

ISL9301EVAL1Z

Evaluation Board Application\Manual

AN1338
Rev 1.00
March 31, 2008

Description

The ISL9301EVAL1Z is an evaluation tool for the ISL9301 single-cell Li-ion battery charger. The evaluation tool provides a complete evaluation platform addressing all datasheet specifications and functionality. The jumpers on the board facilitate the programming of the charge current, different charging conditions, and can be used to make other necessary connections, such as current measurement.

The ISL9301 is a Li-ion battery charger with power path management function. It uses separate power paths to supply the system load and charge the battery. This feature allows the system to immediately operate with a completely discharged battery. This feature also allows the charge to terminate when the battery is full while continuing to supply the system with the input source, thus minimizes unnecessary charge/discharge cycles and improves the battery life.

The ISL9301 accepts input voltages ranging from 4.5V up to 28V. Due to the high voltage capability, the components associated with the input circuit on the evaluation board are good for a 28V supply.

The components assembled in the center square constitute a complete charger, indicating the space saving advantage of the typical ISL9301 installation in space-limited applications.

Key Features

- Complete Charger for Single-Cell Li-ion/Polymer Batteries
- Power Path Management Optimize Charge and System Currents
- Intelligent Timeout Interval Based On Actual Charge Current
- Integrated Disconnect Switch to Disconnect the Battery
- 30mV (target) Voltage Accuracy
- Programmable Charge Current
- Programmable End-of-Charge Current
- Charge Current Thermal Foldback for Thermal Protection
- Trickle Charge for Fully Discharged Batteries
- 28V Maximum Voltage at VIN pin
- Power Presence and Charge Indications
- Ambient Temperature Range: -40°C to +85°C
- 3x3 10 Ld DFN Package

What is Needed

The following instruments will be needed to perform testing:

- Power supplies:
 - PS1: DC 30V/2A
 - PS2: DC 0V to 5V, 1.5A
 - DC Electronic load: 20V/2A
- Multimeters
- Oscilloscope
- Cables and wires

Quick Setup Guide (Refer to Figure 1)

DO NOT APPLY POWER UNTIL STEP 6

- Step 1: Connect a 5V supply PS1 to VIN (J6, upper +) with the current limit set at 1A
- Step 2: Connect a 3.8V supply PS2 to BAT output (J2, upper +) with the current limit set at 1A
- Step 3: Connect a current meter to JP5 as shown in Figure 1
- Step 4: Connect the DC electronic load of 1.2A to BAT (J2, upper +)
- Step 5: Insert a jumper shunt on JP6, all other jumper shunts are not installed
- Step 6: Turn on Power Supplies and DC electronic load, adjust the power supply PS2 such that the voltmeter V2 reads 3.8V
- Step 7: Both the red and the green LEDs should be on, indicating power on and charging condition
- Step 8: The current meter I2 should read about 70mA as the charging current
- Step 9: Insert a jumper shunt on JP3 and the current meter I2 should read about 150mA charging current
- Step 10: Insert a jumper shunt on both JP2 and JP3, the current meter I2 should read about 220mA charging current
- Step 11: Reduce the voltage at PS2 to 2.4V for trickle charge currents. The current reading should be 25mA
- Step 12: Slowly reduce the E-Load1 current until the green LED turns off, the current meter I2 should read about 15mA EOC current
- Step 13: Insert a jumper shunt on JP1 and repeat Step 12, the current meter I2 should read 30mA EOC current
- Step 14: DPPM test. Set the current limit on the input supply to 1.5A. Increase E-Load2 output current until VOUT drops to VDPPM level of 4.3V due to input current limit of the ISL9301 and charging current to the battery will reduce; to allow more current to the output due to the DPPM function

