

## POWER MANAGEMENT

### Low Power, 5V/3.0V $\mu$ P Reset

- Active LOW, Open-Drain Output
- 350ms Reset Period

The IMP1233M supply voltage monitor is an improved, low-power replacement for the Dallas Semiconductor DS1233M. Maximum supply current over temperature is a low 20 $\mu$ A, representing 60 percent lower power as compared to the DS1233M.

The IMP1233M issues 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-percent for a 5V power supply. The tolerance is 15-percent for the 3.3V, IMP1233M. 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.

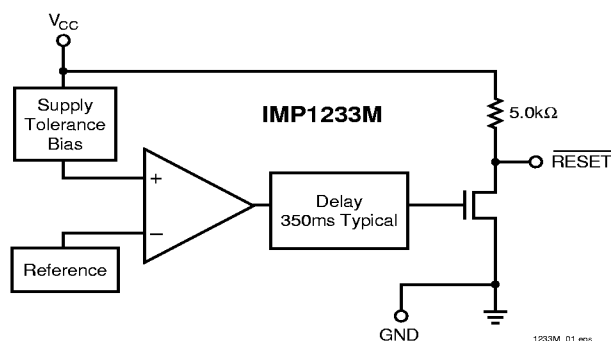
The IMP1233M is designed with a open-drain output stage and operates over the extended industrial temperature range. Devices are available in the compact surface mount SO-8 package and a 3-lead TO-92 package.

Other low power products in this family include the IMP1810/11/12/15/16/17 and IMP1233D.

### Family Selection Guide

| Part     | RESET Voltage (V)   | RESET Time (ms) | Output Stage | RESET Polarity |
|----------|---------------------|-----------------|--------------|----------------|
| IMP1810  | 4.620, 4.370, 4.120 | 150             | Push-Pull    | LOW            |
| IMP1811  | 4.620, 4.350, 4.130 | 150             | Open-Drain   | LOW            |
| IMP1812  | 4.620, 4.350, 4.130 | 150             | Push-Pull    | HIGH           |
| IMP1815  | 3.060, 2.880, 2.550 | 150             | Push-Pull    | LOW            |
| IMP1816  | 3.060, 2.880, 2.550 | 150             | Open-Drain   | LOW            |
| IMP1817  | 3.060, 2.880, 2.550 | 150             | Push-Pull    | HIGH           |
| IMP1233D | 4.625, 4.375, 4.125 | 350             | Open-Drain   | LOW            |
| IMP1233M | 4.625, 4.375, 2.720 | 350             | Open-Drain   | LOW            |

### Block Diagram



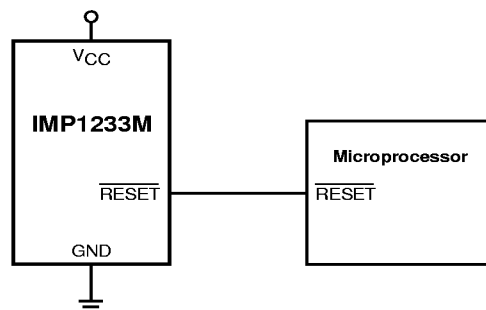
### Key Features

- ◆ Improved Dallas DS1233M replacement
  - 60% lower maximum supply current
- ◆ Low Supply Current
  - 20 $\mu$ A maximum (5.5V)
  - 15 $\mu$ A maximum (3.6V)
- ◆ 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 $\Omega$  internal pull-up
- ◆ Precision temperature-compensated voltage reference and comparator
- ◆ Eliminates external components
- ◆ Pin function compatible with the Motorola MC33064, MC34064, MC33164 and MC34164
- ◆ Motorola 68xxx and HC16 compatible
- ◆ Low-cost TO-92 package
- ◆ Compact surface mount SO-8 package
- ◆ Operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

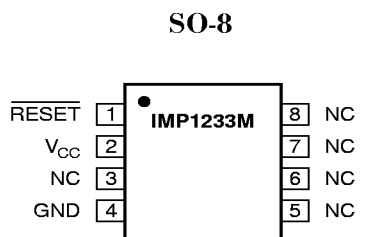
### Applications

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

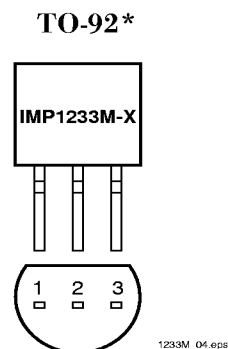
### Typical Application



## Pin Configuration



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## Pin Descriptions

| Pin Numbers      |       | Name            | Function                |
|------------------|-------|-----------------|-------------------------|
| SO-8             | TO-92 |                 |                         |
| 1                | 1     | RESET           | Active LOW reset output |
| 2                | 2     | V <sub>CC</sub> | Power supply input      |
| 3, 5, 6, 7 and 8 | —     | NC              | No connection           |
| 4                | 3     | GND             | Ground                  |

