



## General Description

The MIC809-5 is a power supply supervisor that provides under-voltage monitoring and power-on reset generation in an industry standard 3-pin SOT package and SC-70 package. The reset output is asserted at power-on and any time the input voltage drops below the programmed threshold. It remains asserted for 30ms (min.) after the input subsequently rises back above the threshold boundary. The MIC809-5 has an active-low reset output.

The MIC809-5 is inherently immune to brief power supply transients. Typical supply current is a low 5 $\mu$ A. For those applications that require a manual reset function, see the MIC811/812. For those applications that require a longer reset timeout, see the MIC809/810. (The MIC809-5 is identical to the industry-standard MIC809 with the exception of a shorter reset timeout).

## Features

- Under-voltage monitor
- Power-on reset generation (30ms minimum)
- Choice of threshold voltages
- Active-low reset output
- No external components required
- Rejects brief input transients
- Industry standard package and pinout
- 3-pin IttyBitty™ SOT23-3 package and SC-70 package

## Applications

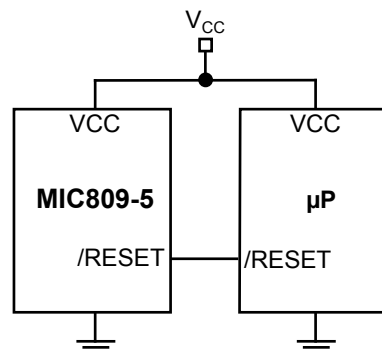
- PDAs, hand-held PCs
- Embedded controllers
- Telecommunications systems
- Power supplies
- Wireless/cellular systems
- Networking hardware

## Ordering Information

| Part Number  | Marking   | Typical Application Voltage* | Nominal Threshold Voltage | t <sub>RST</sub> (ms) | Operating Temp. Range | Package | Pb-Free |
|--------------|-----------|------------------------------|---------------------------|-----------------------|-----------------------|---------|---------|
| MIC809-5SU   | IX        | 3.3V $\pm$ 5%                | 2.93                      | 30                    | -40°C to +85°C        | SOT23-3 | No      |
| MIC809-5SBC3 | IX        | 3.3V $\pm$ 5%                | 2.93                      | 30                    | -40°C to +85°C        | SC70-3  | No      |
| MIC809-5SUY  | <u>IX</u> | 3.3V $\pm$ 5%                | 2.93                      | 30                    | -40°C to +85°C        | SOT23-3 | Yes     |
| MIC809-5SYC3 | <u>IX</u> | 3.3V $\pm$ 5%                | 2.93                      | 30                    | -40°C to +85°C        | SC70-3  | Yes     |

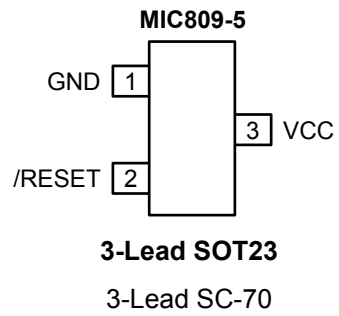
\*Other voltages available. Contact Micrel for details. Minimum order may apply.

## Typical Application



## Pin Configuration

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## Pin Description

| Pin Number | Pin Name | Pin Function                                                                                                                                                                                           |
|------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | GND      | Ground return for all IC functions.                                                                                                                                                                    |
| 2          | /RESET   | Digital Output. Active-low. Asserted whenever $V_{CC}$ falls below the threshold voltage. It will remain asserted for no less than 30ms and be de-asserted after $V_{CC}$ returns above the threshold. |
| 3          | VCC      | Analog Input. Power supply input to the IC.                                                                                                                                                            |

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            |

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

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

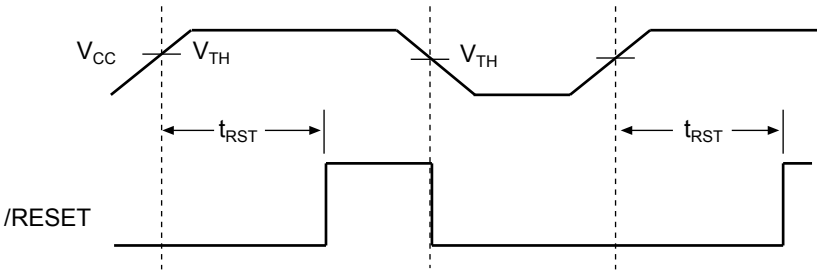
Electrical Characteristics

For typical values,  $V_{CC} = 3.3\text{V}$ ,  $T_A = 25^\circ\text{C}$ ; **bold** are for -40°C to +85°C; unless otherwise noted

