



MIC6315

Open-Drain μ P Reset Circuit

General Description

The MIC6315 is an inexpensive reset generator circuit that monitors 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 MIC6315 has an active low, open-drain /RESET output. The reset output is guaranteed to remain asserted for a minimum of either 20ms, 140ms, or 1100ms after V_{CC} has risen above the designed reset threshold level. The MIC6315 comes in a 4-pin SOT-143 package.

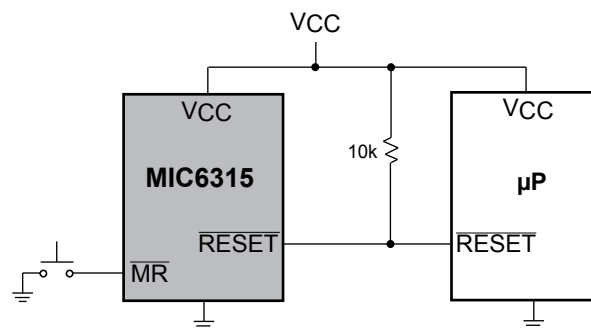
Features

- Precision voltage monitor for 3V, 3.3V or 5V power supplies
- /RESET remains valid with V_{CC} as low as 1V
- 5 μ A supply current
- 20ms, 140ms, or 1100ms minimum reset pulse widths available
- Manual reset input
- 4-pin SOT-143 package

Applications

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

Typical Application



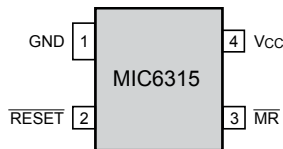
Ordering Information^(1, 2)

| Standard | | Pb-Free | | Nominal V_{TH} (V) | Min. t_{RST} (ms) | Operating Temp. Range | Package |
|---------------|---------|----------------|-----------|-------------------------|------------------------|--------------------------|----------------|
| Part Number | Marking | Part Number | Marking | | | | |
| MIC6315-26D2U | NY | MIC6315-26D2UY | <u>NY</u> | 2.63 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-29D2U | NM | MIC6315-29D2UY | <u>NM</u> | 2.93 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-30D2U | N2 | MIC6315-30D2UY | <u>N2</u> | 3.00 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-31D2U | NF | MIC6315-31D2UY | <u>NF</u> | 3.08 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-40D2U | NW | MIC6315-40D2UY | <u>NW</u> | 4.00 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-41D2U | N6 | MIC6315-41D2UY | <u>N6</u> | 4.10 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-44D2U | NG | MIC6315-44D2UY | <u>NG</u> | 4.38 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-46D2U | NQ | MIC6315-46D2UY | <u>NQ</u> | 4.63 | 20 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-26D3U | NR | MIC6315-26D3UY | <u>NR</u> | 2.63 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-29D3U | NP | MIC6315-29D3UY | <u>NP</u> | 2.93 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-30D3U | N3 | MIC6315-30D3UY | <u>N3</u> | 3.00 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-31D3U | NU | MIC6315-31D3UY | <u>NU</u> | 3.08 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-40D3U | N8 | MIC6315-40D3UY | <u>N8</u> | 4.00 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-41D3U | N5 | MIC6315-41D3UY | <u>N5</u> | 4.10 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-42D3U | ON | MIC6315-42D3UY | <u>ON</u> | 4.20 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-44D3U | NH | MIC6315-44D3UY | <u>NH</u> | 4.38 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-46D3U | NX | MIC6315-46D3UY | <u>NX</u> | 4.63 | 140 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-26D4U | NS | MIC6315-26D4UY | <u>NS</u> | 2.63 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-29D4U | NN | MIC6315-29D4UY | <u>NN</u> | 2.93 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-30D4U | N4 | MIC6315-30D4UY | <u>N4</u> | 3.00 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-31D4U | 2N | MIC6315-31D4UY | <u>2N</u> | 3.08 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-40D4U | M9 | MIC6315-40D4UY | <u>M9</u> | 4.00 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-41D4U | M7 | MIC6315-41D4UY | <u>M7</u> | 4.10 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-44D4U | NJ | MIC6315-44D4UY | <u>NJ</u> | 4.38 | 1100 | -40°C to +85°C | 4-lead SOT-143 |
| MIC6315-46D4U | NZ | MIC6315-46D4UY | <u>NZ</u> | 4.63 | 1100 | -40°C to +85°C | 4-lead SOT-143 |

Notes:

1. All devices available in tape and reel only.
2. Parts not yet assigned an identification code are shown as "zz". Contact Micrel for details. Minimum order may apply.

