HN809 / HN810

3-Pin Microprocessor Reset Monitors

Product Description

The HN809/810 microprocessor supervisory circuits can be used to monitor the power supplies in microprocessor and digital systems. They provide a reset to the microprocessor during power-up, power-down and brown-out conditions. The function of the HN809/810 is to monitor the V_{CC} supply voltage, and assert a reset signal whenever this voltage declines below the factory-programmed reset threshold. The reset signal remains asserted until V_{CC} has risen above V_{RESET} for a minimum period of time. The HN809 has an active-low $\overline{RESET}$ output, while the HN810 has an active-high RESET output.

Seven standard reset voltage options are available, suitable for monitoring 5V, 3.3V, and 3V supply voltages.

With a low supply current of only 15μA, the HN809/810 are ideal for use in portable equipment. The HN809/HN810 are available in the 3-pin SOT23 package.

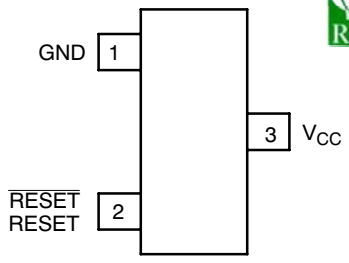
Features

- Precise monitoring of 3V, 3.3V, and 5V supply voltages
- Superior upgrade to MAX809/810
- Fully specified over temperature
- Guaranteed RESET Output valid for V_{CC}≥1V
  - Active-low $\overline{RESET}$ Output (HN809)
  - Active-high RESET Output (HN810)
- Low Supply Current.
- Power supply transient immunity

Applications

- Microprocessor Systems
- Computers
- Controllers
- Intelligent Instruments
- Portable/Battery-Powered Equipment
- Automotive

Pin Configuration



SOT23-3

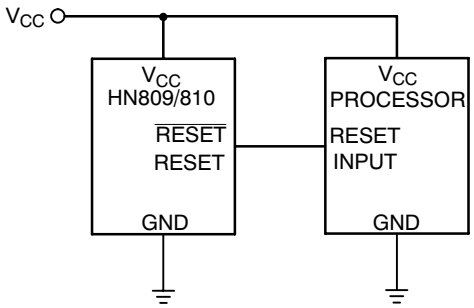
(Top View)

NOTE: $\overline{RESET}$ is for HN809
RESET is for HN810

Pin Descriptions

Pin No.	Name	Pin Function
1	GND	Ground reference
2	$\overline{RESET}$ (HN809)	Active-low output. $\overline{RESET}$ remains low while V_{CC} is below the reset threshold, and for a minimum period of time after V_{CC} rises above the reset threshold.
	RESET (HN810)	Active-high output. RESET remains high while V_{CC} is below the reset threshold, and for a minimum period of time after V_{CC} rises above the reset threshold.
3	V_{CC}	Supply Voltage (+5V, +3.3V, or +3.0V)

Typical Application Circuit



Order and Threshold Information

V_{TH} (V)	HN809 Series	HN810 Series	Package
2.45	HN809M-2.45	HN810M-2.45	SOT23-3
2.63	HN809M-2.63	HN810M-2.63	
2.93	HN809M-2.93	HN810M-2.93	
3.08	HN809M-3.08	HN810M-3.08	
4.00	HN809M-4.00	HN810M-4.00	
4.38	HN809M-4.38	HN810M-4.38	
4.63	HN809M-4.63	HN810M-4.63	

Absolute Maximum Ratings (Note 1)

V_{CC} ---------- −0.3V to 7.0V
RESET, $\overline{RESET}$ ---------- −0.3V to (V_{CC}+ 0.3V)
Input Current, V_{CC} Pin ---------- 20mA
Output Current, RESET, $\overline{RESET}$ Pin ---------- 20mA
Continuous Power Dissipation (Note 3) ---------- 320mW
θ_{JA}, SOT23-3 ---------- 326°C/W
Ambient Temperature Range ---------- −40°C to +85°C
Storage Temperature Range ---------- −55°C to +150°C
Lead Temperature (soldering, 10sec) ---------- +300°C

Electrical Characteristics

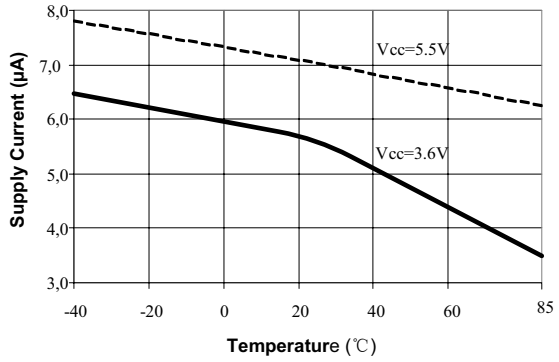
V_{CC} = full range, T_A = −40°C to +85°C, unless otherwise noted. Typical values are at T_A = +25°C, V_{CC}=5V for 4.63/4.38 versions, V_{CC} = 3.3V for 3.08/2.93 versions, and V_{CC} = 3V for 2.63 version (Note 2).

