

# FM1233D

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

### General Description

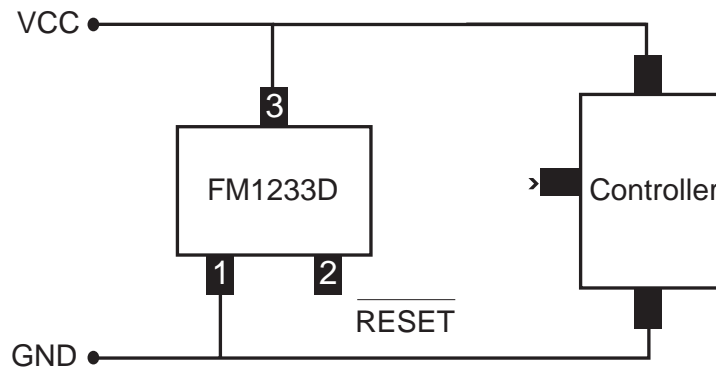
The FM1233D is a supervisor circuit that monitors a microprocessor power supply or other system voltage and issues a reset pulse when a fault condition exists. Several different threshold voltages are offered to accommodate 5V systems with different tolerances.

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 FM1233D is of open-drain active low type.

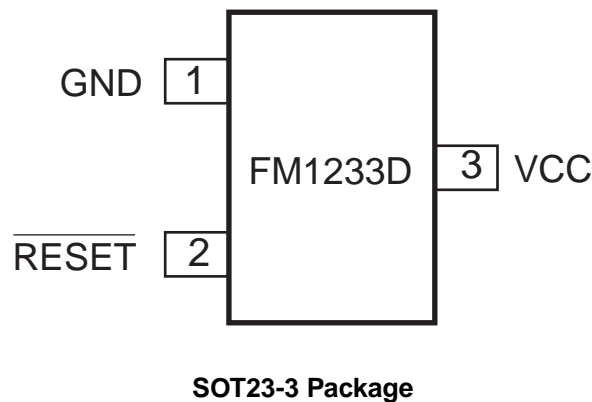
### Features

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

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.

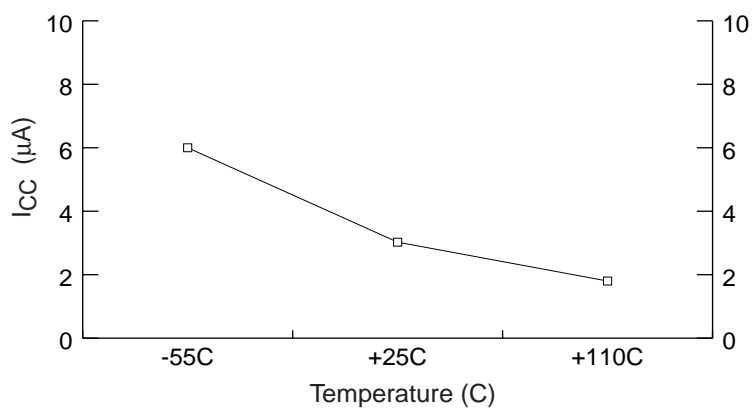
## Electrical Characteristics ( $V_{CC} = 5V$ ; $T_A = -40^\circ C$ to $+105^\circ C$ unless otherwise noted) (Note 1)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Operating Voltage	$V_{CC}$			4.5	5	5.5	V
Supply Current	$I_{CC}$	$V_{CC} < 5V$			3	6	$\mu A$
Reset Threshold	$V_{TH}$	FM1233DF		4.40	4.63	4.86	V
Reset Threshold	$V_{TH}$	FM1233DD		4.16	4.38	4.55	V
Reset Threshold	$V_{TH}$	FM1233DE		3.91	4.12	4.32	V
Reset Output Voltage	$V_{OL}$	FM1233D	$I_{sink} = 5mA$ $V_{CC} = V_{TH}(min)$			0.4	V
Reset Timeout Period	$t_{RST}$	FM1233D		140	256	560	ms

