



rev 1.0

Low Power, 5V/3.0V, μ P Reset, Active LOW, Open-Drain Output

General Description

The ASM1233M is a voltage supervisor with low-power, 5V μ P Reset, with an active LOW, open-drain output. Maximum supply current over temperature is a low 20 μ A.

The ASM1233M 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% and 10% for a 5V power supply. The tolerance is 15% for the 3.3V, ASM1233M. 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 350ms to allow the power supply and system microprocessor to stabilize.

The ASM1233M is designed with a open-drain output stage and operates over the extended industrial temperature range. Devices are available in compact surface mount SO-8 packages and 3-lead TO-92 packages.

Other low power products in this family include the ASM1810/11/12/15/16/17 and ASM1233D.

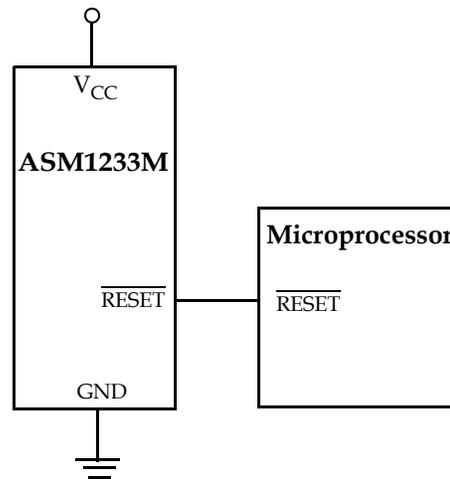
Key Features

- Low Supply Current
 - 20 μ A maximum (5.5 V)
 - 15 μ A maximum (3.6 V)
- Automatically restarts a microprocessor after power failure
- 350ms reset delay after V_{CC} returns to an in-tolerance condition
- Active LOW power-up reset, 5k Ω internal pull-up
- Precision temperature-compensated voltage reference and comparator
- Eliminates external components
- Low-cost TO-92 package
- Compact surface mount SO-8 package
- Operating temperature -40 $^{\circ}$ C to +85 $^{\circ}$ C

