RX 200 Series

RSCAN-UART Bridge

R01AN3474EU0100
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Sep 09, 2016

Introduction

This document describes an application which captures messages detected on a CAN network and sends them to a UART terminal for display. The UART terminal may also type in a command which allows a message to be sent on the CAN network.

NOTE: When developing an application with the RSKRX231 and the E1 emulator, and the E1 emulator is powering the target board, be sure that it is supplying 5.0V and not 3.3V (specified in Debug Configuration) or the RSCAN will not operate properly.

Target Device

The following is a list of devices that are currently supported by this application:

- RX231 Group

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Related Documents

- RSCAN Module Using Firmware Integration Technology (R01AN2805EU)
- SCI Multi-Mode Module Using Firmware Integration Technology (R01AN1815EU)
- Board Support Package Firmware Integration Technology Module (R01AN1685EU)
- Firmware Integration Technology User's Manual (R01AN1833EU)
- Adding Firmware Integration Technology Modules to Projects (R01AN1723EU)
- Adding Firmware Integration Technology Modules to CubeSuite+ Projects (R01AN1826EJ)

Contents

1. Overview

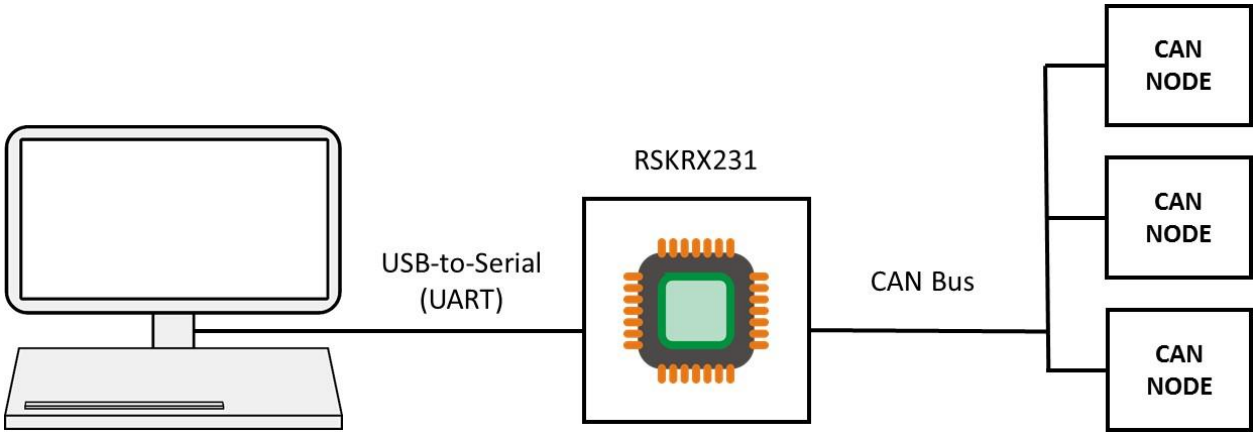
This application is a simple demo which displays messages received over a CAN network on a terminal display. Messages typed in at a terminal can also be transmitted on the CAN network.

The UART interface by default communicates at 115k baud, 1 stop, and no parity over the USB-to-Serial port on the RSKRX231 board. The CAN network by default communicates at 500kHz.

This program begins by sending dummy messages to the terminal until an 's' (stop) is received. This is to ensure that the terminal is connected properly before continuing. Once this is done, the CAN driver is initialized and any CAN network messages received are immediately sent to the terminal.

Typing the character '?' or 'm' (menu) at the terminal shows commands available for processing. Whenever a character is received from the terminal, all incoming CAN network messages are ignored so UART communications are not interfered with. Normal CAN processing continues when the 'r' (resume) command is received or when a message from the terminal is sent to the CAN network.

The 'o' command indicates if any internal message overflow has been detected by this application. Some minor configuration adjustments can be made to alleviate this (Section 2.3).

