



## MIC811/812

### Microprocessor Reset Circuits

#### General Description

The MIC811 and MIC812 are inexpensive microprocessor supervisory circuits that monitor power supplies in microprocessor based systems.

The function of this device is to assert a reset if either the power supply drops below a designated reset threshold level or /MR is forced low. Several different reset threshold levels are available to accommodate 3V, 3.3V or 5V powered systems.

The MIC811 has an active low /RESET output, while the MIC812 offers an active high RESET output. The reset output is guaranteed to remain asserted for a minimum of 140ms after VCC has risen above the designed reset threshold level. Having a push-pull output stage, the MIC811/812 does not require a pull-up resistor at the output. The MIC811/812 comes in a 4-pin SOT-143 package.

If a microprocessor voltage supervisor with an open-drain output stage is needed, see MIC6315.

Datasheets and support documentation are available on Micrel's web site at: [www.micrel.com](http://www.micrel.com).

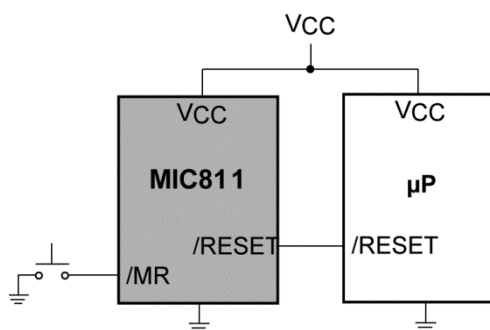
#### Features

- Precision voltage monitor for 3V, 3.3V or 5V power supplies
- /RESET remains valid with VCC as low as 1V
- 5 $\mu$ A typical supply current
- 140ms minimum reset pulse width available
- Manual reset input
- Available in 4-pin SOT-143 package

#### Applications

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

#### Typical Application



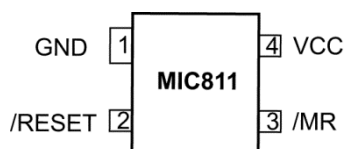
## Ordering Information

| Part Number<br>Pb-Free | Marking <sup>(1)</sup> | Threshold Voltage | Operating Temp. Range | Package       |
|------------------------|------------------------|-------------------|-----------------------|---------------|
| MIC811LUY              | <u>KL</u>              | 4.63              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC811MUJ              | <u>KM</u>              | 4.38              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC811JUY              | <u>KJ</u>              | 4.00              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC811TUY              | <u>KT</u>              | 3.08              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC811SUY              | <u>KS</u>              | 2.93              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC811RUY              | <u>KR</u>              | 2.63              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC812LUY              | <u>LL</u>              | 4.63              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC812MUJ              | <u>LM</u>              | 4.38              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC812JUY              | <u>LJ</u>              | 4.00              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC812TUY              | <u>LT</u>              | 3.08              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC812SUY              | <u>LS</u>              | 2.93              | –40°C to +85°C        | 4-pin SOT-143 |
| MIC812RUY              | <u>LR</u>              | 2.63              | –40°C to +85°C        | 4-pin SOT-143 |

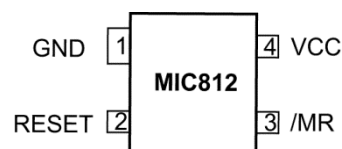
### Note:

1. “\_” underbar symbol not to scale

## Pin Configuration



MIC811 4-Pin SOT-143 (U)



MIC812 4-Pin SOT-143 (U)

## Pin Description

| MIC811 | MIC812 | Pin Name | Pin Name                                                                                                                                                                                                                                                                                    |
|--------|--------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | 1      | GND      | IC Ground Pin.                                                                                                                                                                                                                                                                              |
| 2      | N/A    | /RESET   | /RESET goes low if VCC falls below the reset threshold and remains asserted for one reset timeout period (140ms min.) after VCC exceeds the reset threshold.                                                                                                                                |
| N/A    | 2      | RESET    | RESET goes high if VCC falls below the reset threshold and remains asserted for one reset timeout period (140ms min.) after VCC exceeds the reset threshold.                                                                                                                                |
| 3      | 3      | /MR      | Manual Reset Input. A logic low on /MR will force a reset. The reset will remain asserted as long as /MR is held low and for one reset timeout period (140ms min.) after /MR goes high. This input can be shorted to ground via a switch or driven from CMOS or TTL logic. Float if unused. |
| 4      | 4      | VCC      | Power Supply Input.                                                                                                                                                                                                                                                                         |

