



## MIC6315

### Open-Drain $\mu$ 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 is available in a 4-pin SOT-143 package.

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

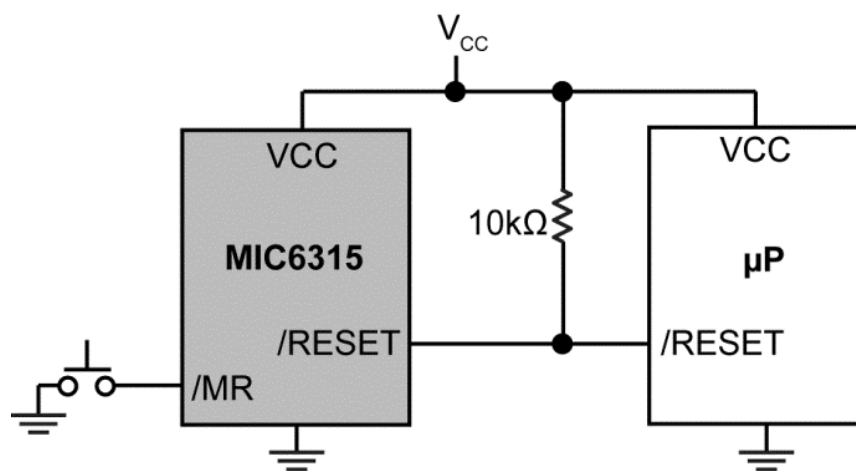
#### Features

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

#### Applications

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

#### Typical Application



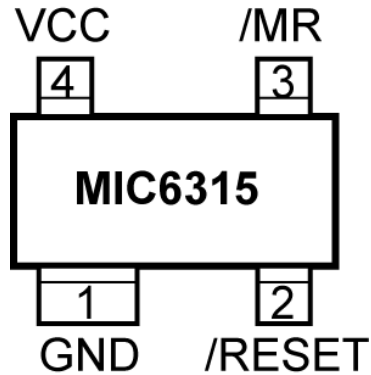
## Ordering Information

| Part Number <sup>(1,2)</sup> | Marking <sup>(3)</sup> | Nominal V <sub>TH</sub><br>(V) | Minimum t <sub>RST</sub><br>(ms) | Operating<br>Temperature<br>Range | Package       | Lead Finish |
|------------------------------|------------------------|--------------------------------|----------------------------------|-----------------------------------|---------------|-------------|
| MIC6315-26D2UY               | <u>NY</u>              | 2.63                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-29D2UY               | <u>NM</u>              | 2.93                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-30D2UY               | <u>N2</u>              | 3.00                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-31D2UY               | <u>NF</u>              | 3.08                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-40D2UY               | <u>NW</u>              | 4.00                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-41D2UY               | <u>N6</u>              | 4.10                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-44D2UY               | <u>NG</u>              | 4.38                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-46D2UY               | <u>NQ</u>              | 4.63                           | 20                               | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-26D3UY               | <u>NR</u>              | 2.63                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-29D3UY               | <u>NP</u>              | 2.93                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-30D3UY               | <u>N3</u>              | 3.00                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-31D3UY               | <u>NU</u>              | 3.08                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-40D3UY               | <u>N8</u>              | 4.00                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-41D3UY               | <u>N5</u>              | 4.10                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-42D3UY               | <u>05</u>              | 4.20                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-44D3UY               | <u>NH</u>              | 4.38                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-46D3UY               | <u>NX</u>              | 4.63                           | 140                              | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-26D4UY               | <u>NS</u>              | 2.63                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-29D4UY               | <u>NN</u>              | 2.93                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-30D4UY               | <u>N4</u>              | 3.00                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-31D4UY               | <u>2N</u>              | 3.08                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-40D4UY               | <u>M9</u>              | 4.00                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-41D4UY               | <u>M7</u>              | 4.10                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-44D4UY               | <u>NJ</u>              | 4.38                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |
| MIC6315-46D4UY               | <u>NZ</u>              | 4.63                           | 1100                             | -40°C to +85°C                    | 4-Pin SOT-143 | Pb-Free     |

**Note:**

1. Ship format Tape and reel only (ordering part number add space TR example. MIC6315-26D2UY TR).
2. Standard reel quantity is 3000 pieces.  
Reel diameter 7in. / Hub diameter 2in. / Width 8mm.
3. Underbar symbol (   ) may not be to scale.

