# Low Power, 3.3V/3.0V µP Reset Active LOW, Push-Pull Output

## General Description

The ASM1815 is a voltage supervisory device with low-power, 3.3V/3.0V µP Reset, active LOW, Push-Pull output. Maximum supply current over temperature is a low 15µA (at 3.6V).

The ASM1815 generates an active LOW reset signal whenever the monitored supply is out of tolerance. A precision reference and comparator circuit monitor power supply ($V_{CC}$) level. Tolerance level options are 5%, 10% and 20%. When an out-of-tolerance condition is detected, an internal power-fail signal is generated which forces an active LOW reset signal. After $V_{CC}$ returns to an in-tolerance condition, the reset signal remains active for 150ms to allow the power supply and system microprocessor to stabilize.

The ASM1815 is designed with a push-pull output stage and operates over the extended industrial temperature range. Devices are available in TO-92 and compact surface mount SOT-23 packages.

Other low power products in this family include the ASM1810/ 11/12/16/17, ASM1233D and ASM1233M.

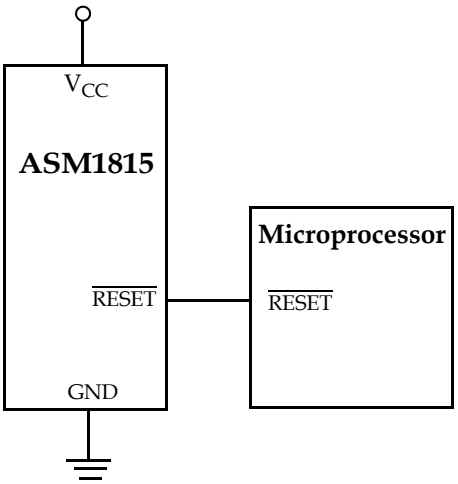
## Key Features

- Low Supply Current
  - •20 µA maximum (5.5 V)
  - •15 µA maximum (3.6 V)
- Automatically restarts a microprocessor after power failure
- 150ms reset delay after $V_{CC}$ returns to an in-tolerance condition
- Active LOW power-up reset
- Precision temperature-compensated voltage reference and comparator
- Eliminates external components
- TO-92 and compact surface mount SOT-23 package
- Push-Pull output for minimum current drain
- Operating temperature -40°C to +85°C

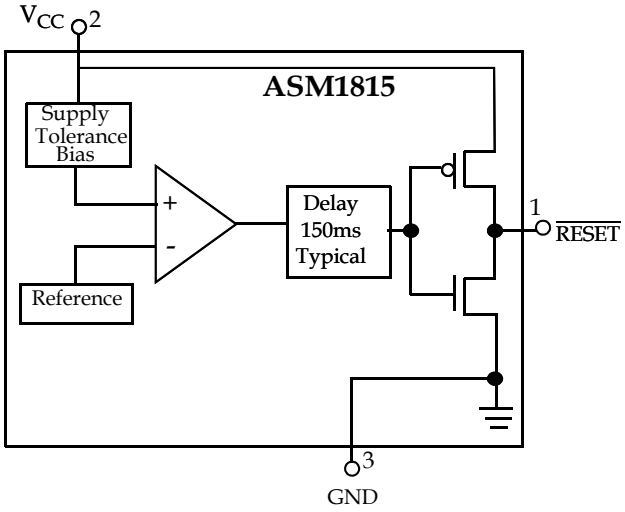
## Applications

- Set-top boxes
- Cellular phones
- PDAs
- Energy management systems
- Embedded control systems
- Printers
- Single board computers

## Typical Operating Circuit

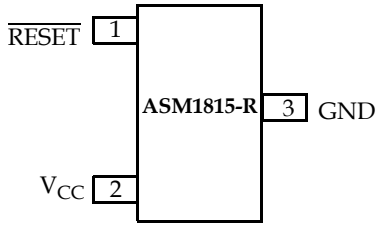



## Block Diagram

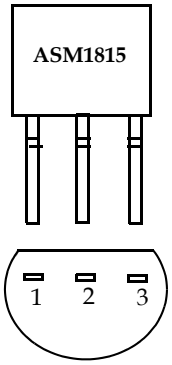


## Pin Configuration

SOT-23




TO-92




## Pin Description

| TO-92 Pin # | SOT-23 Pin # | Pin Name | Description |
|---|---|---|---|
| 1 | 1 | $\overline{\text{RESET}}$ | Active LOW reset output |
| 2 | 2 | $V_{CC}$ | Power supply input |
| 3 | 3 | GND | Ground |

