

ISL8088EVAL1Z

REVA Dual 800mA Low Quiescent Current 2.25MHz High Efficiency Synchronous Buck Regulator

AN1492
Rev 2.00
February 14, 2014

Description

The ISL8088EVAL1Z kit is intended for use by individuals with requirements for Point-of-Load applications sourcing from 2.75V to 5.5V. The ISL8088EVAL1Z evaluation board is used to demonstrate the performance of the ISL8088 low quiescent current mode converter.

The ISL8088 is offered in a 3mmx3mm 10 Ld DFN package with 1mm maximum height. The complete converter occupies less than 1.8cm² area.

Key Features:

- Dual 800mA High Efficiency Synchronous Buck Regulator with up to 97% Efficiency
- 800mA Guaranteed Output Current per channel
- Power-Good (PG) output with 1ms Delay
- 2.75V to 5.5V Supply Voltage
- 3% Output Accuracy Over-Temperature/Load/Line
- Start-up with Pre-biased Output
- Internal Digital Soft-Start - 2ms
- Soft-Stop Output Discharge During Disabled
- 30µA Quiescent Supply Current in PFM Mode
- Selectable Forced PWM Mode and PFM Mode
- External Synchronization up to 4MHz
- Typical 6.5µA Logic Controlled Shutdown Current
- 100% Maximum Duty Cycle for Lowest Dropout
- Internal Current Mode Compensation
- Peak Current Limiting.
- Over-Temperature Protection
- Independent Enable

Recommended Equipment

The following materials are recommended to perform testing:

- 0V to 10V Power Supply with at least 3A source current capability or 5V battery
- Electronic Loads capable of sinking current up to 3A
- Digital Multimeters (DMMs)
- 100MHz quad-trace oscilloscope
- Signal generator

Quick Setup Guide

1. Ensure that the circuit is correctly connected to the supply and loads prior to applying any power.
2. Connect the bias supply to VIN. Plus terminal to VIN and negative return to PGND.
3. Verify that position is ON for SW2 and SW3.
4. Turn on the power supply.
5. Verify the output voltage is 2.5V for V_{OUT1} and 1.8V for V_{OUT2}.

Evaluating the Other Output Voltage

The ISL8088EVAL1Z kit output is preset to 2.5V for V_{OUT1} and 1.8V for V_{OUT2}; however, output voltages can be adjusted from 0.6V to 3.3V. The output voltage programming resistor, R2 (or R5 in Channel 2), will depend on the desired output voltage of the regulator. The value for the feedback resistor is typically between 0Ω and 750kΩ as shown in Equation 1.

Let's set R3 = 100kΩ, then R2 will be:

$$R2 = R3 \left(\frac{V_{OUT}}{V_{FB}} - 1 \right) \tag{EQ. 1}$$

If the output voltage desired is 0.6V, then R3 is left unpopulated and short R2. For faster response performance, add 10pF in parallel to R2.

