

## ISL91108IIA-EVZ/ISL91108IIN-EVZ

Evaluation Board

AN1903  
Rev 1.00  
March 11, 2014

### Evaluation Board Features

- ISL91108 high efficiency buck-boost regulator
- Input voltage rating from 1.8V to 5.5V
- Resistor programmable output voltage on the ISL91108IIA-EVZ evaluation board
- Fixed 3.3V output voltage on the ISL91108IIN-EVZ evaluation board
- Up to 1.5A output current ( $P_{VIN} = 3.0V$ ,  $V_{OUT} = 3.3V$ )
- 2.5MHz switching frequency
- Jumper selectable EN (enabled/disabled)
- Jumper selectable MODE (auto-PFM/forced-PWM)
- Connectors, testpoints, and jumpers for easy evaluation

### Required Equipment

- Power supply capable of delivering up to 5.5V and 4A
- Electronic load
- Multimeter to measure voltages and currents
- Oscilloscope

### Testpoints, Connectors, and Jumpers

TABLE 1. DESCRIPTION OF TEST POINTS

TEST POINT(S)	DESCRIPTION
TP1	LX1 (Input side of power inductor)
TP2	LX2 (Output side of power inductor)
TP3	$V_{OUT}$

TABLE 2. DESCRIPTION OF CONNECTORS

CONNECTOR	DESCRIPTION
J1	Header for connecting input power. Includes S+ and S- sense lines.
J2	Header for connecting external load. Includes S+ and S- sense lines.

TABLE 3. DESCRIPTION OF JUMPERS

JUMPER	DESCRIPTION
J3	Jumper to select EN input logic state. Set EN = $V_{IN}$ to enable device, or set EN = GND to disable device.
J4	Jumper to select MODE input logic state. Set MODE = $V_{IN}$ to enable auto-PFM mode, or set MODE = GND to select forced PWM mode.  To use external sync feature, remove this jumper and apply an external clock between 2.75MHz and 3.25MHz on the center pin on the J4 header.

### Quick Setup Guide

1. Install jumper on J3, shorting EN to VIN.
2. Install jumper on J4, shorting MODE to VIN.
3. Connect power supply to J1, with voltage setting between 1.8V and 5.5V.
4. Connect electronic load to J2.
5. Place scope probes on VOUT testpoint, and other testpoints of interest.
6. Turn on the power supply.
7. Monitor the output voltage startup sequence on the scope. The waveforms will look similar to that shown in Figures 1 and 2.
8. Turn on the electronic load.
9. Measure the output voltage with the voltmeter. The voltage should regulate within data sheet spec limits.
10. To determine efficiency, measure input and output voltages at the Kelvin sense testpoints (S+ and S-) which are part of J1 and J2 headers. The bench power supply can be connected to the PVIN and GND headers on J1. The electronic load can be connected to the VOUT and GND headers on J2. Measure the input and output currents. Calculate efficiency based on these measurements.
11. To test external sync, remove the jumper at J4, then apply an external clock between 2.75MHz and 3.25MHz on the MODE input (the center pin of header J4).