## Absolute Maximum Ratings<sup>(2)</sup>

|                                        |                |
|----------------------------------------|----------------|
| Terminal Voltage (VCC) .....           | -0.3V to +6.0V |
| Input Current (VCC, /MR).....          | 20mA           |
| Output Current (/RESET, RESET) .....   | 20mA           |
| Lead Temperature (soldering, 10s)..... | 300°C          |
| Storage Temperature (Ts).....          | 5°C to 150°C   |
| Rate of Rise (VCC) .....               | 100V/μs        |
| ESD Rating <sup>(4)</sup> .....        | 3kV            |

## Operating Ratings<sup>(3)</sup>

|                                                  |                |
|--------------------------------------------------|----------------|
| Operating Temperature Range                      |                |
| MIC811 .....                                     | -40°C to +85°C |
| MIC812 .....                                     | -40°C to +85°C |
| Power Dissipation (T <sub>A</sub> = +70°C) ..... | 320mW          |
| Thermal Resistance                               |                |
| SOT-143 (θ <sub>JA</sub> ) .....                 | 265°C/W        |

## Electrical Characteristics<sup>(5)</sup>

For typical values, VCC = 5V for MIC8\_L/M/J, VCC = 3.3V for MIC8\_S/T, VCC = 3V for MIC8\_R; T<sub>A</sub> = 25°C, **bold** values indicate -40°C to ≤ T<sub>A</sub> ≤ +85°C; unless noted.

| Symbol           | Parameter               | Condition                                                           | Min             | Typ  | Max         | Units |
|------------------|-------------------------|---------------------------------------------------------------------|-----------------|------|-------------|-------|
| VCC              | Operating Voltage Range | T <sub>A</sub> = -40°C to 85°C                                      | <b>1</b>        |      | <b>5.5</b>  | V     |
| I <sub>VCC</sub> | Supply Current          | MIC811L/M/J, MIC812L/M/J: VCC = 5.0V, no load                       |                 | 5    | <b>15</b>   | μA    |
|                  |                         | MIC811S/T, MIC812S/T: VCC = 3.3V, no load                           |                 | 5    | <b>10</b>   | μA    |
|                  |                         | MIC811R, MIC812R: VCC = 3.0V, no load                               |                 | 5    | <b>10</b>   | μA    |
| V <sub>TH</sub>  | Reset Voltage Threshold | MIC811L, MIC812L                                                    | <b>4.50</b>     | 4.63 | <b>4.75</b> | V     |
|                  |                         | MIC811M, MIC812M                                                    | <b>4.25</b>     | 4.38 | <b>4.50</b> | V     |
|                  |                         | MIC811J, MIC812J                                                    | <b>3.89</b>     | 4.00 | <b>4.10</b> | V     |
|                  |                         | MIC811T, MIC812T                                                    | <b>3.00</b>     | 3.08 | <b>3.15</b> | V     |
|                  |                         | MIC811S, MIC812S                                                    | <b>2.85</b>     | 2.93 | <b>3.00</b> | V     |
|                  |                         | MIC811R, MIC812R                                                    | <b>2.55</b>     | 2.63 | <b>2.70</b> | V     |
| t <sub>RST</sub> | Reset Timeout Period    |                                                                     | <b>140</b>      | 240  | <b>560</b>  | ms    |
| V <sub>OH</sub>  | /RESET Output Voltage   | I <sub>SOURCE</sub> = 800μA, MIC811L/M/J                            | <b>VCC-1.5V</b> |      |             | V     |
|                  |                         | I <sub>SOURCE</sub> = 500μA, MIC811R/S/T                            | <b>0.8xVCC</b>  |      |             | V     |
| V <sub>OL</sub>  | /RESET Output Voltage   | VCC = V <sub>TH</sub> min., I <sub>SINK</sub> = 3.2mA, MIC811L/M/J  |                 |      | <b>0.4</b>  | V     |
|                  |                         | VCC = V <sub>TH</sub> min., I <sub>SINK</sub> = 1.2mA, MIC811R/S/T  |                 |      | <b>0.3</b>  | V     |
|                  |                         | VCC > 1V, I <sub>SINK</sub> = 50μA, T <sub>A</sub> = -40°C to +85°C |                 |      | <b>0.3</b>  | V     |
| V <sub>OH</sub>  | RESET Output Voltage    | 1.8V < VCC < V <sub>TH</sub> min., I <sub>SOURCE</sub> = 150μA      | <b>0.8xVCC</b>  |      |             | V     |
| V <sub>OL</sub>  | RESET Output Voltage    | I <sub>SINK</sub> = 3.2mA, MIC812L/M/J                              |                 |      | <b>0.4</b>  | V     |
|                  |                         | I <sub>SINK</sub> = 1.2mA, MIC812R/S/T                              |                 |      | <b>0.3</b>  | V     |

