Introducing General Purpose Voltage Supervisors to Increase System Reliability

The ISL88001, ISL88002 and ISL88003 are a family of extremely low power voltage supervisors that monitor critical power supply voltages and ensure the proper initialization of the system circuits in a wide variety of applications.

Consuming as little as 160nA of bias current and offered for the most popular voltage supply rails over the 1.8V to 5V range, the reset threshold voltages are specified to be accurate to within ±1.2% at nominal operating temperature and the reset signal is valid down to 1V. These attributes make this family of supervisors an easy choice for applications in battery-operated systems.

By providing Power-On Reset and supply voltage supervision in small 3 Ld SC-70 and SOT-23 packages, these devices can help to lower system cost, reduce board space requirements and increase the reliability of critical systems.

Active high and active low reset outputs are available in push-pull and open drain configurations.

Low Power Consumption

Figure 1 shows the normalized bias current of the various ISL8800x parts relative to the +25°C typical value from the data sheet. From the low 160nA, 1.8V monitoring parts to the high 215nA, 5V monitoring parts the ISL88001 family provides very low power consumption necessary for long life for battery powered portable equipment.

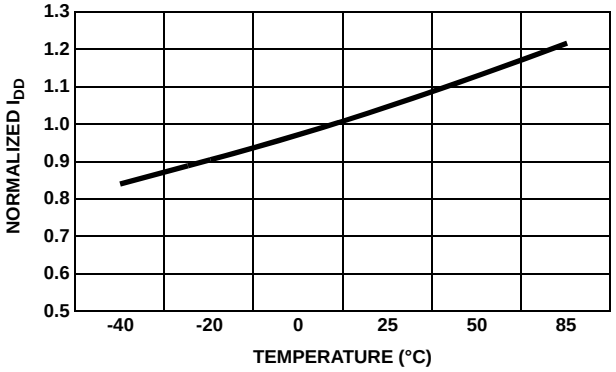


FIGURE 1. NORMALIZED BIAS CURRENT

High Accuracy Voltage Monitor

The ISL8800x family excels in providing an unparalleled high degree of accuracy over the entire rated industrial temperature range. See Figure 2 illustrating that the normalized V_{THVDD} population over temperature is ±1.1% from the +25°C typical value for each threshold variant.

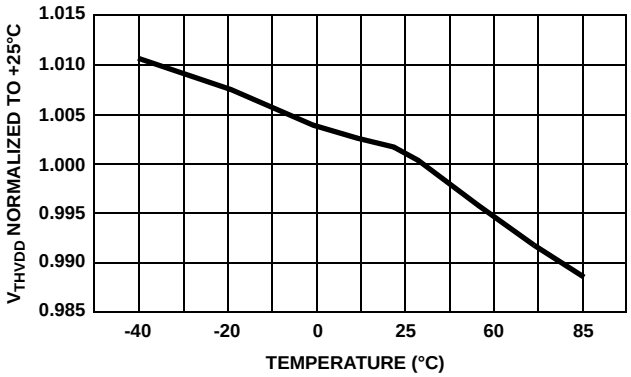


FIGURE 2. NORMALIZED OVER-TEMPERATURE V_{THVDD}

Small Footprint

The choices of either the SC-70 or the SOT-23 three lead packages provides the user with two of the most popular leaded small packages for easy assembly with both footprints nominally measuring < 6.7mm^2.

Wide Selection of Voltage Thresholds

The ISL8800x family offers nine different monitor thresholds covering the four most used low voltage rails (5.0V, 3.3V, 2.5V, 1.8V), providing ~92% and ~87% nominal threshold levels for each rail and an additional ~90% nominal threshold level for the 3.0V voltage.

Choosing a RESET Output Type

This supervisor family offers both open-drain and push-pull reset output options. Questions arise about which is most appropriate for a specific application, so this section offers help to answer them.

The ISL88001 $\overline{\text{RESET}}$ and the ISL88003 RESET outputs are push-pull type outputs consisting of a pair of complementary MOSFETs (Figure 3), like a comparator output stage.