## Typical Start-up Waveforms

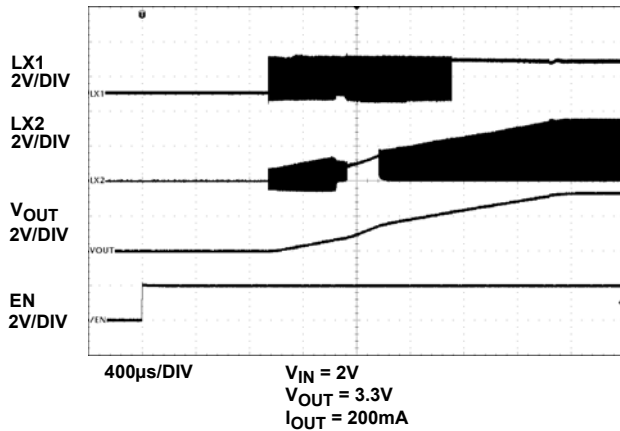


FIGURE 1. ISL91108 START-UP WITH  $V_{IN} = 2V$  and  $V_{OUT} = 3.3V$

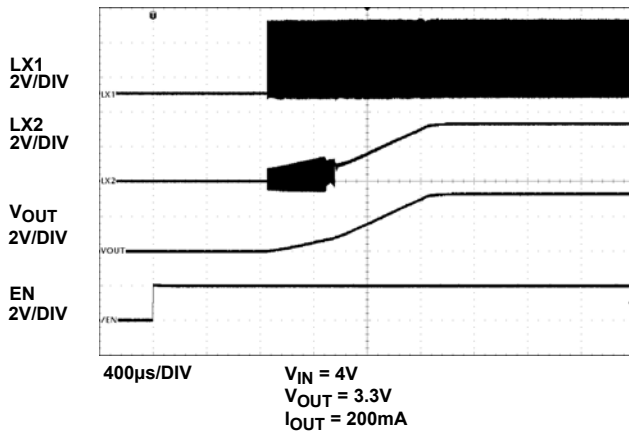


FIGURE 2. ISL91108 START-UP WITH  $V_{IN} = 4V$  and  $V_{OUT} = 3.3V$

## Output Voltage Programming

The ISL91108IIA-EVZ evaluation board uses resistors to program the output voltage. To change the output voltage, resistor R1 should be removed and replaced with a resistor value corresponding to the desired output voltage, as shown in Table 4. A precision resistor with 1% tolerance should be used.