## Ordering Information

| Device Summary |                          |                     |                 |              |           |                |              |                |
|----------------|--------------------------|---------------------|-----------------|--------------|-----------|----------------|--------------|----------------|
| Part Number    | RESET Output Voltage (V) | RESET Tolerance (%) | RESET Time (ms) | Output Stage |           | TO-92* Package | SO-8 Package | RESET Polarity |
|                |                          |                     |                 | Open-Drain** | Push-Pull |                |              |                |
| IMP1233M-55    | 4.625                    | 5                   | 350             | X            |           | X              |              | LOW            |
| IMP1233M-5     | 4.375                    | 10                  | 350             | X            |           | X              |              | LOW            |
| IMP1233M-3     | 2.720                    | 15                  | 350             | X            |           | X              |              | LOW            |
| IMP1233MS-55   | 4.625                    | 5                   | 350             | X            |           |                | X            | LOW            |
| IMP1233MS-5    | 4.375                    | 10                  | 350             | X            |           |                | X            | LOW            |
| IMP1233MS-3    | 2.720                    | 15                  | 350             | X            |           |                | X            | LOW            |

\* Add /S to Part Number for straight (unformed) leads. (ie. IMP18xx-x/S)

\*\* Internal 5kΩ resistor pull up.

1233M03

## Absolute Maximum Ratings

Voltage on  $V_{CC}$  ..... -0.5V to 6.5V  
 Voltage on  $\overline{RESET}$  ..... -0.5V to  $V_{CC} + 0.5V$   
 Operating Temperature Range ..... -40°C to 85°C

Soldering Temperature ..... 260°C for 10 seconds  
 Storage Temperature ..... -55°C to 125°C

*Voltages measured with respect to ground.  
 These are stress ratings only and functional operation is not implied.*

## 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  | Units      |
|------------------------------------------------------|------------|-----------------------------------------------------|-----------------|-----------------|------|------------|
| 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   | $\mu A$    |
| Operating Current                                    | $I_{CC}$   | $V_{CC} \leq 3.6V$ , $\overline{RESET}$ output open |                 | 6               | 15   | $\mu A$    |
| $V_{CC}$ Trip Point (IMP1233M-5)                     | $V_{CCTP}$ |                                                     | 4.25            | 4.375           | 4.49 | V          |
| $V_{CC}$ Trip Point (IMP1233M-55)                    | $V_{CCTP}$ |                                                     | 4.5             | 4.625           | 4.75 | V          |
| $V_{CC}$ Trip Point (IMP1233M-3)                     | $V_{CCTP}$ |                                                     | 2.64            | 2.72            | 2.8  | V          |
| Voltage High Trip Level<br>IMP1233M-5<br>IMP1233M-55 | $V_{HTL}$  |                                                     |                 |                 | 4.75 | V          |
| Voltage Low Trip Level<br>IMP1233M-5<br>IMP1233M-55  | $V_{LTL}$  |                                                     |                 |                 | 4.00 | V          |
| Voltage High Trip Level<br>IMP1233M-3                | $V_{HTL}$  |                                                     |                 |                 | 3.14 | V          |
| Voltage Low Trip Level<br>IMP1233M-3                 | $V_{LTL}$  |                                                     |                 |                 | 2.48 | V          |
| Internal Pull-Up Resistor                            | $R_P$      |                                                     | 3.5             | 5.0             | 7.5  | k $\Omega$ |
| Output Capacitance                                   | $C_{OUT}$  |                                                     |                 |                 | 10   | pF         |
| $V_{CC}$ Detect to $\overline{RESET}$ Low            | $t_{RPD}$  |                                                     |                 | 2               | 10   | $\mu s$    |
| $V_{CC}$ Slew Rate<br>( $V_{HTL} - V_{LTL}$ )        | $t_F$      |                                                     | 300             |                 |      | $\mu s$    |
| $V_{CC}$ Slew Rate<br>( $V_{LTL} - V_{HTL}$ )        | $t_R$      |                                                     | 0               |                 |      | ns         |
| $V_{CC}$ Detect to $\overline{RESET}$ High           | $t_{RPU}$  | $t_R = 5\mu s$                                      | 200             | 350             | 500  | ms         |

Notes: 1. A 1k $\Omega$  external resistor maybe required in some applications for proper operation of the microprocessor reset control circuit.

## Application Information

### Operation – Power Monitor

The IMP1233M detects out-of-tolerance power supply conditions. It resets a processor during power-up and issues a reset to the system processor when the monitored power supply voltage is below the reset threshold (power-down). 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.

