Liteon Semiconductor Corporation
LSP2200

3 PIN Microprocessor Reset Monitors

■ FEATURES

- Precision VCC Monitor for 2.5 V, 3.0V, 3.3 V, and 5.0 V Supplies
- Fully Specified Over Temperature
- Available in Three Output Configurations
  Push-Pull $\overline{\text{RESET}}$ Output
- 250ms Typical Power-On Reset Pulse Width
- 2μA typical Supply Current
- Guaranteed Reset Valid to Vcc=+1V
- Power Supply Transient Immunity
- No External Components
- SOT23-3L Packages

■ APPLICATIONS

- Computers
- Controllers
- Intelligent Instruments
- Critical MPU and MPU Power Monitoring
- Portable/Battery-Powered Equipment
- Automotive

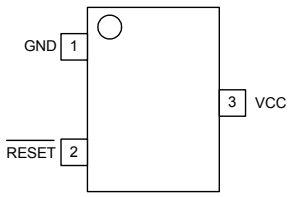
■ GENERAL DESCRIPTION

The LSP2200 is a microprocessor supervisory circuits used to monitor the power supplies in MPU and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +5V, +3.3V, +3.0V, or +2.5V powered circuits

These curcuits perform a single function: they assert a reset signal whenever the Vcc supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after Vcc has risen above the reset threshold. Reset thresholds suitable for operation whit a variety of supply voltages are available. The LSP2200 have push-pull outputs, an active-low $\overline{\text{RESET}}$ output. The reset comparator is designed to ignore fast transients on Vcc, and the outputs are guaranteed to be in the correct logic state for Vcc down to 1V. Low supply current makes the LSP2200 ideal for use in portable equipment. The LSP2200 is available in SOT23-3L package.

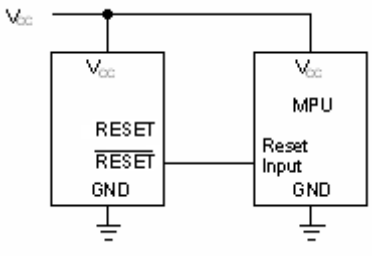
■ PIN CONFIGURATION

(Top View)



Pin	Name	Function
1	GND	Ground reference
2	$\overline{\text{RESET}}$	Active-low output. $\overline{\text{RESET}}$ remains low while VCC is below the reset threshold, and for a reset timeout period after VCC rises above the reset threshold.
3	VCC	Supply voltage (typ.)

■ TYPICAL OPERATION CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Terminal Voltage (with respect to GND)	V_{CC}	-0.3 to 6.0	V
	$\overline{RESET}$ (push-pull)	-0.3 to (V_{CC} + 0.3)	
Output Current, $\overline{RESET}$		20	mA
Rate of Rise, V_{CC}		100	V/μs
Continuous Power Dissipation(TA=70°C)	Pd	320	mW
Operating Temperature Range	Top	-40 to +105	°C
Storage Temperature Range	Tstg	-65 to +150	°C
Lead Temperature (Soldering, 10 Seconds)	T_L	300	°C

