

ISL9220IRTZEVAL1Z (1-cell), ISL9220AIRTZEVAL1Z (2-cell)

Evaluation Board

AN1589
Rev 2.00
Feb 9, 2012

Evaluation Board Features

- Operating Input Voltage Range:
 - 4.5V to 14V for ISL9220IRTZEVAL1Z
 - 9.0V to 14V for ISL9220AIRTZEVAL1Z
- Up to 2A Charge Current
- Two Status Outputs
- 1.2MHz Switching Frequency
- Connector, Test Point and Jumper

Required Equipment

- Power Supply (PS1 & PS2) Capable of Supplying up to 18V and 3A
- Electronic Load (E-Load) (20V/5A), Voltmeter, Oscilloscope

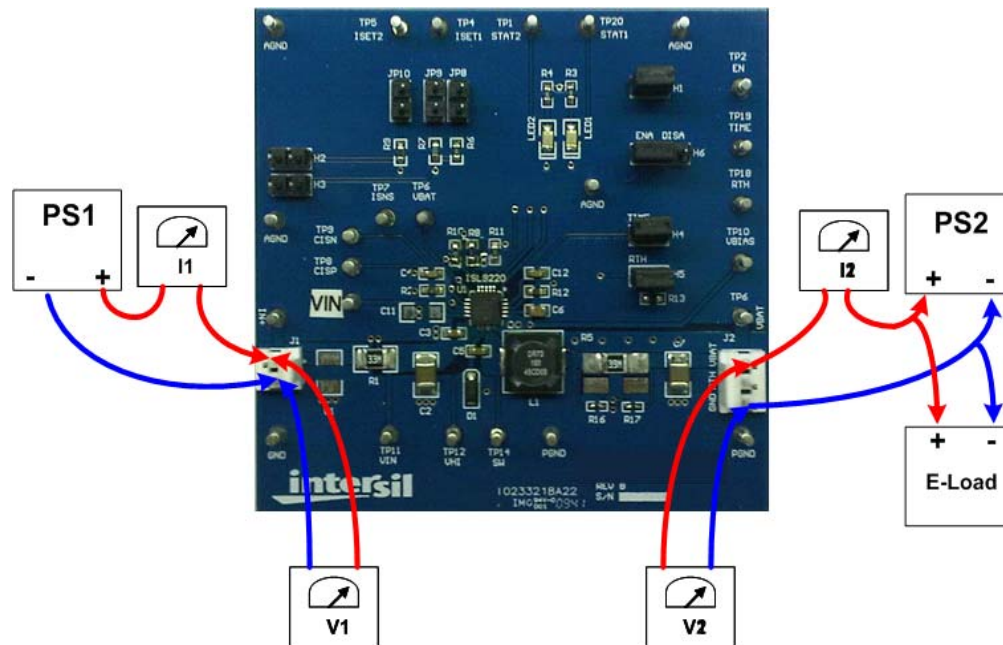


FIGURE 1. QUICK SETUP DIAGRAM

Quick Setup Guide

1. Insert shunts on left two pins of H6, H5 for normal operation and H4 to disable timeout if needed.
2. Connect power supply (PS1) in series with a current meter (I1) to connector IN+.
3. Connect power supply (PS2) in series with a current meter (I2) to VBAT pin of J2.
4. Connect electronic load (E-load) setting at 2.2A to VBAT pin and ground.
5. Connect a voltage meter (V2) on TP6 to measure voltage on VBAT.
6. Place a scope probe on the connector of TP14 to monitor switching waveform.
7. Set input supply PS1 voltage between 4.5V to 14V for 1-cell charge and 9V to 14V for 2-cell charge.
8. Set PS2 so that V2 measures 3.6V on VBAT for 1-cell and 7V for 2-cell.
9. Turn on PS1. LED2 will turn on red indicating power good.
10. Turn on PS2 and E-load. LED1 will turn on green indicating charging in progress.
11. Without shunts on JP8 and JP9, current meter I2 will measure 500mA \pm 10% charge current.
12. Insert a shunt on JP8. The resistance on the ISET1 pin becomes 33.3k Ω and I2 will measure 1.5A \pm 10% charge current.
13. Insert shunt on JP9. The resistance on the ISET1 pin becomes 25k Ω and I1 will measure 2A \pm 10% charge current.
14. Lower the voltage on PS2 until V2 measures 2.5V for 1-cell and 5V for 2-cell. The charger will become trickle mode. I2 will measure around 70mA trickle charge current.
15. Insert a shunt on JP10. I2 will measure around 140mA trickle charge current. For Steps 11 to 15, you should see 1.2MHz switching waveform on the scope.
16. Lower the voltage on PS2 until V2 measures less than 2.5V for 1-cell and less than 5V for 2-cell. The charger will charge in LDO mode current. I2 will measure around 50mA LDO current. The charge stops switching in this mode.
17. Slowly increase the voltage on PS2; the charge current into the PS2 reduces. As current continues to reduce and reaches around 100mA, the end-of-charge event happens and the charger stops charging. At this point, V2 should measure 4.2V, \pm 1% for 1-cell and 8.4V, \pm 1% for 2-cell. STAT1 toggles high, and LED2 turns off. Remove the shunt from JP10, the end-of-charge current changes to 50mA.
18. Charging efficiency can be calculated by $(V_O * I_O) / (V_{IN} * I_{IN}) * 100$. The voltage and current can be read from V1, I1, V2 and I2.