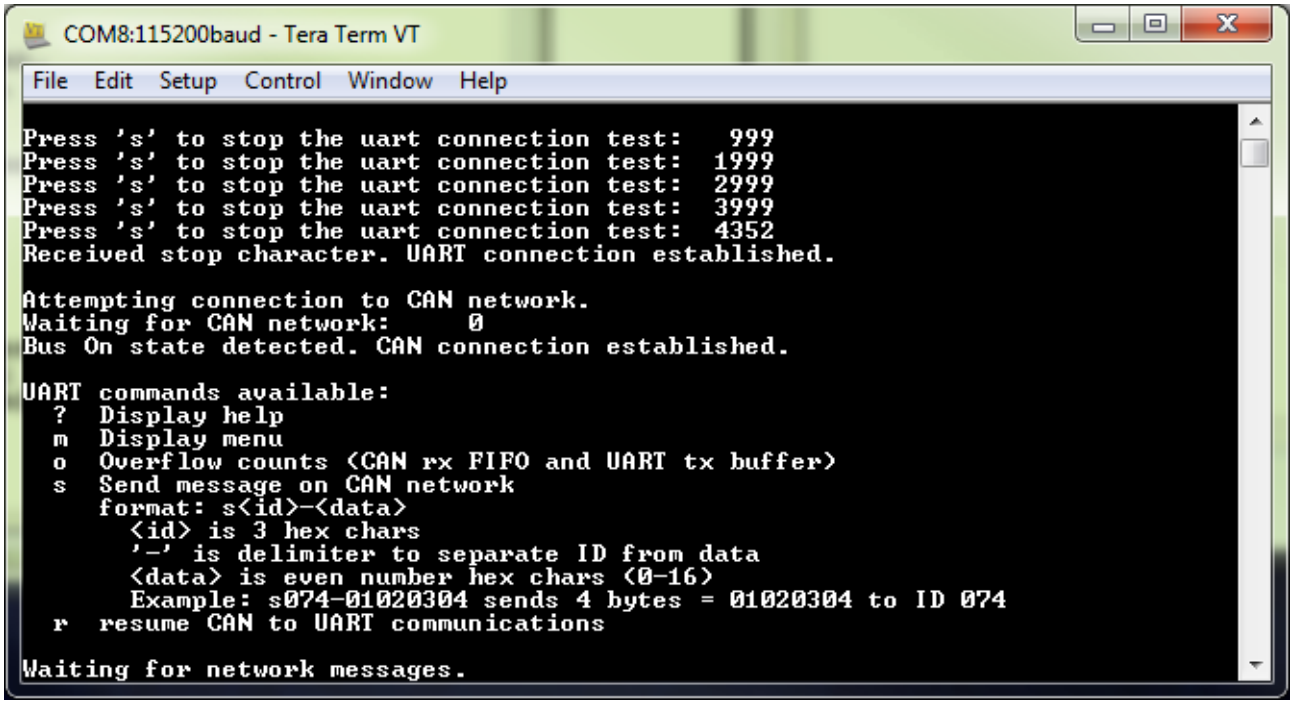


2. Application Operation

2.1 Establishing Communications

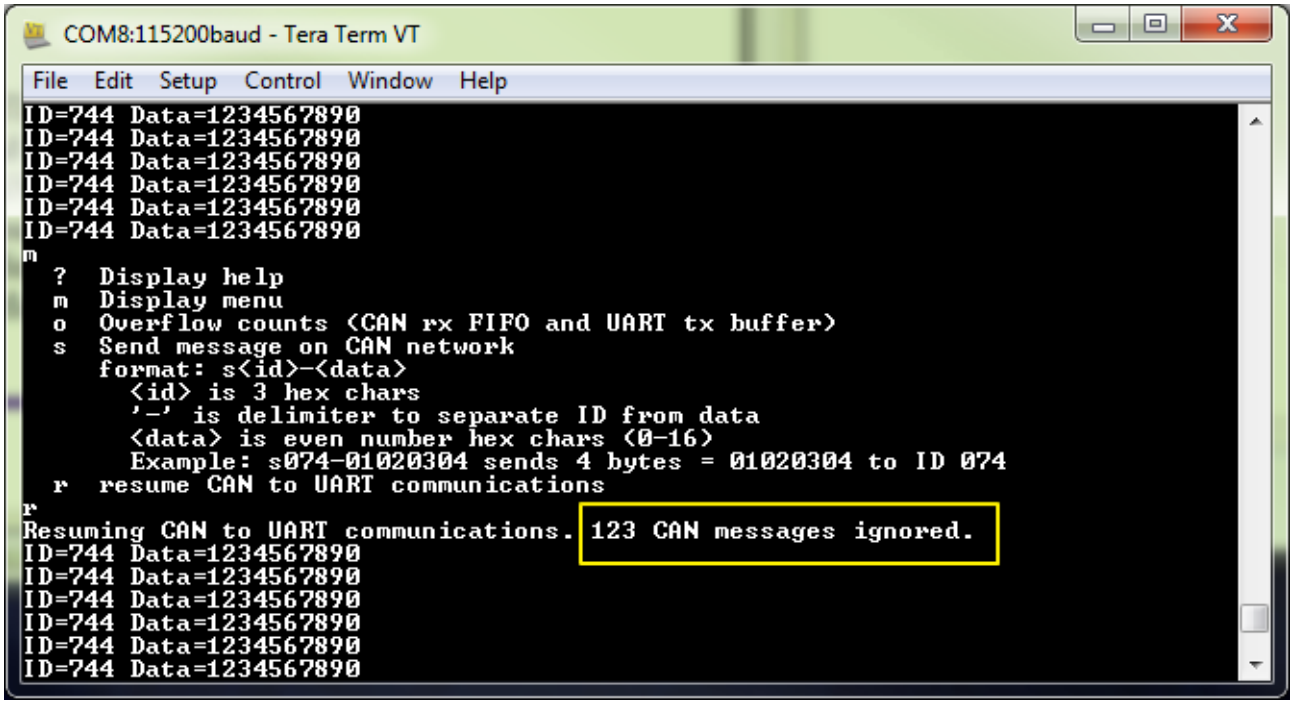
The UART interface by default communicates at 115k baud, 1 stop, and no parity over the USB-to-Serial port on the RSKRX231 board (USB connector next to power jack). If a different configuration is desired, modify the settings in init_uart() in the uart.c file. The CAN network by default communicates at 500kHz. If a different rate is desired, modify the settings in init_can() in the can.c file. The application by default displays all messages detected on the CAN network. If only a subset of messages is desired, modify the receive rule filter in init_can() in the can.c file.

This program begins by sending dummy messages to the terminal until an 's' (stop) is received. When the ‘s’ is received, it is assumed that the board and the host are connected properly. At this point, the CAN network is checked to verify that it is not in a Bus Off state (255+ errors detected). If a Bus Off state is not detected, the RSCAN peripheral and CAN network (if connected) is assumed to be operating properly. Any messages detected on the CAN network will automatically be sent to the terminal. **Be sure the MCU is powered at 5V (not 3.3V) for proper operation!**



