RL78/L12

Utilising Low Voltage Detection (LVD) for e2studio

R01AN1587EG0100
Rev.1.00
Nov 01, 2013

Introduction

The purpose of this Application Note is to show the user how to add the associated RL78/L12 sample code to a new or existing e2studio workspace; as well as give an explanation of what the sample code does.

The sample code demonstrates usage of the Low Voltage Detector (LVD) function. The LVD circuit compares the supply voltage (VDD) with the detection voltage (VLVIH, VLVIL), and generates an internal interrupt signal.

Target Device

RL78/L12

Development environment

IDE: e2studio
Compiler: GNURL78 v12.02 -ELF
Hardware: Renesas Starter Kit for RL78/L12

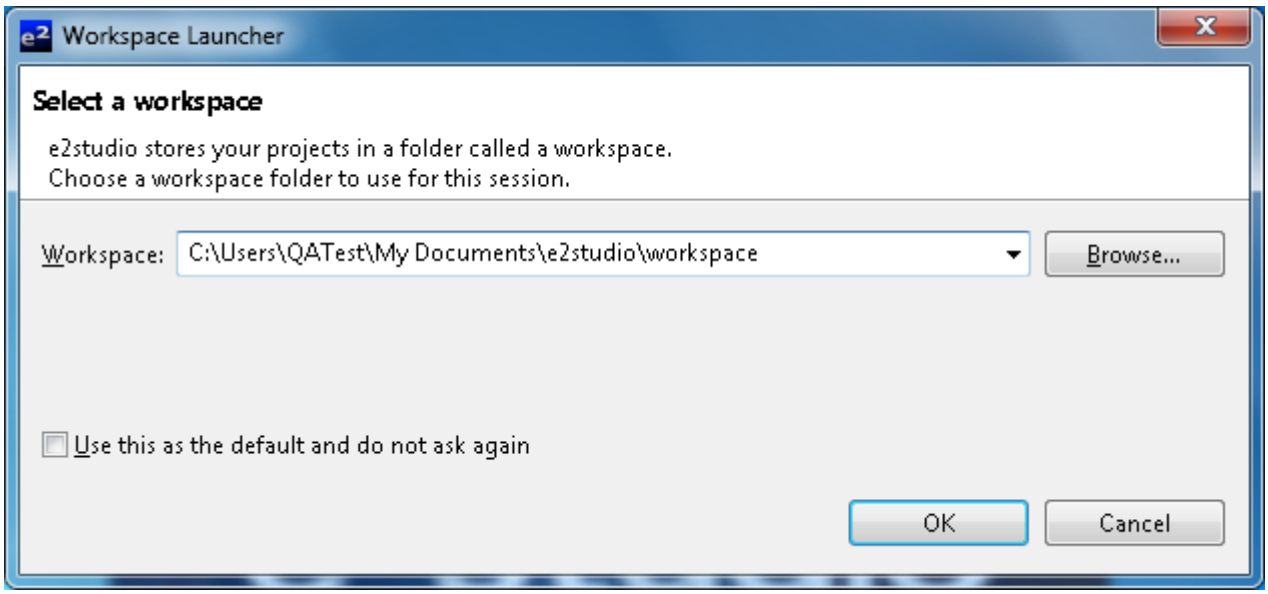
Contents

1. Installation

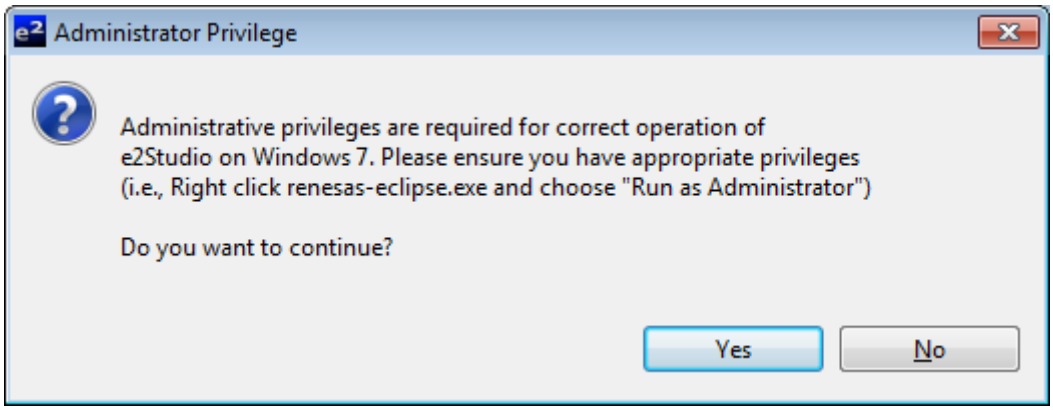
This section assumes e2studio IDE is already installed on the user's personal computer (PC). Create a new folder and name it as 'RSKRL78L12_Workspace'. Copy the zipped file 'an_r01an1587eg0100_rl78l12_lvd.zip', available in the Application Note package downloaded from the website, to this folder. Extract the 'an_r01an1587eg0100_rl78l12_lvd.zip' file to the RSKRL78L12_Workspace folder.