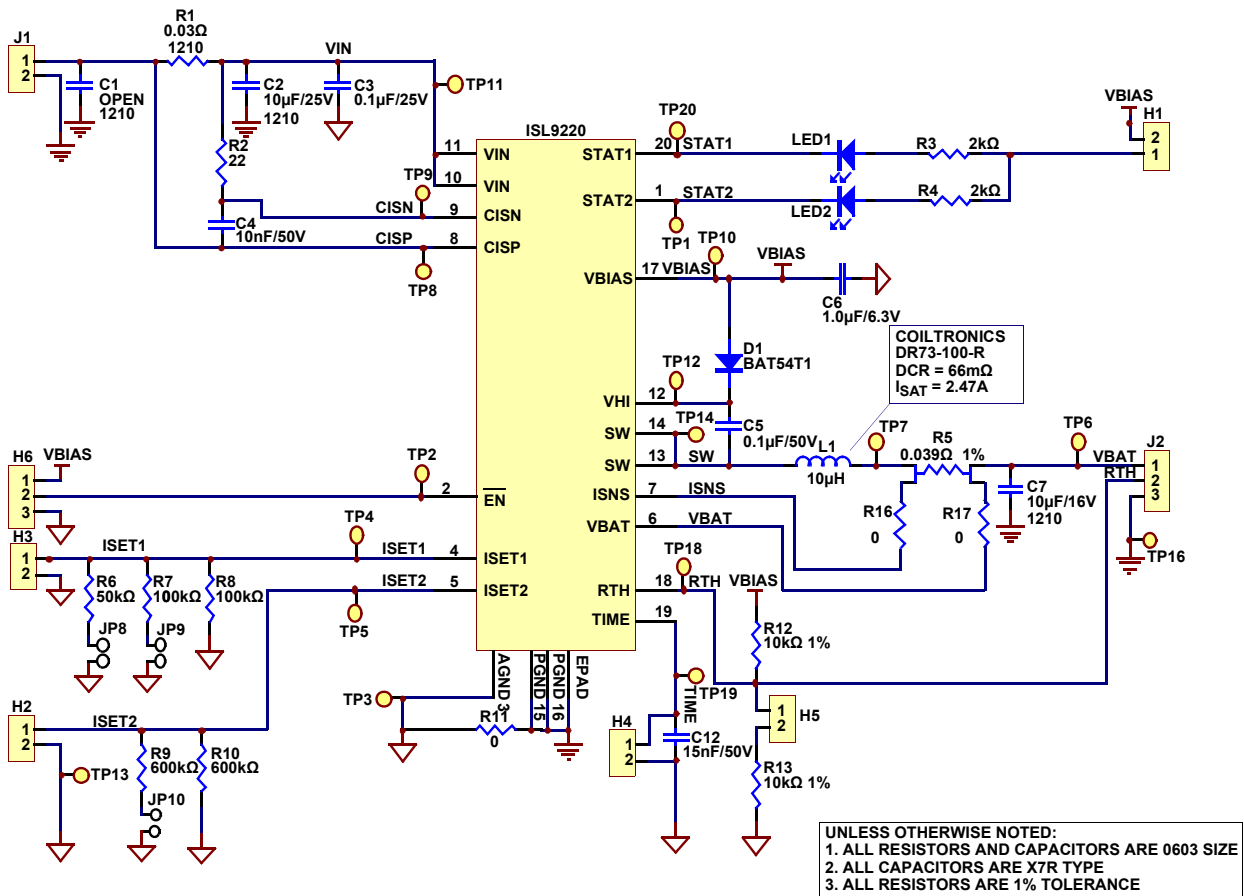


FIGURE 2. ISL9220, ISL9220A EVALUATION BOARD SCHEMATIC

Evaluation Board Layout

