

ISL32704EVAL2Z

User's Manual: Evaluation Board

Industrial Precision

1. Overview

The ISL32704EVAL2Z board enables the evaluation of the [ISL32704EIBZ](#) isolated, half-duplex RS-485 transceiver in a typical bus node application, used in isolated industrial networks.

1.1 Specifications

This board has been configured and optimized for the following operating conditions:

- Up to 4Mbps data rate
- $V_{CC} = 3.3V$

1.2 Ordering Information

Part Number	Description
ISL32704EVAL2Z	ISL32704EIBZ evaluation board

1.3 Key Features

- Drive capability of up to 32x1 UL transceivers
- Isolated 3.3V to 5V DC/DC converter with regulated output

1.4 Related Literature

- For a full list of related documents, visit our website
 - [ISL32704E](#) product page

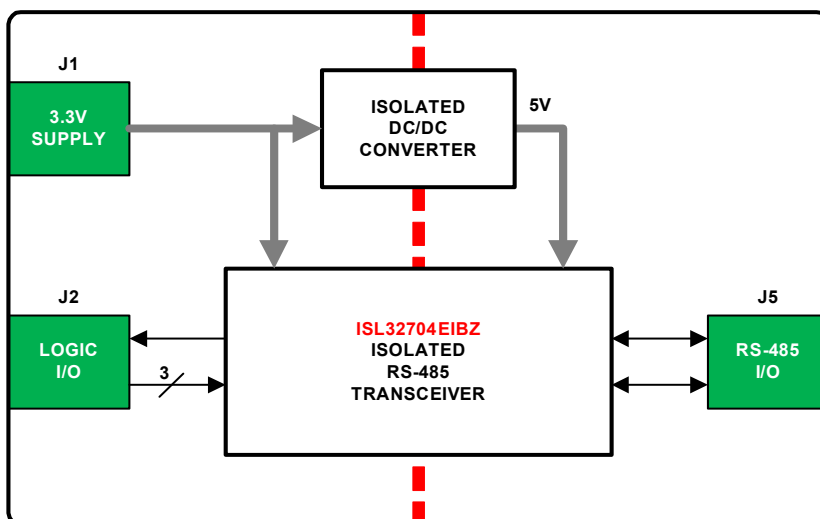


Figure 1.1 Block Diagram

2. Functional Description

The ISL32704EIBZ is an isolated, 4Mbps, half-duplex RS-485 transceiver. The device incorporates a patented refresh circuit to maintain the correct output state with respect to data input. At power-up, the bus outputs follow the truth tables shown in [Tables 2.1](#) and [2.2](#).

The DE input should be held low during power-up to prevent false drive data pulses on the bus. This is accomplished by connecting the DE using a 10k Ω pull-down resistor to GND1.

This transceiver uses a differential input receiver for maximum noise immunity and common-mode rejection. Input sensitivity is $\pm 200\text{mV}$, as required by the RS-485 specification.

The receiver input resistance meets the RS-485 “Unit Load” (UL) requirement of 12k Ω minimum. The receiver includes a “fail-safe if open” function that ensures a high-level receiver output if the receiver inputs are unconnected (floating). The receiver output is tri-statable through the active low $\overline{\text{RE}}$ input.

The RS-485 driver is a differential output device that delivers at least 1.5V across a 54 Ω purely differential load. The driver features low propagation delay skew to maximize bit width and to minimize EMI.

The driver in the ISL32704E is tri-statable through the active high DE input. The outputs of the ISL32704E driver are not slew rate limited, so faster output transition times allow data rates of at least 4Mbps.

Important Notice:

For convenience, an isolated DC/DC converter is used to provide the power supply across the isolation barrier. Its isolation ratings however, are lower than those of the transceiver. Therefore, it must be ensured that the ground potential difference between the left side (GND1, GND2) and the right side (GND3, GND4) of the board remain below 50VAC (see [Figure 3.1](#)).

Table 2.1 Truth Table - Receiving

Receiving			
Inputs			Output
RE	DE	A-B	R
0	0	$\geq 0.2\text{V}$	1
0	0	$\leq -0.2\text{V}$	0
0	0	Inputs Open/Shorted	1
1	1	X	High-Z
1	0	X	High-Z

Table 2.2 Truth Table - Transmitting

Transmitting					
Inputs			Outputs		
RE	DE	D	ISODE	B	A
X	1	1	1	0	1
X	1	0	1	1	0
0	0	X	0	High-Z	High-Z
1	0	X	0	High-Z	High-Z

3. PCB Layout Guidelines

Both supplies, V_{DD1} and V_{DD2} , must be bypassed with 100nF ceramic capacitors. These should be placed as close as possible to the supply pins for proper operation.

