Introduction

Thank you for using the AP4 for RX (the name has been changed from Application Leading Tool for RX).
This document describes the restrictions and points for caution regarding this product. Read this document before using the product.

Contents

Chapter 1. Introduction .............................................................................................................. 3
  1.1 System Requirements ...................................................................................................... 3
  1.1.1 PC .......................................................................................................................... 3
  1.1.2 Development tools .................................................................................................... 3

Chapter 2. Supported Devices .................................................................................................. 4
  2.1 Target Devices .............................................................................................................. 4

Chapter 3. User’s Manuals ..................................................................................................... 7

Chapter 4. Uninstallation ....................................................................................................... 7

Chapter 5. Changes ................................................................................................................ 8
  5.1 List of Changes ............................................................................................................ 8
  5.2 Details of the Changes .................................................................................................. 8
     5.2.1 Initialization of port direction register (PDR) of RX130 ........................................ 8

Chapter 6. History of Corrections Announced in Renesas Tool News .................................. 9

Chapter 7. Points for Caution ............................................................................................... 11
  7.1 List of Points for Caution ............................................................................................ 11
  7.2 Details of Points for Caution ....................................................................................... 12
     7.2.1 Online help ........................................................................................................ 12
     7.2.2 USB .................................................................................................................. 12
     7.2.3 Serial communications interface asynchronous mode .................................. 12
     7.2.4 Processor mode ............................................................................................... 12
     7.2.5 I2C bus interface .............................................................................................. 12
     7.2.6 Initial operation with low power consumption .............................................. 12
     7.2.7 Setting when the USB clock is not to be used .............................................. 12
     7.2.8 How to specify slave addresses of an SCI running in simple I2C mode ........ 12
     7.2.9 Setting the system clock (ICLK) to a Frequency Higher than 32 MHz .......... 13
     7.2.10 Dead-time compensation ............................................................................. 14
     7.2.11 Realtime clock ............................................................................................. 15
     7.2.12 SPI clock synchronous mode ....................................................................... 15
     7.2.13 SCI/SCIF clock synchronous mode ............................................................ 15
7.2.14 All-module clock-stop function.............................................................................. 16
7.2.15 Using the Voltage Detection Circuits....................................................................... 16
7.2.16 When the LCD Controller/Driver and I/O Ports, PB3 and PB5 are Set..................... 16

Revision History.......................................................................................................................... 17
Chapter 1. Introduction

The AP4 for RX is a software tool for generating control programs (device driver programs) for peripheral modules (timers, UARTs, A/D converters, etc.). It generates device driver code from user settings made through a GUI. Other than the code for initializing the peripheral modules, API (Application Programming Interface) functions for operating the peripheral modules are provided.

1.1 System Requirements

The operating environment is as listed below.

1.1.1 PC

- IBM PC/AT compatible (with Windows® 7, Windows® 8.1, or Windows® 10)
- Processor: At least 1 GHz (the product supports hyper-threading and multi-core CPUs)
- Memory capacity: 2 GB or more is recommended. At least 1 GB (or 2 GB for 64-bit versions of Windows®) is required.
- Hard disk capacity: At least 200 MB available
- Display resolution: 1024x768 or higher; at least 65536 colors
- Required elements of the software environment other than the Windows OS: .NET Framework 4.5 plus a language pack

1.1.2 Development tools

- Integrated development environment CS+ from Renesas, V6.01.00 or later
- CC-RX compiler from Renesas, V2.07.00 or later
## Chapter 2. Supported Devices

### 2.1 Target Devices

The devices supported by the CS+ Code Generator for RX V1.16.00 are listed below.