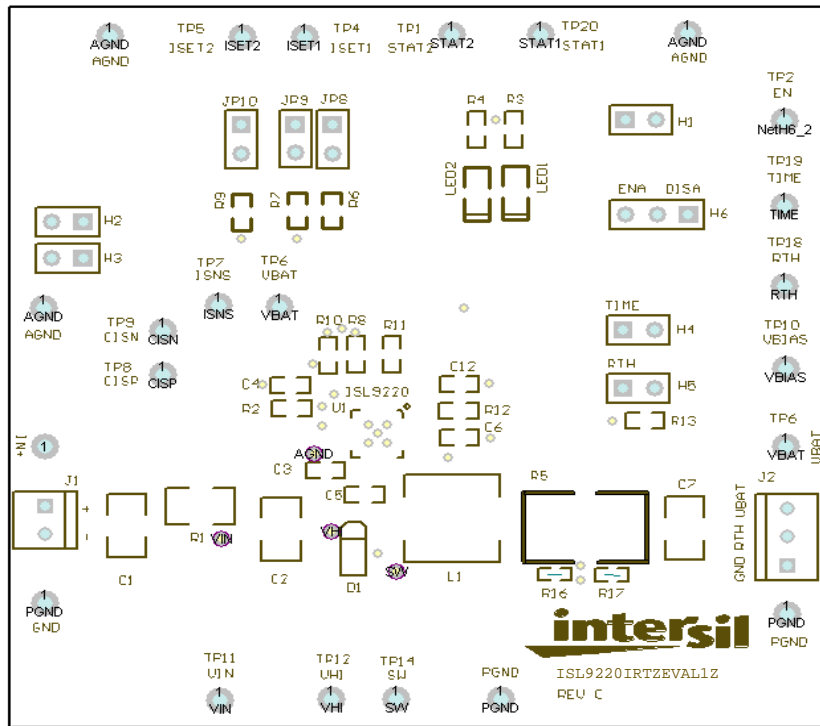


FIGURE 3. SILKSCREEN TOP

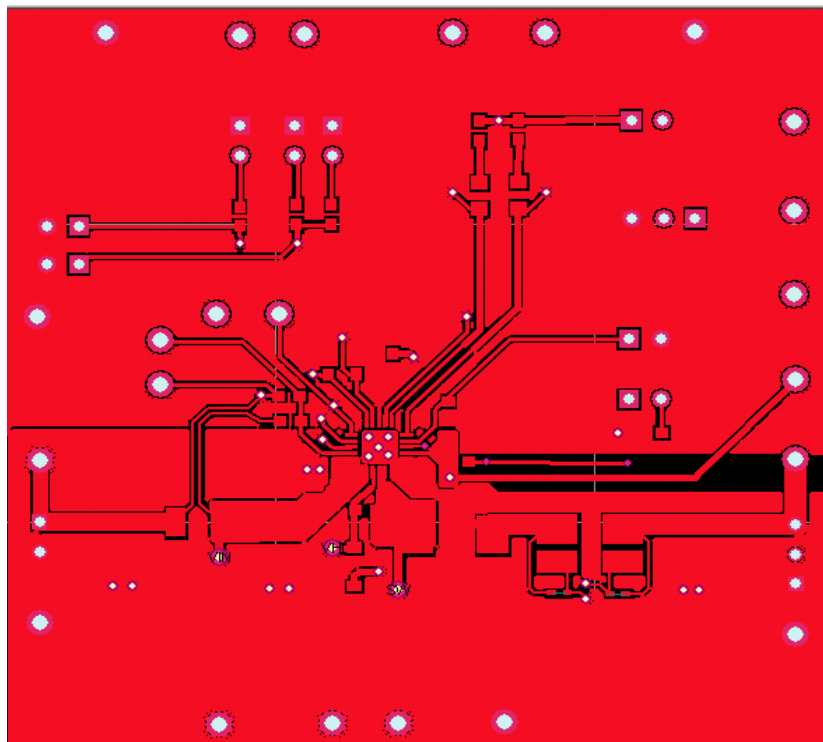