Pin Configuration



MIC6315-xxDyU 4-Lead SOT-143

Pin Description

| Pin Number | Pin Name | Pin Function |
|------------|----------|---|
| 1 | GND | IC Ground Pin. |
| 2 | /RESET | /RESET goes low if V_{CC} falls below the reset threshold and remains asserted for one reset timeout period after V_{CC} exceeds the reset threshold. |
| 3 | /MR | Manual Reset Input. A logic low on /MR forces a reset. The reset will remain asserted as long as /MR is held low and for one reset timeout period after /MR goes high. This input can be shorted to ground via a switch or be driven by TTL or CMOS logic. Float if unused. |
| 4 | VCC | Power Supply Input. |

Absolute Maximum Ratings⁽¹⁾

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

Operating Ratings⁽²⁾

| | |
|--|----------------|
| Operating Temperature Range..... | -40°C to +85°C |
| Input Voltage (/RESET)..... | GND – 5.5V |
| Power Dissipation ($T_A = +70^\circ\text{C}$)..... | 320mW |

Electrical Characteristics

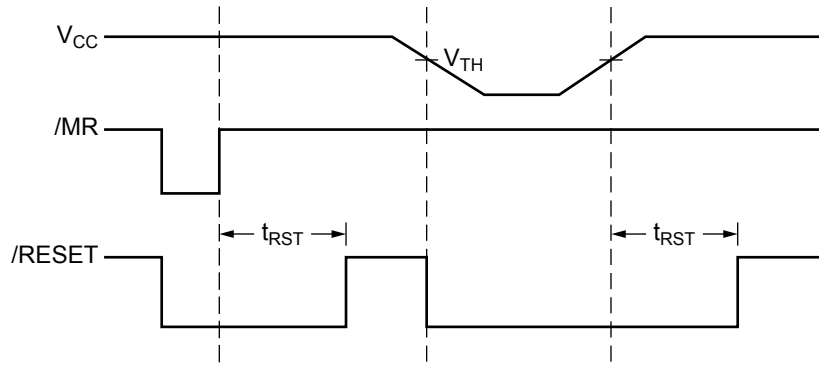
For typical values, $V_{CC} = 2.5V$ to $5.5V$, $T_A = 25^\circ\text{C}$; **bold** values indicate $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$; unless noted

| Symbol | Parameter | Condition | Min | Typ | Max | Units |
|-----------|-------------------------|---|---------------------|----------|----------------------|------------|
| V_{CC} | Operating Voltage Range | | 1 | | 5.5 | V |
| I_{CC} | Supply Current | $V_{CC} = 5.5V$, no load | | 5 | 15 | μ A |
| | | $V_{CC} = 3.6V$, no load | | 5 | 10 | μ A |
| V_{TH} | Reset Voltage Threshold | Note 4 | $V_{TH}-2.5\%$ | V_{TH} | $V_{TH}+2.5\%$ | V |
| t_{RST} | Reset Timeout Period | D2U | 20 | 28 | 44 | ms |
| | | D3U | 140 | 200 | 320 | ms |
| | | D4U | 1100 | 1500 | 2500 | ms |
| V_{OL} | /RESET Output Voltage | $V_{CC} \geq 4.0V$, $I_{SINK} = 3.2mA$ | | | 0.4 | V |
| | | $V_{CC} > 2.5V$, $I_{SINK} = 1.2mA$ | | | 0.3 | V |
| | | $V_{CC} \geq 1.0V$, $I_{SINK} = 50\mu A$ | | | 0.3 | V |
| | /RESET Output Leakage | /RESET deasserted | | | 1 | μ A |
| | /MR Minimum Pulse Width | | 10 | | | μ s |
| | /MR to Reset Delay | | | 0.5 | | μ s |
| V_{IH} | /MR Input Threshold | $V_{TH} > 4.0V$ | 2.3 | | | V |
| | | $V_{TH} < 4.0V$ | $0.7 \times V_{CC}$ | | | V |
| V_{IL} | /MR Input Threshold | $V_{TH} > 4.0V$ | | | 0.8 | V |
| | | $V_{TH} < 4.0V$ | | | $0.25 \times V_{CC}$ | V |
| | /MR Pull-Up Resistance | | 10 | 20 | 30 | k Ω |
| | /MR Glitch Immunity | | | 100 | | ns |

Notes:

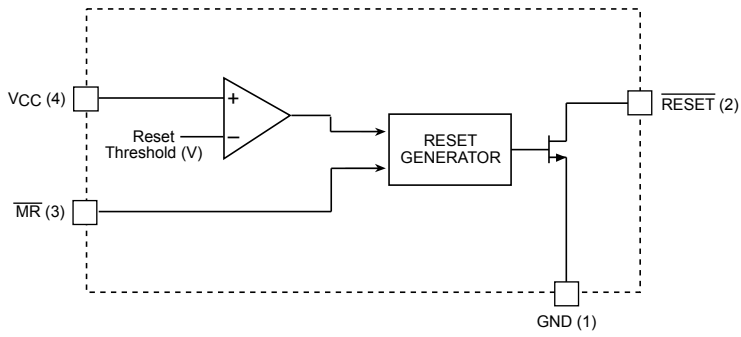
- Exceeding the absolute maximum rating may damage the device.
- The device is not guaranteed to function outside its operating rating.
- Devices are ESD sensitive. Handling precautions recommended. Human body model, 1.5k in series with 100pF.
- Various reset thresholds available. See ordering information or contact factory.

Timing Diagram



Reset Timing Diagram

Functional Diagram



Applications Information

Microprocessor Reset

The /RESET pin is asserted whenever V_{CC} falls below the reset threshold voltage or if /MR (manual reset) is forced low. The /RESET pin remains asserted for the duration of the reset timeout period after V_{CC} has risen above the reset threshold or /MR has returned high. The reset function ensure 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 1V.

The /RESET output is a simple open-drain N-channel MOSFET structure. A pull-up resistor must be used to pull this output up to some voltage. For most applications, this voltage will be the same power supply that supplies V_{CC} to the MIC6315. It is possible, however, to tie this resistor to some other voltage. This will allow the MIC6315 to monitor one voltage while level-shifting the /RESET output to some other voltage. The pull-up voltage must be limited to 6.0V or less (absolute maximum) to avoid damage to the MIC6315. The resistor must be small enough to supply current to the inputs and leakage paths that are driven by the /RESET output.

/RESET Valid at Low Voltage

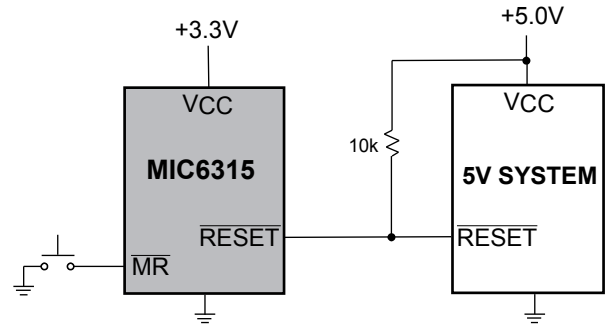
As V_{CC} drops to 0V, the MIC6315 will no longer be able to pull the /RESET output low. At this point, the pull-up resistor will pull the output high. The value of the pull-up resistor and the voltage it is connected to will affect the point at which this happens.

Wire OR'ing The /RESET Output

Because the RESET output is open-drain, several reset sources can be wire-ORed, in parallel, to allow resets from multiple sources.

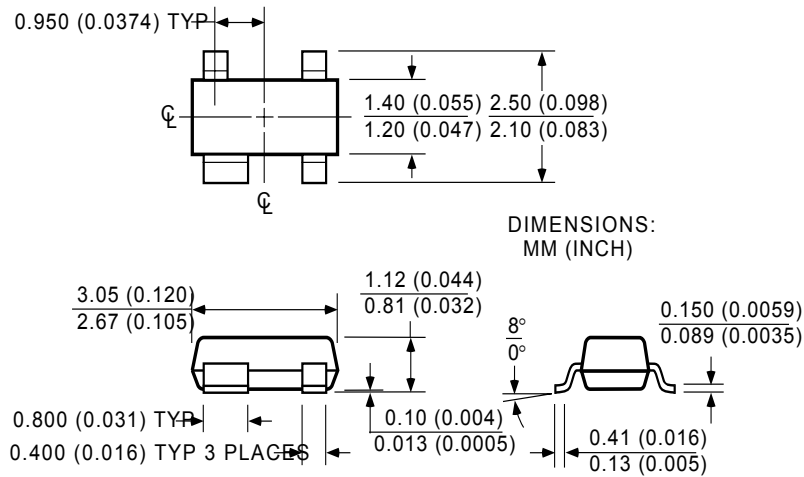
V_{CC} Transients

The MIC6315 is 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 μ s or less will not cause an unwanted reset. If additional transient immunity is needed, a bypass capacitor can be placed a close as possible to the MIC6315.



MIC6315 Used in a Multiple Supply System

Package Information



4-Pin SOT-143 (U)

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