## Application Information

### Operation - Power Monitor

The ASM1815 detects out-of-tolerance power supply conditions. It resets a processor during power-up, power-down and issues a reset to the system processor when the monitored power supply voltage is below the reset threshold. When an out-of-tolerance $V_{CC}$ voltage is detected, the $\overline{RESET}$ signal is asserted. On power-up, $\overline{RESET}$ is kept active (LOW) for approximatley 150ms after the power supply voltage has reached the selected tolerance. This allows the power supply and microprocessor to stablize before $\overline{RESET}$ is released.

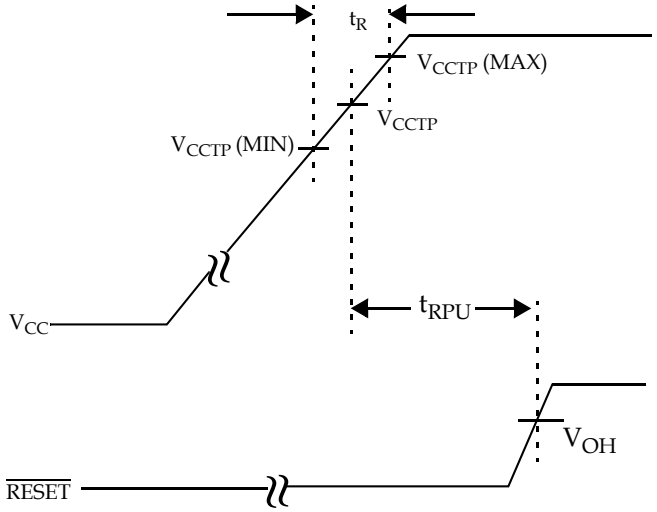



Figure 1: Timing Diagram: Power-Up

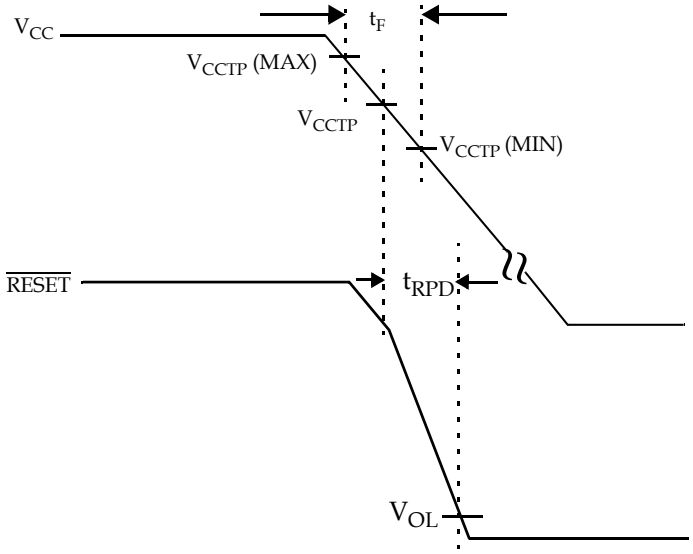



Figure 2: Timing Diagram: Power-Down

### Output Conditions

The ASM1815 active LOW reset signal is valid as long as $V_{CC}$ remains below 1.2V. The $\overline{RESET}$ output on the ASM1815 uses a push-pull drive stage that can maintain a valid output below 1.2V. To sink current with $V_{CC}$ below 1.2V, a resistor can be connected from the reset pin ($\overline{RESET}$) to Ground (see Figure 3). This configuration will give a valid value on the $\overline{RESET}$ output with $V_{CC}$ approaching 0V. During both power up and down, this configuration will draw current when the $\overline{RESET}$ is in the high state. A value of 100kΩ should be adequate to maintain a valid connection.