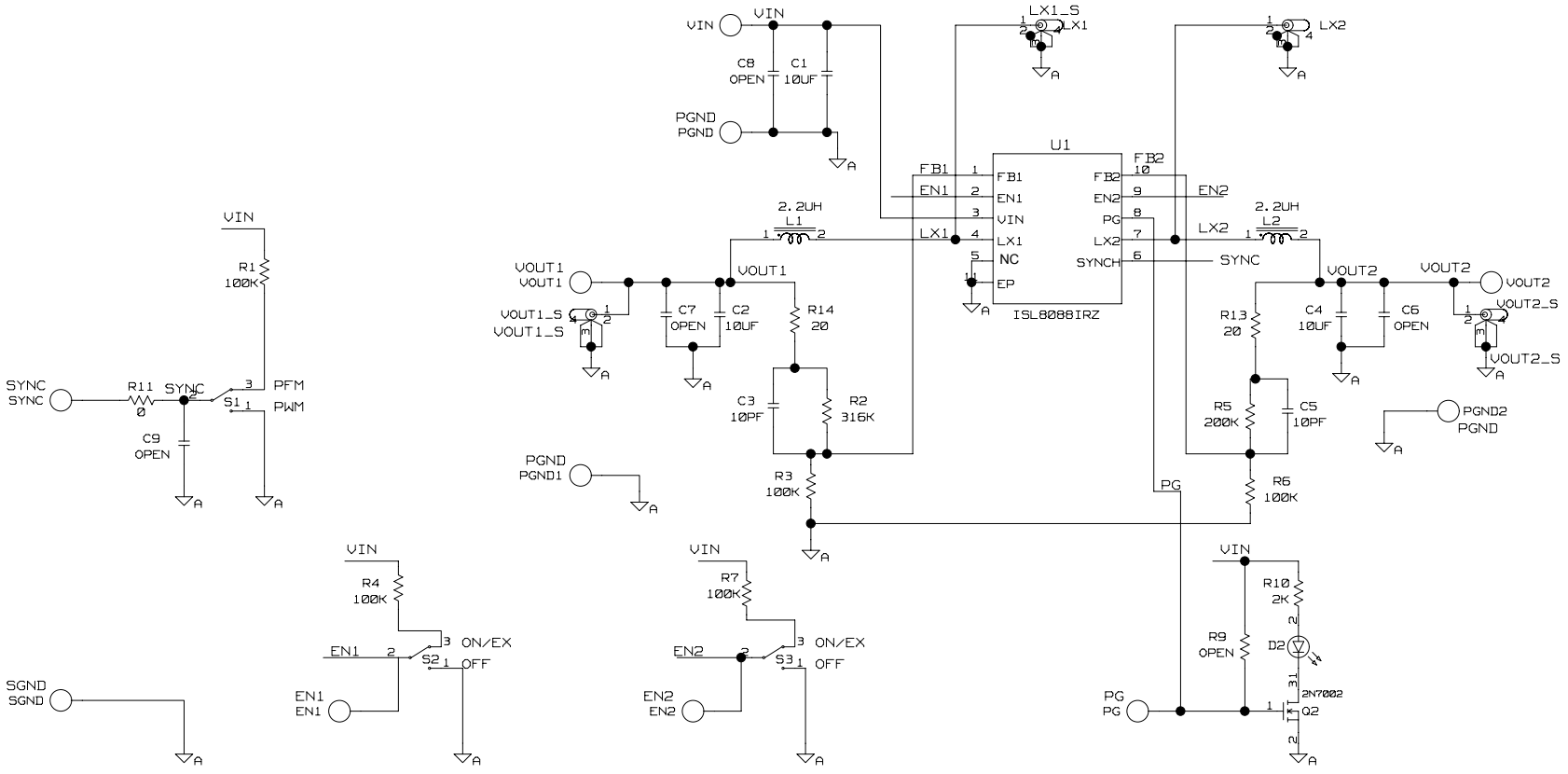
Mode Control

The ISL8088 has a SYNC pin that controls the operation mode. SYNC pin connect to logic high or input voltage VIN for PFM mode; connect to logic low or ground for forced PWM mode. Connect to an external function generator for Synchronization. Negative edge trigger. Do not leave this pin floating.

TABLE 1. SWITCH SETTINGS

SW2&3	ENABLE	ON/OFF CONTROL
1	OFF	Disable V _{OUT}
3	ON	Enable V _{OUT}
SW1	SKIP	FUNCTION
1	PWM	Fixed PWM frequency at light load
3	PFM	Force continuous mode