3.1 ISL32704EVAL2Z Evaluation Board

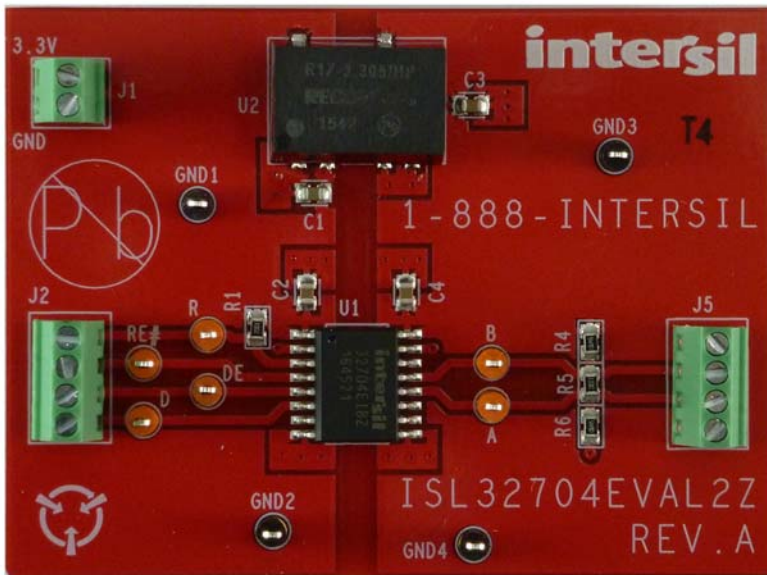


Figure 3.1 Top Side



Figure 3.2 Bottom Side

3.2 ISL32704EVAL2Z Circuit Schematic

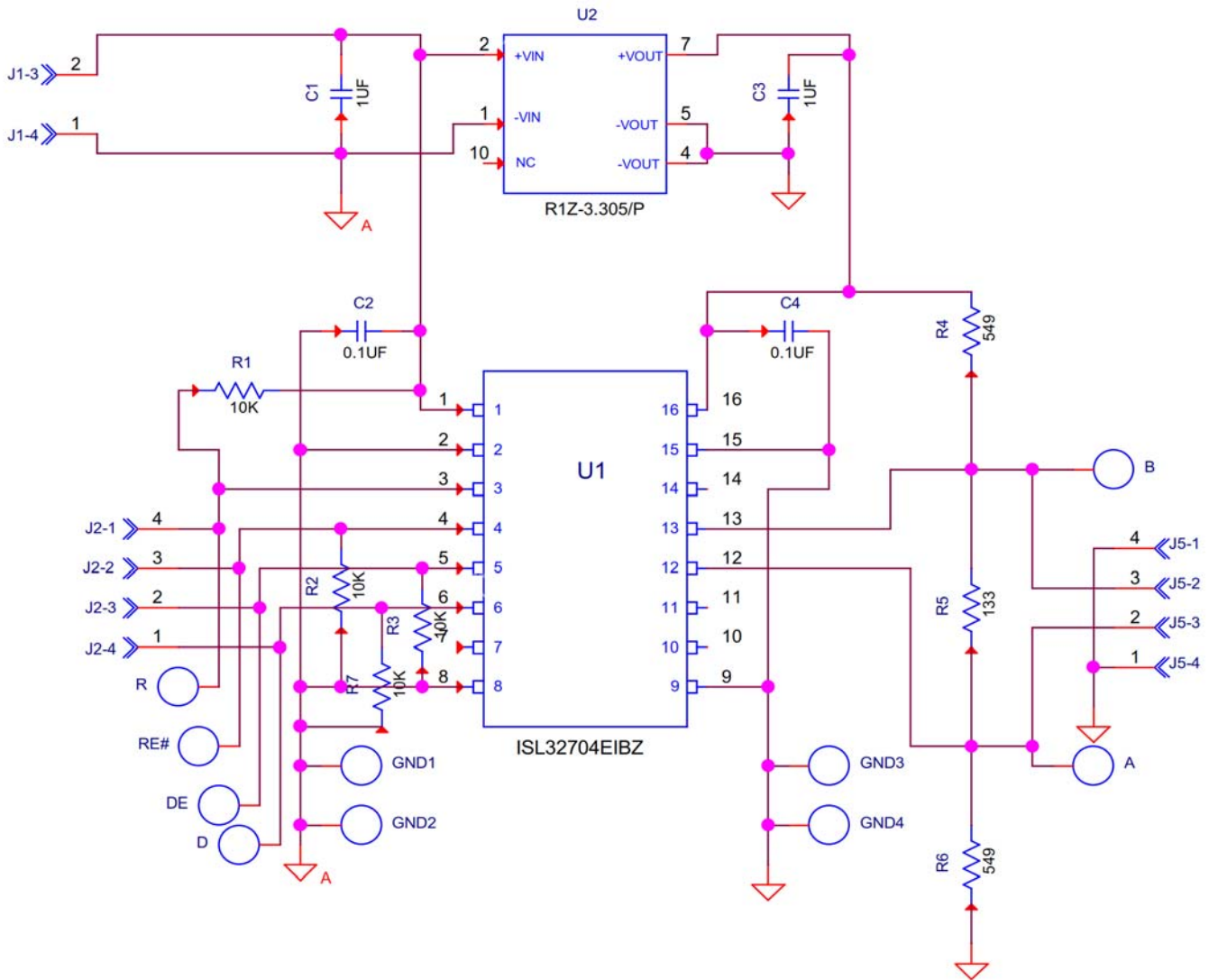


Figure 3.3 ISL32704EVAL2Z Schematic

3.3 Bill of Materials

Manufacturer Part	Qty	Reference Designator	Description	Manufacturer
ISL32704EVAL2ZREVAPCB	1		PWB-PCB, ISL32704EVAL2Z, REVA, ROHS	IMAGINEERING INC
ISL32704EIBZ	1	U1	ISOLATED, 4Mbps, HALF-DUPLEX RS-485 TRANSCEIVER, ROHS	Intersil
R1Z-3.305/P	1	U2	ISOLATED 3.3V-TO-5V DC/DC CONVERTER WITH REGULATED OUTPUT, ROHS	RECOM-POWER
CR0805-8W-1002FT (Pb-Free)	4	R1 - R3, R7	RES, SMD, 0805, 10k, 1/8W, 1%, TF, ROHS	VENKEL
RK73H2AT1330F	1	R5	RES, SMD, 0805, 133Ω, 1/8W, 1%, TF, ROHS	KOA