Symbol	Parameter	Conditions		Min	Typ	Max	Units
	V_{CC} Range	T_A=0°C to +70°C		1.00		5.50	V
		T_A=−40°C to +85°C		1.20		5.50	
I_{CC}	Supply Current	T_A=−40°C to 85°C	V_{CC}=5.5V, HN8_ _ -4.63/4.38/4.00			15.00	µA
			V_{CC}=3.6V, HN8_ _ -3.08/2.93/2.63/2.45			10.00	
V_{TH}	Reset Threshold (Note 4)	HN8_ _ -4.63	T_A=+25°C	4.56	4.63	4.70	V
			T_A=−40°C to 85°C	4.50		4.75	
		HN8_ _ -4.38	T_A=+25°C	4.31	4.38	4.45	
			T_A=−40°C to 85°C	4.25		4.50	
		HN8_ _ -3.08	T_A=+25°C	3.04	3.08	3.11	
			T_A=−40°C to 85°C	3.00		3.15	
		HN8_ _ -2.93	T_A=+25°C	2.89	2.93	2.96	
			T_A=−40°C to 85°C	2.85		3.00	
		HN8_ _ -2.63	T_A=+25°C	2.59	2.63	2.66	
			T_A=−40°C to 85°C	2.55		2.70	
	Reset Threshold Temperature Coefficient				45		ppm/°C
	V_{CC} to Reset Delay (Note 4)	V_{CC} =V_{TH} to (V_{TH} − 100mV)			20		µs
V_{OL}	$\overline{RESET}$ Output Voltage Low (HN809)	V_{CC} =V_{TH} min, I_{SINK} = 1.2mA, HN809-2.63/2.93/3.08				0.3	V
		V_{CC} =V_{TH} min, I_{SINK} =3.2mA, HN809-4.63/4.38				0.4	
		V_{CC} >1.0V, I_{SINK} =50 µA				0.3	
V_{OH}	$\overline{RESET}$ Output Voltage High (HN809)	V_{CC} > V_{TH} max, I_{SOURCE} =500 µA, HN809-2.63/2.93/3.08		0.8V_{CC}			V
		V_{CC} > V_{TH} max, I_{SOURCE} =800 µA, HN809-4.63/4.38		V_{CC}−1.5			
V_{OL}	RESET Output Voltage Low (HN810)	V_{CC} =V_{TH} max, I_{SINK} =1.2mA, HN810-2.63/2.93/3.08				0.3	V
		V_{CC} =V_{TH} max, I_{SINK} =3.2mA, HN810-4.63/4.38				0.4	
V_{OH}	RESET Output Voltage High (HN810)	1.8V < V_{CC} < V_{TH} min, I_{SOURCE} =150 µA		0.8V_{CC}			V

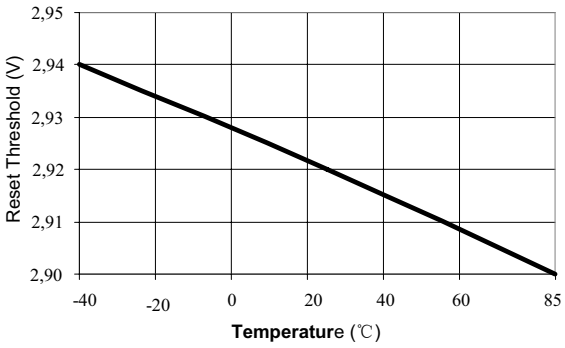
Note 1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Ratings are conditions under which the device operates correctly. Operating ratings do not imply guaranteed performance limits. For guaranteed performance limits and associated test conditions, see the Electrical Characteristics.
Note 2: Production testing done at TA = +25°C, over temperature limits guaranteed by design only.
Note 3: At elevated temperatures, devices must be derated based on package thermal resistance. The device in the SOT23-3 package must be derated at 4mW/°C at ambient temperatures above 70°C. The device has internal thermal protection.
Note 4: $\overline{RESET}$ Output for HN809, RESET output for HN810.