| Symbol     | Parameter                  | Condition                                               | Min                                   | Typ  | Max         | Units         |
|------------|----------------------------|---------------------------------------------------------|---------------------------------------|------|-------------|---------------|
| $V_{CC}$   | Operating Voltage Range    | $T_A = -40^\circ\text{C to } 85^\circ\text{C}$          | <b>1</b>                              |      | <b>5.5</b>  | <b>V</b>      |
| $I_{CC}$   | Supply Current             | $V_{CC} < 3.6\text{V}$                                  |                                       | 5    | <b>10</b>   | $\mu\text{A}$ |
| $V_{TH}$   | Reset Voltage Threshold    | S Voltage Options                                       | <b>2.85</b>                           | 2.93 | <b>3.00</b> | V             |
| $V_{HYST}$ | Typical hysteresis         |                                                         |                                       | 5    |             | mV            |
| $t_{RST}$  | Reset Timeout Period       |                                                         | <b>30</b>                             |      | <b>66</b>   | ms            |
| $t_{PROP}$ | Propogation delay          | /RESET < $V_{OL}$ , 100mV Overdrive                     |                                       | 14.5 |             | $\mu\text{s}$ |
| $V_{OH}$   | /RESET Output Voltage High | $I_{SOURCE} = 500\mu\text{A}$                           | <b><math>0.8 \times V_{CC}</math></b> |      |             | <b>V</b>      |
| $V_{OL}$   | /RESET Output Voltage Low  | $V_{CC} = V_{TH} \text{ min.}, I_{SINK} = 1.2\text{mA}$ |                                       |      | <b>0.3</b>  | V             |
|            |                            | $V_{CC} > 1\text{V}, I_{SINK} = 50\mu\text{A}$          |                                       |      | <b>0.3</b>  | V             |

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

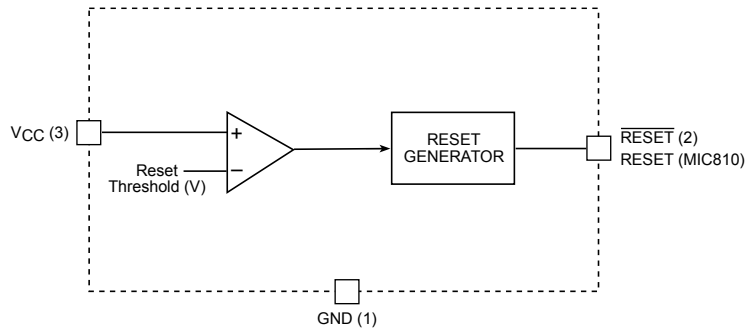
Timing Diagram



Reset Timing Diagram

## Functional Diagram

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## Applications Information

### Microprocessor Reset

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The  $\overline{\text{RESET}}$  pin is asserted whenever  $V_{CC}$  falls below the reset threshold voltage. The  $\overline{\text{RESET}}$  pin remains asserted for a period of 30ms 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.  $\overline{\text{RESET}}$  will remain valid with  $V_{CC}$  as low as 1V.

### Transients on $V_{CC}$

The MIC809-5 is inherently immune to very short “glitches” on  $V_{CC}$ . In the case of very brief transients,  $V_{CC}$  may drop below the reset-voltage threshold without triggering a reset. As shown in the graph, the MIC809-5 is relatively immune to transients with typical duration of 20 $\mu\text{s}$ . The lines on the graph of Figure 1 represent the typical allowable transient duration for a given amount of threshold overdrive that will not generate a reset. The data was taken by adding negative-going square-wave pulse to a DC input voltage set at 0.5V above actual measured threshold for the part being characterized.

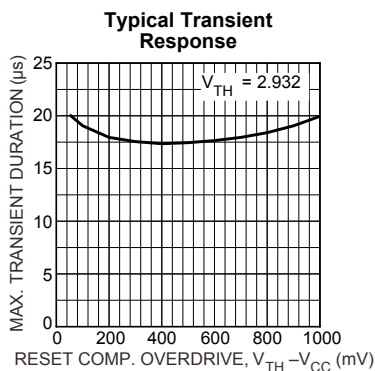


Figure 1. Comparator Overdrive vs. Duration

### Ensuring Proper Operation at Low $V_{CC}$

At levels of  $V_{CC}$  below 1V, the MIC809-5's output driver cannot always turn on sufficiently to produce a valid logic-low. In this situation, other circuits driven by  $\overline{\text{RESET}}$  could be allowed to float, causing undesired operation. (In most cases, however, it is expected that the circuits driven by the MIC809-5 will be similarly inoperative at  $V_{CC} = 1\text{V}$ .)

If a given application requires that  $\overline{\text{RESET}}$  be valid below  $V_{CC} = 1\text{V}$ , this can be accomplished by adding a pull-down resistor to the output. A value of 100k $\Omega$  is recommended, as this is usually an acceptable compromise of leakage current and pull-down current. The resistor's value is not critical, however. See Figure 2.

