# CubeSuite+ Simulator for 78K0R/Kx3 V3.00.03

Release Note

R20UT2511EJ0100
Rev.1.00
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## Contents

# Chapter 1. Target Devices

Below is a list of devices supported by the 78K0R/Kx3 simulator.

| Nickname | Device name |
|---|---|
| 78K0R/KE3 | μPD78F1142, μPD78F1143, μPD78F1144, μPD78F1145, μPD78F1146,<br>μPD78F1142A, μPD78F1143A, μPD78F1144A, μPD78F1145A, μPD78F1146A |
| 78K0R/KF3 | μPD78F1152, μPD78F1153, μPD78F1154, μPD78F1155, μPD78F1156,<br>μPD78F1152A, μPD78F1153A, μPD78F1154A, μPD78F1155A, μPD78F1156A |
| 78K0R/KG3 | μPD78F1162, μPD78F1163, μPD78F1164, μPD78F1165, μPD78F1166,<br>μPD78F1167, μPD78F1168,<br>μPD78F1162A, μPD78F1163A, μPD78F1164A, μPD78F1165A, μPD78F1166A,<br>μPD78F1167A, μPD78F1168A |
| 78K0R/KH3 | μPD78F1174, μPD78F1175, μPD78F1176, μPD78F1177, μPD78F1178,<br>μPD78F1174A, μPD78F1175A, μPD78F1176A, μPD78F1177A, μPD78F1178A |
| 78K0R/KJ3 | μPD78F1184A, μPD78F1185A, μPD78F1186A, μPD78F1187A, μPD78F1188A |

# Chapter 2. User's Manuals

Please read the following user’s manuals together with this document.

| Manual Name | Document Number |
|---|---|
| CubeSuite+ V1.01.00 78K0R Debug | R20UT0732EJ0100 |
| CubeSuite+ V2.00.00 Message | R20UT2448EJ0100 |

# Chapter 3. Key Word for Uninstallation

To uninstall this product, use the integrated uninstaller (uninstalls CubeSuite+).

# Chapter 4. Changes

This chapter describes changes from V3.00.02 to V3.00.03.

## 4.1 Specifications changed

### 4.1.1 Simulation on CubeSuite+ V2.00.00

Support simulation on CubeSuite+ V2.00.00. There is no functional change.

# Chapter 5. Cautions

This section describes cautions for using 78K0R/Kx3 simulator. The following two types of caution are described:

| | |
|---|---|
| •Differences between target devices and simulator | : Differences from behavior of target devices due to simulator specifications |
| •Cautions for using simulator GUI | : Cautions for using the simulator GUI window |

## 5.1 Differences between target devices and simulator

### 5.1.1 Flash self programming function

The following differences exist between the target device and simulator regarding the flash self programming function.

1. Operation when a pull-down resistor is connected to the FLMD0 pin

   In the target device, whether the flash self programming mode can be set via software is determined based on its resistance when a pull-down resistor is externally connected to the FLMD0 pin.

| FLMD0 Pin Handling | Setting via Software |
|---|---|
| Pulled down with a resistance of 100k ohm or more | Available |
| Pulled down with a  resistance of less than 100k ohm | Not guaranteed |

   On the other hand, in the simulator, connection of a pull-down resistor to the FLMD0 pin can be specified in the I/O Panel window but this panel does not have the function to set the resistance value.  As a result, if connection of a pull-down resistor to the FLMD0 pin is specified, it is regarded as an operation equivalent to that being pulled down with a resistance of 100k ohm or more.