■ ELECTRICAL CHARACTERISTICS

(Vcc=full range, T_A = -40°C to +105°C(SOT23) unless otherwise noted.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Vcc Range		TA=0°C to +70		1.0		5.5	V
		TA=-40°C to +105°C		1.2		5.5	
Supply Current(SOT23)	ICC	TA=-40°C to +85°C	VCC＜5.5V,LSP2200-4.63/4.38		2.5	5	μA
			VC＜3.6V, LSP2200-2.32/2.63/2.93/3.08		1.5	4	
		TA=+85°C to +105°C	VCC＜5.5V,LSP2200-4.63/4.38			10	
			VCC＜3.6V, LSP2200-2.32/2.63/2.93/3.08			8	
Reset Threshold (SOT23)	V_{TH}	LSP2200-4.63	TA=+25°C	4.56	4.63	4.70	V
			TA=-40°C to +85°C	4.50		4.75	
			TA=-40°C to +105°C	4.40		4.86	
		LSP2200-4.38	TA=+25°C	4.31	4.38	4.45	
			TA=-40°C to +85°C	4.25		4.50	
			TA=-40°C to +105°C	4.16		4.56	
		LSP2200-4.00	TA=+25°C	3.93	4.00	4.06	
			TA=-40°C to +85°C	3.89		4.10	
			TA=-40°C to +105°C	3.80		4.20	
		LSP2200-3.08	TA=+25°C	3.04	3.08	3.11	
			TA=-40°C to +85°C	3.00		3.15	
			TA=-40°C to +105°C	2.92		3.23	
		LSP2200-2.93	TA=+25°C	2.89	2.93	2.96	
			TA=-40°C to +85°C	2.85		3.00	
			TA=-40°C to +105°C	2.78		3.08	
		LSP2200-2.63	TA=+25°C	2.59	2.63	2.66	
			TA=-40°C to +85°C	2.55		2.70	
			TA=-40°C to +105°C	2.50		2.76	
Reset Threshold Tempco					30		ppm/°C
Vcc to Reset Delay		Vcc= V_{TH} to (V_{TH}-100mV)			20		μs
Reset Active Timeout Period(SOT23)		TA=-40°C to +85°C		140	250	560	ms
		TA=-40°C to +105°C		100		840	
$\overline{RESET}$ Output Voltage Low (push-pull active	V_{OL}	Vcc=V_{TH} min, I_{SINK}=1.2mA LSP2200-2.32/2.63/2.93/3.08				0.1	V
		Vcc=V_{TH} min, I_{SINK}=3.2mA LSP2200-4.00/4.38/4.63				0.2	

low)		Vcc＞1.0V, I_{SINK}=50μA			0.1	
$\overline{RESET}$ Output Voltage High (push-pull active low)	V_{OH}	Vcc＞V_{TH} max, I_{SOURCE}=500μA LSP2200-2.32/2.63/2.93/3.08	0.9Vcc			V
		Vcc＞V_{TH} max, I_{SOURCE}=80μA LSP2200-4.00/4.38/4.63	Vcc-1.5			

Typical Values: TA=-+25°C Vcc=5V for LSP2200-4.00/4.38/4.63
Vcc=3.3V for LSP2200-3.08/2.93
Vcc=3V for LSP2200-2.63
Vcc=2.5V for LSP2200-2.32

■ DETAILED DESCRIPTION

A microprocessor's (MPU) reset input starts the MPU in a known state. The LSP2200 reset to prevent code execution errors during power-up, power-down, or brownout conditions. They assert a reset signal whenever the Vcc supply voltage declines below a preset threshold, keeping it asserted for at least 250ms after Vcc has risen above the reset threshold. The LSP2200 push-pull output stage.

■ APPLICATION INFORMATION

Reset Timing Diagram:

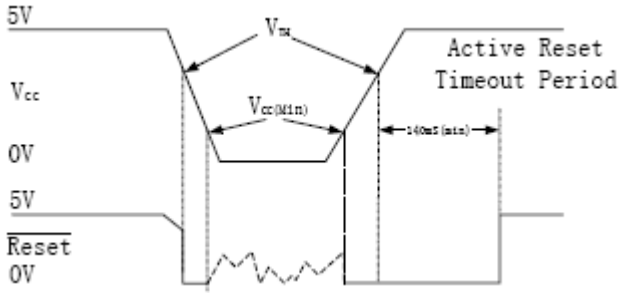
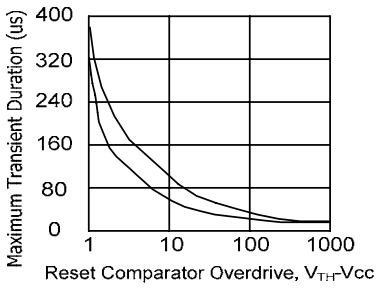


Figure1

When operating properly with 5V in (for example), VOUT will also be about 5V. When VIN starts to fall, VOUT will follow it down as shown. When VIN drops below VTH, VOUT drops to ground and stays there unless VIN 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 VIN down to the ground.
When VIN begins to rise, VOUT follows it until 1.0V or so is reached, whereupon the device regains control, VOUT is pulled to ground, etc. When VIN rises above VTH, VOUT comes out of RESET 140ms later.
If it is required that a lower value than GND + 1.0V is needed on RESET signal during VCC ≤ 1V, a 100K resistor may be used on the device output to GND (Figure 3).

