FAIRCHILD

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FM809/810
3-Pin µC Supervisor Circuits

General Description

The FM809/810 are supervisor circuits that monitor power supply or other system voltages and issue reset pulse whenever the voltage being monitored is out of tolerance. Once asserted, the reset pulse is guaranteed to be valid for a minimum of 140ms (256ms typical). FM809xx offers active low push-pull type of reset while FM810xx offers active high push-pull type. Several threshold voltages are offered to accommodate 5.0V, 3.3V, 3.0V and 2.7V system voltages.

The low supply current (typically 2 µA) recommends FM809/810 devices for portable designs or wherever power saving is primary.

These devices are offered in space saving 3-pin SOT23 and SC70 packages.

Features

- V_{TH} voltages of 4.63V, 4.38V, 4.00V, 3.08V, 2.93V and 2.63V
- $\overline{RESET}$ (FM809) or RESET (FM810) output

- 140ms power-on RESET delay (minimum)
- $\overline{RESET}$ operation guaranteed to 1.0V
- Supply current only 2µA
- No external components
- Operating Range
  – -40°C to +105°C (SOT23)
  – -40°C to +85°C (SC70)
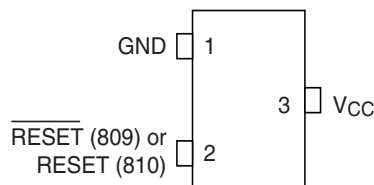- SOT23-3 and SC70-3 packages

Applications

- Microcontrollers and Microprocessors
- Appliances
- Power-Supply Monitoring
- Portable Equipment
- Automotive Systems

Typical Operating Circuit
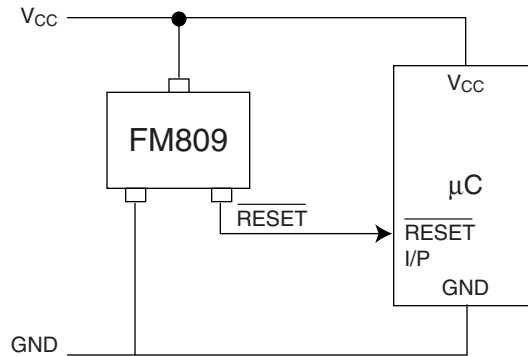
Connection Diagram

FM809/810

SOT23-3 & SC70-3Packages

Absolute Maximum Ratings

Voltage on any terminal relative to GND

V$_{CC}$	-0.3V to +6.0V
RESET, $\overline{RESET}$	-0.3V to (V$_{CC}$ + 0.3V)
Input Current	20mA
Output Current: RESET, $\overline{RESET}$	20mA

ESD Rating

Human Body Model	≥2KV
Machine Model	≥200KV
Rate of Rise of V$_{CC}$	100V/µs
Continuous Power Dissipation (T$_A$ = +70°C)	
SOT23-3 (derate 4mW/°C above +70°C)	320mW
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 SOT23 Package (T$_A$ = 25°C unless otherwise noted) V$_{CC}$ = full range, as noted under conditions. See Note 1.