2. Errors that are not generated

The simulator does not generate the following errors.

| Function Name | Error | |
|---|---|---|
| | Error Name | Return value |
| Initialize function | Processing abortion due to interrupt occurrence | 0x1F |
| Block blank check function | Processing abortion due to interrupt occurrence | 0x1F |
| Block erase function | Erase error | 0x1A |
| | Processing abortion due to interrupt occurrence | 0x1F |
| Word write function | Write error | 0x1C |
| | Processing abortion due to interrupt occurrence | 0x1F |
| Block verify function | Verify (internal verify) error | 0x1B |
| | Processing abortion due to interrupt occurrence | 0x1F |
| Set information function | Erase error | 0x1A |
| | Verify (internal verify) error | 0x1B |
| | Write error | 0x1C |
| | Processing abortion due to interrupt occurrence | 0x1F |
| EEPROM write function | Write error | 0x1C |
| | Verify (internal verify) error | 0x1D |
| | Processing abortion due to interrupt occurrence | 0x1F |

### 5.1.2 Reset

If a reset is generated by the Power-on-Clear circuit (POC) or low-voltage detector (LVI) circuit, the simulator will display "STANDBY" in the status bar. (The status is actually reset, not standby.)

And the behavior differs as follows if a reset is generated by the RESET pin.

[Target device]

Goes into reset status when the RESET pin goes to low level. Reset status is released when it goes to high level.

[Simulator]

Does not go into reset status when the RESET pin goes to low level. When it goes to high level, the simulator momentarily goes into reset status, and then the reset status is released immediately.

### 5.1.3 Oscillation stabilization time of Clock Generator

The simulator does not simulate the clock oscillator oscillation stabilization time.

The oscillation stabilization time is always 0 seconds when a reset or standby is released, regardless of the OSTS register settings. The OSTS register is set to the following values.

- Initial value after reset, during STOP mode, when MSTOP of CSC register = 1: 0x00
- MSTOP of CSC register = 0 after STOP mode release: Values shown in the following table

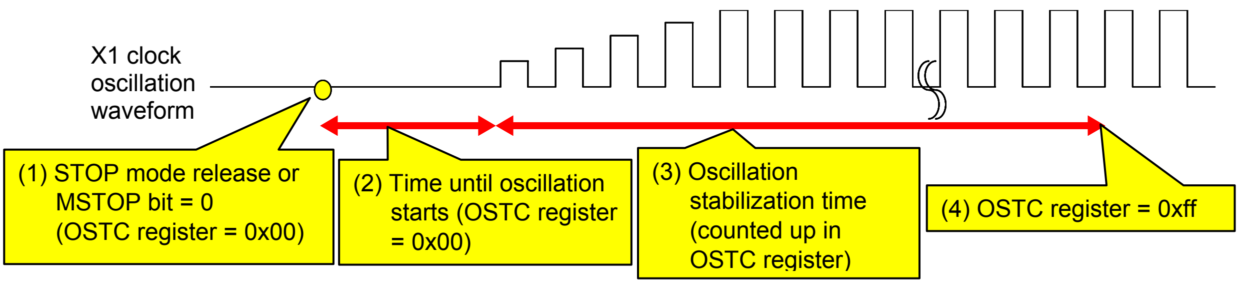
(Maximum value in the target device)

| OSTS Setting Value | OSTC Value |
|---|---|
| 0x0 ($2^8$/fx) | 0x80 |
| 0x1 ($2^9$/fx) | 0xc0 |
| 0x2 ($2^{10}$/fx) | 0xe0 |
| 0x3 ($2^{11}$/fx) | 0xf0 |
| 0x4 ($2^{13}$/fx) | 0xf8 |
| 0x5 ($2^{15}$/fx) | 0xfc |
| 0x6 ($2^{17}$/fx) | 0xfe |
| 0x7 ($2^{18}$/fx) | 0xff |

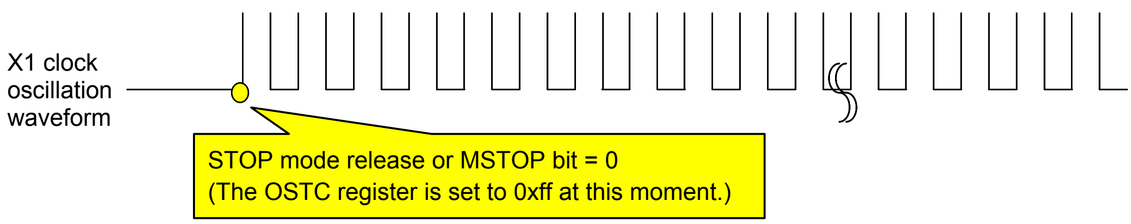
The following figure illustrates this operation.

