



September 2004

## FM1233A 3-Pin $\mu$ C Supervisor Circuit

### General Description

The FM1233A 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 3.3V and 3.0V systems with different tolerances.

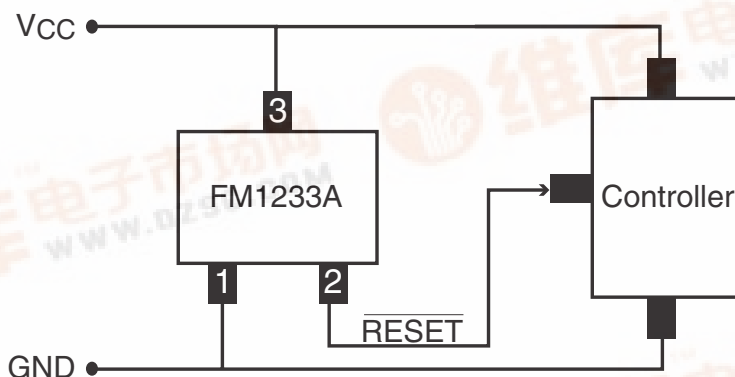
FM1233A features a precision temperature-compensated voltage reference and comparator. When  $V_{CC}$  falls to the threshold voltage, a RESET pulse is issued, holding the output in the active state. When power rises above  $V_{TH}$ , the reset remains asserted for a minimum period ( $t_{RST}$ ) to allow the system clock and other circuits to stabilize. The reset output of FM1233A is of open-drain active low type.

The FM1233A 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 FM1233A.

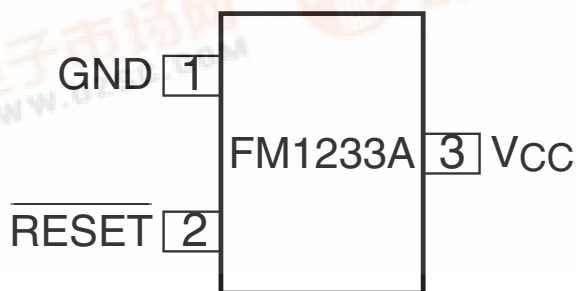
### Features

- Precision monitoring of 3.3V and lower voltage microprocessor systems
- $V_{TH}$  values of 3.08V, 2.88V and 2.72V
- Automatic restart of microprocessor after power failure
- Reset Timeout Period Choice:
  - Options AC and AD: 140ms (min)/256ms (typ)
  - Option ABA: 17ms (min)/32ms (typ)
  - Available on request: 64ms (typ) and 128ms (typ)
- Internal 5k $\Omega$  pull-up resistor
- Operating Temperature -40°C to +105°C
- Monitors external pushbutton override
- Internal switch debounce circuitry
- SOT23-3 package

### Typical Operating Circuit



### Connection Diagram



SOT23-3 Package



## Absolute Maximum Ratings

Voltage on any pin relative to GND		Continuous Power Dissipation ( $T_A = 70^\circ\text{C}$ )	
$V_{CC}$	-0.3V to +6.0V	SOT23 (derate 4mW above $70^\circ\text{C}$ )	300mW
$\overline{\text{RESET}}$	-0.3V to ( $V_{CC} + 0.3\text{V}$ )	Operating Temperature Range	$-40^\circ\text{C}$ to $+105^\circ\text{C}$
Input Current	20mA	Storage Temperature Range	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
Output Current ( $\overline{\text{RESET}}$ )	20mA	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 ( $V_{CC} = 3.3\text{V}$ ; $T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$ unless otherwise noted) (Note 1)