ISL8088EVAL1ZREVA Schematic



NOTE:
PLEASE KEEP FB1, FB2 PINS TRACES SHORT

TABLE 2. BILL OF MATERIALS

PART NUMBER	QTY	UNIT	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
ISL8088EVAL1ZREVAPCB	1	ea		PWB-PCB, ISL8088EVAL1Z, REVA, ROHS	TITAN	ISL8088EVAL1ZREVAPCB
H1045-00100-50V5-T	2	ea	C3, C5	CAP, SMD, 0603, 10pF, 50V, 5%, COG, ROHS	YAGEO	CC0603JRNPO9BN100
					VENKEL	C0603COG500-100JNE
					KEMET	C0603C100J5GACTU
					MURATA	GRM1885C1H100JA01D
					AVX	06035A100JAT2A
H1045-DNP	0	ea	C9	CAP, SMD, 0603, DNP- PLACE HOLDER, ROHS		
H1046-00106-6R3V10-T	3	ea	C1, C2, C4	CAP, SMD, 0805, 10μF, 6.3V, 10%, X5R, ROHS	VENKEL	C0805X5R6R3-106KNE
					KEMET	C0805C106K9PACTU
					AVX	08056D106KAT2A
					MURATA	GRM21BR60J106KE19L
					TAIYO YUDEN	JMK212BJ106KG
H1046-DNP	0	ea	C6 to C8	CAP, SMD, 0805, DNP- PLACE HOLDER, ROHS		
MDT2520-CR2R2M	2	ea	L1, L2	COIL-PWR INDUCTOR, SMD, 2520, 2.2μH, 20%, 1.35A, ROHS	TOKO	MDT2520-CR2R2M
1514-2	6	ea	PGND, PGND1, PGND2, VIN, VOUT1,VOUT2	CONN-TURRET, TERMINAL POST, TH, ROHS	KEYSTONE	1514-2
5000	4	ea	EN1, EN2, PG, SYNC	CONN-MINI TEST PT, VERTICAL, RED, ROHS	KEYSTONE	5000
5001	1	ea	SGND	CONN-MINI TEST PT, VERTICAL, BLK, ROHS	KEYSTONE	5001
LTST-C170CKT	1	ea	D2	LED-GaAs RED, SMD, 2mmx1.25mm, 100mW, 40mA, 10mcd, ROHS	LITEON/VISHAY	LTST-C170CKT
					ROHM	SML-210LTT86
					STANLEY ELEC.	BR112H-TR
ISL8088IRZ	1	ea	U1	IC-DUAL SYNC. BUCK REGULATOR, 10P, DFN, 3X3, ROHS	INTERSIL	ISL8088IRZ
2N7002-T	1	ea	Q2	TRANSISTOR, N-CHANNEL, 3LD, SOT-23, 60V, 115mA	NAT'L SEMICNDTR	2N7002
					MOTOROLA	2N7002LT1
H2511-00200-1/10W1-T	2	ea	R13, R14	RES, SMD, 0603, 20Ω, 1/10W, 1%, TF, ROHS	PANASONIC	ERJ-3EKF20R0V
					YAGEO	RC0603FR-0720RL
					VENKEL	CR0603-10W-20R0FT
H2511-00R00-1/10W-T	1	ea	R11	RESISTOR, SMD, 0603, 0Ω, 1/10W, TF, ROHS		
H2511-01003-1/10W1-T	5	ea	R1, R3, R4, R6, R7	RES, SMD, 0603, 100k, 1/10W, 1%, TF, ROHS		
H2511-02001-1/10W1-T	1	ea	R10	RES, SMD, 0603, 2k, 1/10W, 1%, TF, ROHS	KOA	RK73H1JT2D2001F
					VENKEL	CR0603-10W-2001FT

TABLE 2. BILL OF MATERIALS (Continued)

PART NUMBER	QTY	UNIT	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
H2511-02003-1/10W1-T	1	ea	R5	RES, SMD, 0603, 200k, 1/10W, 1%, TF, ROHS	VENKEL	CR0603-10W-2003FT
					YAGEO	RC0603FR-07200KL
					VISHAY/DALE	CRCW0603200KFKEA
					PANASONIC	ERJ-3EKF2003V
					ROHM	MCR03EZPF2003
H2511-03163-1/10W1-T	1	ea	R2	RES, SMD, 0603, 316k, 1/10W, 1%, TF, ROHS	PANASONIC	ERJ-3EKF3163V
					VENKEL	CR0603-10W-3163FT
					ROHM	MCR03EZPF3163
					YAGEO	RC0603FR-07316KL
					VISHAY/DALE	CRCW0603316KFKEA
H2511-DNP	0	ea	R9	RES, SMD, 0603, DNP-PLACE HOLDER, ROHS		
GT11MSCBE-T	3	ea	S1 to S3	SWITCH-TOGGLE, SMD, ULTRAMINI, 1P, SPST MINI	C&K COMPONENTS	GT11MSCKE