TABLE 4. OUTPUT VOLTAGE PROGRAMMING

DESIRED OUTPUT VOLTAGE (V)	R1 RESISTOR VALUE (kΩ)
2.0	90.9
2.5	127
3.0	165
3.3	187
3.6	210
4.0	243
4.5	280
5.0	316

## ISL91108IIA-EVZ Evaluation Board Schematic

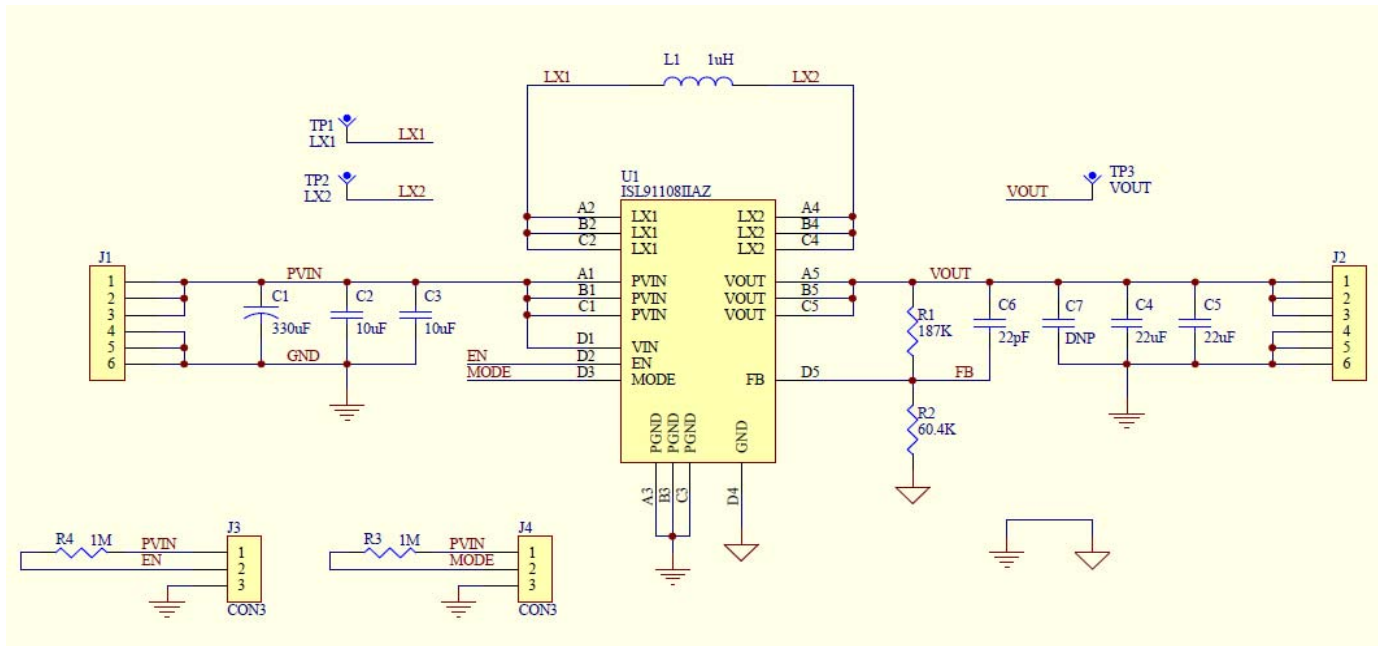


FIGURE 3. ISL91108IIA-EVZ EVALUATION BOARD SCHEMATIC

TABLE 5. ISL91108IIA-EVZ EVALUATION BOARD BILL OF MATERIALS

ITEM#	QTY	DESIGNATORS	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
1	1	U1	ISL91108IIAZ	W4x5.20 WLCSP	Intersil ISL91108 Buck-Boost Regulator with Adjustable Output Voltage	INTERSIL
2	1	L1	1µH	3.2mmx2.5mm	Power Inductor DFE322512C, 4.6A, 34mΩ	TOKO
3	1	C1	330µF	7343	Capacitor, Tantalum	ANY
4	2	C2, C3	10µF/16V/X5R	0603	Capacitor, Ceramic, GRM188R61C106MA73D	Murata
5	2	C4, C5	22µF/10V/X5R	0603	Capacitor, Ceramic, GRM188R61A226M	Murata
6	1	C6	22pF/50V/NPO	0402	Capacitor, Generic	ANY
7	1	C7	0.1µF	0402	Capacitor, Generic	ANY
8	1	R1	187kΩ, 1%	0402	Resistor, Generic	ANY
9	1	R2	60.4kΩ, 1%	0402	Resistor, Generic	ANY
10	2	R3, R4	1MΩ, 5%	0603	Resistor, Generic	ANY
11	2	J1, J2	HDR-6	HDR-6	Vert. Pin Header, 6-Pin, 0.1" Spacing, Generic	ANY
12	2	J3, J4	HDR-3	HDR-3	Vert. Pin Header, 3-Pin, 0.1" Spacing, Generic	ANY
13	3	TP1, TP2, TP3	SCOPEPROBE	SCOPEPROBE	Test Point, Scope Probe 131-5031-00	TEKTRONIX