FIGURE 4. TOP LAYER

Evaluation Board Layout (Continued)

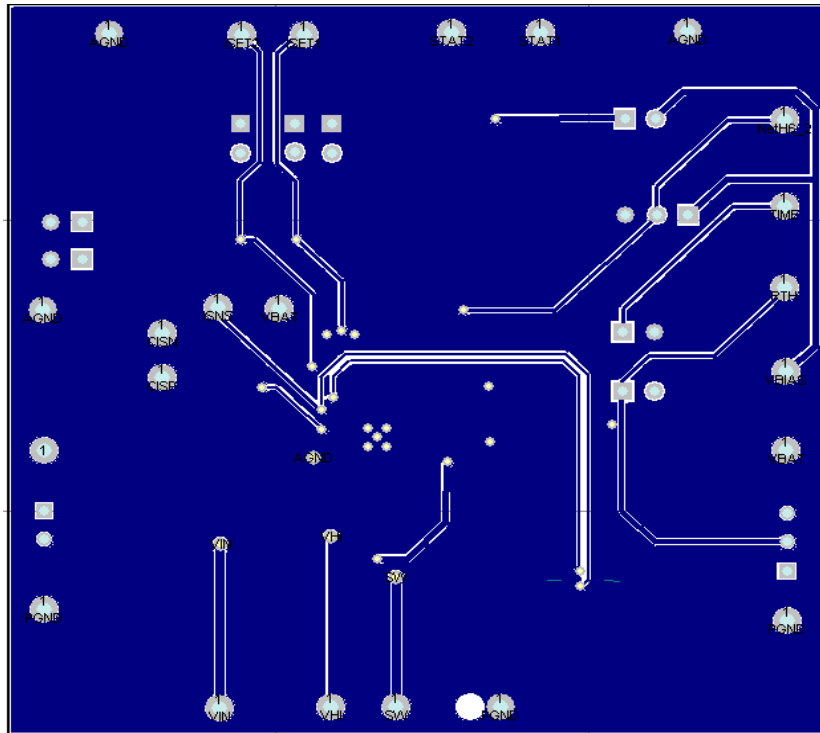


FIGURE 5. BOTTOM LAYER (AGND)