2. Creating the Project Workspace

Open e2studio IDE by clicking the Windows Start button, select All Programs > Renesas Electronics e2studio > Renesas e2studio.



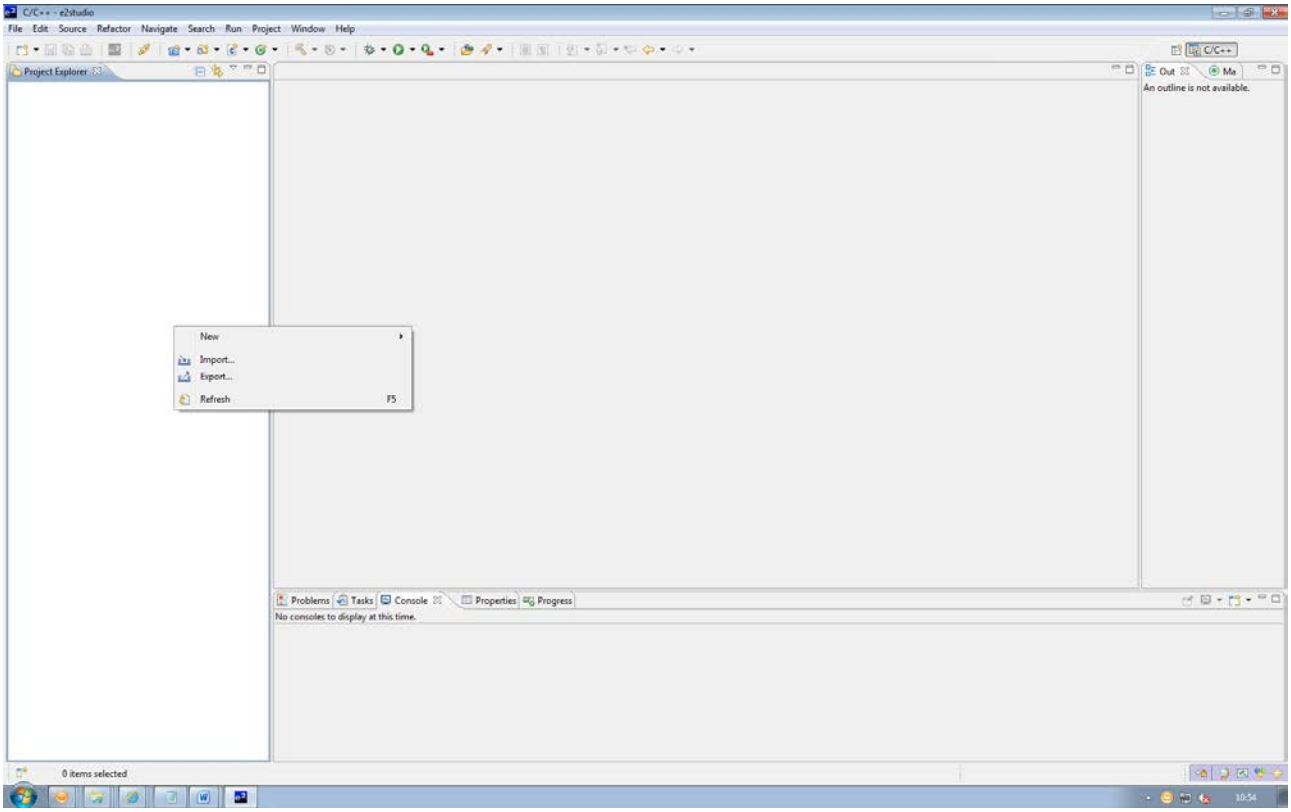
Select <OK>.