## ISL91108IIN-EVZ Evaluation Board Schematic

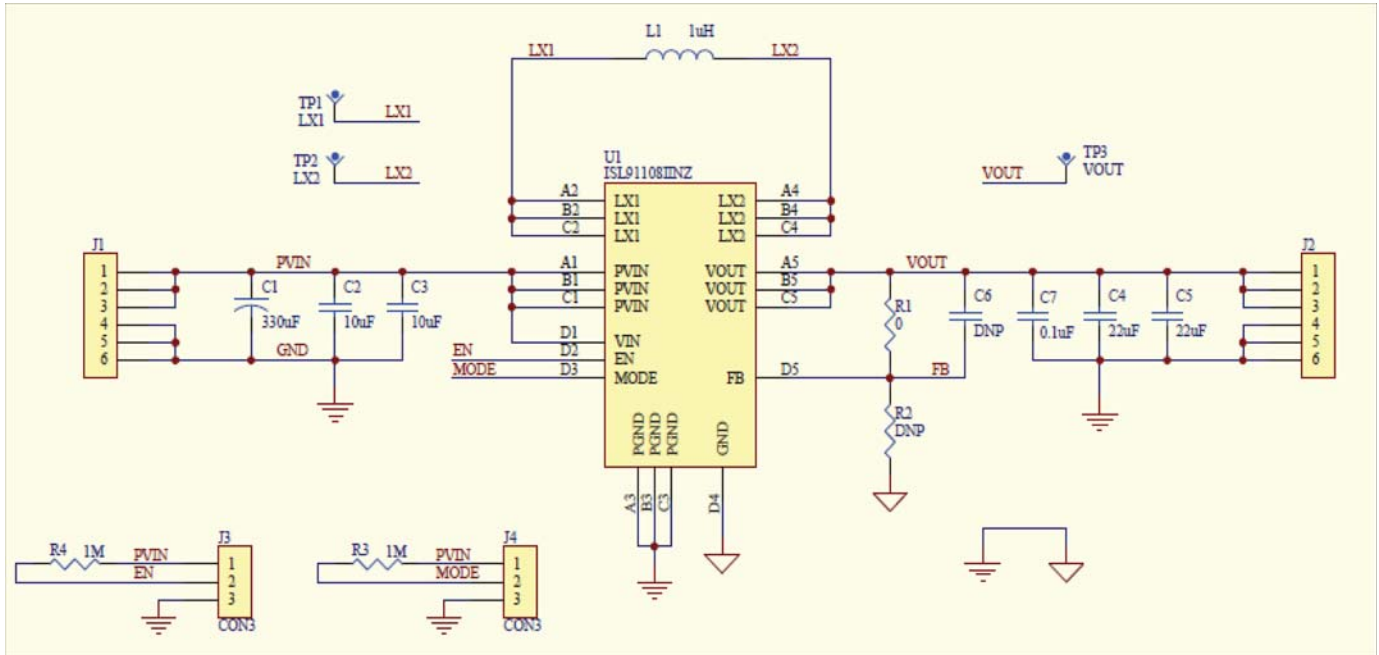


FIGURE 4. ISL91108IIN-EVZ EVALUATION BOARD SCHEMATIC

TABLE 6. ISL91108IIN-EVZ EVALUATION BOARD BILL OF MATERIALS

ITEM#	QTY	DESIGNATORS	PART TYPE	FOOTPRINT	DESCRIPTION	VENDORS
1	1	U1	ISL91108IINZ	W4x5.20 WLCSP	Intersil ISL91108 Buck-Boost Regulator with Fixed 3.3V Output Voltage	INTERSIL
2	1	L1	1µH	3.2mmx2.5mm	Power Inductor DFE322512C, 4.6A, 34mΩ	TOKO
3	1	C1	330µF	7343	Capacitor, Tantalum	ANY
4	2	C2, C3	10µF/16V/X5R	0603	Capacitor, Ceramic, GRM188R61C106MA73D	Murata
5	2	C4, C5	22µF/10V/X5R	0603	Capacitor, Ceramic, GRM188R61A226M	Murata
6	1	C6	DNP	0402		ANY
7	1	C7	0.1µF	0402	Capacitor, Generic	ANY
8	1	R1	0Ω	0402	Resistor, Generic	ANY
9	1	R2	DNP	0402		ANY
10	2	R3, R4	1MΩ, 5%	0603	Resistor, Generic	ANY
11	2	J1, J2	HDR-6	HDR-6	Vert. Pin Header, 6-Pin, 0.1" Spacing, Generic	ANY
12	2	J3, J4	HDR-3	HDR-3	Vert. Pin Header, 3-Pin, 0.1" Spacing, Generic	ANY
13	3	TP1, TP2, TP3	SCOPEPROBE	SCOPEPROBE	Test Point, Scope Probe 131-5031-00	TEKTRONIX