## Pin Configuration



## Pin Description

| Pin Number | Pin Name | Pin Function  |
|------------|----------|---|
| 1          | GND      | IC Ground.  |
| 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<sup>(4)</sup>**

|  |                                   |
|--|-----------------------------------|
| Terminal Voltage                           |                                   |
| (VCC, /RESET).....                         | -0.3V to +6.0V                    |
| (/MR).....                                 | -0.3V to (V <sub>CC</sub> + 0.3V) |
| Rate-of-Rise (VCC).....                    | 100V/μs                           |
| Input Current (VCC, /MR).....              | 20mA                              |
| Output Current (/RESET).....               | 20mA                              |
| Lead Temperature (soldering, 10s).....     | 300°C                             |
| Storage Temperature (T <sub>S</sub> )..... | -65°C to +150°C                   |
| ESD Rating <sup>(6)</sup> .....            | 3kV                               |

**Operating Ratings<sup>(5)</sup>**

|   |                 |
|---|-----------------|
| Input Voltage (/RESET).....                     | GND to 5.5V     |
| Operating Temperature Range.....                | -40°C to +85°C  |
| Junction Temperature (T <sub>J</sub> ).....     | -40°C to +125°C |
| Power Dissipation (T <sub>A</sub> = +70°C)..... | 320mW           |

**Electrical Characteristics**

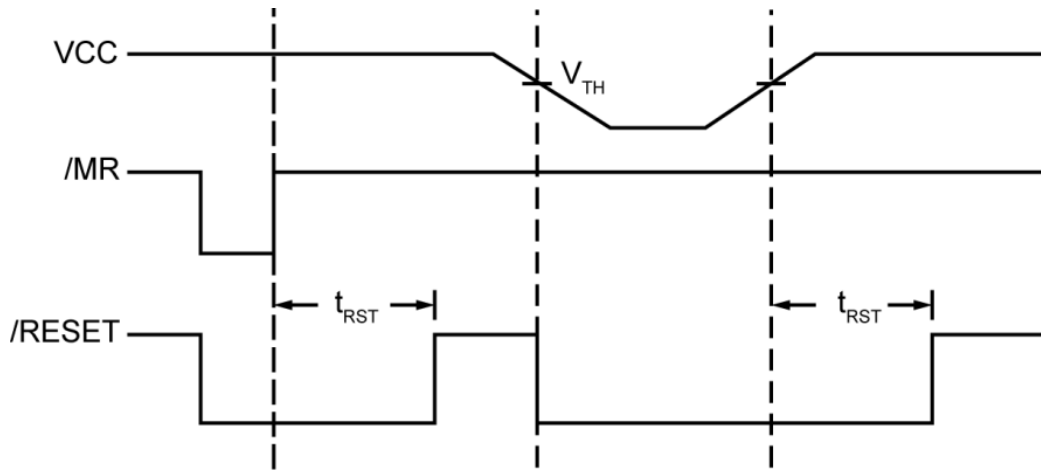
For typical values, V<sub>CC</sub> = 2.5V to 5.5V; T<sub>A</sub> = +25°C, **bold** values indicate -40°C ≤ T<sub>A</sub> ≤ +85°C, unless noted.