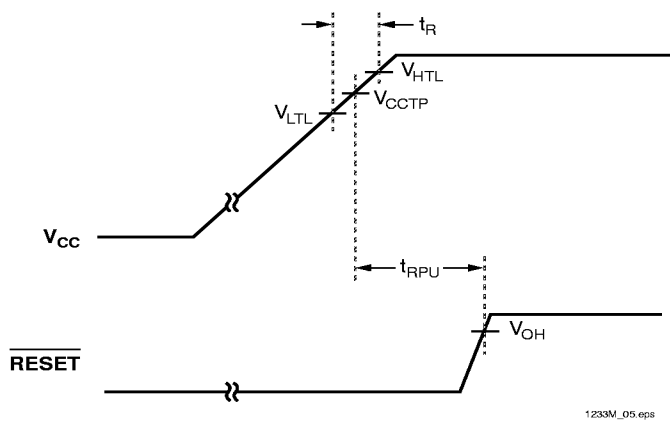


Figure 1. Timing Diagram: Power-Up

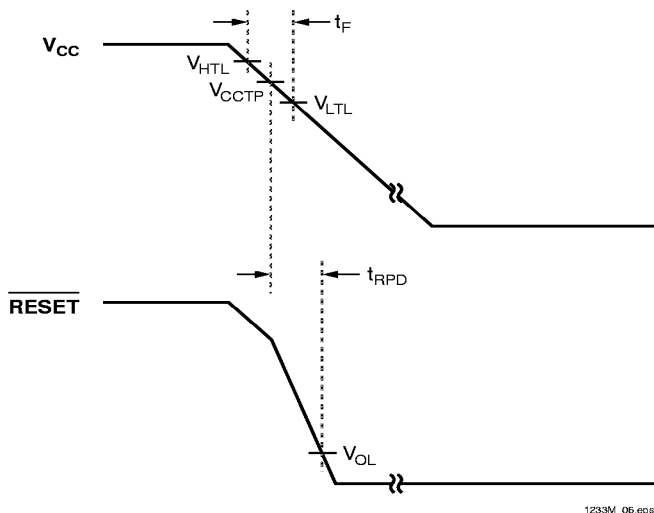
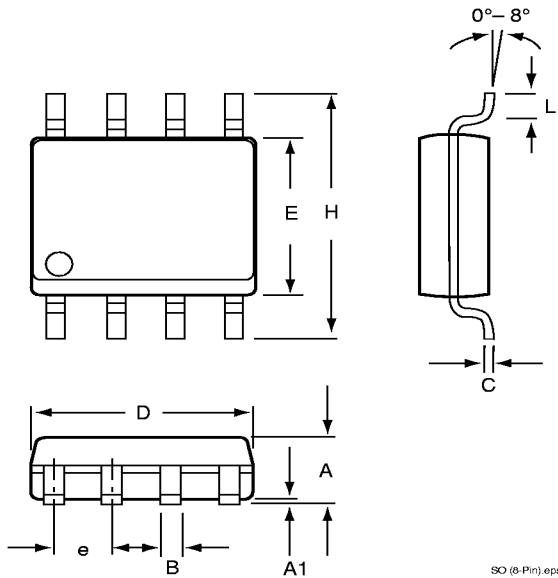


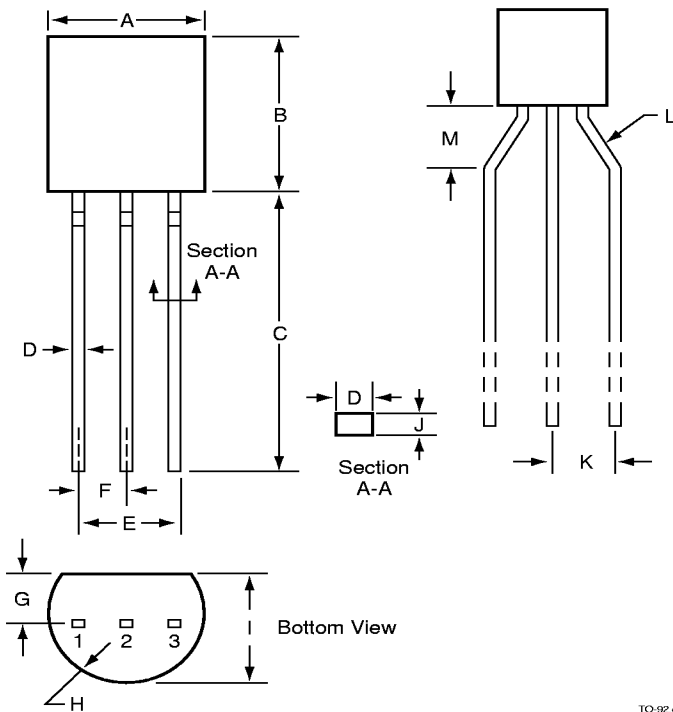
Figure 2. Timing Diagram: Power-Down

## Absolute Maximum Ratings

### Plastic SO-8 (8-Pin)



### TO-92 (3-Pin)



|                             | Inches        |       | Millimeters |       |
|-----------------------------|---------------|-------|-------------|-------|
|                             | Min           | Max   | Min         | Max   |
| <b>Plastic SO-8 (8-Pin)</b> |               |       |             |       |
| 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  |
| <b>TO-92* (3-Pin)</b>       |               |       |             |       |
| 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        |       |

\* Formed leads are standard. Add /S to Part Number for straight leads.

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