Parameter	Symbol	Conditions		Min	Typ (Note 3)	Max	Units
Operating Voltage	V$_{CC}$	T$_A$ = 0°C to +70°C		1.0		5.5	V
		T$_A$ = -40°C to 105°C		1.1		5.5	
Supply Current	I$_{CC}$	T$_A$ = -40°C to 105°C, V$_{CC}$ < 5.5V FM809J/L/M			5	10	µA
		T$_A$ = -40°C to 105°C, V$_{CC}$ < 3.6V FM809R/S/T			2	6	
Reset Threshold	V$_{TH}$	FM8xxL	T$_A$ = -40°C to +105°C	4.40	4.63	4.86	V
		FM8xxM	T$_A$ = -40°C to +105°C	4.18	4.38	4.52	
		FM8xxJ	T$_A$ = -40°C to +105°C	3.90	4.00	4.18	
		FM8xxT	T$_A$ = -40°C to +105°C	2.97	3.08	3.19	
		FM8xxS	T$_A$ = -40°C to +105°C	2.79	2.93	3.00	
		FM8xxR	T$_A$ = -40°C to +105°C	2.49	2.63	2.70	
Reset Threshold Tempco					30		ppm/°C
V$_{CC}$ to Reset Delay (Note 2)		V$_{CC}$ = V$_{TH}$ to (V$_{TH}$ - 100mV)			10	15	µs
Reset Active Timout Period		T$_A$ = -40°C to +105°C		140	256	560	ms
FM809 Output Low ($\overline{RESET}$)	V$_{OL}$	V$_{CC}$ = V$_{TH}$(min), I$_{SINK}$ = 1.2mA, FM809R/S/T				0.3	V
		V$_{CC}$ = V$_{TH}$(min), I$_{SINK}$ = 3.2mA, FM809J/L/M				0.4	
		V$_{CC}$ = < 1.0V, I$_{SINK}$ = 50µA				0.3	
FM809 Output High ($\overline{RESET}$)	V$_{OH}$	V$_{CC}$ > V$_{TH}$(max), I$_{SOURCE}$ = 500µA (R/S/T)		0.8V$_{CC}$			V
		V$_{CC}$ > V$_{TH}$(max), I$_{SOURCE}$ = 800µA (J/M/L)		V$_{CC}$ - 1.5V			
FM810 Output Low (RESET)	V$_{OL}$	V$_{CC}$ = V$_{TH}$(max), I$_{SINK}$ = 1.2mA, FM810R/S/T				0.3	V
		V$_{CC}$ = V$_{TH}$(max), I$_{SINK}$ = 3.2mA, FM810J/L/M				0.4	
FM810 Output High (RESET)	V$_{OH}$	1.8V < V$_{CC}$ < V$_{TH}$(min), I$_{SOURCE}$ = 150µA		0.8V$_{CC}$			V

Note 1: Testing in production is 25°C only. V$_{CC}$ = 5V for FM8xxL/M/J, V$_{CC}$ = 3.3V for FM8xxT/S and V$_{CC}$ = 3V for FM8xxR. Limits over temperature are guaranteed by design.

Note 2: $\overline{RESET}$ output is for FM809. RESET output is for FM810.

Note 3: Typical values are at 25°C.

Note 4: Recommended minimum slew rate for the V$_{CC}$ rampup is 200mV/sec in the 0 to 2V range for the device to function properly.

Absolute Maximum Ratings

Voltage on any terminal relative to GND

V_{CC} -0.3V to +6.0V

RESET, $\overline{RESET}$ -0.3V to (V_{CC} + 0.3V)

Input Current   20mA

Output Current: RESET, $\overline{RESET}$ 20mA

ESD Rating

Human Body model   1.5KV

Machine model   ≥200KV

Rate of Rise of V_{CC} 100V/µs

Continuous Power Dissipation (T_A = +70°C)

SC70-3   174mW

Operating Temperature Range   -40°C to +85°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 SC70 Package (T_A = 25°C unless otherwise noted) V_{CC} = full range, as noted under conditions. See Note 1.

Parameter	Symbol	Conditions		Min	Typ (Note 3)	Max	Units
Operating Voltage	V_{CC}	T_A = 0°C to +70°C		1.4		5.5	V
		T_A = -40°C to 85°C		1.6		5.5	
Supply Current	I_{CC}	T_A = -40°C to 85°C, V_{CC} < 5.5V FM809J/L/M			9	15	µA
		T_A = -40°C to 85°C, V_{CC} < 3.6V FM809R/S/T			6	10	
Reset Threshold	V_{TH}	FM8xxL	T_A = -40°C to +85°C	4.40	4.63	4.86	V
		FM8xxM	T_A = -40°C to +85°C	4.18	4.38	4.52	
		FM8xxJ	T_A = -40°C to +85°C	3.90	4.00	4.18	
		FM8xxT	T_A = -40°C to +85°C	2.97	3.08	3.19	
		FM8xxS	T_A = -40°C to +85°C	2.79	2.93	3.00	
		FM8xxR	T_A = -40°C to +85°C	2.49	2.63	2.70	
Reset Threshold Tempco					30		ppm/°C
V_{CC} to Reset Delay (Note 2)		V_{CC} = V_{TH} to (V_{TH} - 100mV)			10	15	µs
Reset Active Timout Period		T_A = -40°C to +85°C		100	256	560	ms
FM809 Output Low ($\overline{RESET}$)	V_{OL}	V_{CC} = V_{TH}(min), I_{SINK} = 1.2mA, FM809R/S/T				0.35	V
		V_{CC} = V_{TH}(min), I_{SINK} = 3.2mA, FM809J/L/M				0.4	
		V_{CC} = < 1.0V, I_{SINK} = 50µA				0.3	
FM809 Output High ($\overline{RESET}$)	V_{OH}	V_{CC} > V_{TH}(max), I_{SOURCE} = 500µA (R/S/T)		$0.8V_{CC}$			V
		V_{CC} > V_{TH}(max), I_{SOURCE} = 800µA (J/M/L)		V_{CC} - 1.5V			
FM810 Output Low (RESET)	V_{OL}	V_{CC} = V_{TH}(max), I_{SINK} = 1.2mA, FM810R/S/T				0.35	V
		V_{CC} = V_{TH}(max), I_{SINK} = 3.2mA, FM810J/L/M				0.4	
FM810 Output High (RESET)	V_{OH}	1.8V < V_{CC} < V_{TH}(min), I_{SOURCE} = 150µA		$0.8V_{CC}$			V