| Symbol           | Parameter               | Condition   | Min.                         | Typ.            | Max.                         | Units |
|------------------|-------------------------|---|------------------------------|-----------------|------------------------------|-------|
| V <sub>CC</sub>  | Operating Voltage Range |   | <b>1</b>                     |                 | <b>5.5</b>                   | V     |
| I <sub>CC</sub>  | Supply Current          | V <sub>CC</sub> = 5.5V, no load.                  |                              | 5               | <b>15</b>                    | μA    |
|                  |                         | V <sub>CC</sub> = 3.6V, no load.                  |                              | 5               | <b>10</b>                    |       |
| V <sub>TH</sub>  | Reset Voltage Threshold | Note 7  | <b>V<sub>TH</sub> - 2.5%</b> | V <sub>TH</sub> | <b>V<sub>TH</sub> + 2.5%</b> | V     |
| t <sub>RST</sub> | Reset Timeout Period    | D2U   | <b>20</b>                    | 28              | <b>44</b>                    | ms    |
|                  |                         | D3U   | <b>140</b>                   | 200             | <b>320</b>                   |       |
|                  |                         | D4U   | <b>1100</b>                  | 1500            | <b>2500</b>                  |       |
| V <sub>OL</sub>  | /RESET Output Voltage   | V <sub>CC</sub> ≥ 4.0V, t <sub>SINK</sub> = 3.2mA |                              |                 | <b>0.4</b>                   | V     |
|                  |                         | V <sub>CC</sub> ≥ 2.5V, t <sub>SINK</sub> = 1.2mA |                              |                 | <b>0.3</b>                   |       |
|                  |                         | V <sub>CC</sub> ≥ 1.0V, t <sub>SINK</sub> = 50μA  |                              |                 | <b>0.3</b>                   |       |
|                  | /RESET Output Leakage   | /RESET de-asserted                                |                              |                 | <b>1</b>                     | μA    |
|                  | /MR Minimum Pulse Width |   | <b>10</b>                    |                 |                              | μs    |
|                  | /MR-to-Reset Delay      |   |                              | 0.5             |                              | μs    |
| V <sub>IH</sub>  | /MR Input Threshold     | V <sub>TH</sub> > 4.0V                            | <b>2.3</b>                   |                 |                              | V     |
|                  |                         | V <sub>TH</sub> < 4.0V                            | <b>0.7 × V<sub>CC</sub></b>  |                 |                              |       |
| V <sub>IL</sub>  | /MR Input Threshold     | V <sub>TH</sub> > 4.0V                            |                              |                 | <b>0.8</b>                   | V     |
|                  |                         | V <sub>TH</sub> < 4.0V                            |                              |                 | <b>0.25 × V<sub>CC</sub></b> |       |
|                  | /MR Pull-Up Resistance  |   | <b>10</b>                    | 20              | <b>30</b>                    | kΩ    |
|                  | /MR Glitch Immunity     |   |                              | 100             |                              | ns    |

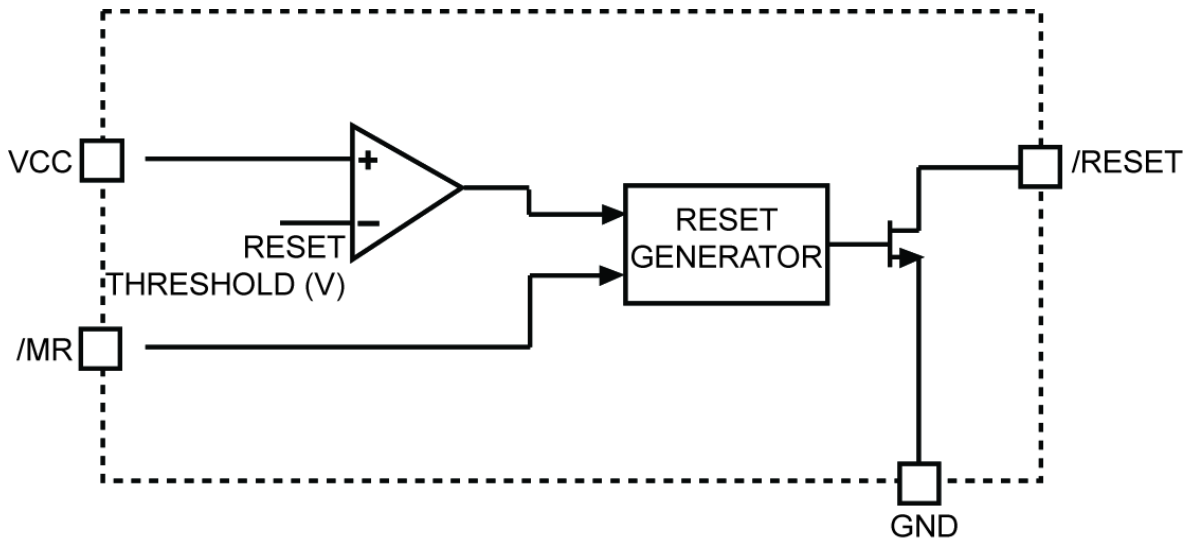
**Notes:**

- 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.
- Various reset thresholds available. See [Ordering Information](#) or contact factory.

### Timing Diagram



### Functional Diagram



## Application 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 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 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-OR'ed, 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 duration of 20 $\mu$ s or less will not cause an unwanted reset. If additional transient immunity is needed, a bypass capacitor can be placed as close as possible to the MIC6315.