TABLE 1. ISL9220, ISL9220A EVALUATION BOARD BILL OF MATERIALS

ITEM#	QTY	DESIGNATOR	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
1	1	R1	0.033Ω 1/3W 1%	1210	P33NACT-ND	DIGIKEY
2	1	R2	22	603	RMCF1/1622FRTE-ND	DIGIKEY
3	2	R3, R4	2kΩ	603	311-2.00KHRCT-ND	DIGIKEY
4	1	R6	49.9kΩ	603	CR0603-10W4532FT	VENKEL
5	2	R7, R8	100kΩ	603	CR0603-16W1003FT	VENKEL
6	2	R9, R10	600kΩ	603	CR0603-10W4993FT	VENKEL
7	1	R11	0	603	CR0603-16W000T	VENKEL
8	2	R12, R13	10kΩ	603	RHM10.0KHTR-ND	DIGIKEY
9	1	R5	0.039Ω 1/3W 1%	1210	P39NATR-ND	DIGIKEY
10	2	C2, C7	10μF/25V	1210	GRM32DR71E106KA12L	MURATA
11	2	C3, C5	0.1μF/25V	603	C1608X7R1H104K	TDK
12	1	C4	10nF/50V	603	C1608X7R1H103	TDK
13	1	C6	1.0μF/16V	0805	GRM21BR71C475KA73L	MURATA
14	1	C12	15nF/50V	603	GRM188R71H153KA73L	MURATA
15	1	D1	RED	0805	67-1552-1-ND	DIGIKEY
16	1	D2	GREEN	0805	67-1553-1-ND	DIGIKEY
17	1	L1	10μH	DR73-100-R	704-DR73-100-R	MOUSER

TABLE 1. ISL9220, ISL9220A EVALUATION BOARD BILL OF MATERIALS (Continued)

ITEM#	QTY	DESIGNATOR	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
18	13	TP1, TP2, TP4, TP5, TP7, TP8, TP9, TP10, TP12, TP14, TP18, TP19, TP20	TEST POINT		2110-00-80-00-00-070	MILL-MAX
19	3	GND, AGND, PGND	TEST POINT		2110-00-80-00-00-070	MILL-MAX
20	3	IN+, TP6, TP11	TEST POINT		2110-00-80-00-00-070	MILL-MAX
21	6	JP4, JP5, JP7, JP8, JP9, JP10	CON2	JUMPER	538-22-28-4020	MOUSER
22	1	J1	CONN		A1921-ND	DIGIKEY
23	1	J2	CONN		A19470-ND	DIGIKEY
24	1	C1	OPEN	1210		
25	2	R16, R17	0 ohm	0402	RMCF0402ZTOR00	STACKPOLE
26	1	U1		4mmx4mm TQFN	ISL9220, ISL9220A	INTERSIL

TABLE 2. DESCRIPTION OF JUMPERS

JUMPER	DESCRIPTION
H1	The jumper installed to connect R3 and R4 to VBIAS pin as power supply to the LED1 and LED2
H2	The jumper installed to short ISET2 pin to ground
H3	The jumper to short ISET1 pin to ground
H4	If a shunt is inserted on H4, TIME pin is shorted to ground, and the TIMEOUT function will be disabled. If H4 is open, TIMEOUT function will be enabled and timeout can be set with capacitor at the pin
H5	If a shunt is installed on H5, VBIAS will be scaled down to 2.5V at the RTH pin by the resistive divider of R12 and R13 and the charger will operate in normal mode. If H5 is open, RTH pin will be pulled high, and the charger is in suspend mode
H6	It is a 3 pin jumper. If a shunt is inserted on the left two pins, the EN pin is connected to ground and the charger is enabled. If a shunt is inserted on the right two pins, the EN pin is connected to VBIAS and the charger is disabled
JP8	Parallels an additional 50kΩ resistor to ISET1 pin such that the charge current will be set at 1.5A with JP9 open
JP9	Parallels an additional 100kΩ resistor to ISET1 pin such that the charge current will be set at 1A with JP8 open. If both JP8 and JP9 are inserted, the charge current will be 2A. If both JP8 and JP9 are open, the charge current will be 500mA
JP10	Parallels an additional 600kΩ resistor to ISET2 pin to set a trickle charge current of 140mA

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