In the target device, the X1 clock oscillation starts after the states (1) to (4) have passed. In the simulator, states (1) to (4) end instantly and the X1 clock oscillation starts.

[In target device (an example of when OSTS is set to 0x07)]




[In simulator (an example of when OSTS is set to 0x07)]



Therefore, pay attention to the code that waits for oscillation stabilization.

There is no problem if a program is created with the condition that the execution exits the oscillation stabilization wait period when the OSTC register value becomes the maximum value, or when the OSTC register value exceeds the specified value, but if a program is created with the condition that the execution exits the oscillation stabilization wait period when the OSTC register value becomes a value other than the maximum value, the execution enters an infinite loop.

The following shows examples of code that causes/does not cause problems.

(This is an example of when OSTS is set to 0x07)

Correct program example (1)

```
while(OSTC != 0xff)
{
NOP();/* wait */
}
```

Correct program example (2)

```
while(OSTC <= 0xf0)
{
NOP();/* wait */
}
```

Example of program that may cause problems

```
while(OSTC != 0xf0)
{
NOP();/* wait */
}
```

### 5.1.4 SFR with clock generator (AMPH/FSEL/HIOTRM)

The simulator does not simulate the following SFRs, which belong to the clock generator. Read/write for each register can be performed normally, but the operation does not change even if its value is changed.

- Bit 0 (AMPH) of clock operation mode control register (CMC)
- Bit 0 (FSEL) of operation speed mode control register (OSMC)
- High-speed internal oscillator trimming register (HIOTRM)

[Bit 0 (AMPH) of clock operation mode control register (CMC)]

This register is used to set the oscillator gain according to the frequency when oscillating the high-speed system clock. If a wrong setting is made, the high-speed system clock may not oscillate in the target device. In the simulator, however, wrong settings do not affect the oscillation of the high-speed system clock.

[Bit 0 (FSEL) of operation speed mode control register (OSMC)]

This register is used to control the step-up circuit for the high-speed flash memory operation.
If a wrong setting is made, read or instruction fetch from the flash memory may fail, or self programming may fail in the target device. In the simulator, however, wrong settings do not affect the operation.

[High-speed internal oscillator trimming register (HIOTRM)]

This register is used to correct the high-speed internal oscillator accuracy. This register is provided in the target device because the high-speed internal oscillator usually causes errors. In the simulator, however, the high-speed internal oscillator does not cause errors, so it is not simulated.

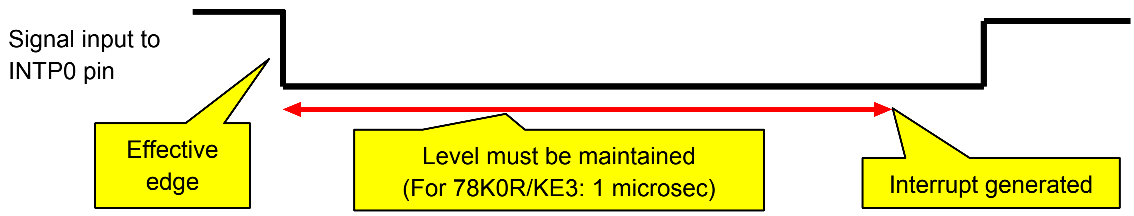
### 5.1.5 Noise reduction circuit for external-interrupt pin

The simulator does not simulate the noise reduction circuit. For example, if you input the active level to an external-interrupt pin with a noise reduction circuit, the interrupt will be received even if the active-level amplitude is too low.

The example below considers the case when there is input to the INTP0 pin.