Negative-Going V_{CC} Transients

In addition to issuing a reset to the MPU during power-up, power-down, and brownout conditions, the LSP2200 is relatively immune to short-duration negative-going Vcc transients (glitches). Figure2 shows typical transient duration vs. reset comparator overdrive, for which the LSP2200 do not generate a reset pulse. The graph was generated using a negative going pulse applied to Vcc, starting 0.5V above the actual reset threshold and ending below it by the magnitude in dicated (reset comparator overdrive). The graph indicates the maximum pulse width a negative-going Vcc transient can have without causing a reset pulse. As the magnitude of the transient increases (goes farther below the reset threshold), the maximum allowable pulse width decreases. Typically, for the LSP2200-4.63/4.38, a Vcc transient that goes 100mV below the reset threshold and lasts 20μs or less will not cause a reset pulse. A 0.1μF bypass capacitor mounted as close as possible to the VCC pin provides additional transient immunity.



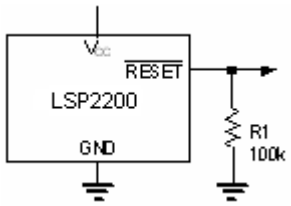


Figure 2 Figure 3

Ensuring a Valid Reset Output: Down to VCC = 0

When VCC falls below 1V, the LSP2200 $\overline{\text{RESET}}$ output no longer sinks current-it becomes an open circuit. Therefore, high-impedance CMOS logic input connected to $\overline{\text{RESET}}$ can drift to undetermined voltages. This presents no problem in most applications since most MPU and other circuitry is inoperative with Vcc below 1V. However, in applications where $\overline{\text{RESET}}$ must be valid down to 0V, adding a pull-down resistor to $\overline{\text{RESET}}$ causes any stray leakage currents to flow to ground, holding $\overline{\text{RESET}}$ low Figure 3. R1's value is not critical, 100kΩ is large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground

Bi-directional Reset Pin Interface

The LSP2200 can interface with the μP/μC's directional Reset Pin by connecting a 4.7KΩ resister in series with LSP2200's $\overline{\text{RESET}}$ pin and the μP/μC's directional Reset Pin.

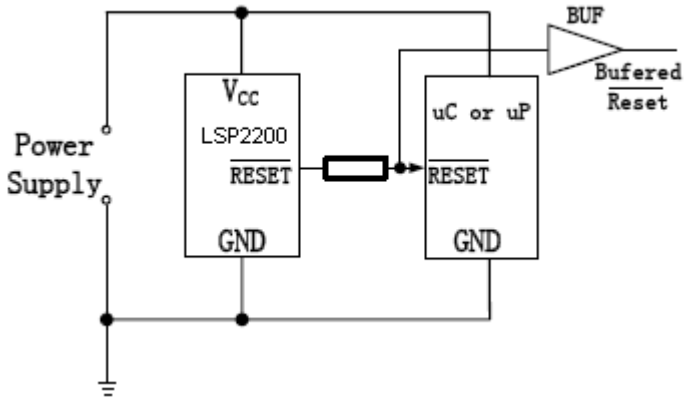


Figure 4

Special Voltage Detection

For the special voltage to be detected, the best way is to inform our sales representatives your exact voltage value, we will supply the suitable version to meet your spec. Donot use the divided resistors to get the object voltage value. When the output of the reset circuit is changing, the current though the resistors and the reset IC is much different .It may cause the false.