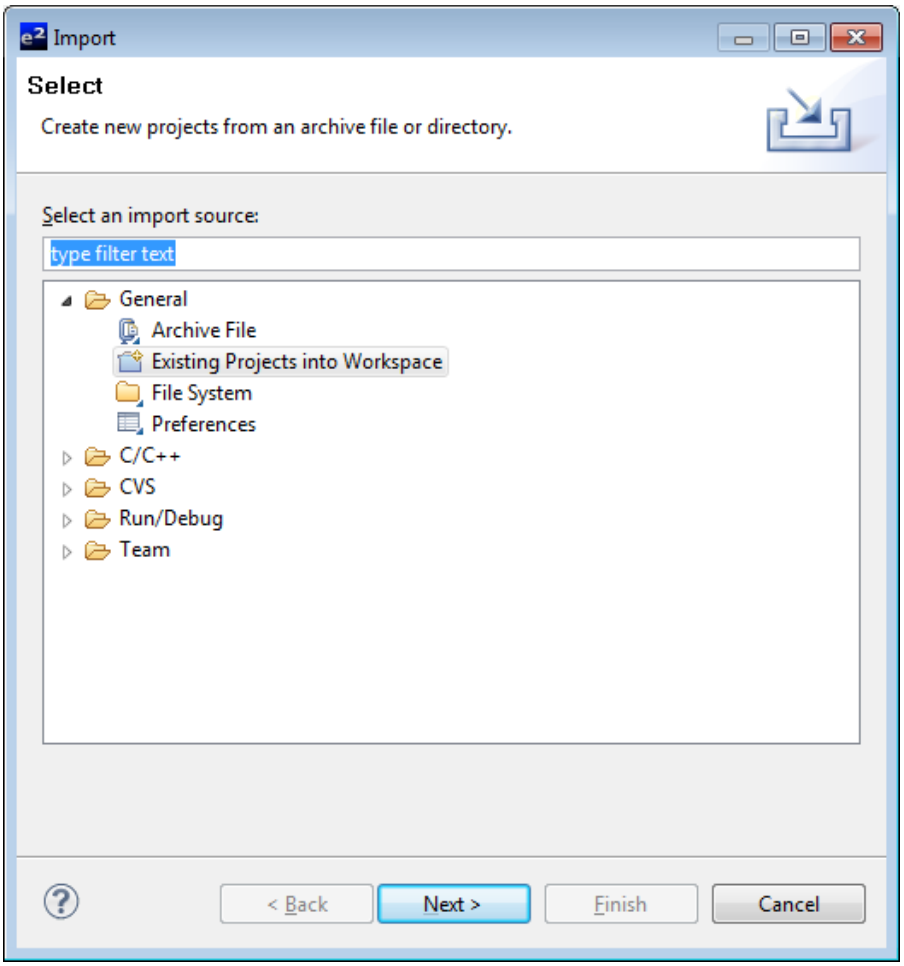
Select <Yes> to Administrator Privilege dialog.

On the welcome screen select ‘Go to the Workbench’ icon as shown above.

1. Once the e2studio environment has initialised, right click in the project explorer window and click <Import…>



2. The Import dialog will now appear. Expand the “General” folder icon, and select “Existing Projects into Workspace”, then click ‘Next’.