<table>
<thead>
<tr>
<th>Group (HWM number)</th>
<th>Number of pins</th>
<th>Device name</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX110 group (R01UH0421EJ0100)</td>
<td>36 pins</td>
<td>R5F5110HAxLM, R5F5110JAxLM, R5F51101AxLM, R5F51103AxLM</td>
</tr>
<tr>
<td></td>
<td>40 pins</td>
<td>R5F5110HAxF, R5F5110JAxNF, R5F51101AxNF, R5F51103AxNF</td>
</tr>
<tr>
<td></td>
<td>48 pins</td>
<td>R5F5110JAxFL, R5F5110JAxNE, R5F51101AxFL, R5F51101AxNE, R5F51103AxFL, R5F51103AxNE, R5F51104AxFL, R5F51104AxNE, R5F51105AxFL, R5F51105AxNE</td>
</tr>
<tr>
<td></td>
<td>64 pins</td>
<td>R5F5110JAxFK, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFL, R5F5110JAxFP, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF</td>
</tr>
<tr>
<td>RX111 group (R01UH0365EJ0120)</td>
<td>36 pins</td>
<td>R5F511111AxLM, R5F51113AxLM, R5F5111JAxLM</td>
</tr>
<tr>
<td></td>
<td>40 pins</td>
<td>R5F511111AxNF, R5F51113AxNF, R5F5111JAxNF</td>
</tr>
<tr>
<td></td>
<td>48 pins</td>
<td>R5F5110JAxFL, R5F5110JAxNE, R5F51101AxFL, R5F51101AxNE, R5F51103AxFL, R5F51103AxNE, R5F51104AxFL, R5F51104AxNE, R5F51105AxFL, R5F51105AxNE</td>
</tr>
<tr>
<td></td>
<td>64 pins</td>
<td>R5F5110JAxFK, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFL, R5F5110JAxFP, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF, R5F5110JAxJF, R5F5110JAxFM, R5F5110JAxLF</td>
</tr>
<tr>
<td>RX113 group (R01UH0448EJ0100)</td>
<td>64 pins</td>
<td>R5F51135AxFM, R5F51136AxFM, R5F51137AxFM, R5F51138AxFM</td>
</tr>
<tr>
<td></td>
<td>100 pins</td>
<td>R5F51135AxJN, R5F51136AxJN, R5F51137AxJN, R5F51138AxJN, R5F51135AxFN, R5F51136AxFN, R5F51137AxFN, R5F51138AxFN</td>
</tr>
<tr>
<td>RX130 group (R01UH0560EJ0100)</td>
<td>48 pins</td>
<td>R5F51303AxFL, R5F51305AxFL, R5F51303AxNE, R5F51305AxNE</td>
</tr>
<tr>
<td></td>
<td>64 pins</td>
<td>R5F51303AxFM, R5F51305AxFM, R5F51303AxFK, R5F51305AxFK</td>
</tr>
<tr>
<td></td>
<td>80 pins</td>
<td>R5F51303AxFN, R5F51305AxFN</td>
</tr>
<tr>
<td>RX230 group (R01UH0496EJ0110)</td>
<td>48 pins</td>
<td>R5F52305AxNE, R5F52306AxNE, R5F52305AxFL, R5F52306AxFL</td>
</tr>
<tr>
<td></td>
<td>64 pins</td>
<td>R5F52305AxND, R5F52306AxND, R5F52305AxFM, R5F52306AxFM, R5F52305AxLF, R5F52306AxLF</td>
</tr>
<tr>
<td></td>
<td>100 pins</td>
<td>R5F52305AxLA, R5F52306AxLA, R5F52305AxFP, R5F52306AxFP</td>
</tr>
</tbody>
</table>
## Table 1-2 Supported Devices