ISL8088EVAL1Z Board Layout

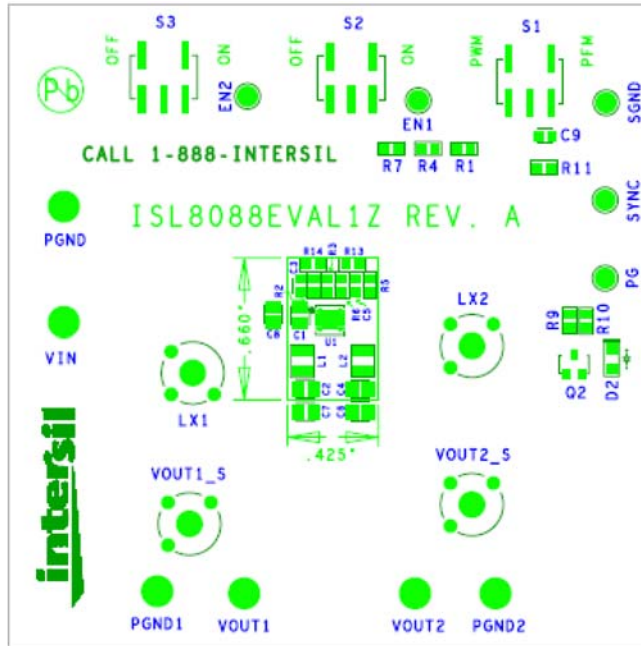


FIGURE 1. TOP COMPONENTS

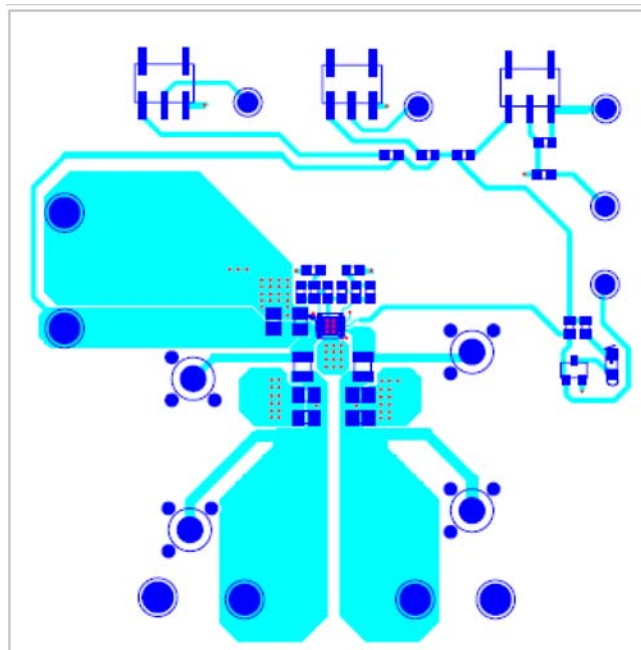


FIGURE 2. TOP LAYER ETCH

ISL8088EVAL1Z Board Layout (Continued)