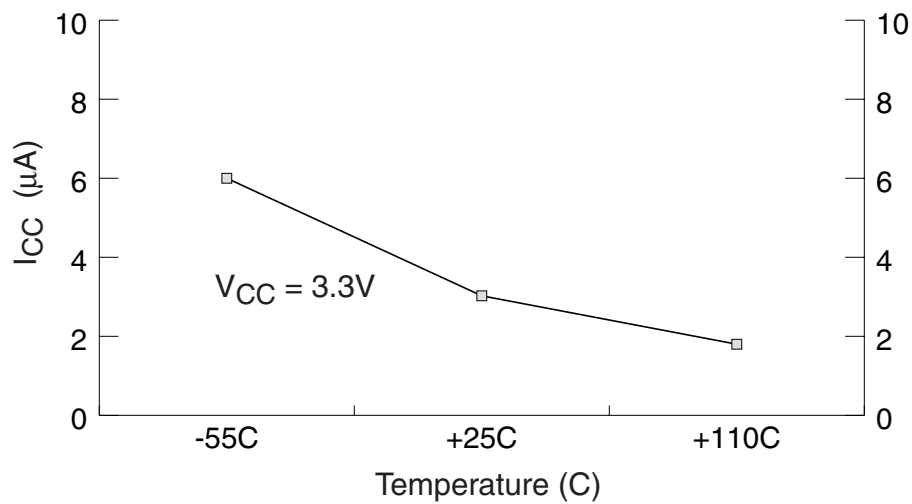
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Operating Voltage	$V_{CC}$		1.2	3.3	5.5	V
Supply Current	$I_{CC}$	$V_{CC} < 3.3\text{V}$		3	6	$\mu\text{A}$
Reset Threshold	$V_{TH}$	FM1233AC	2.70	2.88	2.97	V
Reset Threshold	$V_{TH}$	FM1233AD	2.58	2.72	2.86	V
Reset Threshold	$V_{TH}$	FM1233ABA	2.97	3.08	3.19	V
Reset Output Voltage	$V_{OL}$	$I_{SINK} = 1.2\text{mA}$ $V_{CC} = V_{TH(min)}$			0.4	V
Reset Timeout Period	$t_{RST}$	FM1233AC, FM1233AD	140	256	560	ms
Reset Timeout Period	$t_{RST}$	FM1233ABA	17	32	64	ms
Pushbutton Detect	$PBV_{DET}$	$V_{CC} = 3.3\text{V}$	0.8		2.0	V
Pushbutton Release	$PBV_{REL}$	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.

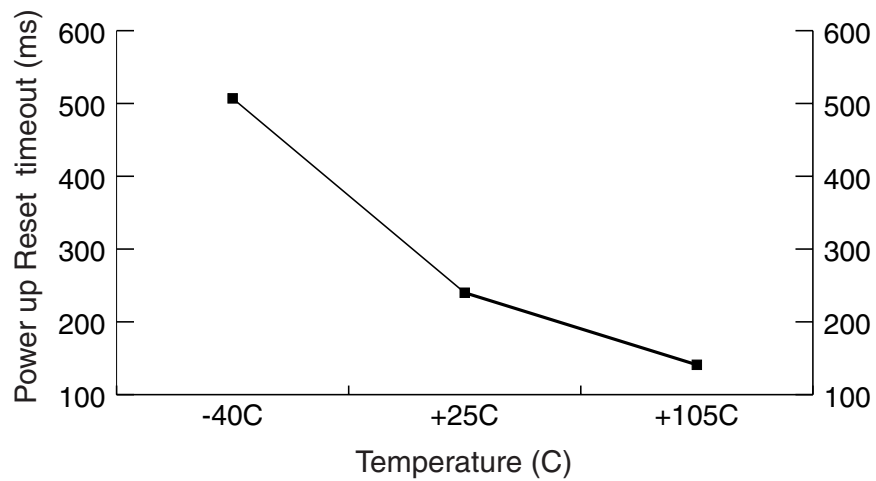
**Note 2:**  $C = 100\text{pF}$ ,  $V_{CC} = 3.3\text{V}$ . It is recommended to connect 100pF capacitor between the Reset pin and Ground pin if pushbutton reset is implemented.