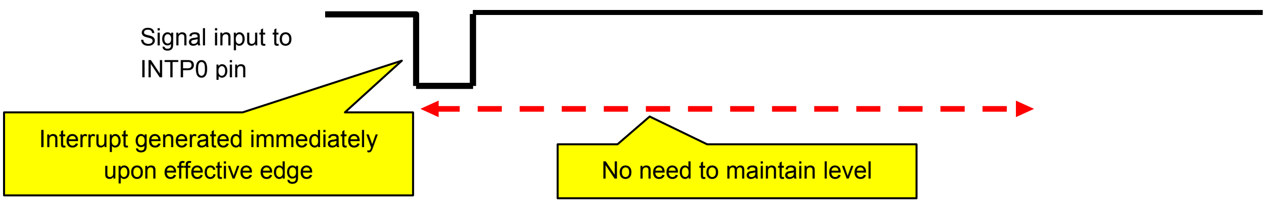
There is a noise reduction circuit on the INTP0 pin of the target device. For this reason, in order to generate an interrupt, it is necessary to input an effective edge to the target device, and subsequently maintain the signal level. (See the user's manual of the target device for the length of time it must be maintained.)

**Target device behavior (falling effective edge)**




In the case of the simulator, however, this noise reduction circuit is not simulated. For this reason, an interrupt will be generated any time a valid edge is generated. (No need to maintain signal level).

**Simulator behavior (falling effective edge)**




### 5.1.6 IIC bus simulation

IIC bus simulation is not supported.

### 5.1.7 External bus interface functions

Some of the external bus interface functions can be simulated, and some cannot.

[Functions that can be simulated]

* ROM and RAM connection
* Access to connected ROM/RAM

[Functions that cannot be simulated]

* External bus-related SFR simulation

  (External bus access is possible even without configuring SFR.)
* Access speed simulation

  (Access time is always 0 clock cycles. Additionally, signal input to the WAIT pin is ignored.)
* Check signal input to external bus pins in the [Timing Chart] window

  (It will appear as high impedance.)

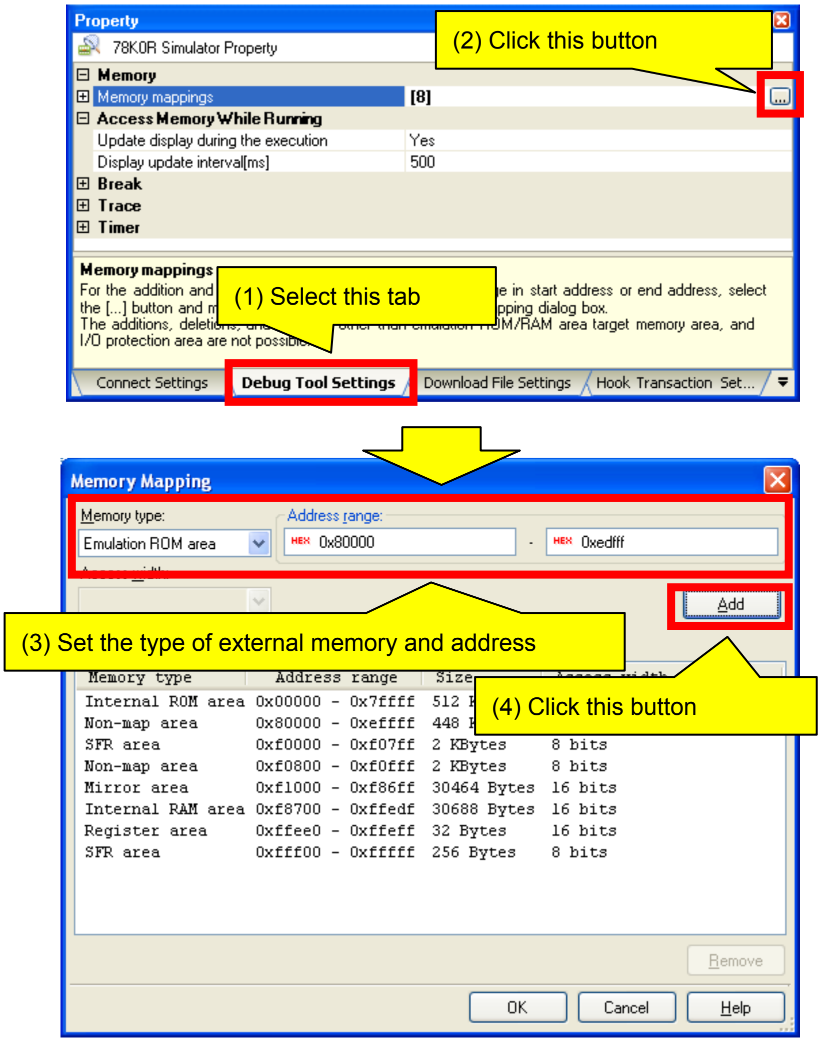
When connecting ROM or RAM to the external bus, perform configuration in the Property panel, from the Debugging Tool Setting tab.