<table>
<thead>
<tr>
<th>Group (HWM number)</th>
<th>Number of pins</th>
<th>Device name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RX231 group</strong> (R01UH0496EJ0110)</td>
<td>48 pins</td>
<td>R5F52315AxNE, R5F52316AxNE, R5F52317AxNE, R5F52318AxNE, R5F52315CxNE, R5F52316CxNE, R5F52317BxNE, R5F52318BxNE, R5F52315AxFL, R5F52316AxFL, R5F52317AxFL, R5F52318AxFL, R5F52315CxFL, R5F52316CxFL, R5F52317BxFL, R5F52318BxFL</td>
</tr>
<tr>
<td></td>
<td>64 pins</td>
<td>R5F52315AxND, R5F52316AxND, R5F52317AxND, R5F52318AxND, R5F52315CxND, R5F52316CxND, R5F52317BxND, R5F52318BxND, R5F52315AxFM, R5F52316AxFM, R5F52317AxFM, R5F52318AxFM, R5F52315CxFM, R5F52316CxFM, R5F52317BxFM, R5F52318BxFM, R5F52315CxLF, R5F52316CxLF</td>
</tr>
<tr>
<td></td>
<td>100 pins</td>
<td>R5F52315AxLA, R5F52316AxLA, R5F52317AxLA, R5F52318AxLA, R5F52315CxLA, R5F52316CxLA, R5F52317BxLA, R5F52318BxLA, R5F52315AxFP, R5F52316AxFP, R5F52317AxFP, R5F52318AxFP, R5F52315CxFP, R5F52316CxFP, R5F52317BxFP, R5F52318BxFP, R5F52315CxLF, R5F52316CxLF</td>
</tr>
<tr>
<td><strong>RX23T group</strong> (R01UH0520EJ0110)</td>
<td>48 pins</td>
<td>R5F523T3AxFL, R5F523T5AxFL</td>
</tr>
<tr>
<td></td>
<td>52 pins</td>
<td>R5F523T3AxFD, R5F523T5AxFD</td>
</tr>
<tr>
<td></td>
<td>64 pins</td>
<td>R5F523T3AxFM, R5F523T5AxFM</td>
</tr>
<tr>
<td><strong>RX24T group</strong> (R01UH0576EJ0200)</td>
<td>64 pins</td>
<td>R5F524T8AxFM, R5F524TAxFM</td>
</tr>
<tr>
<td></td>
<td>80 pins</td>
<td>R5F524TAAxF, R5F524TAAxF, R5F524T8AxFN, R5F524T8AxFN</td>
</tr>
<tr>
<td></td>
<td>100 pins</td>
<td>R5F524T8AxFP, R5F524TAAxFP, R5F524TBAxFP, R5F524TCAxFP, R5F524TEaxFP</td>
</tr>
<tr>
<td><strong>RX24U group</strong> (R01UH0658EJ0100)</td>
<td>100 pins</td>
<td>R5F524UBAxFP, R5F524UCaxFP, R5F524UEaxFP</td>
</tr>
<tr>
<td></td>
<td>144 pins</td>
<td>R5F524UBAxFB, R5F524UCaxFB, R5F524UEaxFB</td>
</tr>
<tr>
<td><strong>RX64M group</strong> (R01UH0377EJ0100)</td>
<td>100 pins</td>
<td>R5F564MFCxlJJ, R5F564MFdxlJJ, R5F564MGcxlJJ, 5F564MGdxlJJ, R5F564MJcxlJJ, R5F564MJdxlJJ, R5F564MLcxlJJ, R5F564MLdxlJJ, R5F564MFCxFP, R5F564MFDxFP, R5F564MGcxFP, R5F564MGdxFP, R5F564MJcxFP, R5F564MJdxFP, R5F564MLcxFP, R5F564MLdxFP</td>
</tr>
<tr>
<td></td>
<td>144/145 pins</td>
<td>R5F564MFcxBF, R5F564MFdxFB, R5F564MGcxBF, R5F564MGdxFB, R5F564MJcxBF, R5F564MJdxFB, R5F564MLcxBF, R5F564MLdxFB, R5F564MFCxLk, R5F564MFdxLk, R5F564MGcXLK, R5F564MGdXLK, R5F564MJcXLK, R5F564MJdXLK, R5F564MLcXLK, R5F564MLdXLK</td>
</tr>
<tr>
<td></td>
<td>176/177 pins</td>
<td>R5F564MFCxFc, R5F564MFDxFC, R5F564MGcxFC, R5F564MGdxFC, R5F564MJcxFC, R5F564MJdxFC, R5F564MLcxFC, R5F564MLdxFC, R5F564MFCxLC, R5F564MFdxLC, R5F564MGcXLc, R5F564MGdXLc, R5F564MJcXLc, R5F564MJdXLc, R5F564MLcXLc, R5F564MLdXLc, R5F564MFCxBG, R5F564MFdxBG, R5F564MGcxBG, R5F564MGdxBG, R5F564MJcxBG, R5F564MJdxBG, R5F564MLcxBG, R5F564MLdxBG</td>
</tr>
</tbody>
</table>