RC0805FR-07549RL	2	R4, R6	RES, SMD, 0805, 549Ω, 1/8W, 1%, TF, ROHS	YAGEO
C0805X5R160-106KNE	2	C1, C3	CAP, SMD, 0805, 10μF, 16V, 10%, X5R, ROHS	VENKEL
ECJ-2VB1E104K	2	C2, C4	CAP, SMD, 0805, 0.1μF, 25V, 10%, X7R, ROHS	PANASONIC
1725656	1	J1	CONN-TERMINAL BLK, TH, 2P, 6A, 125V, 20-30AWG, 2.54mm, ROHS	PHOENIX CONTACT
1725672	2	J2, J5	CONN-TERMINAL BLOCK, 4POS, 0.1, 26-20AWG, 63V, 6A, ROHS	PHOENIX CONTACT
5001	4	GND1 - GND4	CONN-MINI TEST PT, VERTICAL, BLK, ROHS	KEYSTONE
5003	6	A, B, D, R, DE, RE#	CONN-MINI TEST POINT, VERTICAL, ORG, ROHS	KEYSTONE
S-2261	1	Place assy in bag	BAG, STATIC, 4x6, ZIPLOC, ROHS	ULINE
LABEL-DATE CODE	1	AFFIX TO BACK OF PCB	LABEL-DATE CODE_LINE 1: YRWK/REV#, LINE 2: BOM NAME	INTERSIL