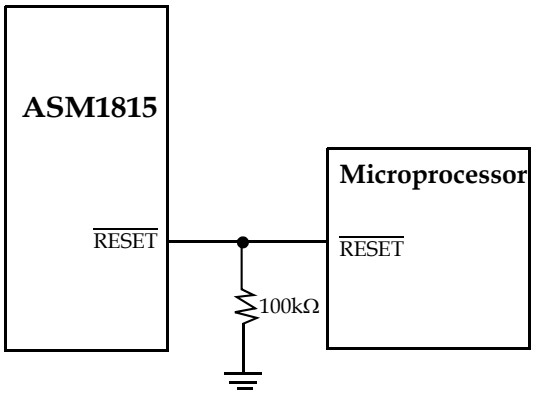



Figure 3: $\overline{RESET}$ Valid to 0V $V_{CC}$

## Absolute Maximum Ratings

| Parameter | Min | Max | Unit |
|---|---|---|---|
| Voltage on $V_{CC}$ | -0.5 | 7 | V |
| Voltage on $\overline{RESET}$ | -0.5 | $V_{CC}$ + 0.5 | V |
| Operating Temperature Range | -40 | 85 | °C |
| Soldering Temperature (for 10 sec) | | 260 | °C |
| Storage Temperature | -55 | 125 | °C |
| ESD rating<br>HBM<br>MM | | <br>2<br>200 | <br>KV<br>V |
| NOTE: These are stress ratings only and functional use is not implied. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability. | | | |

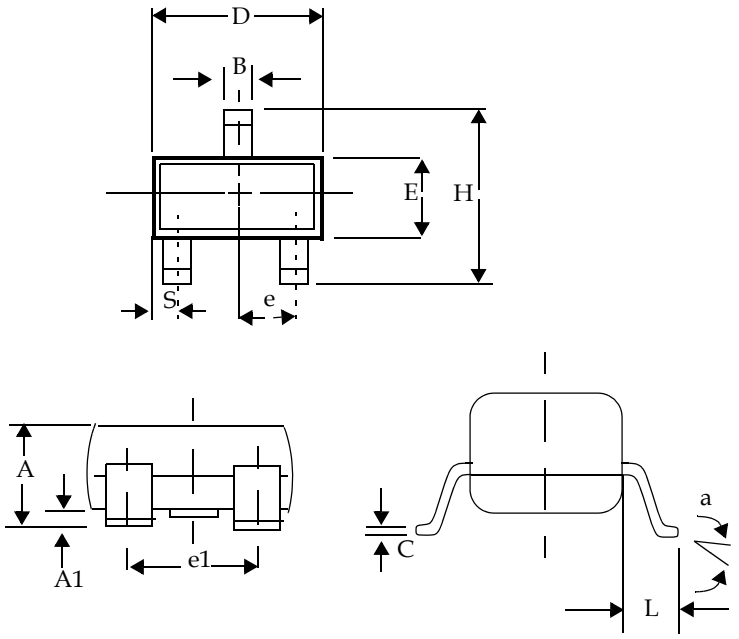
## Electrical Characteristics

Unless otherwise noted, $V_{CC}$= 1.2V to 5.5V and specifications are over the operating temperature range of -40°C to +85°C. All voltages are referenced to ground

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | 1.2 | | 5.5 | V |
| Output Voltage | $V_{OH}$ | $I_{OUT}$ < 500 µA | $V_{CC}$ - 0.5V | $V_{CC}$ - 0.1V | | V |
| Output Current | $I_{OH}$ | Output = 2.4V, $V_{CC} \geq$ 2.7V | | 350 | | µA |
| Output Current | $I_{OL}$ | Output = 0.4V, $V_{CC} \geq$ 2.7V | +10 | | | mA |
| Operating Current | $I_{CC}$ | $V_{CC}$ < 5.5V, $\overline{RESET}$ output open | | 8 | 20 | µA |
| Operating Current | $I_{CC}$ | $V_{CC} \leq$ 3.6V, $\overline{RESET}$ output open | | 6 | 15 | µA |
| $V_{CC}$ Trip Point (ASM1815R-5) | $V_{CCTP}$ | | 2.98 | 3.06 | 3.15 | V |
| $V_{CC}$ Trip Point (ASM1815R-10) | $V_{CCTP}$ | | 2.80 | 2.88 | 2.97 | V |
| $V_{CC}$ Trip Point (ASM1815R-20) | $V_{CCTP}$ | | 2.47 | 2.55 | 2.64 | V |
| Output Capacitance | $C_{OUT}$ | | | | 10 | pF |
| $V_{CC}$ Detect to $\overline{RESET}$ Low | $t_{RPD}$ | | | 2 | 5 | µs |
| $V_{CC}$ Slew Rate ($V_{CCTP}$ (MAX) to $V_{CCTP}$ (MIN)) | $t_F$ | | 300 | | | µs |
| $V_{CC}$ Slew Rate ($V_{CCTP}$ (MIN) to $V_{CCTP}$ (MAX)) | $t_R$ | | 0 | | | ns |
| $V_{CC}$ Detect to $\overline{RESET}$ High | $t_{RPU}$ | $t_r$ = 5µs | 100 | 150 | 250 | ms |
| Note: The $t_F$ value is for reference in defining values for $t_{RPD}$ and should not be considered for proper operation or use. | | | | | | |

