

# FM1233B

## 3-Pin $\mu$ C Supervisor Circuit

### General Description

The FM1233B is a supervisor circuit that monitors a microprocessor power supply or other system voltage and issues a reset pulse when a fault condition exists. Several different threshold voltages are offered to accommodate 5V systems with different tolerances.

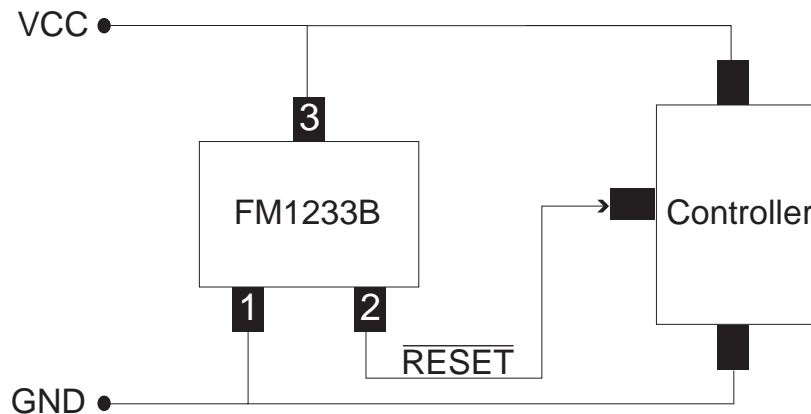
The device features a precision temperature-compensated voltage reference and comparator. When  $V_{CC}$  falls to the threshold voltage, a RESET pulse is issued, holding the output in the active state. When power rises above  $V_{TH}$ , the reset remains for approximately 250 ms to allow the system clock and other circuits to stabilize. The reset output of FM1233B is of open-drain active low type.

The FM1233B also can monitor a switch closure on its output, enabling it to recognize an external reset from a pushbutton switch or a  $\mu$ P. In the case of a switch, the closure will be debounced by circuitry internal to the FM1233B.

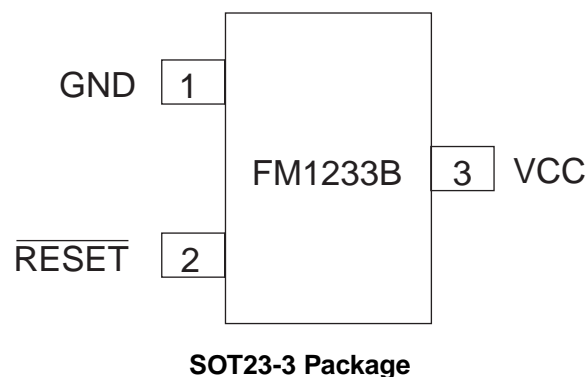
### Features

- Precision monitoring of 5V and lower voltage microprocessor systems
- $V_{TH}$  values of 4.62V, 4.38V and 4.12V
- Automatic restart of microprocessor after power failure
- 140ms (min) power-on RESET delay (typ.: 256ms)
- Internal 5k $\Omega$  pull-up resistor
- Other reset choices available: 32 to 128ms
- Operating Temperature -40°C to +105°C
- Monitors external pushbutton override
- Internal switch debounce circuitry
- SOT23-3 package

### Typical Operating Circuit



### Connection Diagram



## Absolute Maximum Ratings

|                                    |                              |   |                 |
|------------------------------------|------------------------------|---|-----------------|
| Voltage on any pin relative to GND |                              | ESD Rating:   |                 |
| $V_{CC}$                           | -0.3V to +6.0V               | Human body model                                    | $\geq 2kV$      |
| RESET                              | -0.3V to ( $V_{CC} + 0.3V$ ) | Machine Model                                       | $\geq 200V$     |
| Input Current                      | 20mA                         | Continuous Power Dissipation ( $T_A = 70^\circ C$ ) |                 |
| Output Current (RESET)             | 20mA                         | SOT23 (derate 4mW above $70^\circ C$ )              | 300mW           |
|                                    |                              | Operating Temperature Range                         | -40°C to +105°C |
|                                    |                              | Storage Temperature Range                           | -65°C to +150°C |
|                                    |                              | Lead Temperature (soldering, 10s)                   | +300°C          |

These are stress ratings only, and functional operation is not implied for these levels or beyond. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