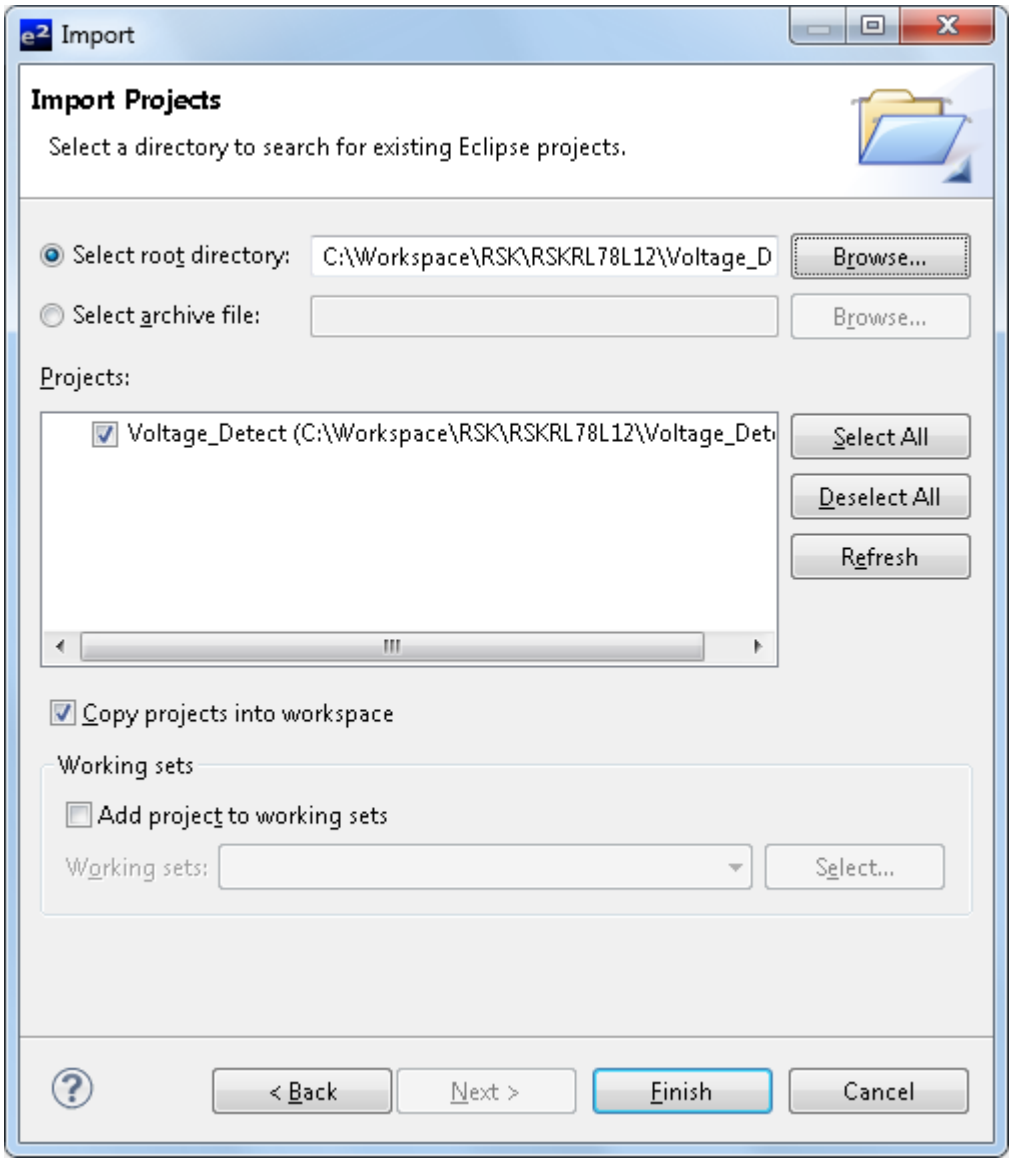


3. The Import Dialog will now appear and specify the project to import. Click the “Browse” button and locate the directory: C:\Workspace\RSK\RSKRL78L12.

   Navigate to the unzipped Voltage_Detect folder located in RSKRL78L12 Workspace folder.
   Select the Voltage_Detect folder.

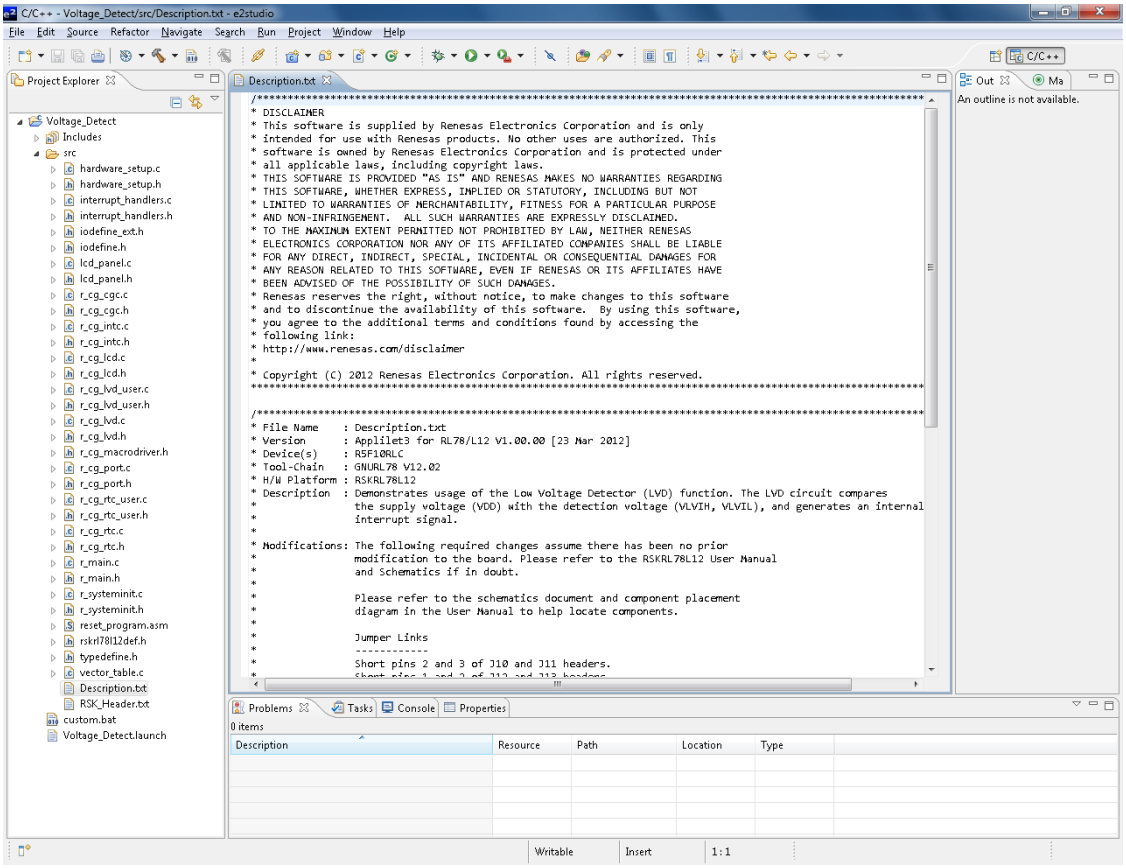
   And also ensure that the ‘Copy projects into workspace’ option is ticked, and then click <Finish>