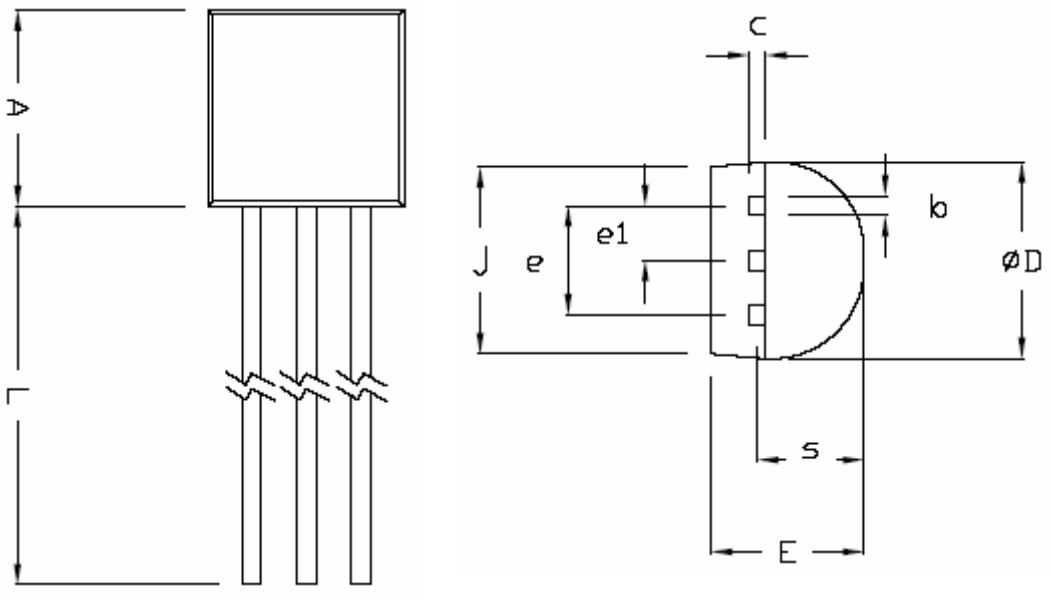
## Package Dimension

### Plastic SOT-23 (3-Pin)




| | Inches | | Millimeters | |
|---|---|---|---|---|
| | **Min** | **Max** | **Min** | **Max** |
| **Plastic SOT-23 (3-Pin)** | | | | |
| A | 0.030 | 0.046 | 0.75 | 1.17 |
| A1 | 0.002 | 0.006 | 0.05 | 0.15 |
| B | 0.012 | 0.020 | 0.30 | 0.50 |
| C | 0.003 | 0.008 | 0.08 | 0.20 |
| D | 0.110 | 0.120 | 2.80 | 3.04 |
| E | 0.047 | 0.055 | 1.20 | 1.40 |
| e | 0.037 BSC | | 0.95 BSC | |
| e1 | 0.075 BSC | | 1.9 BSC | |
| H | 0.083 | 0.104 | 2.10 | 2.64 |
| L | 0.016 | 0.024 | 0.40 | 0.60 |
| a | $0^o$ | $8^o$ | $0^o$ | $8^o$ |
| S | NA | | NA | |