## Electrical Characteristics ( $V_{CC} = 5V$ ; $T_A = -40^\circ C$ to $+105^\circ C$ unless otherwise noted) (Note 1)

| Parameter            | Symbol      | Conditions    |  | Min  | Typ  | Max  | Units   |
|----------------------|-------------|---------------|--|------|------|------|---------|
| Operating Voltage    | $V_{CC}$    |               |  | 1.2  |      | 5.5  | V       |
| Supply Current       | $I_{CC}$    | $V_{CC} < 5V$ |  |      | 3    | 6    | $\mu A$ |
| Reset Threshold      | $V_{TH}$    | FM1233BF      |  | 4.40 | 4.62 | 4.86 | V       |
| Reset Threshold      | $V_{TH}$    | FM1233BD      |  | 4.16 | 4.38 | 4.55 | V       |
| Reset Threshold      | $V_{TH}$    | FM1233BE      |  | 3.91 | 4.12 | 4.32 | V       |
| Reset Output Voltage | $V_{OL}$    | FM1233B       | $I_{sink} = 5mA$<br>$V_{CC} = V_{TH(min)}$ |      |      | 0.4  | V       |
| Reset Timeout Period | $t_{RST}$   | FM1233B       |  | 140  | 256  | 560  | ms      |
| Pushbutton Detect    | $PBV_{DET}$ | FM1233B       | $V_{CC} = 5V$                              | 0.8  |      | 2.0  | V       |
| Pushbutton Release   | $PBV_{REL}$ | FM1233B       | Note 2                                     |      | 0.3  | 1.5  | V       |

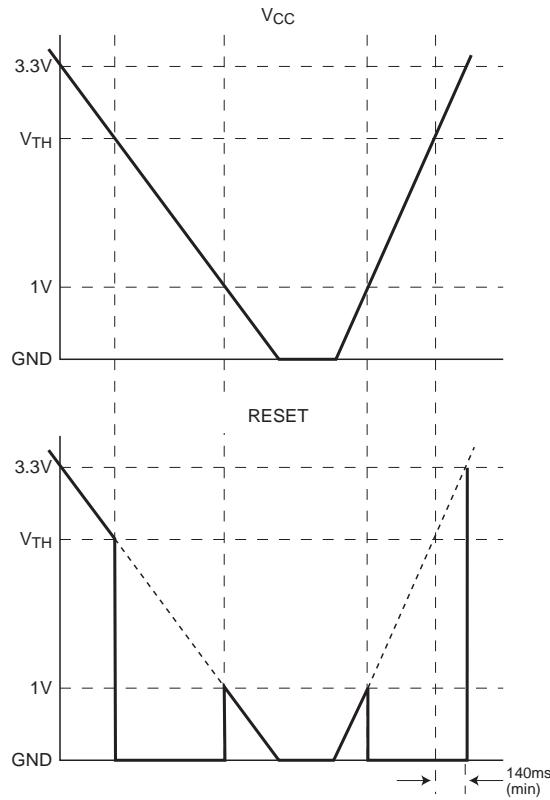
**Note 1:** Testing at production is done at 25°C only. Limits over temperature are guaranteed by design.

**Note 2:** C = 100pF,  $V_{CC} = 5V$ . It is recommended to connect 100pF capacitor between the Reset pin and Ground pin if pushbutton reset is implemented.

## Pin Descriptions

| Pin Number | Name     | Function  |
|------------|----------|---|
| 1          | GND      | GROUND  |
| 2          | RESET    | RESET remains LOW while $V_{CC}$ is below $V_{TH}$ , and for at least 140ms after $V_{CC}$ rises above $V_{TH}$ . |
| 3          | $V_{CC}$ |   |

## Circuit Timing



When operating properly with 5V  $V_{CC}$  (for example),  $\overline{\text{RESET}}$  will also be about 5V. When  $V_{CC}$  starts to fall,  $\overline{\text{RESET}}$  will follow it down as shown. When  $V_{CC}$  drops below  $V_{TH}$ ,  $\overline{\text{RESET}}$  drops to ground ("issues a RESET") and stays there unless  $V_{CC}$  also falls below its minimum operating voltage, approx. 1V. At this point, the supervisor loses control, and its output may rise, only to again follow  $V_{CC}$  down to the ground.

When  $V_{CC}$  begins to rise,  $\overline{\text{RESET}}$  follows it until 1.0V or so is reached, whereupon the device regains control,  $\overline{\text{RESET}}$  is pulled to ground, etc. When  $V_{CC}$  rises above  $V_{TH}$ ,  $\overline{\text{RESET}}$  comes out of RESET 140 ms later.

If it is required that a lower value than GND + 1.0V is needed on RESET signal during  $V_{CC} \leq 1V$ , a 100K resistor may be used on the device output to GND.

## General Description

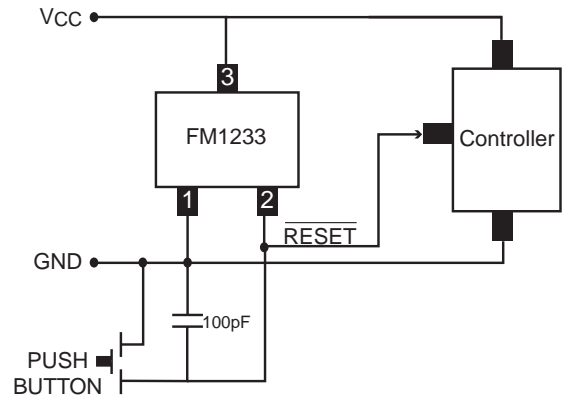
The FM1233B features a highly accurate voltage reference to which  $V_{CC}$  is compared. Once  $V_{CC}$  is below the specified threshold, it will drive the  $\overline{RESET}$  line and continue to hold it low until  $V_{CC}$  returns above the threshold and the time for the  $\overline{RESET}$  pulse duration has expired. The FM1233B is immune to short negative going transients on the  $V_{CC}$  line. The placement of a  $0.1\mu\text{F}$  bypass capacitor as close as possible to the  $V_{CC}$  pin provides additional transient immunity.