# ISL91108 Evaluation Board Layout

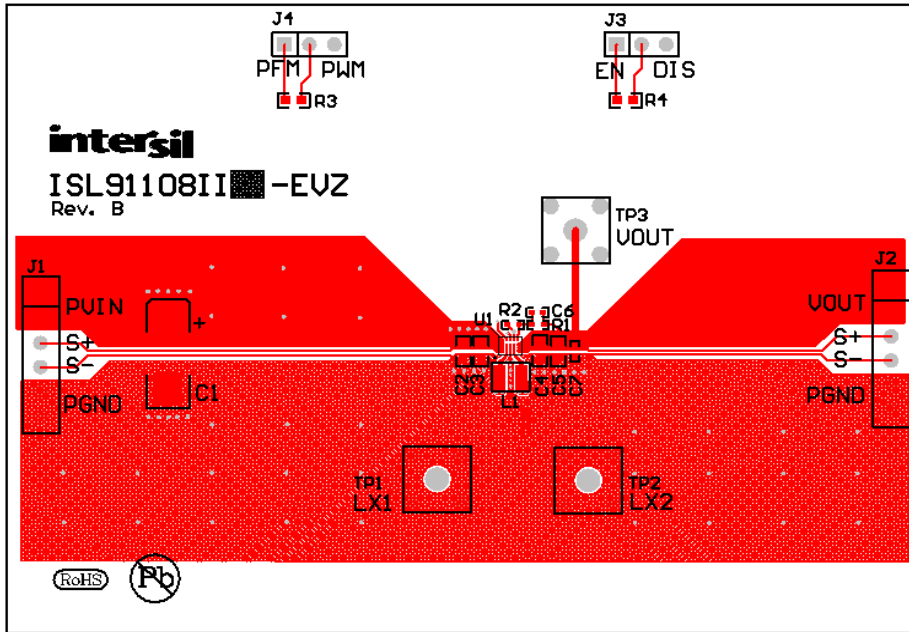


FIGURE 5. ISL91108 EVALUATION BOARD LAYOUT

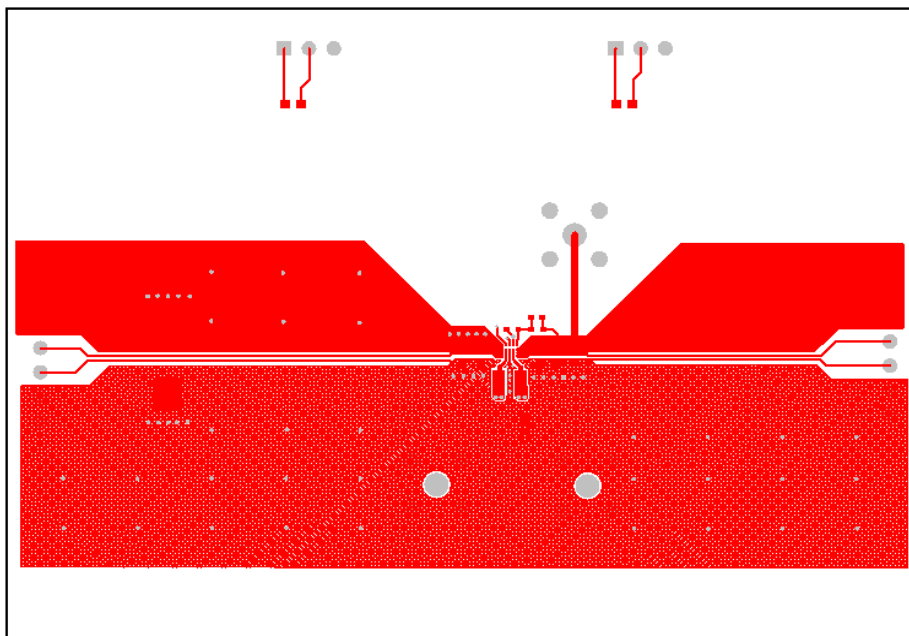


FIGURE 6. TOP LAYER

# ISL91108 Evaluation Board Layout (Continued)

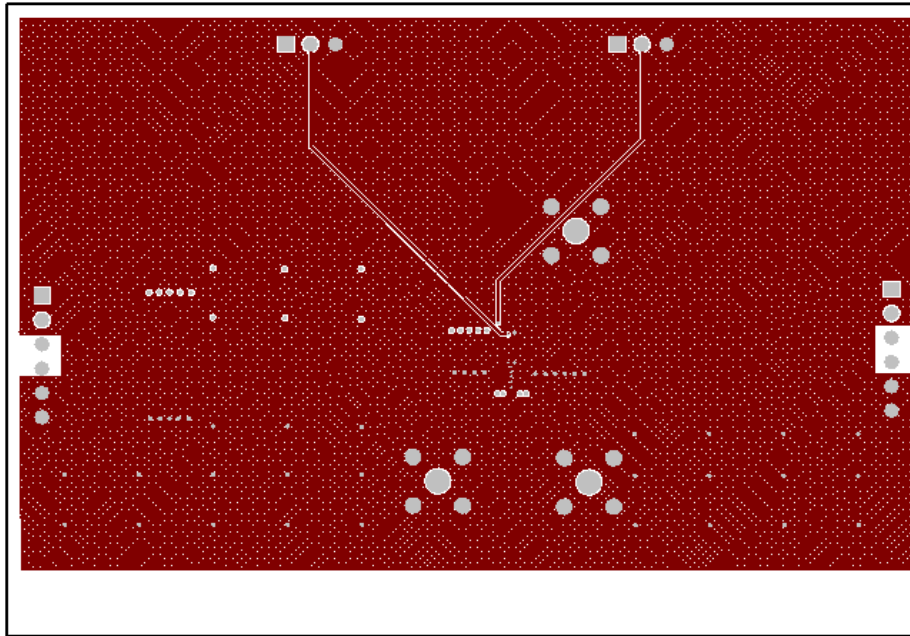