   The IDE e2studio will load the project.


Import
Import Projects
Select a directory to search for existing Eclipse projects.
Select root directory:
C:\Workspace\RSK\RSKRL78L12\Voltage_D
Browse...
Select archive file:
Browse...
Projects:
Voltage_Detect (C:\Workspace\RSK\RSKRL78L12\Voltage_Det
Select All
Deselect All
Refresh
Copy projects into workspace
Working sets
Add project to working sets
Working sets:
Select...
< Back
Next >
Finish
Cancel

3. Opening Sample Code and Source Files

Once the project has been opened, the source code and all dependant files can be opened in the editor by expanding the folders in the Project Tree window and double clicking the files listed. All files have been grouped according to their file type.



4. Source Code Functionality

The source code project is specifically written to run on the appropriate RSK. However this source code can be useful as an example even without the RSK.

The project was written using source files containing API functions generated using Code Generator. The project will contain a C source file ‘r_main.c’. This source file includes the C function main(). All source files and dependent files whose filenames are prefixed with ‘r_’ were generated using Applilet3 (Application Leading Tool). For more information, refer to Description.txt.

5. Code Execution

Demonstrates usage of the Low Voltage Detector (LVD) function. The LVD circuit compares the supply voltage (VDD) with the detection voltage (VLVIH, VLVIL), and generates an internal interrupt signal.

Modifications:

The following required changes assume there has been no prior modification to the board. Please refer to the RSKRL78L12 User Manual and Schematics if in doubt.

Please refer to the schematics document and component placement diagram in the User Manual to help locate components.

Jumper Links

Short pins 2 and 3 of J10 and J11 headers.

Short pins 1 and 2 of J12 and J13 headers.

Connect a variable 5V-regulated power supply to the PWR connector.

Instructions :

1. Compile the sample code, and download to the RSK. Click the 'Debug Icon' button to start program execution. Click again if the program stops at main().

2. Observe the incrementing timer showing the hours, minutes and seconds count in the following format:

HH:MM

SS

The heart symbol will continuously flash as long as the voltage level is set above the low detection voltage level (VLVIL) 3.98V. The battery symbol will show a full 4 bars whilst the level is above 3.98V. 'VDET' will be shown at the bottom of the LCD panel.

3. Slowly reduce the supply voltage just below 3.98V. The battery will show 3 bars. The heart symbol is turned off and the timer continues running. 'VLOW' will be shown at the bottom of the LCD panel.

4. Slowly increment the supply voltage. When the voltage rises above the high detection voltage level (VLVIH) 4.06V, the battery will show full bars and the heart symbol will resume flashing. 'VDET' will be shown at the bottom of the LCD panel.

5. Go to step 3 to repeat the test.

6. Website, Inquiries and Support

Renesas Electronics Website
http://www.renesas.com/
Inquiries
http://www.renesas.com/inquiry
Support
http://www.renesas.com/rskrl78l12

Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	November 01, 2013	—	First edition issued

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 accord 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 type 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.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

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: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, 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 906, 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 Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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