For a  $V_{CC}$  value below 1.0V, the FM1233B does not sink very much current on the  $\overline{RESET}$  pin. This is not a problem in most systems since common devices are not functional in this range. If it is desired for the FM1233B reset to be functional below this range, use a  $100\text{k}\Omega$  pull-down resistor between  $\overline{RESET}$  and  $V_{SS}$ .

## Bi-Directional Reset

The FM1233B permits an external pushbutton to initiate a reset. Such a connection to pin 2 will be debounced,  $\overline{RESET}$  will go low and recover in typically 250ms. For proper operation, the external switch should be paralleled by an external capacitor of 100pF to  $0.01\mu\text{F}$ .

## Connecting an External Reset to the FM1233B

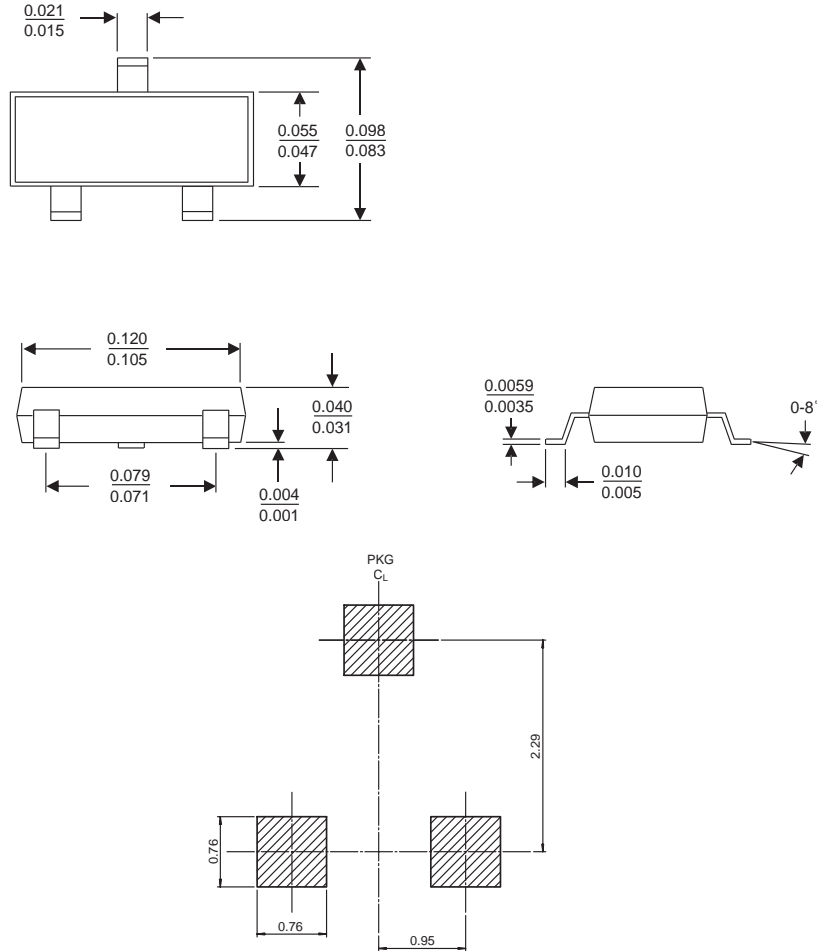


## Ordering Information

| Part Number | Top Marking | RESET Threshold (V) | Output Type            | Package Type | Packing Method    |
|-------------|-------------|---------------------|------------------------|--------------|-------------------|
| FM1233BFS3X | 3BF         | 4.62                | Open-Drain, active LOW | 3-Pin, SOT23 | 3000 units in T&R |
| FM1233BDS3X | 3BD         | 4.38                | Open-Drain, active LOW | 3-Pin, SOT23 | 3000 units in T&R |
| FM1233BES3X | 3BE         | 4.12                | Open-Drain, active LOW | 3-Pin, SOT23 | 3000 units in T&R |

**Note 3:** Devices listed above feature 250ms typical reset pulse width. Consult Fairchild Sales for other reset pulse width options.

**Physical Dimensions** inches (millimeters) unless otherwise noted



**SOT-23 Package Dimensions**  
**FS Pkg Code AU**

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