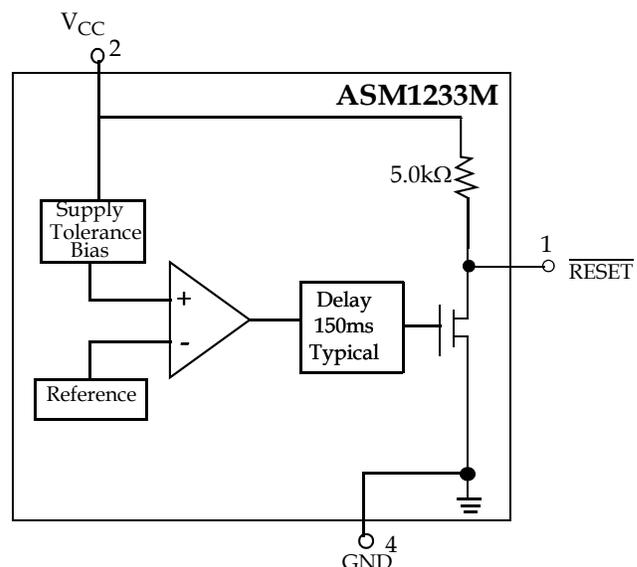
Applications

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

Typical Operating Circuit



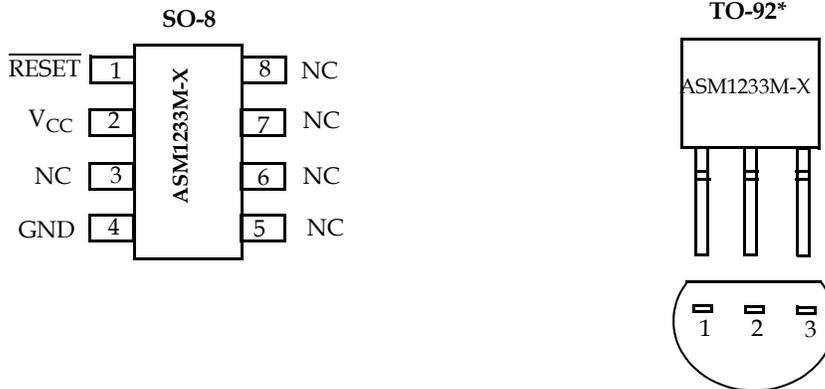
Block Diagram





rev 1.0

Pin Configuration



Pin Description

| Pin # | | Pin Name | Description |
|------------------|-------|-----------------|-------------------------|
| SO-8 | TO-92 | | |
| 1 | 1 | RESET | Active LOW reset output |
| 2 | 2 | V _{CC} | Power supply input |
| 3, 5, 6, 7 and 8 | - | NC | No Connection. |
| 4 | 3 | GND | Ground. |

* See Ordering Information



rev 1.0

Application Information

Operation - Power Monitor

The ASM1233M detects out-of-tolerance power supply conditions. It resets a processor during power-up, power-down and generates 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 $\overline{\text{RESET}}$ signal is asserted. On power-up, $\overline{\text{RESET}}$ is kept active (LOW) for approximately 350ms after the power supply voltage has reached the selected tolerance. This allows the power supply and microprocessor to stabilize before $\overline{\text{RESET}}$ is released.

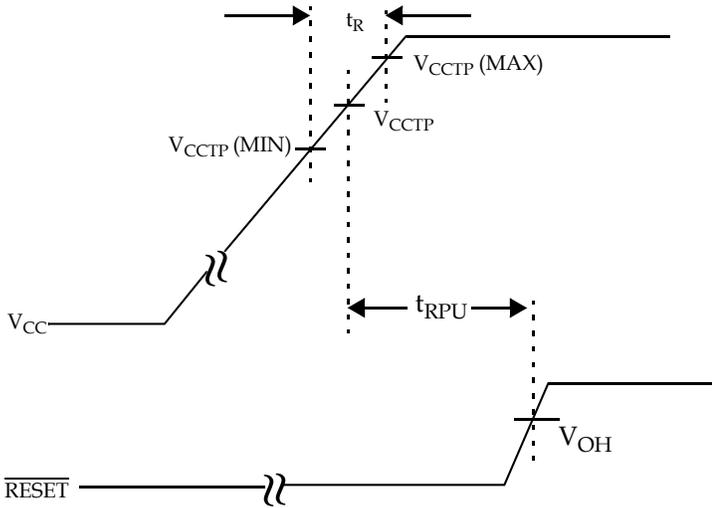


Figure 1: Timing Diagram: Power-Up

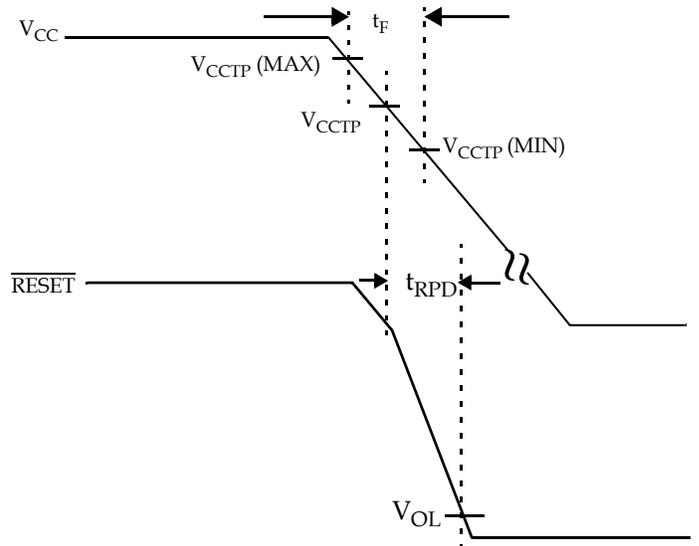


Figure 2: Timing Diagram: Power-Down



rev 1.0

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 |

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.



rev 1.0

Electrical Characteristics

Unless otherwise noted, $V_{CC} = 1.2V$ to $5.5V$ and specifications are over the operating temperature range of $-40^{\circ}C$ to $+85^{\circ}C$.