Note 1: Testing in production is 25°C only. V_{CC} = 5V for FM8xxL/M/J, V_{CC} = 3.3V for FM8xxT/S and V_{CC} = 3V for FM8xxR. Limits over temperature are guaranteed by design.

Note 2: $\overline{RESET}$ output is for FM809. RESET output is for FM810.

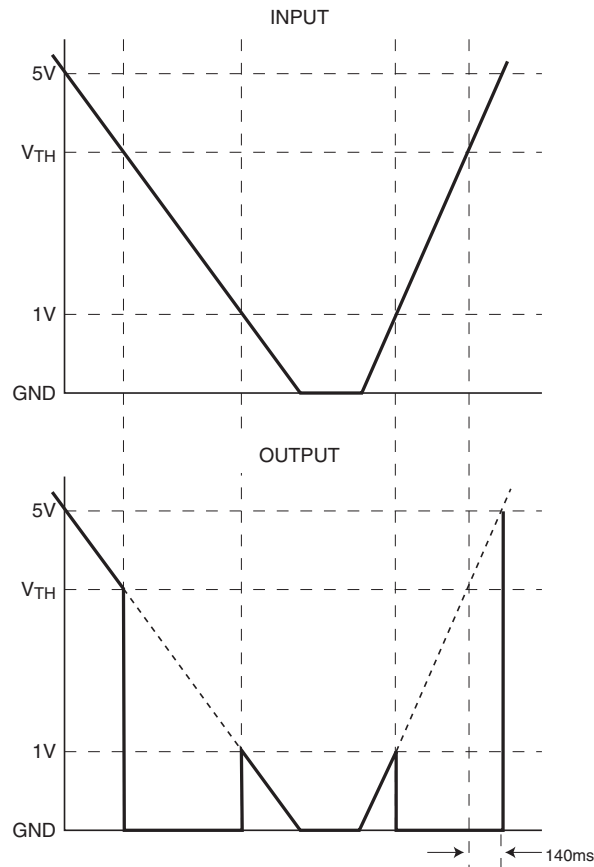**Note 3:** Typical values are at 25°C.

Pin Descriptions

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

* with overbar, FM809 (RESET); without, FM810 (RESET).

Circuit Timing (e.g.: FM809)

When operating properly with 5V in (for example), V_{OUT} will also be about 5V. When V_{IN} starts to fall, V_{OUT} will follow it down as shown. When V_{IN} drops below V_{TH}, V_{OUT} drops to ground ("issues a RESET") and stays there unless V_{IN} 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_{IN} down to the ground.

When V_{IN} begins to rise, V_{OUT} follows it until 1.0V or so is reached, whereupon the device regains control, V_{OUT} is pulled to ground, etc. When V_{IN} rises above V_{TH}, V_{OUT} 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 for the FM809, to V_{CC} for the FM810).

