

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 $\pm 1.2\%$ 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.

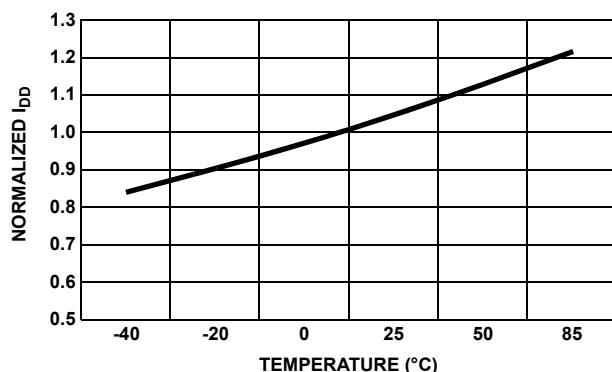


FIGURE 1. NORMALIZED BIAS CURRENT

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 $\pm 1.1\%$ from the +25°C typical value for each threshold variant.

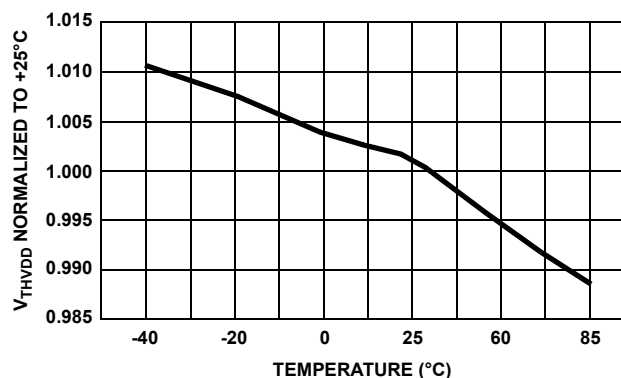


FIGURE 2. NORMALIZED OVER-TEMPERATURE V_{THVDD}

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 $< 6.7\text{mm}^2$.

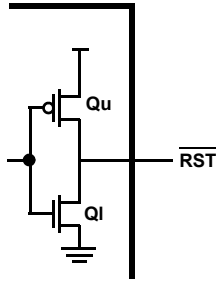
Wide Selection of Voltage Thresholds

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 $\sim 92\%$ and $\sim 87\%$ nominal threshold levels for each rail and an additional $\sim 90\%$ 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.

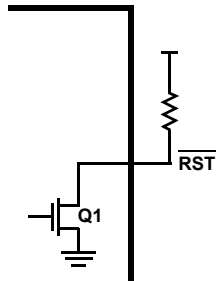
The ISL88001 $\overline{\text{RESET}}$ and the ISL88003 RESET outputs are push-pull type outputs consisting of a pair of complementary MOSFETs (Figure 3), like a comparator output stage.

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 Q_l turns off and Q_u turns on. Conversely, the ISL88003 $\overline{\text{RESET}}$ is asserted (goes LOW) when $V_{DD} > V_{THVDD}$ after t_{POR} as Q_l turns on and Q_u 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 $\overline{\text{RESET}}$ does not sink or source a high enough current to drag the output voltage from its intended state.

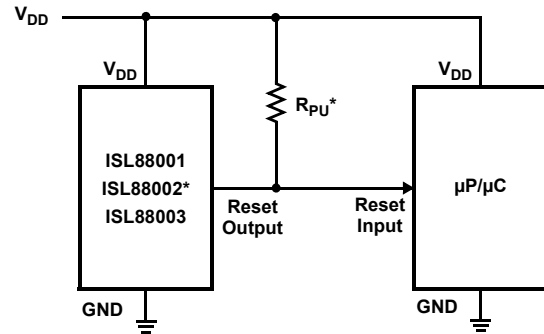
The ISL88002 $\overline{\text{RESET}}$ output is an open drain of an internal MOSFET (Figure 4).

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 Q_1 turns on. $\overline{\text{RESET}}$ goes HIGH when $V_{DD} > V_{THVDD}$ as Q_1 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.

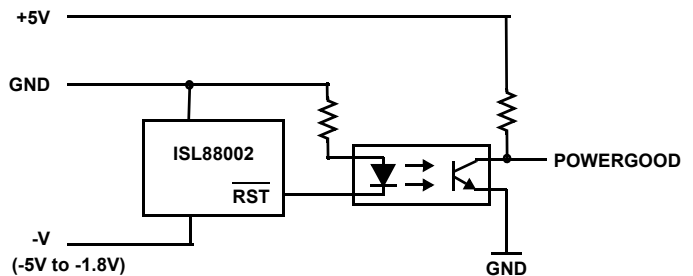


FIGURE 6. NEGATIVE VOLTAGE APPLICATION DIAGRAM

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.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
 2. Renesas Electronics hereby expressly disclaims any warranties against liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
 4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
 5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
 6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
 7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
 8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
 9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
 10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
 11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.
- (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
- (Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)



SALES OFFICES

Renesas Electronics Corporation

<http://www.renesas.com>

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

Renesas Electronics America Inc.

1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.

17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338