FAIRCHILD SEMICONDUCTOR®

February 2003

FM1233E
3-Pin µC Supervisor Circuit

General Description

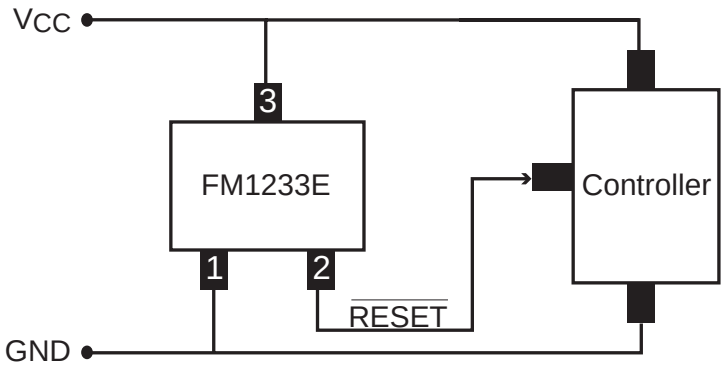
The FM1233E is a supervisor circuit that monitors a microprocessor power supply or other system voltage and issues a reset pulse when a fault condition exists. Several different threshold voltages are offered to accommodate 3V systems with different tolerances.

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 FM1233E is of open-drain active low type.

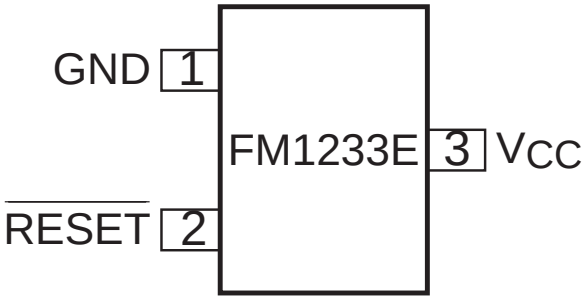
Features

- Precision monitoring of 3.3V and lower voltage microprocessor systems
- V_{TH} values of 2.88V, 2.72V
- Automatic restart of microprocessor after power failure
- 140ms (min) power-on $\overline{\text{RESET}}$ delay (typ.: 256ms)
- Internal 5kΩ 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



SOT23-3 Package

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Absolute Maximum Ratings

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

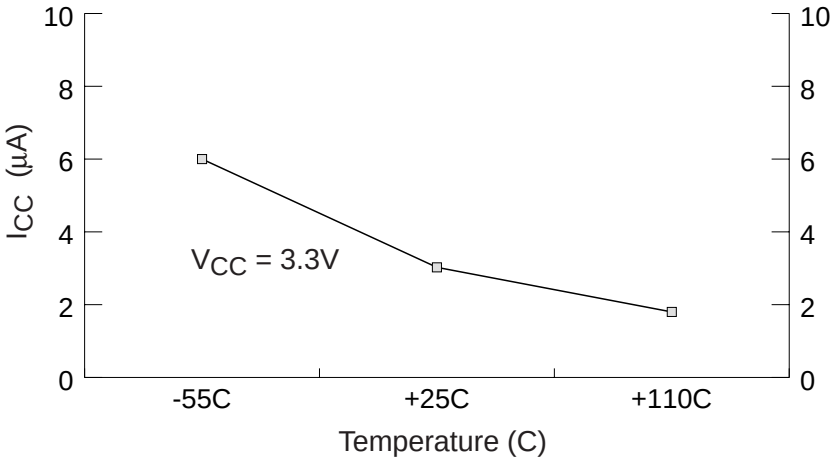
Electrical Characteristics (V_{CC} = 3.3V; TA = -40°C to +105°C unless otherwise noted) (Note 1)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Operating Voltage	V_{CC}			1.2	3.3	5.5	V
Supply Current	I_{CC}	V_{CC} < 3.3V			3	6	µA
Reset Threshold	V_{TH}	FM1233EC		2.70	2.88	2.97	V
Reset Threshold	V_{TH}	FM1233ED		2.58	2.72	2.86	V
Reset Output Voltage	V_{OL}	FM1233E	I_{SINK} = 5mA V_{CC} = V_{TH}(min)			0.4	V
Reset Timeout Period	t_{RST}	FM1233E		140	256	560	ms

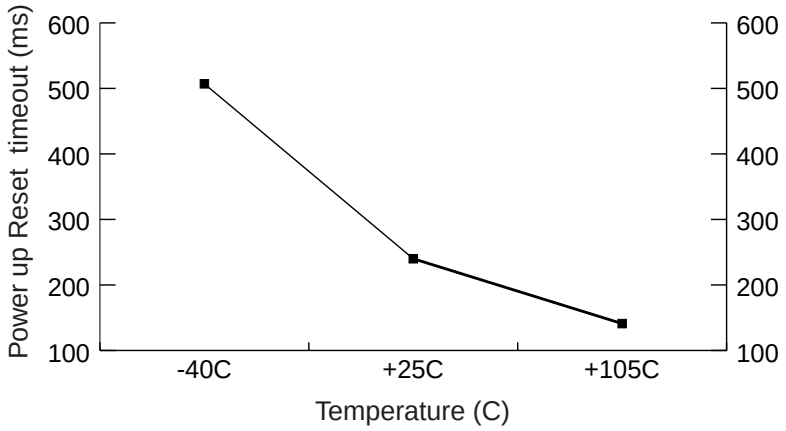
Note 1: Testing at production is done at 25°C only. Limits over temperature are guaranteed by design.