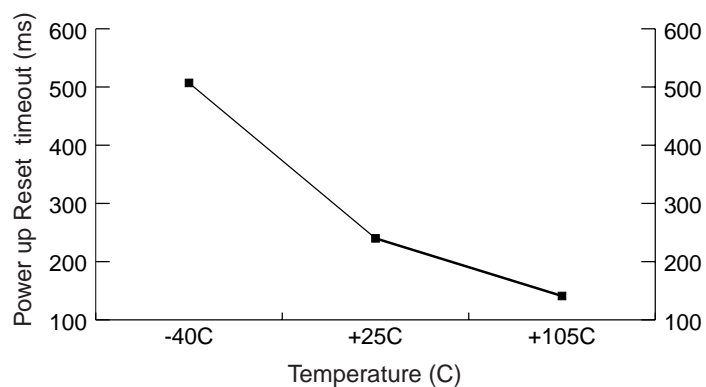
Note 1: Testing at production is done at  $25^\circ C$  only. Limits over temperature are guaranteed by design.

## Typical Operating Characteristics

### Supply Current Vs. Temperature



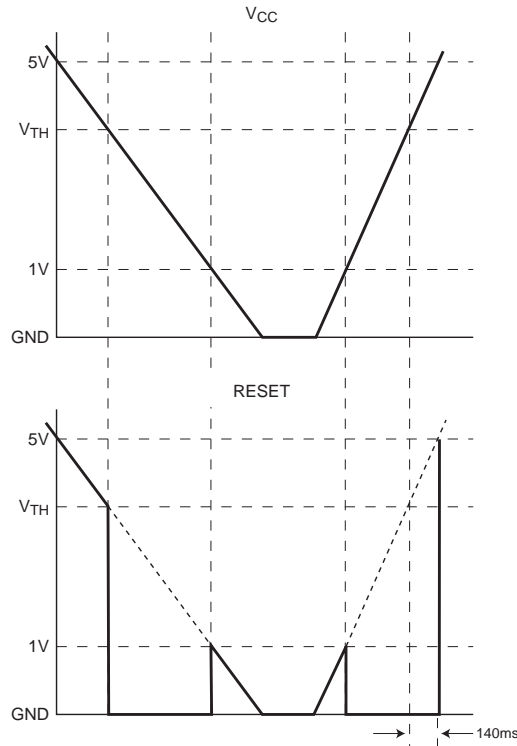
### Power up Reset Timeout Vs. Temperature



## 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 (Ex: FM1233D)



When operating properly with 5V  $V_{CC}$  (for example),  $\overline{RESET}$  will also be about 5V. When  $V_{CC}$  starts to fall,  $\overline{RESET}$  will follow it down as shown. When  $V_{CC}$  drops below  $V_{TH}$ ,  $\overline{RESET}$  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,  $\overline{RESET}$  follows it until 1.0V or so is reached, whereupon the device regains control,  $\overline{RESET}$  is pulled to ground, etc. When  $V_{CC}$  rises above  $V_{TH}$ ,  $\overline{RESET}$  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 FM1233D 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 FM1233D 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.