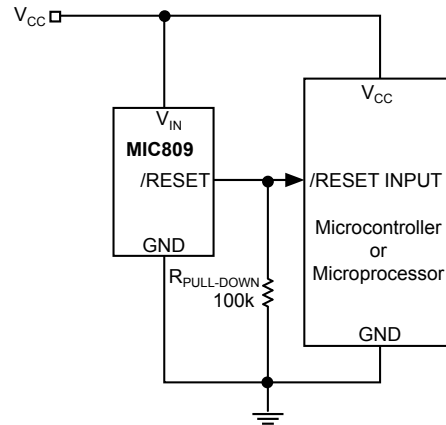


Figure 2. Ensuring a Valid  $\overline{\text{RESET}}$  Signal at Low Voltage

### Interfacing to Processors with Bidirectional Reset Pins

Some microprocessors have reset signal pins that are bidirectional, rather than input only. The Motorola 68HC11 family is one example. To prevent excessive current flow when the processor asserts its reset output, a series resistor is employed between the MIC809-5's output and the reset pin. This limits the current that will flow between the MIC809-5 and the reset pin to a theoretical maximum of  $V_{CC}/R_{\text{SERIES}}$ . Because this resistor also limits the drive capability of the supervisor's output, a buffer may be required to drive additional circuitry. See Figure 3.

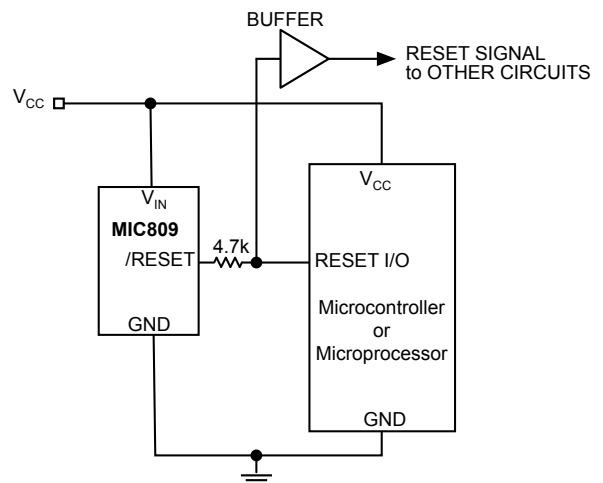
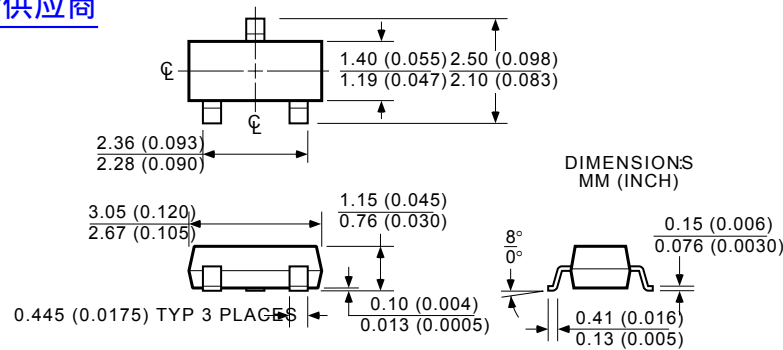
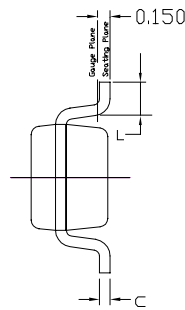


Figure 3. Interfacing to Processors with Bidirectional Reset Pins

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Technical drawing of a rectangular plate with rounded corners. The top view shows a rectangle with overall width  $D$  and overall height  $L$ . The distance from the center to the edge of the rounded corner is  $e$ . The plate has four mounting holes, two on the top and two on the bottom, with a hole diameter of  $\varnothing$ . The distance between the centers of the top holes is  $\varnothing$ , and the distance between the centers of the bottom holes is  $\varnothing$ . The distance from the center of the plate to the center of the top holes is  $\varnothing$ , and the distance from the center of the plate to the center of the bottom holes is  $\varnothing$ . The side view shows the plate with a thickness of  $A_1$  and a total height of  $A_2$ .



| SYMBOL | MIN      | MAX  |
|--------|----------|------|
| E      | 1.15     | 1.35 |
| D      | 1.85     | 2.25 |
| HE     | 2.00     | 2.30 |
| A      | 0.80     | 1.10 |
| A2     | 0.80     | 1.00 |
| A1     | 0.00     | 0.10 |
| e      | 0.65 BSC |      |
| b      | 0.15     | 0.30 |
| c      | 0.08     | 0.25 |
| L      | 0.21     | 0.41 |

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH & METAL BURR.

### 3-Lead SC-70 (C3)