Ordering Information (FM809)

Part Number	Top Marking	RESET Threshold (V)	Output Type	Package Type	Packing Method
FM809LS3X	09L	4.63	Push-Pull, active LOW	3-Pin, SOT23	3000 units in T&R
FM809MS3X	09M	4.38	Push-Pull, active LOW	3-Pin, SOT23	3000 units in T&R
FM809JS3X	09J	4.00	Push-Pull, active LOW	3-Pin, SOT23	3000 units in T&R
FM809TS3X	09T	3.08	Push-Pull, active LOW	3-Pin, SOT23	3000 units in T&R
FM809SS3X	09S	2.93	Push-Pull, active LOW	3-Pin, SOT23	3000 units in T&R
FM809RS3X	09R	2.63	Push-Pull, active LOW	3-Pin, SOT23	3000 units in T&R
FM809LP3X	VLY	4.63	Push-Pull, active LOW	3-Pin, SC70	3000 units in T&R
FM809MP3X	VMY	4.38	Push-Pull, active LOW	3-Pin, SC70	3000 units in T&R
FM809JP3X	VJY	4.00	Push-Pull, active LOW	3-Pin, SC70	3000 units in T&R
FM809TP3X	VTY	3.08	Push-Pull, active LOW	3-Pin, SC70	3000 units in T&R
FM809SP3X	VSY	2.93	Push-Pull, active LOW	3-Pin, SC70	3000 units in T&R
FM809RP3X	VRY	2.63	Push-Pull, active LOW	3-Pin, SC70	3000 units in T&R

Note 4: Devices listed above feature 250ms typical Reset Pulse width. Consult Fairchild sales for other reset pulse width options.

Note 5: For the SC70 package, the third character of the top marking, identified as "Y" in the above table, identifies wafer lot code.
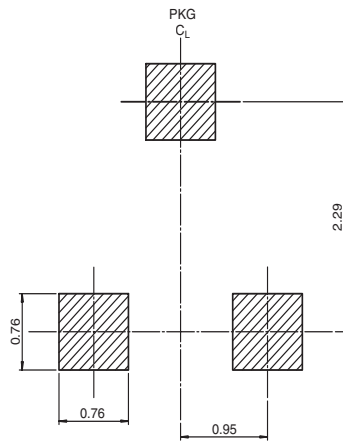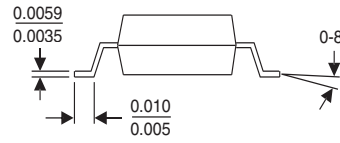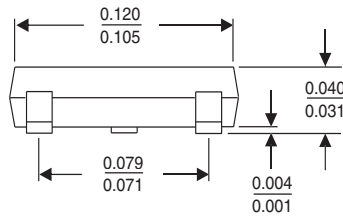
Ordering Information (FM810)

Part Number	Top Marking	RESET Threshold (V)	Output Type	Package Type	Packing Method
FM810LS3X	10L	4.63	Push-Pull, active HIGH	3-Pin, SOT23	3000 units in T&R
FM810MS3X	10M	4.38	Push-Pull, active HIGH	3-Pin, SOT23	3000 units in T&R
FM810JS3X	10J	4.00	Push-Pull, active HIGH	3-Pin, SOT23	3000 units in T&R
FM810TS3X	10T	3.08	Push-Pull, active HIGH	3-Pin, SOT23	3000 units in T&R
FM810SS3X	10S	2.93	Push-Pull, active HIGH	3-Pin, SOT23	3000 units in T&R
FM810RS3X	10R	2.63	Push-Pull, active HIGH	3-Pin, SOT23	3000 units in T&R
FM810LP3X	ZLY	4.63	Push-Pull, active HIGH	3-Pin, SC70	3000 units in T&R
FM810MP3X	ZMY	4.38	Push-Pull, active HIGH	3-Pin, SC70	3000 units in T&R
FM810JP3X	ZJY	4.00	Push-Pull, active HIGH	3-Pin, SC70	3000 units in T&R
FM810TP3X	ZTY	3.08	Push-Pull, active HIGH	3-Pin, SC70	3000 units in T&R
FM810SP3X	ZSY	2.93	Push-Pull, active HIGH	3-Pin, SC70	3000 units in T&R
FM810RP3X	ZRY	2.63	Push-Pull, active HIGH	3-Pin, SC70	3000 units in T&R

Note 6: Devices listed above feature 250ms typical Reset Pulse width. Consult Fairchild sales for other reset pulse width options.

