

# 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.

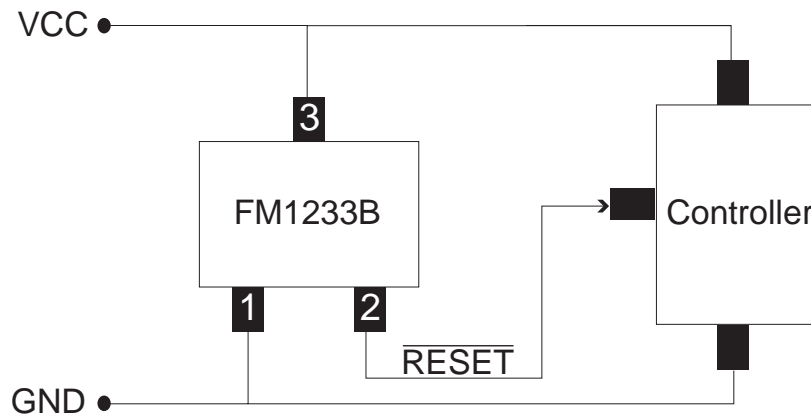
The device features a precision temperature-compensated voltage reference and comparator. When  $V_{CC}$  falls to the threshold voltage, a RESET pulse is issued, holding the output in the active state. When power rises above  $V_{TH}$ , the reset remains for approximately 250 ms to allow the system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

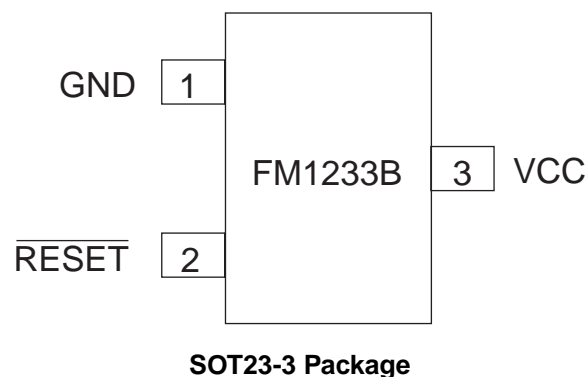
### Features

- 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	$\geq 2$ kV
RESET	-0.3V to ( $V_{CC} + 0.3$ V)	Machine Model	$\geq 200$ V
Input Current	20mA	Continuous Power Dissipation ( $T_A = 70^\circ\text{C}$ )	
Output Current (RESET)	20mA	SOT23 (derate 4mW above $70^\circ\text{C}$ )	300mW
		Operating Temperature Range	$-40^\circ\text{C}$ to $+105^\circ\text{C}$
		Storage Temperature Range	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
		Lead Temperature (soldering, 10s)	$+300^\circ\text{C}$

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

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Operating Voltage	$V_{CC}$			1.2		5.5	V
Supply Current	$I_{CC}$	$V_{CC} < 5\text{V}$			3	6	$\mu\text{A}$
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	$I_{\text{sink}} = 5\text{mA}$ $V_{CC} = V_{TH(\text{min})}$			0.4	V
Reset Timeout Period	$t_{RST}$	FM1233B		140	256	560	ms
Pushbutton Detect	$PBV_{DET}$	FM1233B	$V_{CC} = 5\text{V}$	0.8		2.0	V
Pushbutton Release	$PBV_{REL}$	FM1233B	Note 2		0.3	1.5	V

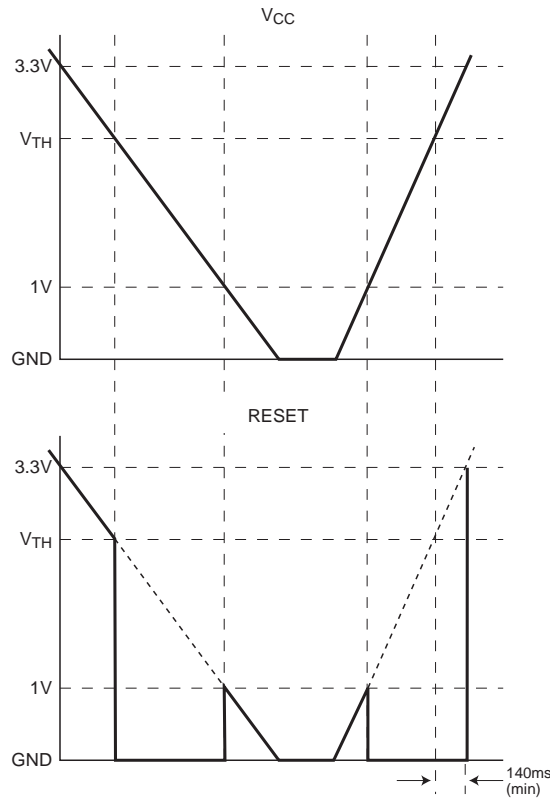
**Note 1:** Testing at production is done at  $25^\circ\text{C}$  only. Limits over temperature are guaranteed by design.