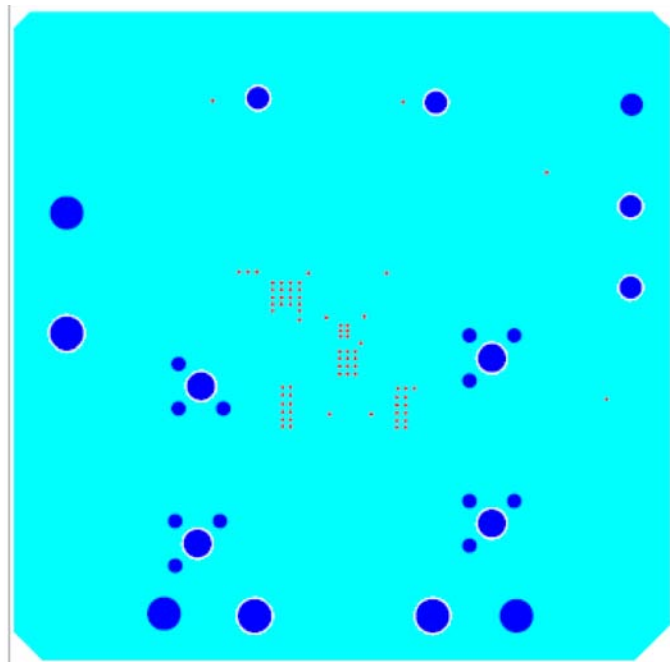


FIGURE 3. 2ND LAYER ETCH

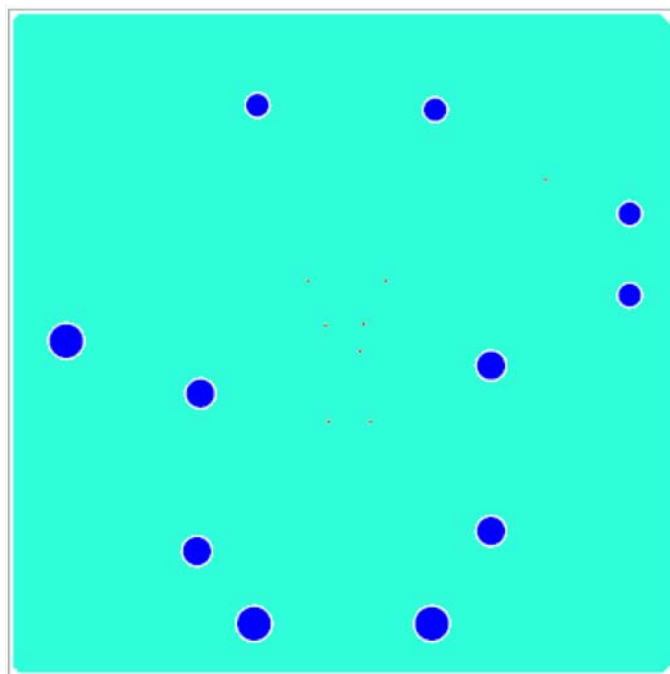


FIGURE 4. 3RD LAYER ETCH

ISL8088EVAL1Z Board Layout (Continued)

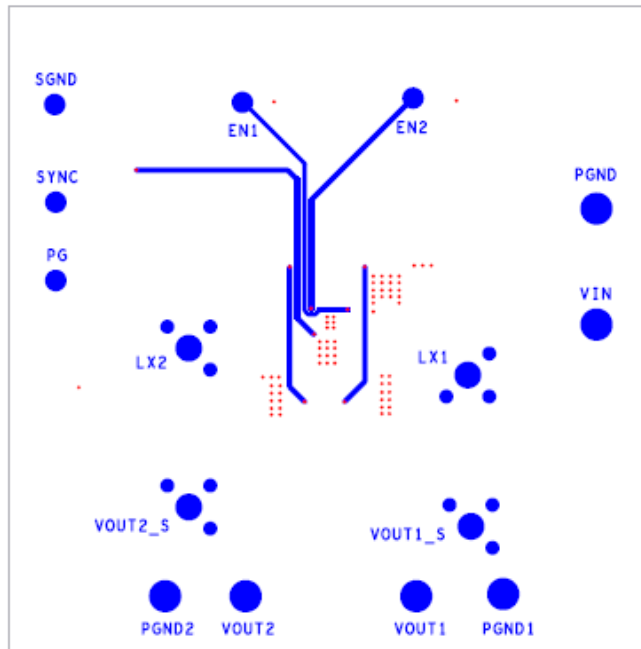


FIGURE 5. BOTTOM LAYER COMPONENTS (MIRRORS)

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