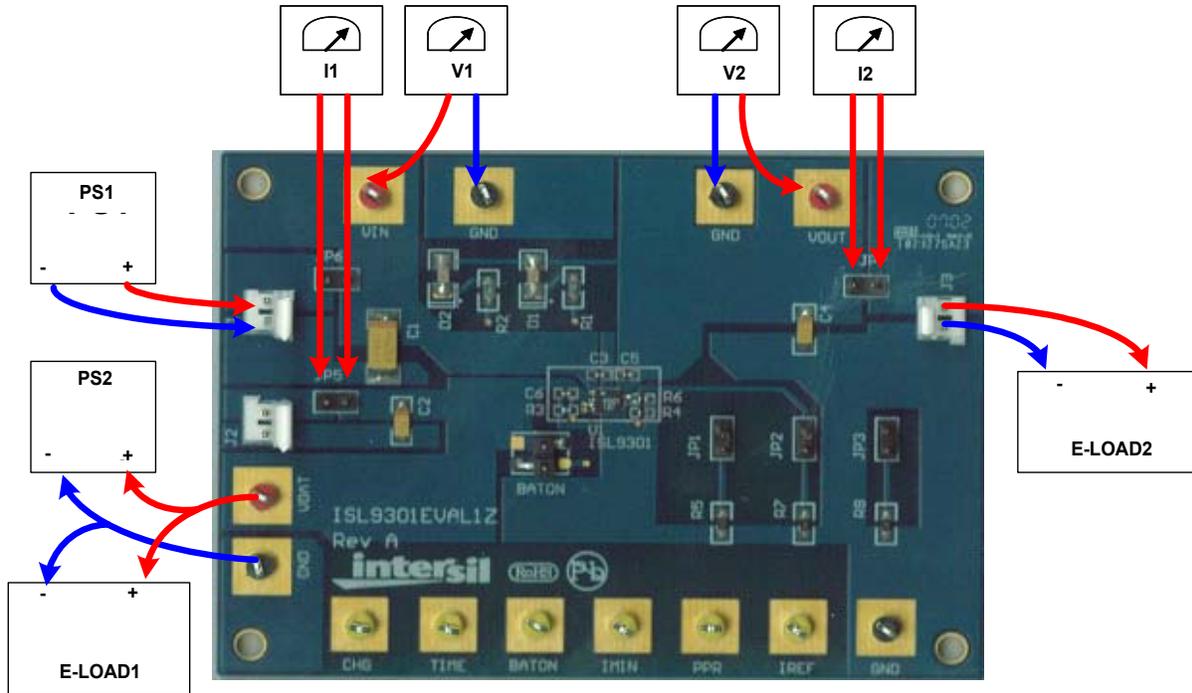


FIGURE 1. CONNECTION OF EQUIPMENT

Description of Jumper Settings

JP1 - Parallels an additional 274k resistor to the IMIN pin (total R_{IMIN} = 173k), such that the End-of-Charge Current will be increased to 30mA (R_{IMIN} is 274k and the EOC current is 15mA without the shunt).

JP2 - Parallels an additional 53.4k resistor to the IREF pin (total R_{IREF} = 26.7k), such that the charge current will be increased to 0.15A (R_{IREF} is 53.4k and the charge current is 70mA if the shunt on JP3 is removed).

JP3 - Parallels an additional 53.4k resistor to the IREF pin (total R_{IREF} = 26.7k), such that the charge current will be increased to 0.15A (R_{IREF} is 53.4k and the charge current is 70mA if the shunts on both JP2 is removed). Shunts JP2 and JP3 are installed, such that two additional 53.4k resistor to IREF pin (total R_{IREF} = 17.8k), the charge current will be increased to 0.24A.

JP5 - A shunt installed on JP5 connects the BAT pin to the output connector J2 if IBAT measurement is not needed. The shunt can be replaced by a current meter if charge current measurement is needed as shown in Figure 1.

JP6 - A shunt installed on JP6 connects the VIN pin to the output connector J1 if output current measurement is not needed. The shunt can be replaced by a current meter if input current measurement is needed as shown in Figure 1.

JP7 - A shunt installed on JP7 connects the VOUT pin to the output connector J3 if input current measurement is not needed. The shunt can be replaced by a current meter if

output current measurement is needed as shown in Figure 1.

JP8 - A shunt installed on JP8 connects BATON pin to VBAT such that VOUT is connected to VBAT through an internal MOSFET when VIN is not applied. When VIN is applied, BATON pin has no impact on VOUT and VBAT.