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} | $I_{OUT} < 500 \mu A$ | $V_{CC} - 0.5V$ | $V_{CC} - 0.1V$ | | V |
| Output Current | I_{OL} | Output = 0.4V, $V_{CC} \geq 2.7V$ | +8 | | | mA |
| Operating Current | I_{CC} | $V_{CC} < 5.5V$, \overline{RESET} output open | | 8 | 20 | μA |
| Operating Current | I_{CC} | $V_{CC} < = 3.6V$, \overline{RESET} output open | | 6 | 15 | μA |
| V_{CC} Trip Point (ASM1233M-5) | V_{CCTP} | | 4.25 | 4.375 | 4.49 | V |
| V_{CC} Trip Point (ASM1233M-55) | V_{CCTP} | | 4.5 | 4.625 | 4.75 | V |
| V_{CC} Trip Point (ASM1233M-3) | V_{CCTP} | | 2.64 | 2.72 | 2.8 | V |
| Voltage High Trip Level ASM1233M-5 ASM1233M-55 | V_{HTL} | | | | 4.75 | V |
| Voltage Low Trip Level ASM1233M-5 ASM1233M-55 | V_{LTL} | | | | 4.00 | V |
| Voltage High Trip Level ASM1233M-3 | V_{HTL} | | | | 3.14 | V |
| Internal Pull-up Resistor | R_P | | 3.5 | 5.0 | 7.5 | k Ω |
| Output Capacitance | C_{OUT} | | | | 10 | pF |
| V_{CC} Detect to \overline{RESET} Low | t_{RPD} | | | 2 | 10 | μs |
| V_{CC} Slew Rate ($V_{HTL} - V_{LTL}$) | t_F | | 300 | | | μs |
| V_{CC} Slew Rate ($V_{LTL} - V_{HTL}$) | t_R | | 0 | | | ns |
| V_{CC} Detect to \overline{RESET} High | t_{RPU} | $t_r = 5\mu s$ | 200 | 350 | 500 | ms |

Note: A 1k Ω resistor maybe required in some applications for proper operation of the microprocessor reset control circuit.



rev 1.0

Family Selection Guide

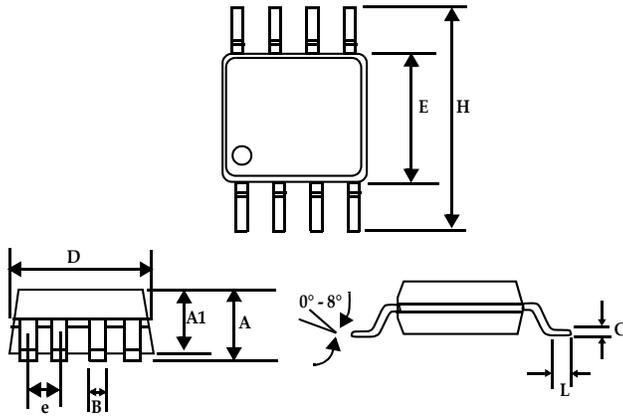
| Part # | RESET Voltage (V) | RESET Time (ms) | Output Stage | RESET Polarity |
|----------|---------------------|-----------------|--------------|----------------|
| ASM1810 | 4.620, 4.370, 4.120 | 150 | Push-Pull | LOW |
| ASM1811 | 4.620, 4.350, 4.130 | 150 | Open-Drain | LOW |
| ASM1812 | 4.620, 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 |