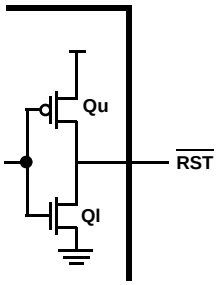


FIGURE 3. PUSH-PULL $\overline{\text{RESET}}$ OUTPUT

The ISL88001 $\overline{\text{RESET}}$ is de-asserted (goes HIGH) when $V_{DD} > V_{THVDD}$ after t_{POR} as Ql turns off and Qu turns on. Conversely, the ISL88003 RESET is asserted (goes LOW) when $V_{DD} > V_{THVDD}$ after t_{POR} as Ql turns on and Qu turns off.

Although push-pull outputs provide high speed response, near rail-to-rail HIGH and LOW levels, and the capability to source or sink current, only one can be installed on a common bus. More than one push-pull circuit on a bus will result in the device with the strongest sourcing or sinking current capability to dominate the resulting output state. Users should ensure that the circuit connected to RESET does not sink or source a high enough current to drag the output voltage from its intended state.

The ISL88002 $\overline{\text{RESET}}$ output is an open drain of an internal MOSFET (Figure 4).

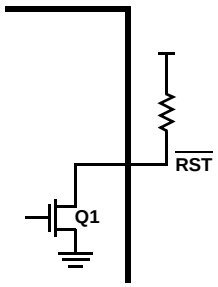
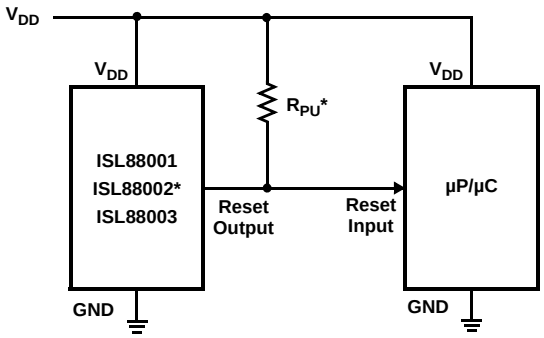


FIGURE 4. OPEN DRAIN $\overline{\text{RESET}}$ OUTPUT

An external pull-up resistor connected from $\overline{\text{RESET}}$ to a supply voltage is needed to provide a high signal output. $\overline{\text{RESET}}$ goes LOW when $V_{DD} < V_{THVDD}$ as Q1 turns on. $\overline{\text{RESET}}$ goes HIGH when $V_{DD} > V_{THVDD}$ as Q1 turns off after t_{POR} and $\overline{\text{RESET}}$ is pulled high to the supply rail via the external pull-up resistor. Besides V_{DD}, the pull-up resistor can be connected to any equal or lesser voltage level as V_{DD} on the ISL88002.

Applications

Figure 5 illustrates a typical ISL8800x application whereby the supply to a critical component or system sub-circuit is monitored in close proximity. This allows the ISL8800x to most accurately monitor and report the state of the supply.



*** Necessary for ISL88002**

FIGURE 5. TYPICAL APPLICATION DIAGRAM

Figure 6 illustrates an example configuration where the need for an accurate negative potential monitor is needed.

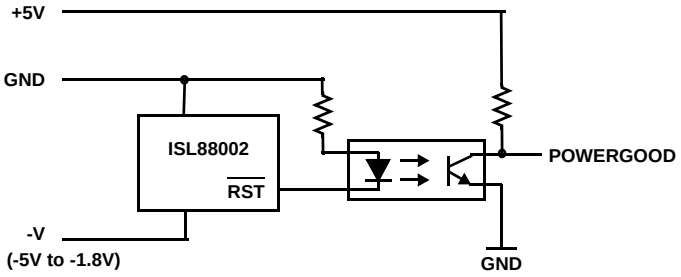


FIGURE 6. NEGATIVE VOLTAGE APPLICATION DIAGRAM

Summary

The versatile ISL88001, ISL88002, ISL88003 devices are specifically designed to provide low power consumption and high threshold accuracy, making them especially suitable for all manner of monitoring in various electrical equipment, electronic and portable devices.