Typical Performance Characteristics

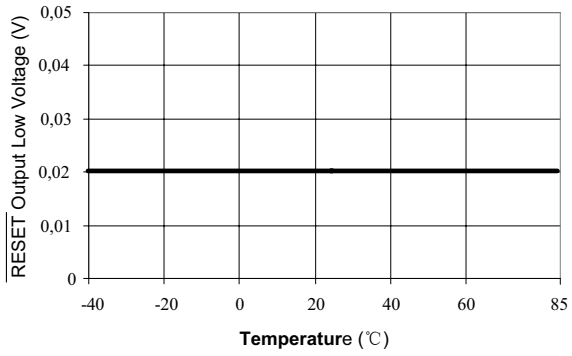
Supply Current vs. Temperature



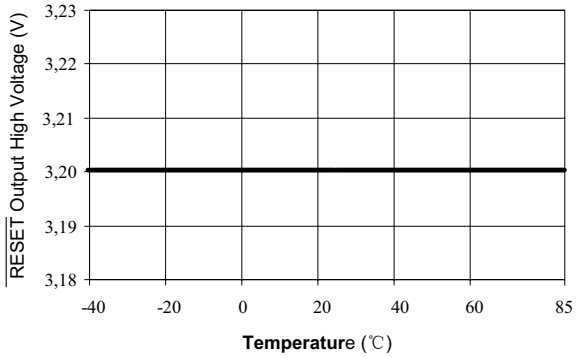
Reset Threshold vs. Temperature
(HN809-2.93)



$\overline{\text{RESET}}$ Output Low Voltage vs. Temperature
(V_{CC}=2,85V, I_{OL}=1,2mA)



$\overline{\text{RESET}}$ Output High Voltage vs. Temperature
(V_{CC}=3,3V, I_{OH}=500μA)



Applications Information

Benefits of Precision Reset Thresholds

A microprocessor supply supervisor must provide a reset output within a predictable range of the supply voltage. A common threshold range is between 5% and 10% below the nominal supply voltage. The 4.63V and 3.08V options of the HN809/810 use highly accurate circuitry to ensure that the reset threshold occurs only within this range (for 5V and 3.3V supplies). The other voltage options have the same tight tolerance to ensure a reset signal for other narrow monitor ranges. See *Table 1* for examples of how the standard reset thresholds apply to 3V, 3.3V, and 5V nominal supply voltages.

TABLE 1. Reset Thresholds Related to Common Supply Voltages

Reset Threshold	3.0V	3.3V	5.0V
4.63 ± 3%			90 -95%
4.38 ± 3%			85 -90%
3.08 ± 3%		90 -95%	
2.93 ± 3%		86 -90%	
2.63 ± 3%	85 -90%	77 -81%	

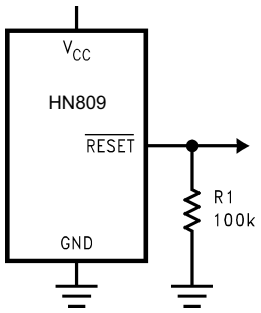


FIGURE 1. RESET Valid to V_{CC} = Ground Circuit

Ensuring a Valid Reset Output Down to V_{CC} = 0V

When V_{CC} falls below 1V, the HN809 $\overline{\text{RESET}}$ output no longer sinks current. A high-impedance CMOS logic input connected to $\overline{\text{RESET}}$ can therefore drift to undetermined voltages. To prevent this situation, a 100kΩ resistor should be connected from the $\overline{\text{RESET}}$ output to ground, as shown in *Figure 1*.

A 100kΩ pull-up resistor to V_{CC} is also recommended for the HN810, if RESET is required to remain valid for V_{CC} < 1V.