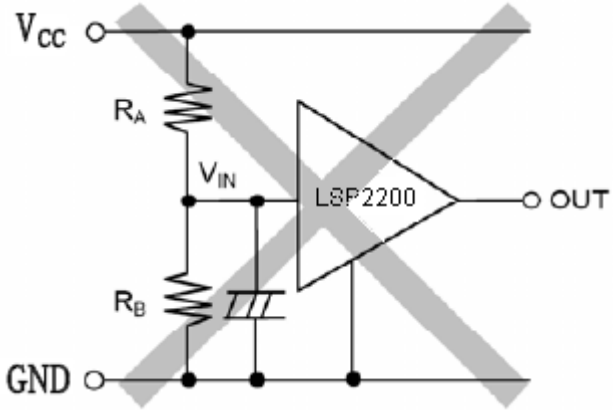


Figure 5

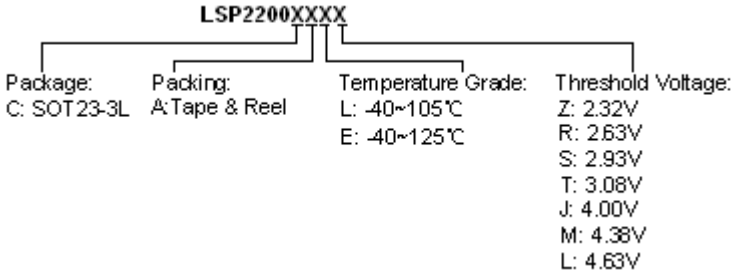
Benefits of Highly Accurate Reset Threshold

Most MPU supervisor ICs have reset threshold voltages between 5% and 10% below the value of nominal supply voltages. This ensures a reset will not occur within 5% of the nominal supply, but will occur when the supply is 10% below nominal.

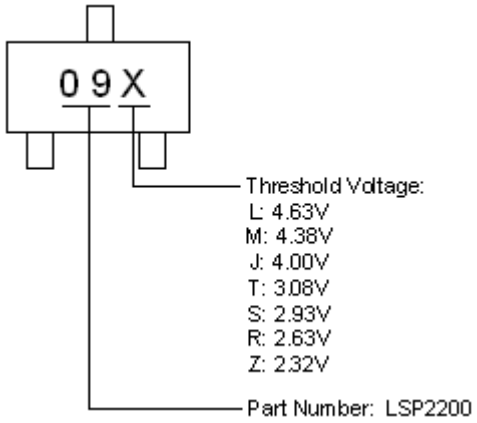
When using ICs rated at only the nominal supply ±5%, this leaves a zone of uncertainty where the supply is between 5% and 10% low, and where the reset may or may not be asserted.

The LSP2200-4.63/3.08/2.32 use highly accurate circuitry to ensure that reset is asserted close to the 5% limit, and long before the supply has declined to 10% below nominal.

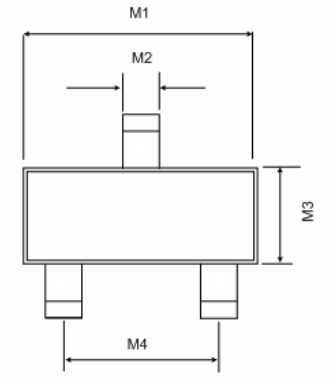
■ ORDERING INFORMATION



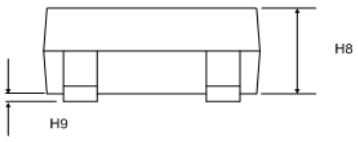
■ MARKING INFORMATION

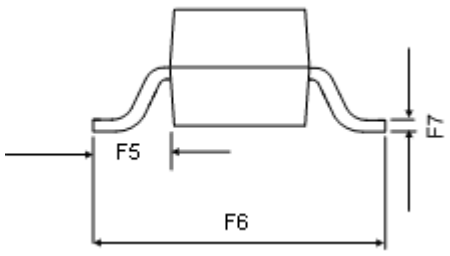


■ PACKAGE INFORMATION



Symbol	Dimensions In Millimeters	
	Min.	Max.
M1	2.8	3.0
M2	0.35	0.5
M3	1.3	1.7
M4	1.7	2.1
F5	0.6	
F6	2.05	2.75
F7	0.1	
H8	1.0	1.4
H9	0	0.15





■ UPDATE HISTORY

Date	Version	Descriptions