Note 7: For the SC70 package, the third character of the top marking, identified as "Y" in the above table, identifies wafer lot code.
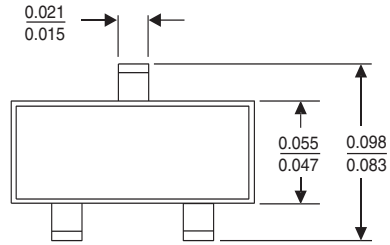
Physical Dimensions inches (millimeters) unless otherwise noted

$\frac{0.021}{0.015}$

$\frac{0.055}{0.047}$ $\frac{0.098}{0.083}$

$\frac{0.120}{0.105}$

$\frac{0.040}{0.031}$

$\frac{0.079}{0.071}$ $\frac{0.004}{0.001}$

$\frac{0.0059}{0.0035}$

$\frac{0.010}{0.005}$

0-8˚

PKG
C$_L$

2.29

0.76

0.76

0.95

LAND PATTERN RECOMMENDATION

SOT-23 Package Dimensions
FS Pkg Code AU

FM809/810 Rev. G

Physical Dimensions inches (millimeters) unless otherwise noted

.087 (2.2)
.071 (1.8)

.053 (1.35)
.045 (1.15)

.087 (2.2)
.079 (2.0)

.043 (1.1)
.032 (.80)

.004 (.10)

.009 (.23)
.005 (.13)

.010 (.25)
.004 (.10)

.018 (.45)
.006 (.15)

.026
(.65)

.016 (.40)
.012 (.30)

.052
(1.3)

0.65   0.65

1.80

0.5

0.6
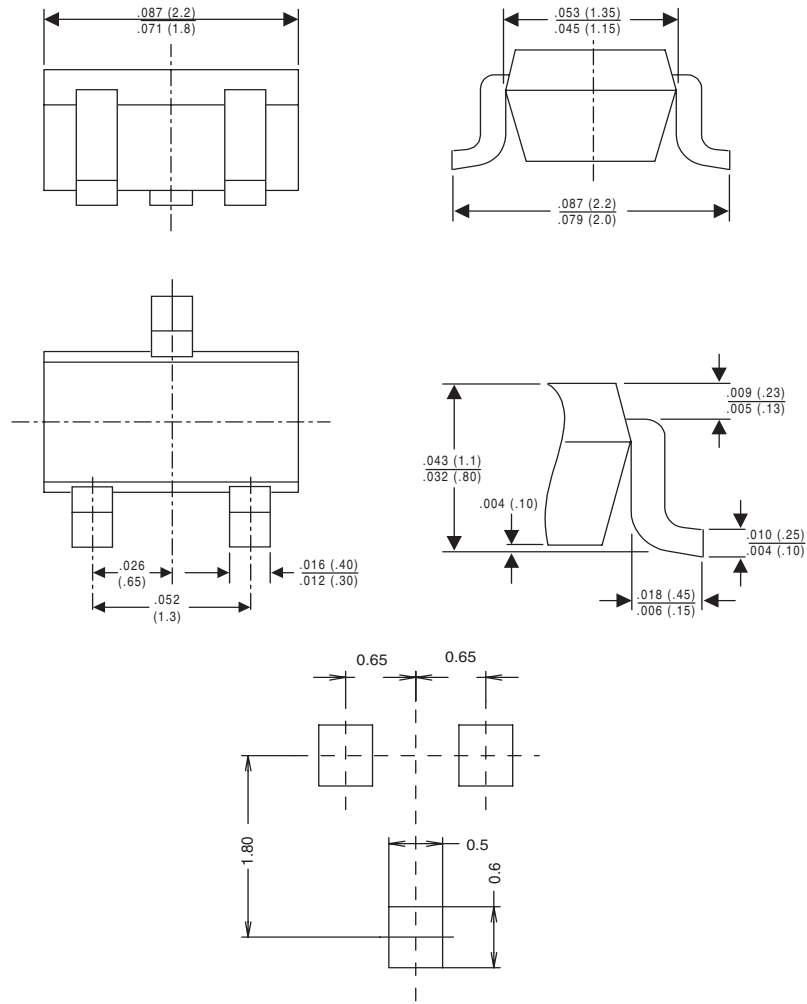
Land Pattern Recommendation

SC70 Package Dimensions

FM809/810 Rev. G

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2. 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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