3.4 Board Layout

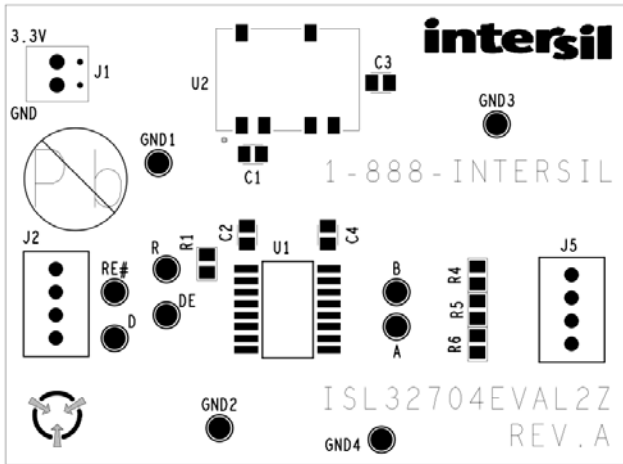


Figure 3.4 Silkscreen Top

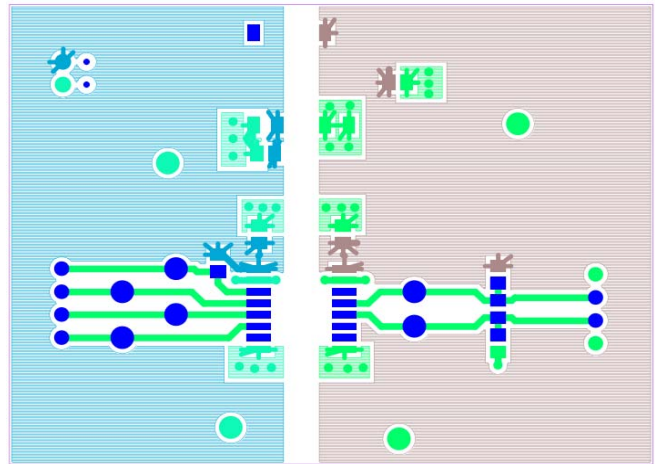


Figure 3.5 Top Layer

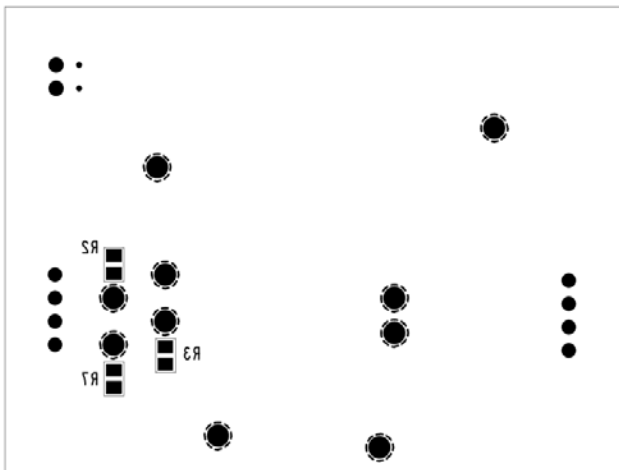


Figure 3.6 Silkscreen Bottom

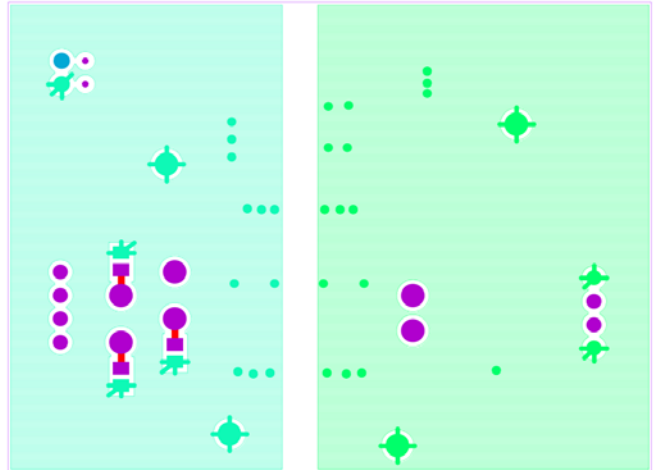


Figure 3.7 Bottom Layer

4. Typical Performance Curves

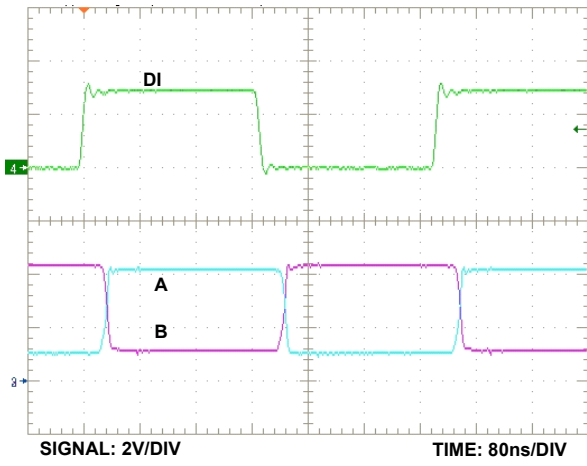


Figure 4.1 Transmit Mode

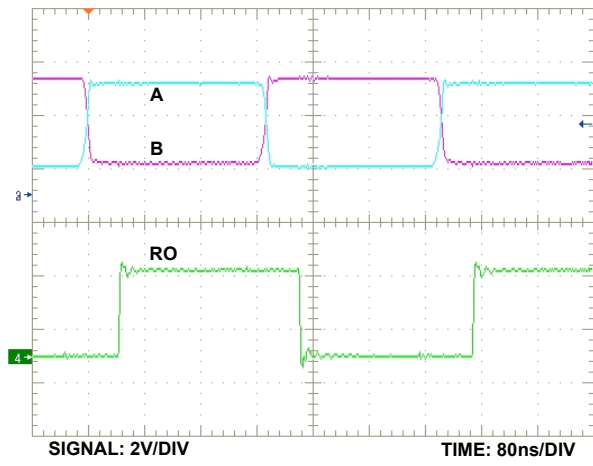


Figure 4.2 Receive Mode

5. Revision History

Rev.	Date	Description	
		Page	Summary
0.00	Apr 3, 2017	—	Initial release

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

ISL32704EVAL2Z User's Manual: Hardware

Publication Date: Rev.0.00 Apr 3, 2017

Published by: Renesas

ISL32704EVAL2Z

