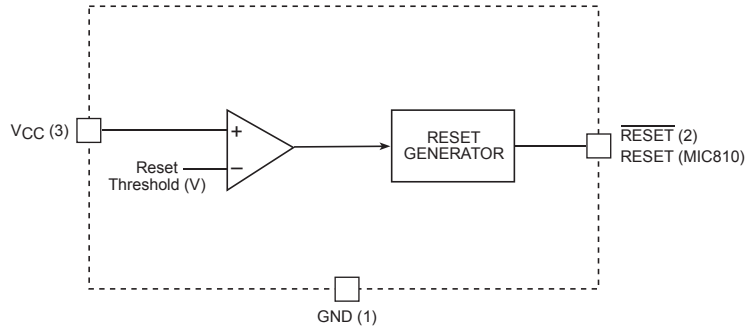
1. Exceeding the absolute maximum rating may damage the device.
2. The device is not guaranteed to function outside its operating rating.
3. Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF.
4. Specification for packaged product only.

# Timing Diagram



Reset Timing Diagram

# Functional Diagram



## Applications Information

### Microprocessor Reset

The /RESET (or RESET) pin is asserted whenever  $V_{CC}$  falls below the reset threshold voltage. The /RESET pin remains asserted for a period of 140ms after  $V_{CC}$  has risen above the reset threshold voltage. The reset function ensures the microprocessor is properly reset and powers up in a known condition after a power failure. /RESET will remain valid with  $V_{CC}$  as low as 1.4V (1V for SC-70 package).

### $V_{CC}$ Transients

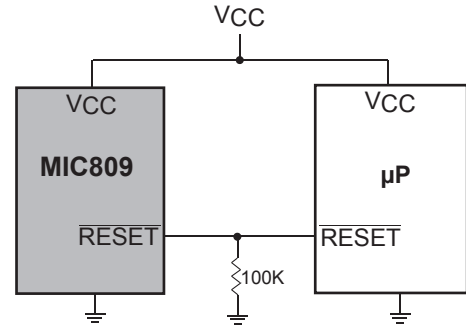
The MIC809/810 are relatively immune to negative-going  $V_{CC}$  glitches below the reset threshold. Typically, a negative-going transient 125mV below the reset threshold with a duration of 20 $\mu$ s or less (SC70 package) will not cause a reset.

### Interfacing to Bidirectional Reset Pins

The MIC809/810 can interface with  $\mu$ Ps with bidirectional reset pins by connecting a 4.7k $\Omega$  resistor in series with the MIC809/810 output and the  $\mu$ P reset pin.

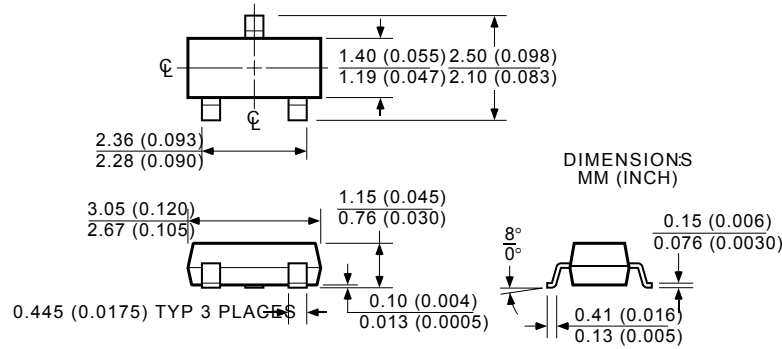
### /RESET Valid at Low Voltage

A resistor can be added from the /RESET pin to ground to ensure the /RESET output remains low with  $V_{CC}$  down to 0V. A 100k $\Omega$  resistor connected from the /RESET to ground is recommended. The resistor should be small enough to pull-down any stray leakage currents and large enough not to load the reset output. See Figure below.

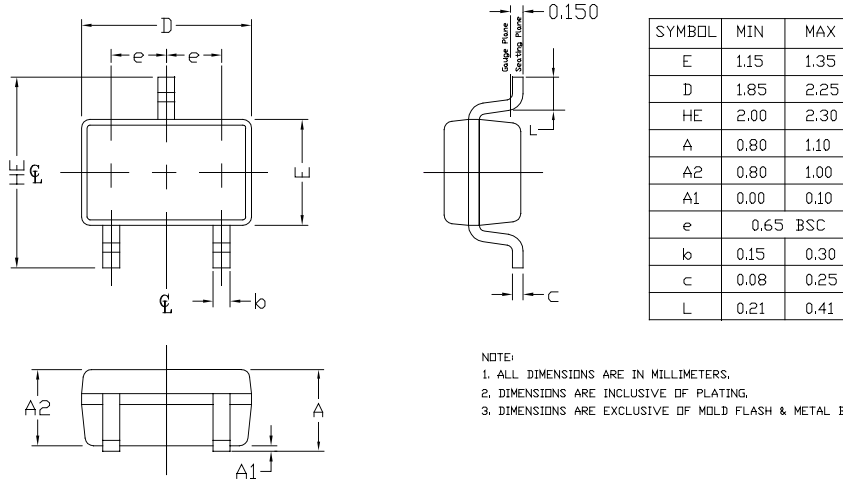


Reset Valid to  $V_{CC} = 0V$

Package Information



3-lead SOT-23 (M3)



3-Lead SC-70 (C3)

**MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA**

TEL + 1 (408) 944-0800 FAX + 1 (408) 474-1000 WEB <http://www.micrel.com>

The information furnished by Micrel in this data sheet is believed to be accurate and reliable. However, no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is at Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2005 Micrel, Incorporated.