Typical Operating Characteristics

Supply Current Vs. Temperature



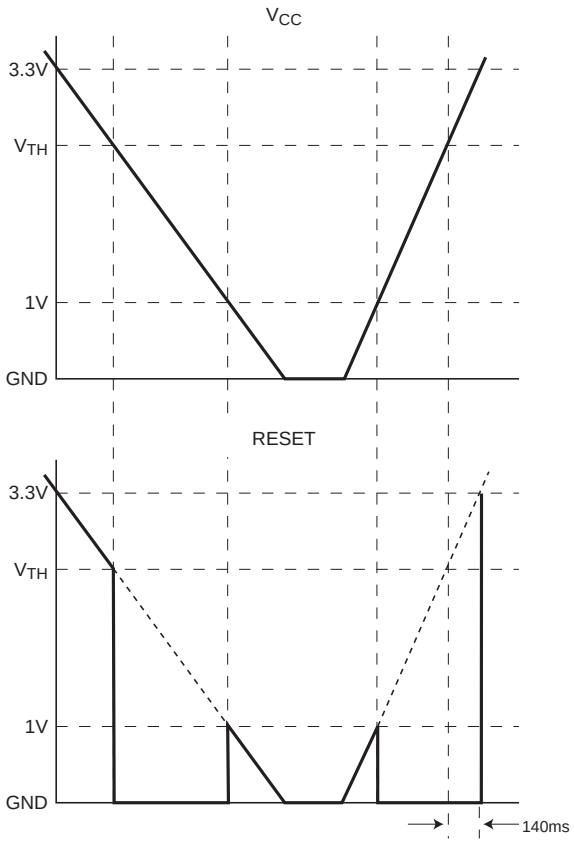
Power up Reset Timeout Vs. Temperature



Pin Descriptions

Pin Number	Name	Function
1	GND	GROUND
2	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ 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: FM1233E)



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 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 FM1233E 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 FM1233E is immune to short negative going transients on the V_{CC} line. The placement of a 0.1µF bypass capacitor as close as possible to the V_{CC} pin provides additional transient immunity.

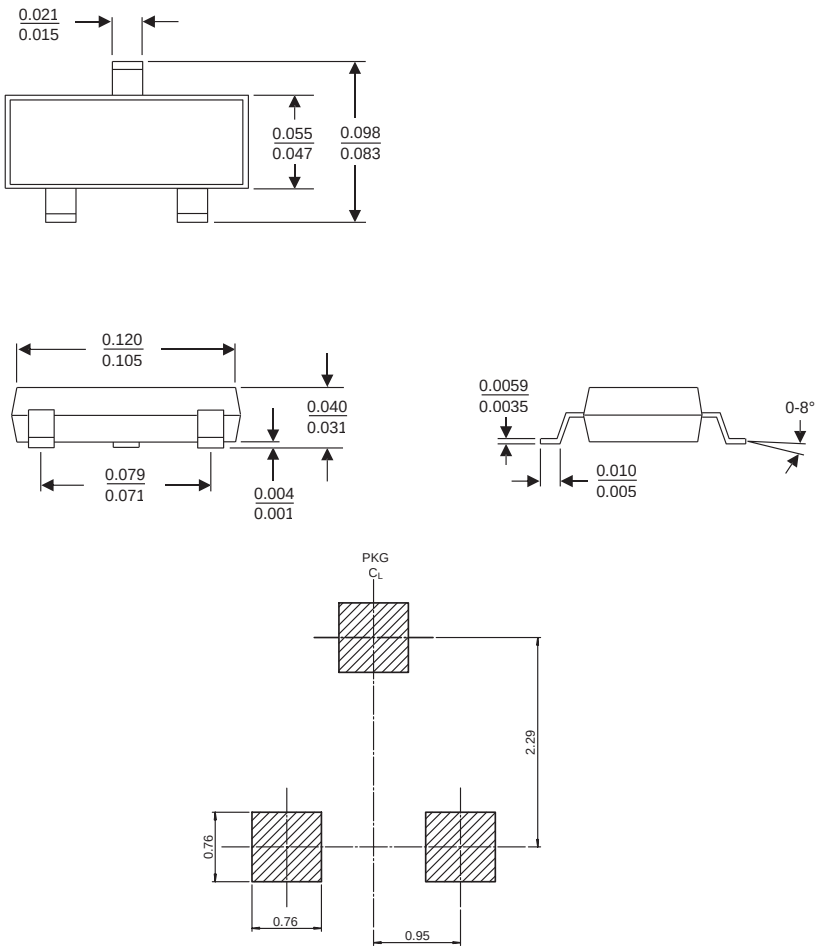
For a V_{CC} value below 1.0V, the FM1233E does not sink very much current on the $\overline{\text{RESET}}$ pin. This is not a problem in most systems since common devices are not functional in this range. If it is desired for the FM1233E reset to be functional below this range, use a 100KΩ pull-down resistor between $\overline{\text{RESET}}$ and V_{SS}.

Ordering Information

Part Number	Top Marking	RESET Threshold (V)	Output Type	Package Type	Packing Method
FM1233ECS3X	3EC	2.88	Open-Drain, active LOW	3-Pin, SOT23	3000 units in T&R
FM1233EDS3X	3ED	2.72	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



LAND PATTERN RECOMMENDATION

SOT-23 Package Dimensions
FS Pkg Code AU

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