TABLE 1. JUMPER SETTING SUMMARY

JUMPER	POSITION	FUNCTION
JP1	Shunt installed	Set EOC current to 30mA
JP2	Shunt installed	Sets charging current to 0.15A, if shunt on JP3 is not installed
JP3	Shunt installed	Sets charging current to 0.15A, if shunt on JP2 is not installed
JP5	Shunt installed	Connects BAT to J2
JP6	Shunt installed	Connects VIN to J1
JP7	Shunt installed	Connects VOUT to J3
JP8	Shunt installed	Connects VOUT to VBAT when VIN is not applied.

Schematic

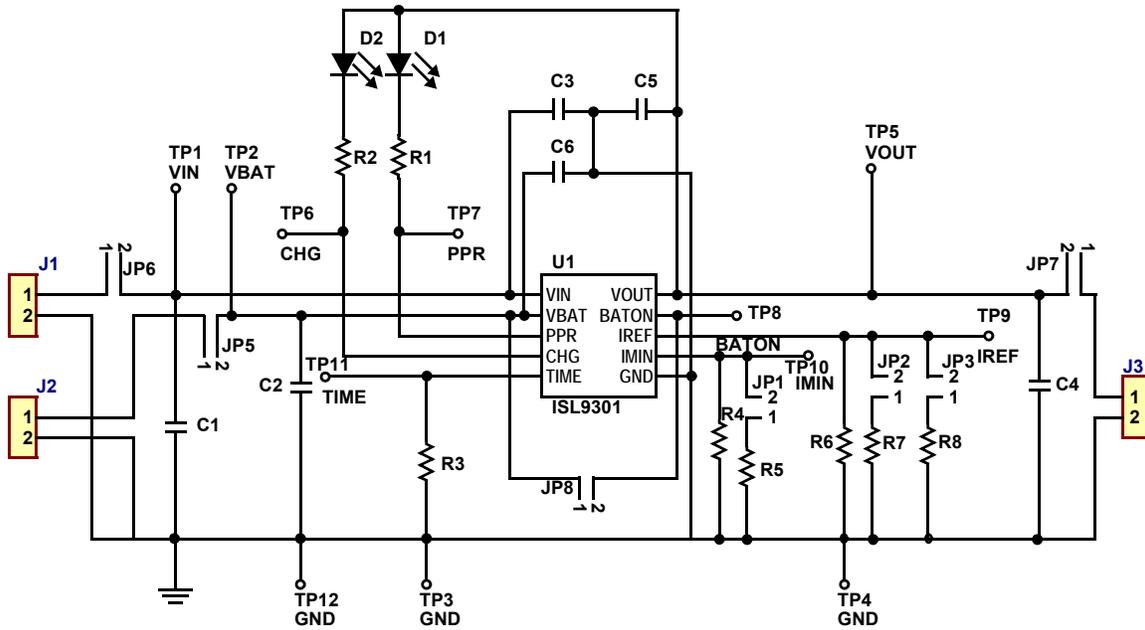


FIGURE 2. ISL9301EVAL1Z SCHEMATIC

PCB Layout

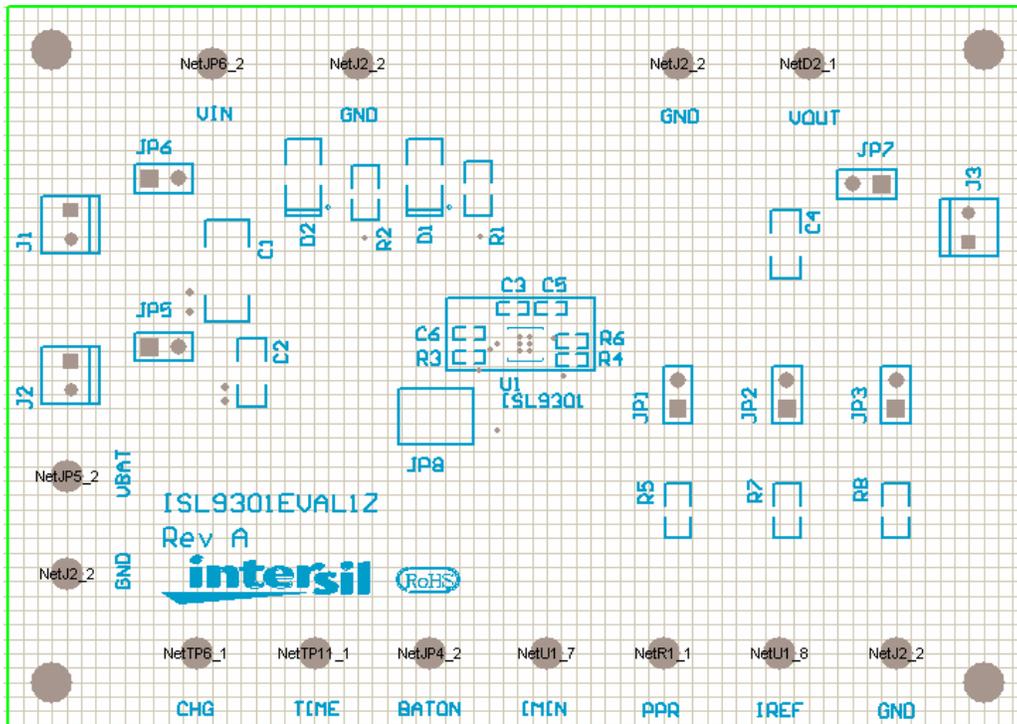


FIGURE 3. SILK LAYER

PCB Layout (Continued)