2.2 UART Command Operation

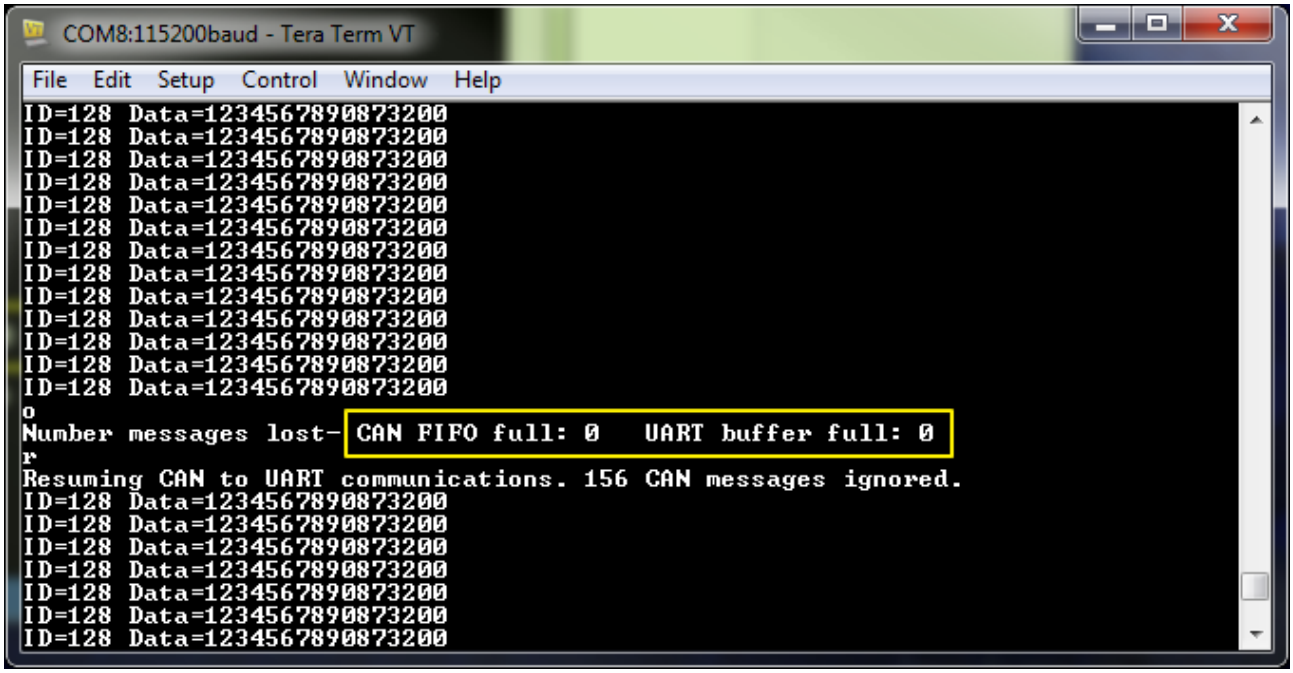
Whenever a valid character is received from the terminal, all incoming CAN network messages are ignored so UART communications are not interfered with. Normal CAN processing continues when the 'r' (resume) command is received or when a message from the terminal is sent to the CAN network. The number of CAN network messages ignored are displayed upon resumption of normal CAN message monitoring.



2.3 Handling Message Overflow

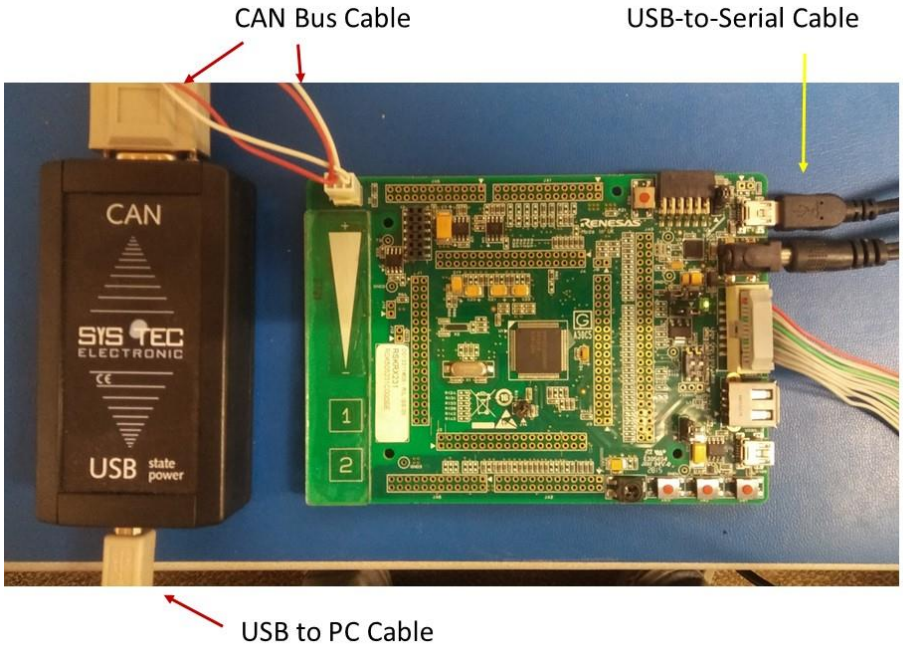
The 'o' command indicates if any internal overflow has been detected by this app. If the UART transmit buffer overflows, increasing the size of SCI_CFG_CH5_TX_BUFSIZ in r_sci_config.h or increasing the baud rate (Section 2.1) will reduce or eliminate this. Note that there may be a small overflow at startup depending upon the amount of CAN traffic versus UART speed.