## Typical Operating Characteristics

Supply Current Vs. Temperature



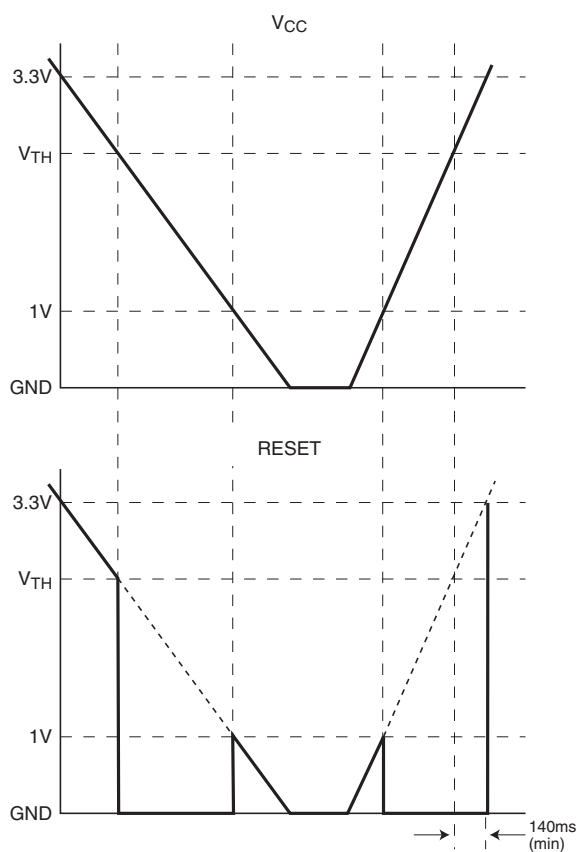
Power up Reset Timeout Vs. Temperature



## Pin Descriptions

Pin Number	Name	Function
1	GND	GROUND
2	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ remains LOW while $V_{CC}$ is below $V_{TH}$ , and for at least the minimum Reset Timeout period after $V_{CC}$ rises above $V_{TH}$ .
3	$V_{CC}$	

## Circuit Timing (Ex: FM1233A)



When operating properly with 3V  $V_{CC}$  (for example),  $\overline{\text{RESET}}$  will also be about 3V. 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 after the minimum Reset Timeout period.

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 FM1233A features a highly accurate voltage reference to which  $V_{CC}$  is compared. Once  $V_{CC}$  is below the specified threshold, it will drive the  $\overline{\text{RESET}}$  line and continue to hold it low until  $V_{CC}$  returns above the threshold and the time for the RESET pulse duration has expired. The FM1233A is immune to short negative going transients on the  $V_{CC}$  line. The placement of a 0.1 $\mu$ F bypass capacitor as close as possible to the  $V_{CC}$  pin provides additional transient immunity.

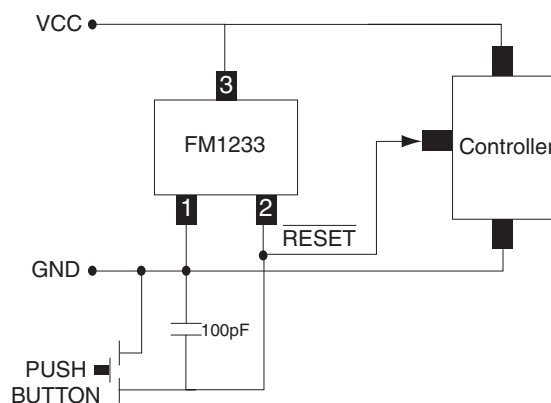
For a  $V_{CC}$  value below 1.0V, the FM1233A does not sink very much current on the  $\overline{\text{RESET}}$  pin. This is not a problem in most systems since common devices are not functional in this range. If it is desired for the FM1233A reset to be functional below this range, use a 100K $\Omega$  pull-down resistor between  $\overline{\text{RESET}}$  and  $V_{SS}$ .