### Notes:

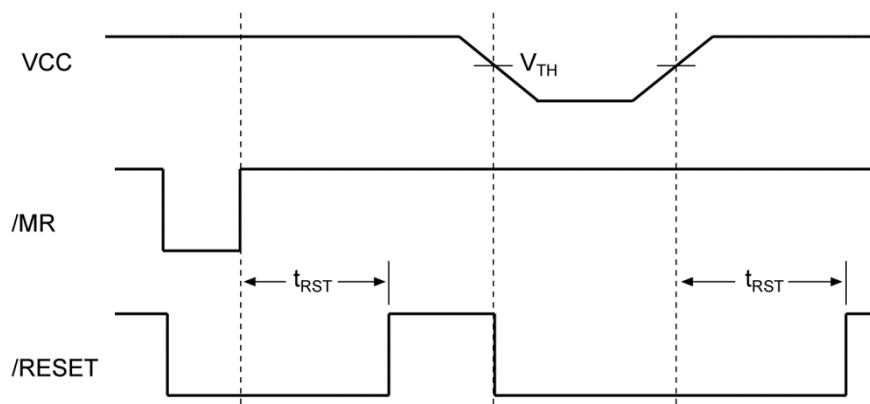
- Exceeding the absolute maximum ratings may damage the device.
- The device is not guaranteed to function outside its operating ratings.
- Devices are ESD sensitive. Handling precautions are recommended. Human body model, 1.5kΩ in series with 100pF.
- Specification for packaged product only

## Electrical Characteristics (Continued)<sup>(5)</sup>

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

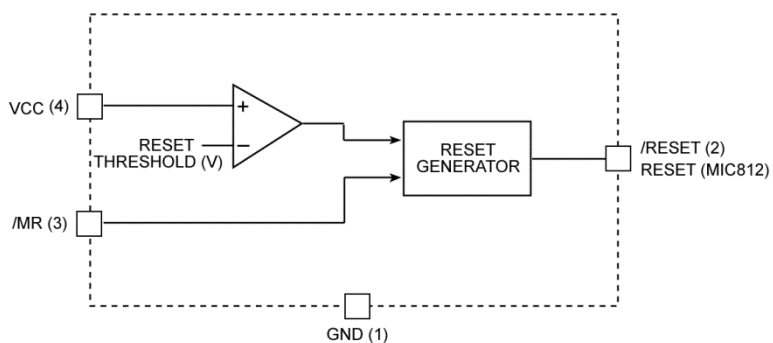
| Symbol   | Parameter               | Condition                                           | Min                                   | Typ | Max                                    | Units     |
|----------|-------------------------|-----------------------------------------------------|---------------------------------------|-----|----------------------------------------|-----------|
|          | /MR Minimum Pulse Width |                                                     | <b>10</b>                             |     |                                        | $\mu s$   |
|          | /MR to Reset Delay      |                                                     |                                       | 0.5 |                                        | $\mu s$   |
| $V_{IH}$ | /MR Input Threshold     | $V_{CC} > V_{TH} \text{ max.}, \text{MIC81\_L/M/J}$ | <b>2.3</b>                            |     |                                        | V         |
|          |                         | MIC81_R/S/T                                         | <b><math>0.7 \times V_{CC}</math></b> |     |                                        | V         |
| $V_{IL}$ | /MR Input Threshold     | $V_{CC} > V_{TH} \text{ max.}, \text{MIC81\_L/M/J}$ |                                       |     | <b>0.8</b>                             | V         |
|          |                         | MIC81_R/S/T                                         |                                       |     | <b><math>0.25 \times V_{CC}</math></b> | V         |
|          | /MR Pull-Up Resistance  |                                                     | <b>10</b>                             | 20  | <b>30</b>                              | $k\Omega$ |
|          | /MR Glitch Immunity     |                                                     |                                       | 100 |                                        | ns        |