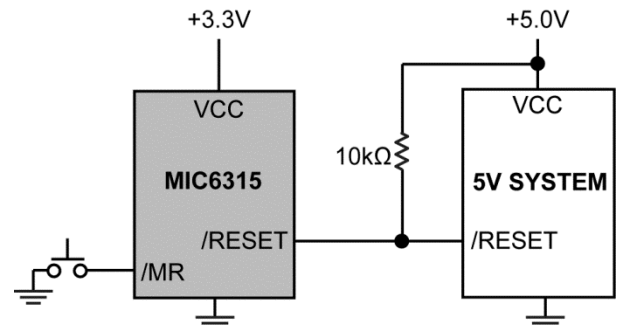
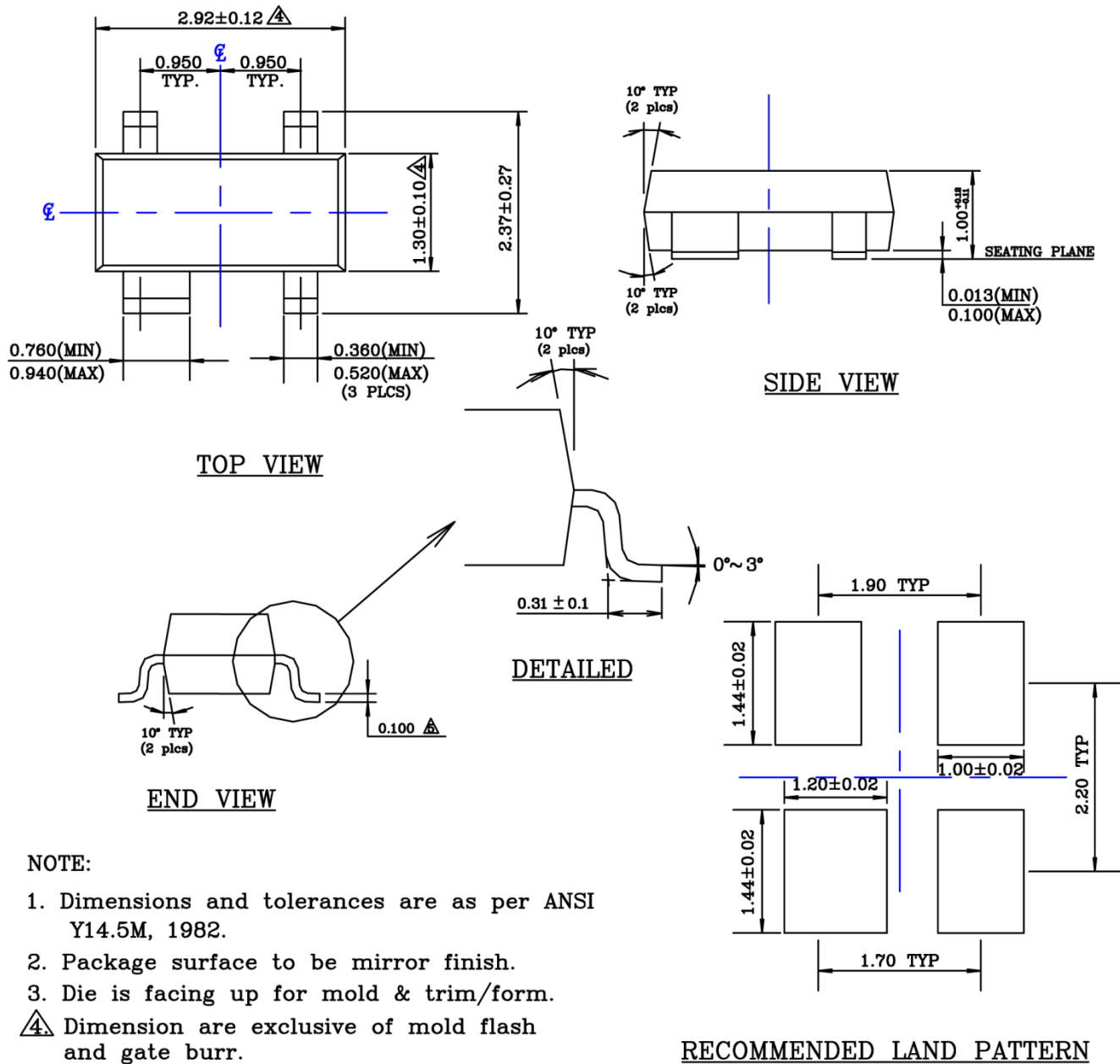


Figure 1. MIC6315 as Used in a Multiple Supply System

Package Information and Recommended Landing Pattern<sup>(8)</sup>



4-Pin SOT-143 (U)

Note:

8. Package information is correct as of the publication date. For updates and most current information, go to [www.micrel.com](http://www.micrel.com).

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