## Bi-Directional Reset

The FM1233A permits a pushbutton (or a signal) to initiate a reset externally. Once this external reset is detected on the reset pin, FM1233 also actively asserts the reset signal to maintain the Reset Timeout period when the external reset is not present.

FM1233 internally debounces glitches seen during a typical push button closure. For proper operation, the external switch should be paralleled by an external capacitor of 100pF to 0.01 $\mu$ F.

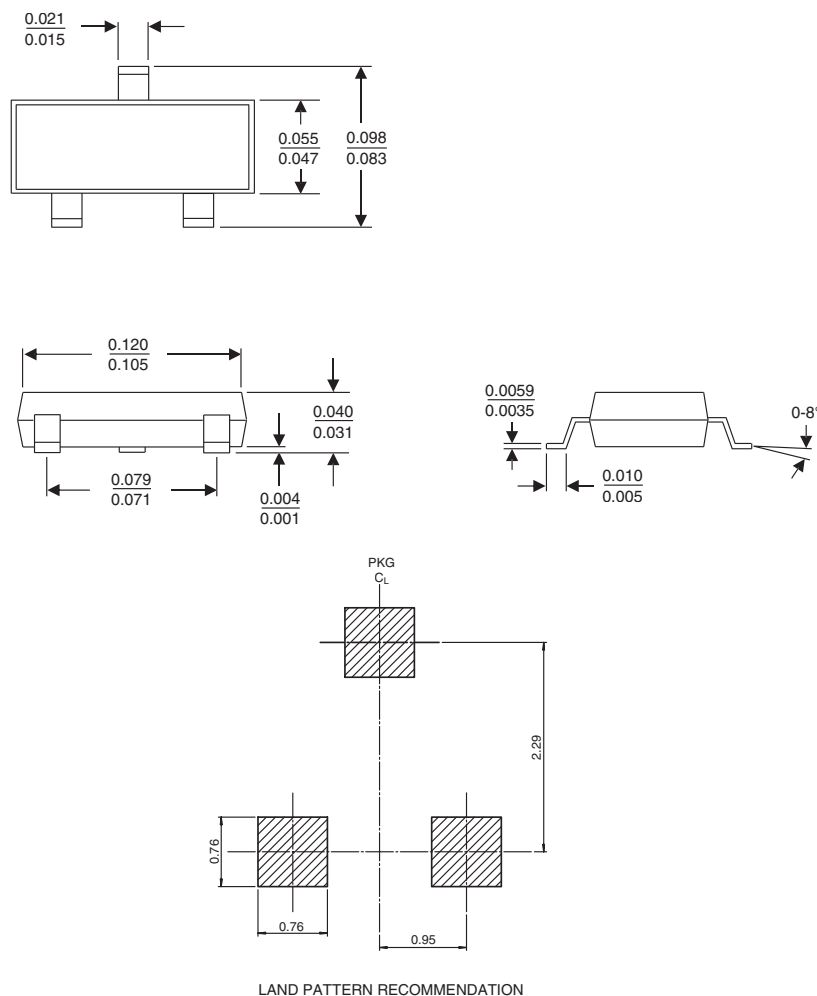
## Connecting an External Reset to the FM1233A



## Ordering Information

Part Number	Top Marking	RESET Threshold (V)	Output Type	Package Type	Packing Method
FM1233ACS3X	33AC	2.88	Open-Drain, active LOW	3-Pin, SOT23	3000 units in T&R
FM1233ADS3X	33AD	2.72	Open-Drain, active LOW	3-Pin, SOT23	3000 units in T&R
FM1233ABAS3X	3ABA	3.08	Open-Drain, active LOW	3-PIN, SOT23	3000 units in T&R

**Note 3:** FM1233AC and FM1233AD feature 256ms (typ) Reset timeout while FM1233ABA features 32ms (typ) Reset Timeout. 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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