**Note 2:**  $C = 100\text{pF}$ ,  $V_{CC} = 5\text{V}$ . It is recommended to connect  $100\text{pF}$  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  $\text{GND} + 1.0\text{V}$  is needed on RESET signal during  $V_{CC} \leq 1\text{V}$ , a 100K resistor may be used on the device output to GND.

## General Description

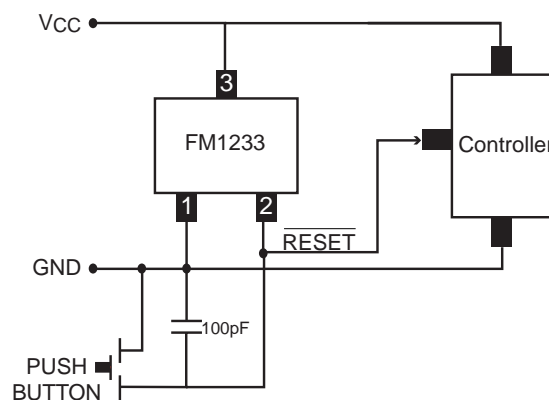
The FM1233B features a highly accurate voltage reference to which  $V_{CC}$  is compared. Once  $V_{CC}$  is below the specified threshold, it will drive the  $\overline{RESET}$  line and continue to hold it low until  $V_{CC}$  returns above the threshold and the time for the  $\overline{RESET}$  pulse 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  $100\text{pF}$  to  $0.01\mu\text{F}$ .

## Connecting an External Reset to the FM1233B

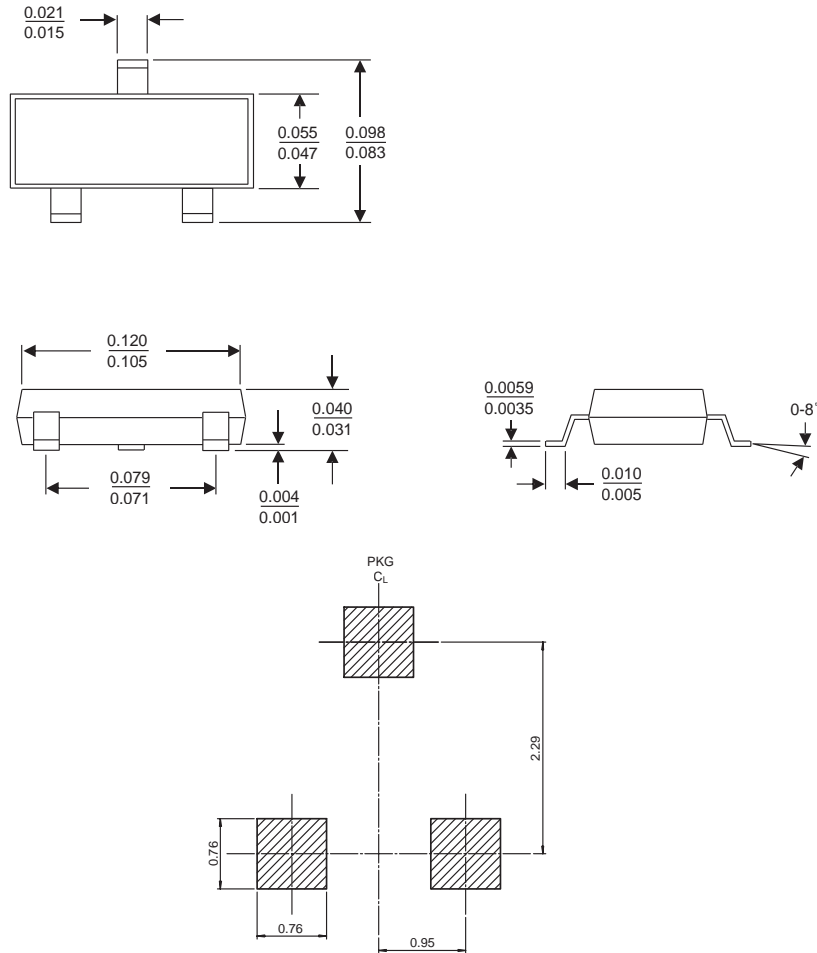


## Ordering Information

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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