**To-92 (3-Pin)**




| | Dimensions in Inches | | Dimensions in Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| **TO-92** | | | | |
| A | 0.175 | 0.185 | 4.445 | 4.699 |
| b | 0.016 | 0.020 | 0.406 | 0.508 |
| C | 0.014 | 0.016 | 0.356 | 0.406 |
| ϕD | 0.175 | 0.185 | 4.445 | 4.699 |
| E | 0.138 | 0.144 | 3.505 | 3.658 |
| e | 0.098 | 0.102 | 2.489 | 2.591 |
| e1 | 0.045 | 0.055 | 1.143 | 1.397 |
| j | 0.168 | 0.174 | 4.269 | 4.420 |
| L | 0.500 | 0.585 | 12.7 | 14.86 |
| s | 0.095 | 0.099 | 2.413 | 2.515 |

## Family Selection Guide

| Part # | RESET Voltage (V) | RESET Time (ms) | Output Stage | RESET Polarity |
|---|---|---|---|---|
| ASM1810 | 4.620, 4.370, 4.120 | 150 | Push-Pull | LOW |
| ASM1811 | 4.620, 4.350, 4.130 | 150 | Open-Drain | LOW |
| ASM1812 | 4.620, 4.350, 4.130 | 150 | Push-Pull | HIGH |
| ASM1815 | 3.060, 2.880, 2.550 | 150 | Push-Pull | LOW |
| ASM1816 | 3.060, 2.880, 2.550 | 150 | Open-Drain | LOW |
| ASM1817 | 3.060, 2.880, 2.550 | 150 | Push-Pull | HIGH |
| ASM1233D | 4.625, 4.375, 4.125 | 350 | Open-Drain | LOW |
| ASM1233M | 4.625, 4.375, 2.720 | 350 | Open-Drain | LOW |

## Ordering Information

| Device Summary | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Part ** Number** | **RESET Output Voltage (V)** | **RESET Tolerance (%)** | **RESET Time (ms)** | **Push-Pull Output Stage** | **SOT-23 Package** | **RESET Polarity** | **Package Marking** |
| **TIN - LEAD DEVICES** | | | | | | | |
| ASM1815R-5 | 3.06 | 5 | 150 | ◆ | ◆ | LOW | RJLL |
| ASM1815R-10 | 2.88 | 10 | 150 | ◆ | ◆ | LOW | RKLL |
| ASM1815R-20 | 2.55 | 20 | 150 | ◆ | ◆ | LOW | RLLL |
| **LEAD FREE DEVICES** | | | | | | | |
| ASM1815R-5F | 3.06 | 5 | 150 | ◆ | ◆ | LOW | KJLL |
| ASM1815R-10F | 2.88 | 10 | 150 | ◆ | ◆ | LOW | KKLL |
| ASM1815R-20F | 2.55 | 20 | 150 | ◆ | ◆ | LOW | KLLL |
| **Part ** Number** | **RESET Output Voltage (V)** | **RESET Tolerance (%)** | **RESET Time (ms)** | **Push-Pull Output Stage** | **TO-92 Package** | **RESET Polarity** | **Package Marking** |
| **TIN - LEAD DEVICES** | | | | | | | |
| ASM1815-5 | 3.06 | 5 | 150 | ◆ | ◆ | LOW | ASM1815-5 |
| ASM1815-10 | 2.88 | 10 | 150 | ◆ | ◆ | LOW | ASM1815-10 |
| ASM1815-20 | 2.55 | 20 | 150 | ◆ | ◆ | LOW | ASM1815-20 |
| **LEAD FREE DEVICES** | | | | | | | |
| ASM1815-5F | 3.06 | 5 | 150 | ◆ | ◆ | LOW | ASM1815-5F |
| ASM1815-10F | 2.88 | 10 | 150 | ◆ | ◆ | LOW | ASM1815-10F |
| ASM1815-20F | 2.55 | 20 | 150 | ◆ | ◆ | LOW | ASM1815-20F |

* *Add /T to Part Number for Tape and Reel (i.e ASM18xx-x/T)
LL- Lot Code

Alliance Semiconductor Corporation
2575, Augustine Drive,
Santa Clara, CA 95054
Tel: 408 - 855 - 4900
Fax: 408 - 855 - 4999
www.alsc.com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