Connect by entering:

* Type of memory to connect to (emulation ROM area or emulation RAM area)
* Memory address to connect to

This setting enables both:

* Writing to external bus
* Reading from external bus



### 5.1.8 DMA controller

The transfer speeds of the target device and simulator differ as follows when simulating the DMA controller.

[Target device]

* It takes two clock cycles to complete one DMA transfer. The CPU waits during this period.
* If there is contention for transfer timing with another channel's DMA, then one of the DMA transfers will be placed on hold; after the other DMA transfer is completed, the one on hold will begin.

[Simulator]

* It takes zero clock cycles to complete one DMA transfer. For this reason, the CPU does not wait.
* If there is contention for transfer timing with another channel's DMA, then both of the DMA transfers are performed simultaneously.

### 5.1.9 Operation clock of timer array unit

Do not specify an operation clock that is 233 Hz or lower. If the operation clock (CKmk) of the timer array unit (m=0 or 1, k=0 or 1) is 233 Hz or lower, then the timer array unit will not operate correctly (it will behave as if operating via a clock that is faster than the one selected).

### 5.1.10 Input pulse interval measurement mode of timer array unit

When the input pulse interval measurement mode of the timer array unit is being used, the behavior when an effective edge is detected on the TImn (mn = 00-07 or 10-13) pin differs.

[Target device]

The TCRmn timer counter register (mn=00-07 or 10-13) is initialized to 0x0000.

[Simulator]

The TCRmn timer counter register (mn=00-07 or 10-13) is to 0xFFFF.

For this reason, the pulse width count will be one less than on the target device.

### 5.1.11 Noise filter of timer array unit

Although the target device's timer array unit has a function to turn the noise filter on and off in order to reduce noise on the timer input pin, the simulator does not simulate this. (There is no difference in behavior whether filtering is on or off.) Since there is no noise in the simulator's signal, it would be meaningless to simulate this function.

### 5.1.12 Operation clock of serial array unit

Do not use INTTM02 or INTTM03 as the operation clock for the serial array unit. (Doing so will prevent the serial array unit from operating at all.)

### 5.1.13 Noise filter of serial array unit

Although the target device's serial array unit has a function to turn the noise filter on and off in order to reduce noise on the input pin, the simulator does not simulate this. (There is no difference in behavior whether filtering is on or off.) Since there is no noise in the simulator's signal, it would be meaningless to simulate this function.

### 5.1.14 SFR 0/1 constant bit

The SFR has bits that are always 0 or 1.

For example, bits 3 to 7 are always 0 for the oscillation stabilization time selection register (OSTS).

| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| OSTS | 0 | 0 | 0 | 0 | 0 | OSTS2 | OSTS1 | OSTS0 |

Bits are always 0

Although the values of these bits cannot be changed in the case of the target device, the values can be changed in the case of the simulator. Note that changing these values has no effect on behavior.