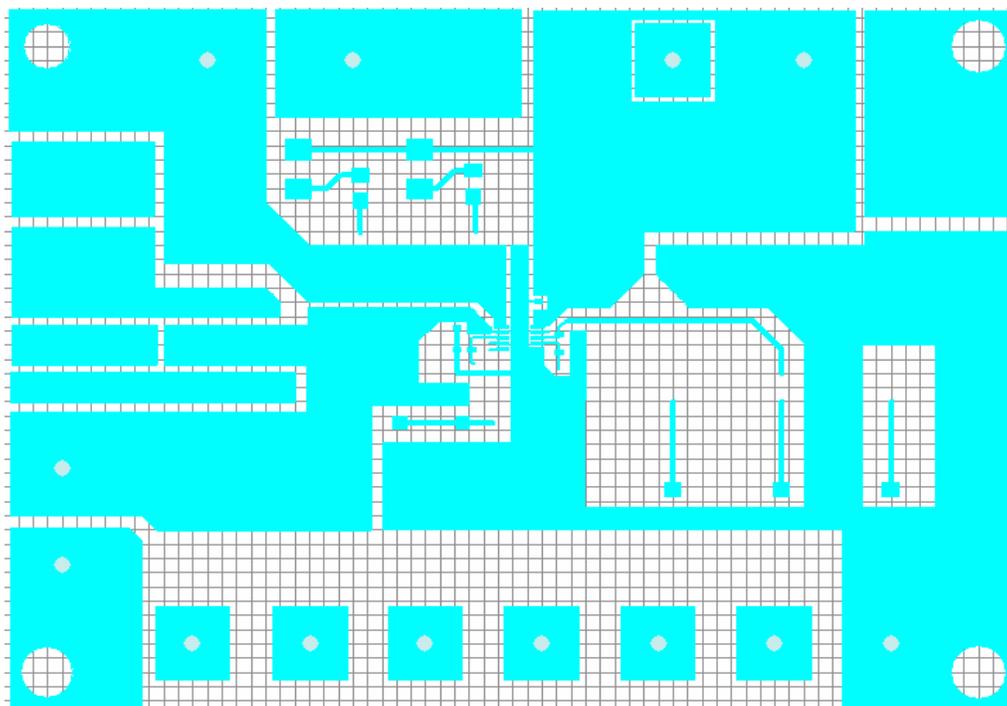


FIGURE 4. TOP LAYER

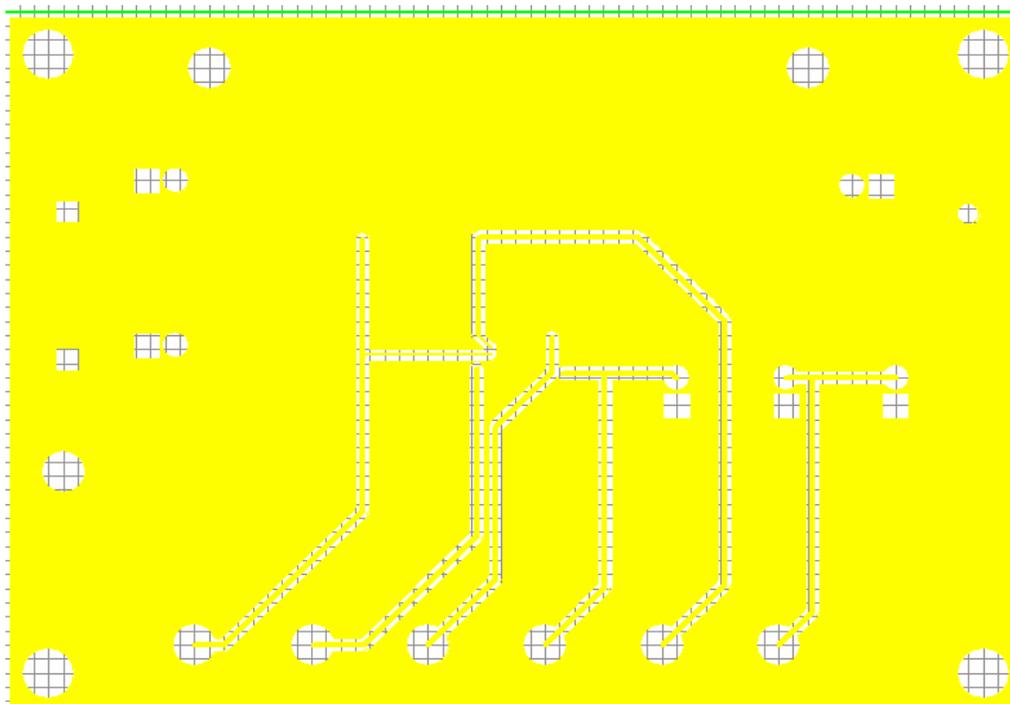


FIGURE 5. BOTTOM LAYER

ISL9301EVAL1Z Bill Of Materials

ITEM	QTY	REFERENCE	PART DESCRIPTION	PCB FOOTPRINT	PART NUMBER	VENDOR
1	1	U1	ISL9301 Power Pather Charger	3x3 DFN	ISL9301	Intersil
2	2	R1, R2	0805, 470, 5% Resistor	0805	ERJ-6GEYJ471V	Panasonic
3	1	R3	0402, 100k, 1% Resistor	0402	ERJ-2RKF1003X	Panasonic
4	1	R4	0402, 274k, 1% Resistor	0402	ERJ-2RKF2743X	Panasonic
5	1	R6	0402, 53.4k, 1% Resistor	0402	ERJ-2RKF5902X	Panasonic
6	1	R5	0805, 274k, 1% Resistor	0805	ERJ-6ENF2743V	Panasonic
7	2	R7, R8	0805, 53.4k, 1% Resistor	0805	ERJ-6ENF5902V	Panasonic
8	1	C1	4.7 μ F, 35V, Tantalum	2512	ECS-T1VC475R	Panasonic
9	3	C3, C5, C6	0.01 μ F, 50V, X7R Ceramic	0402	C0402C103K5RACTU	Kemet
10	2	C2, C4	10 μ F, 6.3V, Tantalum	1206	ECS-T0JY106R	Panasonic
11	3	J1, J2, J3	2.54mm Center Header, 2ckt		22-11-2022	Molex
12	3	VIN, VOUT, VBAT	Test point, Red		5010	Keystone
13	6	TIME, CHG, PPR, IREF, IMIN, BATON	Test point, Yellow		5014	Keystone
14	4	GND	Test point, Black		5011	Keystone
15	5	JP2, JP3, JP5, JP6, JP7, JP8	2.54mm header, 2ckt		22-28-4020	Molex
16	1	D2	Green LED	0805	SML-LXT0805GW-TR	Lumex Opto
17	1	D1	Red LED	0805	SML-LXT0805IW-TR	Lumex Opto

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 and 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