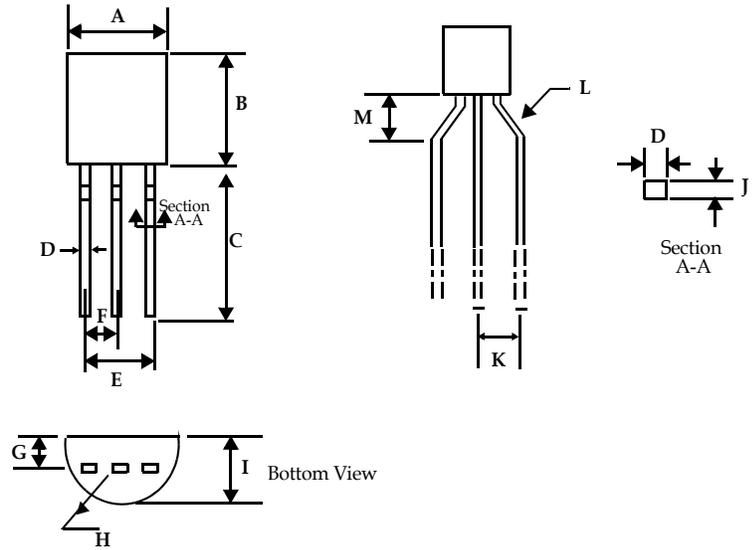
rev 1.0

Package Information

Plastic SO-8 (8-Pin)



TO-92 (3-Pin)



| | Inches | | Millimeters | |
|----------------------|--------|-------|-------------|------|
| | Min | Max | Min | Max |
| Plastic SO-8 (8-Pin) | | | | |
| A | 0.053 | 0.069 | 1.35 | 1.75 |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 |
| B | 0.013 | 0.020 | 0.33 | 0.51 |
| C | 0.007 | 0.010 | 0.19 | 0.25 |
| e | 0.050 | | 1.27 | |
| E | 0.150 | 0.157 | 3.80 | 4.00 |
| H | 0.228 | 0.244 | 5.80 | 6.20 |
| L | 0.016 | 0.050 | 0.40 | 1.27 |
| D | 0.189 | 0.197 | 4.80 | 2.00 |

| | Inches | | Millimeters | |
|----------------------|---------------|-------|-------------|-------|
| | Min | Max | Min | Max |
| Plastic SO-8 (8-Pin) | | | | |
| TO-92* (3-Pin) | | | | |
| A | 0.175 | 0.195 | 4.45 | 4.95 |
| B | 0.170 | 0.192 | 4.32 | 4.96 |
| C | 0.500 | 0.610 | 12.70 | 15.49 |
| D | 0.016 | 0.022 | 0.406 | 0.559 |
| E | 0.095 | 0.105 | 2.41 | 2.67 |
| F | 0.045 | 0.60 | 1.14 | 1.52 |
| G | 0.45 | 0.060 | 1.14 | 1.52 |
| H | 0.085 | 0.095 | 2.16 | 2.41 |
| I | 0.130 | 0.155 | 3.30 | 3.94 |
| J | 0.014 | 0.020 | 0.35 | 0.51 |
| K | 0.093 | 0.115 | 2.36 | 2.92 |
| L | 45° | 60° | 45° | 60° |
| M | 0.118 Typical | | 3.00 | |



rev 1.0

Ordering Information

| Device Summary | | | | | | | |
|----------------|--------------------------|---------------------|-----------------|---------------------------|----------------|--------------|----------------|
| Part Number | RESET Output Voltage (V) | RESET Tolerance (%) | RESET Time (ms) | Open-Drain Output Stage** | TO-92 Package* | SO-8 Package | RESET Polarity |
| ASM1233M-55 | 4.625 | 5 | 350 | ◆ | ◆ | | LOW |
| ASM1233M-5 | 4.375 | 10 | 350 | ◆ | ◆ | | LOW |
| ASM1233M-3 | 2.720 | 15 | 350 | ◆ | ◆ | | LOW |
| ASM1233MS-55 | 4.625 | 5 | 350 | ◆ | | ◆ | LOW |
| ASM1233MS-5 | 4.375 | 10 | 350 | ◆ | | ◆ | LOW |
| ASM1233MS-3 | 2.720 | 15 | 350 | ◆ | | ◆ | LOW |

* Add /S to Part Number for straight (unformed) leads. (i.e. ASM1233xx-x/S)
 ** Internal 5kΩ resistor pull-up



ASM1233M



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