### 5.1.15 Comparator stabilization time of A/D converter

The comparator stabilization times of the A/D converter are different for the target device and simulator.

[Target device]

It takes 1 microsecond from the start of operation of the comparator until it stabilizes. Any A/D conversion results obtained before stabilization will be invalid. For this reason, it is necessary to ignore the first A/D conversion results.

[Simulator]

Comparator operation stabilizes immediately upon startup. For this reason, A/D conversion results obtained within 1 microsecond of the start of operation will be correct, and there is thus no need to ignore the first A/D conversion results.

### 5.1.16 Default voltage of $AV_{REF0}$ pin and $AV_{REF1}$ pin

Default voltage of $AV_{REF0}$ pin is 5.0V. And default voltage of $AV_{REF1}$ pin is 3.6V.

Note : The meaning of "Default voltage " is the voltage when the pin have no connection.

### 5.1.17 Interrupt response time

The interrupt response times of the target device and simulator differ.

[Target device]

It takes 9 to 14 clock cycles from the generation of an interrupt until actual vector interrupt processing begins.

[Simulator]

Vector interrupt processing begins immediately upon the interrupt.

### 5.1.18 Execution of illegal instructions

If an illegal instruction (instruction code: 0xFF) is executed, the target device will be reset, but the simulator will go into an infinite loop (the illegal instruction will be executed repeatedly).

## 5.2 Cautions for using simulator GUI

### 5.2.1 Cautions for controlling each windows

The following keyboard operations are not available in the simulator windows (signal-data editor window, I/O panel window, and serial window).

* Navigation via tab or arrow keys (←, ↑, →, ↓)
* Deletion via the Del or Backspace keys
* Copy & paste and other operations via the Ctrl + C, V, X, A, or Z keys.

Perform the above operations as follows.

* Navigation: Navigate using the mouse.
* Deletion: Right click and perform the action via the context menu.
* Copy & paste, etc.: Right click and perform the action via the context menu.

### 5.2.2 Cautions for closing simulator GUI window

The simulator GUI window can only be closed by disconnecting from the debugging tool, or by closing CubeSuite+ proper. (The [X] button cannot be clicked.)

Additionally, although it appears that the [X] button can be pressed if Aero is enabled in Windows Vista, pressing this button will not close the GUI window.

### 5.2.3 Cautions for showing help for the simulator GUI window

Pressing the F1 key in the simulator GUI window will not display the help if none of the internal windows are visible (e.g. the I/O panel window).

To display the help for the simulator GUI window, from the GUI window's menu, select [Help] > [Main Window].

### 5.2.4 Cautions for disconnecting the debug tool

CubeSuite+ may exit if the debugging tool is disconnected while any of the following dialog boxes is open from the simulator GUI window. Make sure that the following dialog boxes are closed before disconnecting the debugging tool.

| | |
|---|---|
| •Save As | •Parts Button Properties |
| •Open | •Analog Button Properties |
| •New | •Parts Key Properties |
| •Color | •Parts Level Gauge Properties |
| •Font | •Parts Led Properties |
| •Customize | •Parts Segment LED Properties |
| •Loop | •Parts Matrix Led Properties |
| •Select Pin | •Parts Buzzer Properties |
| •Search Data | •Pull up / Pull down |
| •Format (UART) | •Entry Bitmap |
| •Format (CSI) | •Object Properties |
| •Message (e.g. Error) | |

### 5.2.5 Cautions for setting the Host Machine's language and region

If a Japanese OS is installed on your Host Machine, then if the language or region is set to other than Japanese/Japan, the menus and dialog-box names of the simulator GUI window will be shown in English. Similarly, if a non-Japanese OS is installed on your Host Machine, then if the language or region is set to Japanese/Japan, the menus and dialog-box names of the simulator GUI window will be shown in Japanese.

**SALES OFFICES** Renesas Electronics Corporation http://www.renesas.com

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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





Colophon 2.2