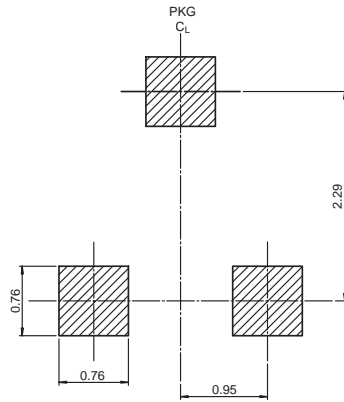
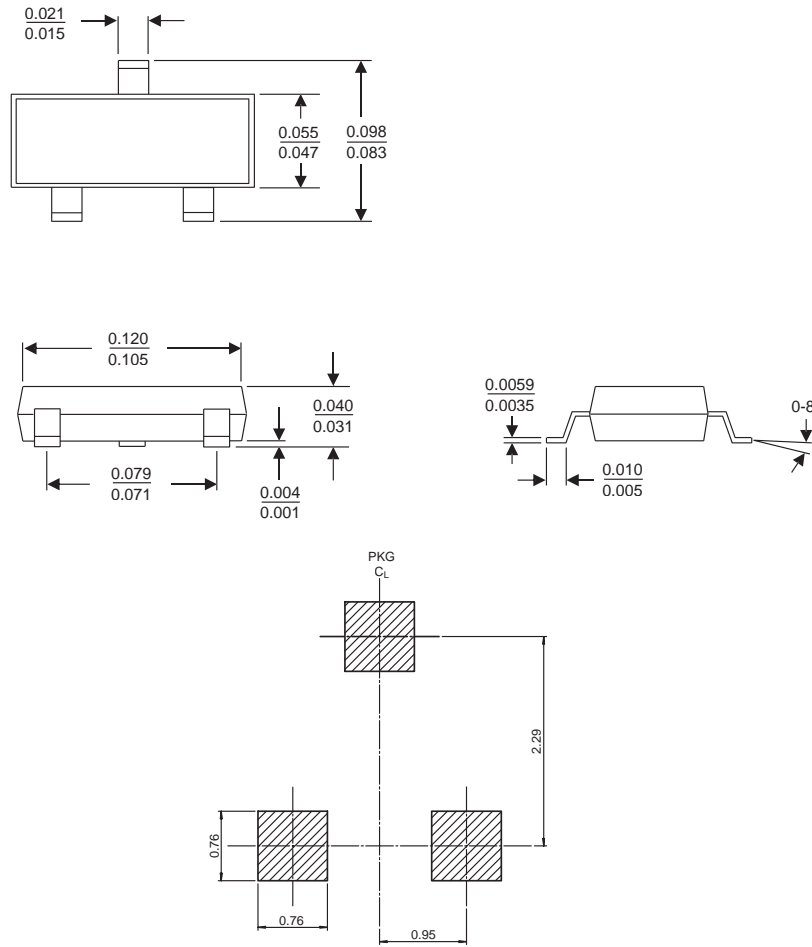
For a  $V_{CC}$  value below 1.0V, the FM1233D does not sink very much current on the  $\overline{RESET}$  pin. This is not a problem in most systems since common devices are not functional in this range. If it is desired for the FM1233D reset to be functional below this range, use a  $100\text{K}\Omega$  pull-down resistor between  $\overline{RESET}$  and  $V_{SS}$ .

## Ordering Information

Part Number	Top Marking	RESET Threshold (V)	Output Type	Package Type	Packing Method
FM1233DFS3X	3DF	4.62	Open-Drain, active LOW	3-Pin, SOT23	3000 units in T&R
FM1233DDS3X	3DD	4.38	Open-Drain, active LOW	3-Pin, SOT23	3000 units in T&R
FM1233DES3X	3DE	4.12	Open-Drain, active LOW	3-Pin, SOT23	3000 units in T&R

**Note 5:** 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**

**Life Support Policy**

Fairchild's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President of Fairchild Semiconductor Corporation. As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**Fairchild Semiconductor Americas Customer Response Center**  
Tel: 1-888-522-5372

**Fairchild Semiconductor Europe**  
 Fax: +44 (0) 1793-856858  
 Deutsch Tel: +49 (0) 8141-6102-0  
 English Tel: +44 (0) 1793-856856  
 Français Tel: +33 (0) 1-6930-3696  
 Italiano Tel: +39 (0) 2-249111-1

**Fairchild Semiconductor Hong Kong**  
 8/F, Room 808, Empire Centre  
 68 Mody Road, Tsimshatsui East  
 Kowloon, Hong Kong  
 Tel: +852-2722-8338  
 Fax: +852-2722-8383

**Fairchild Semiconductor Japan Ltd.**  
 4F, Natsume Bldg.  
 2-18-6, Yushima, Bunkyo-ku  
 Tokyo, 113-0034 Japan  
 Tel: 81-3-3818-8840  
 Fax: 81-3-3818-8841