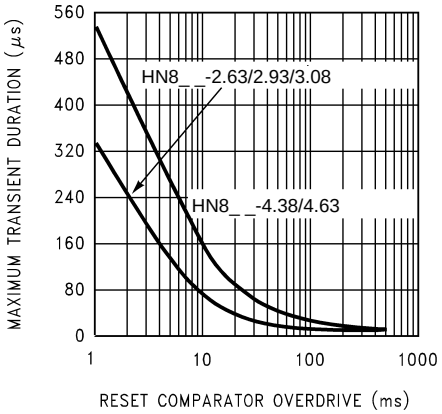


FIGURE 2. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive

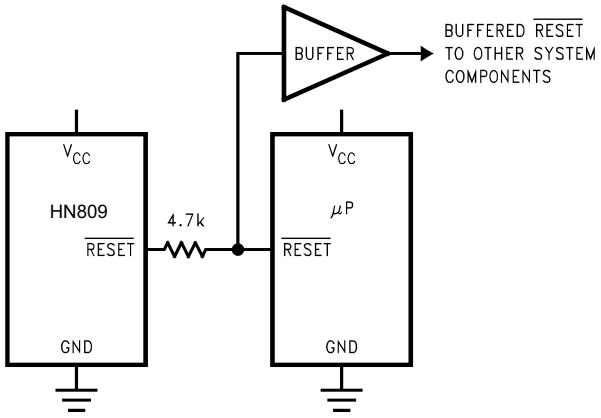


FIGURE 3. Interfacing to Microprocessors with Bidirectional Reset I/O

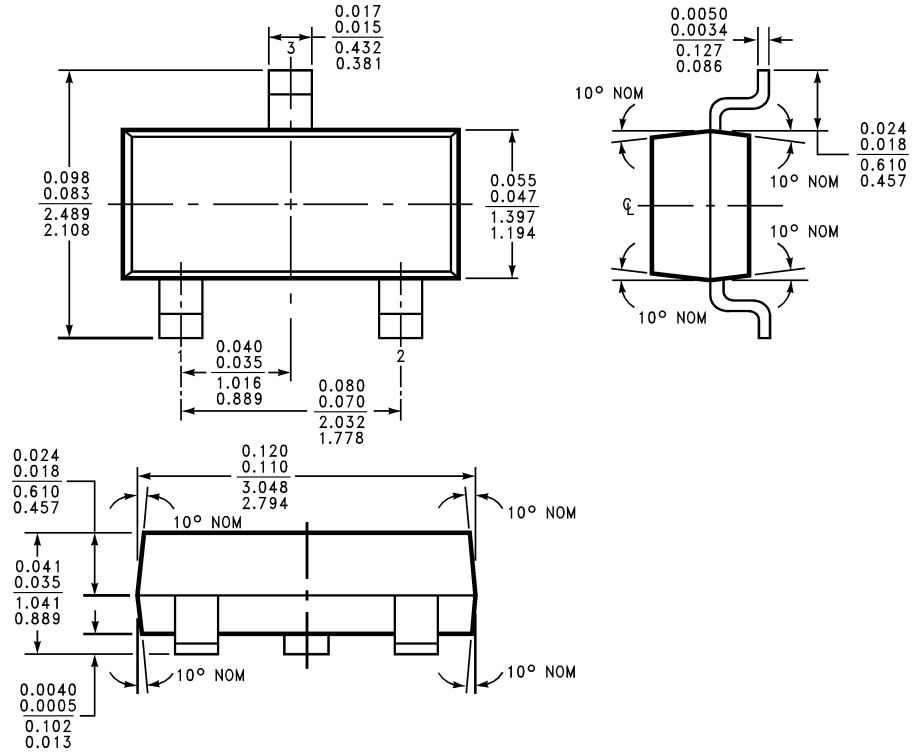
Negative-Going V_{CC} Transients

The HN809/810 are relatively immune to short negative-going transients or glitches on V_{CC}. *Figure 2* shows the maximum pulse width a negative-going V_{CC} transient can have without causing a reset pulse. In general, as the magnitude of the transient increases, going further below the threshold, the maximum allowable pulse width decreases. Typically, for the 4.63V and 4.38V version of the HN809/810, a V_{CC} transient that goes 100mV below the reset threshold and lasts 20µs or less will not cause a reset pulse. A 0.1 µF bypass capacitor mounted as close as possible to the V_{CC} pin will provide additional transient rejection.

Interfacing to µPs with Bidirectional Reset Pins

Microprocessors with bidirectional reset pins, such as the Motorola 68HC11 series, can be connected to the HN809 $\overline{\text{RESET}}$ output. To ensure a correct output on the HN809 even when the microprocessor reset pin is in the opposite state, connect a 4.7kΩ resistor between the HN809 $\overline{\text{RESET}}$ output and the µP reset pin, as shown in *Figure 3*. Buffer the HN809 $\overline{\text{RESET}}$ output to other system components.

Physical Dimensions inches (millimeters) unless otherwise noted



3-Lead SOT23-3
For Ordering, refer to Ordering Information table