If the CAN receive-FIFO overflows, the only option is to increase the depth of the receive FIFO. **For advanced users only:** The depth of the receive FIFO in the RSCAN driver can be increased by changing the RSCAN.RFCC0.BIT.RFDC value in R_CAN_ConfigFIFO (currently has a depth of 4). Note that increasing the depth means making use of reserved buffers allocated for other possible uses. This includes 4 for receive mailboxes, 4 for another receive FIFO, and 4 for a transmit FIFO. This makes the total depth possible 16.

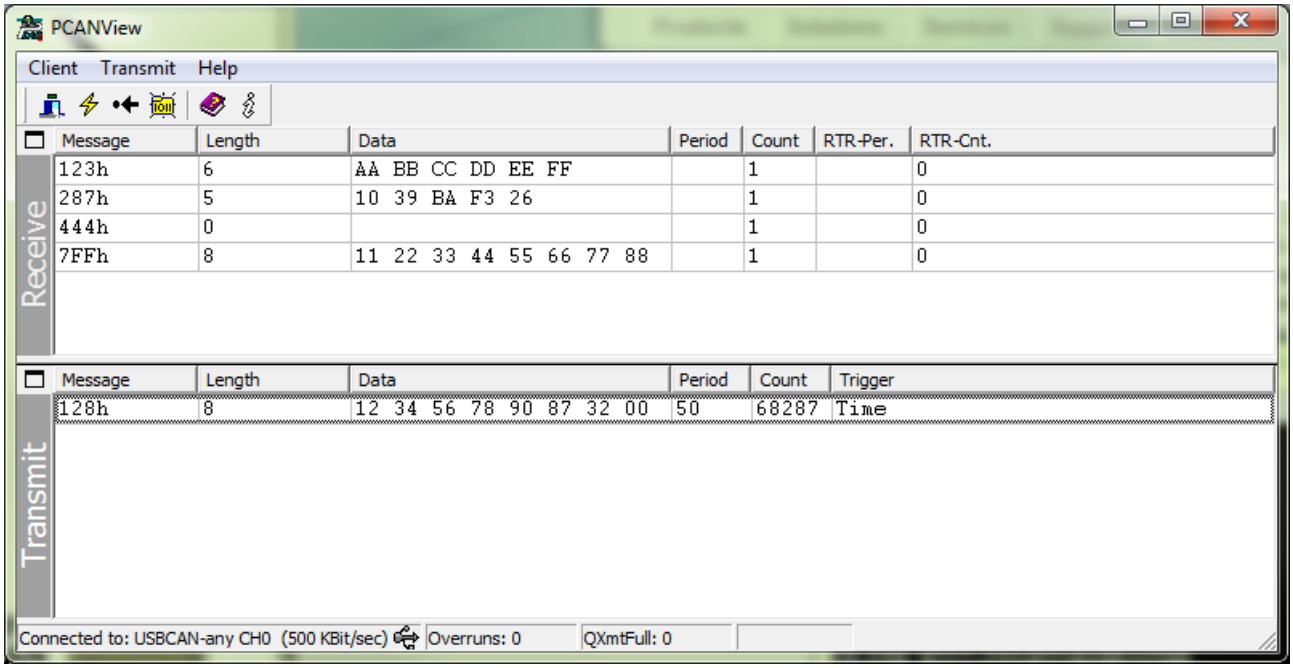


3. Demonstration with the SYS TEC CAN Bus Analyzer

A convenient way to demonstrate the RSCAN-UART Bridge is by using a CAN bus analyzer such as the SYS TEC USB-CANmodul1 (www.systec-electronic.com). This is the “CAN sniffer” that comes with the Renesas CAN development kits (such as the older Flash Over CAN r01an0235eu), and can also be ordered online directly from SYS TEC, Germany.



The sniffer acts just like this application- it displays messages detected on the CAN network and can send a message (repeatedly if desired) as well. Their GUI runs on Windows and the sniffer is connected via USB.



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Revision Record

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Sep 09, 2016	—	Initial release

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of an MPU or MCU in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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Renesas Electronics America Inc.
2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

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: +44-1628-585-100, Fax: +44-1628-585-900

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, P. R. China 200333
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 II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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