## Timing Diagram



Reset Timing Diagram

## Functional Diagram



## Application Information

### Microprocessor Reset

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

### VCC Transients

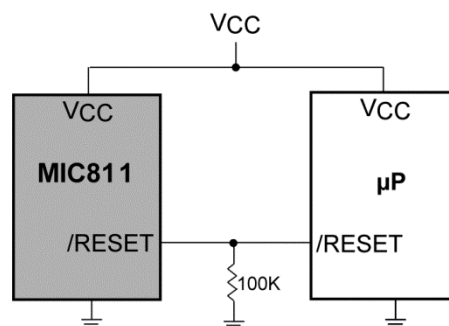
The MIC811/812 are relatively immune to negative-going VCC glitches below the reset threshold. Typically, a negative-going transient 125mV below the reset threshold with a duration of 20μs or less will not cause a reset.

### Interfacing to Bidirectional Reset Pins

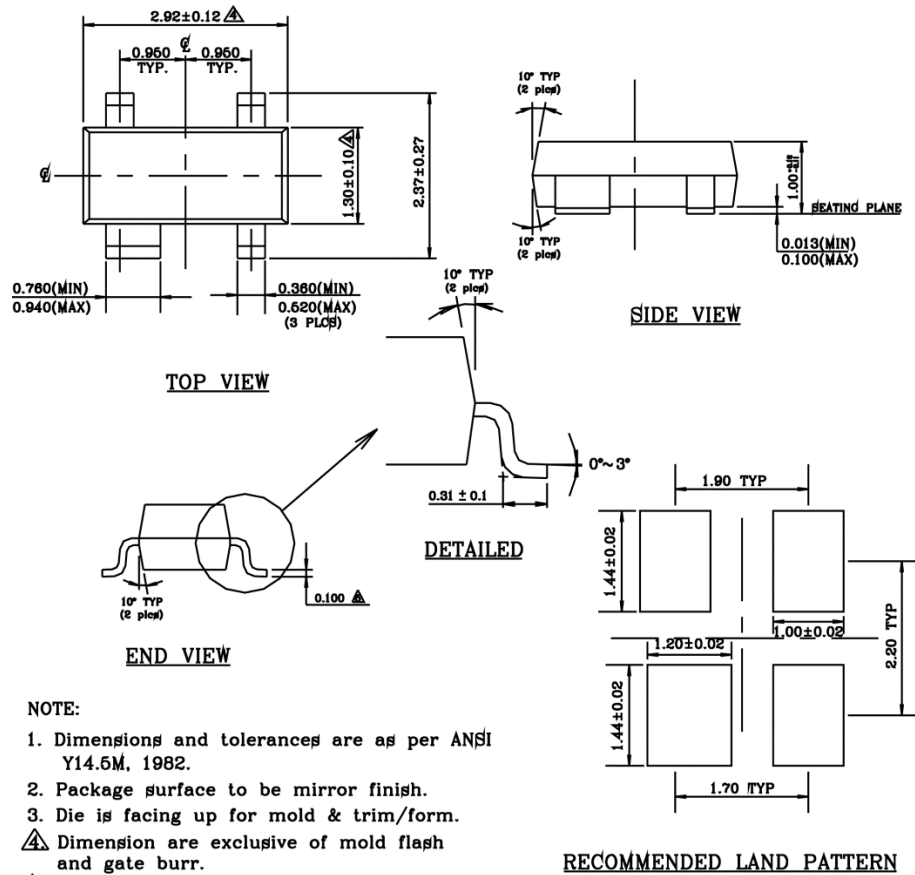
The MIC811/812 can interface with μPs with bidirectional reset pins by connecting a 4.7kΩ resistor in series with the MIC811/812 output and the μP reset pin.

### /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<sub>CC</sub> down to 0V. A 100kΩ resistor connected from the /RESET to ground is recommended. The size of the resistor should be large enough not to load the output excessively and small enough to pull-down any stray leakage currents.



## Package Information



4-Pin SOT-143 (U)

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