FIGURE 7. MID LAYER

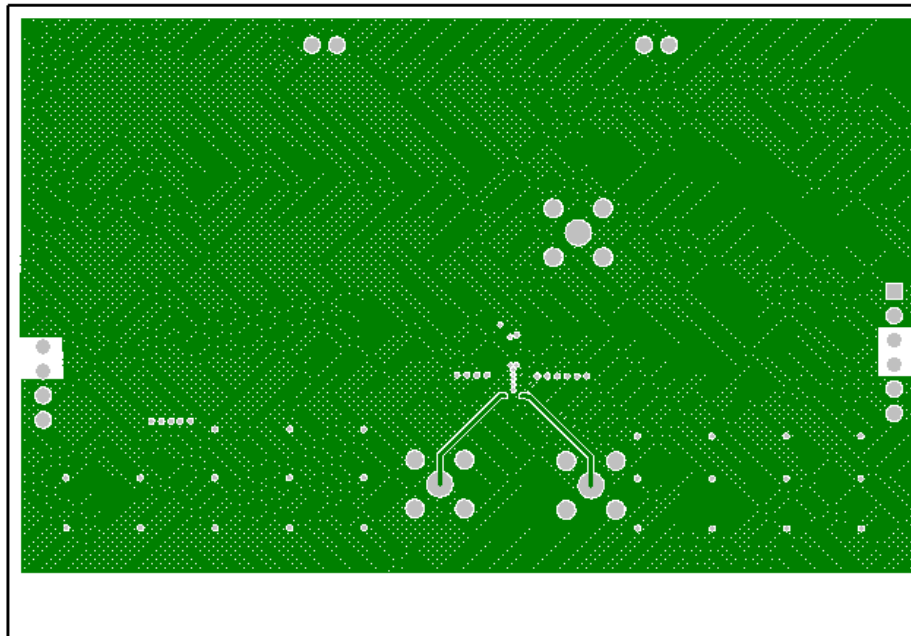


FIGURE 8. MID LAYER 2

## ISL91108 Evaluation Board Layout (Continued)

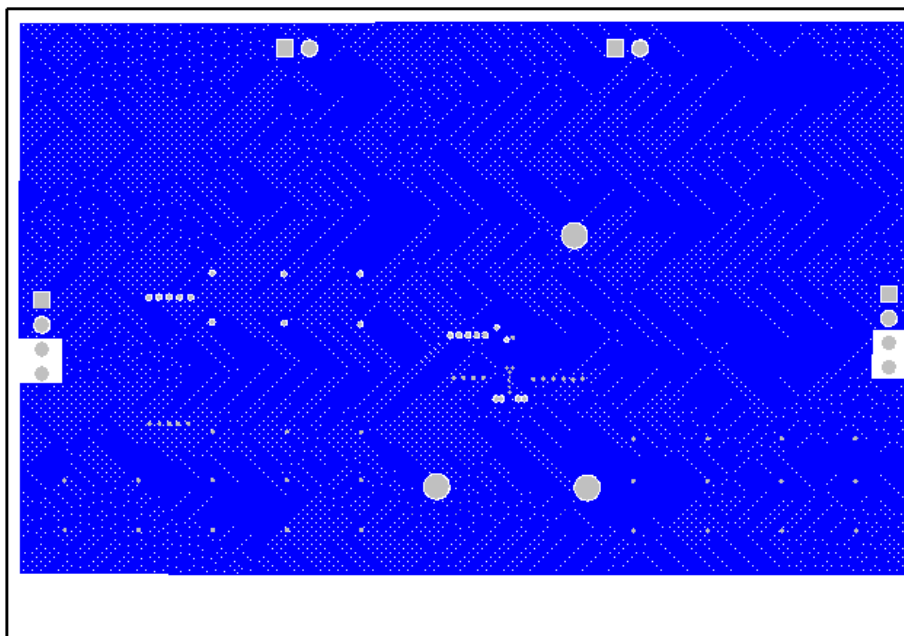


FIGURE 9. BOTTOM LAYER

## 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