Jun. 28, 2019
<table>
<thead>
<tr>
<th>Group (HWM number)</th>
<th>Number of pins</th>
<th>Device name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RX65N group</strong> (R01UH0590EJ0100)</td>
<td>100 pins</td>
<td>R5F565N9AxLJ, R5F565N9BxLJ, R5F565N9ExLJ, R5F565N9FxLJ, R5F565N7AxLJ, R5F565N7BxLJ, R5F565N7ExLJ, R5F565N7FxLJ, R5F565N4AxLJ, R5F565N4BxLJ, R5F565N4ExLJ, R5F565N4FxLJ, R5F565N9AxFP, R5F565N9BxFP, R5F565N9ExFP, R5F565N9FxFP, R5F565N7AxFP, R5F565N7BxFP, R5F565N7ExFP, R5F565N7FxFP, R5F565N4AxFP, R5F565N4BxFP, R5F565N4ExFP, R5F565N4FxFP</td>
</tr>
<tr>
<td></td>
<td>144/145 pins</td>
<td>R5F565N9AxFB, R5F565N9BxFB, R5F565N9ExFB, R5F565N9FxFB, R5F565N7AxFB, R5F565N7BxFB, R5F565N7ExFB, R5F565N7FxFB, R5F565N9AxLJ, R5F565N9BxLJ, R5F565N9ExLJ, R5F565N9FxLJ, R5F565N7AxLJ, R5F565N7BxLJ, R5F565N7ExLJ, R5F565N7FxLJ, R5F565N9AxLF, R5F565N9BxLF, R5F565N9ExLF, R5F565N9FxLF, R5F565N7AxLF, R5F565N7BxLF, R5F565N7ExLF, R5F565N7FxLF, R5F565N4AxLF, R5F565N4BxLF, R5F565N4ExLF, R5F565N4FxLF</td>
</tr>
<tr>
<td><strong>RX651 group</strong> (R01UH0590EJ0100)</td>
<td>100 pins</td>
<td>R5F56519AxLJ, R5F56519BxLJ, R5F56519ExLJ, R5F56519FxLJ, R5F56517AxLJ, R5F56517BxLJ, R5F56517ExLJ, R5F56517FxLJ, R5F56514AxLJ, R5F56514BxLJ, R5F56514ExLJ, R5F56514FxLJ, R5F56519AxFP, R5F56519BxFP, R5F56519ExFP, R5F56519FxFP, R5F56517AxFP, R5F56517BxFP, R5F56517ExFP, R5F56517FxFP, R5F56514AxFP, R5F56514BxFP, R5F56514ExFP, R5F56514FxFP</td>
</tr>
<tr>
<td></td>
<td>144/145 pins</td>
<td>R5F56519AxFB, R5F56519BxFB, R5F56519ExFB, R5F56519FxFB, R5F56517AxFB, R5F56517BxFB, R5F56517ExFB, R5F56517FxFB, R5F56514AxFB, R5F56514BxFB, R5F56514ExFB, R5F56514FxFB, R5F56519AxLJ, R5F56519BxLJ, R5F56519ExLJ, R5F56519FxLJ, R5F56517AxLJ, R5F56517BxLJ, R5F56517ExLJ, R5F56517FxLJ, R5F56514AxLJ, R5F56514BxLJ, R5F56514ExLJ, R5F56514FxLJ, R5F56519AxLF, R5F56519BxLF, R5F56519ExLF, R5F56519FxLF, R5F56517AxLF, R5F56517BxLF, R5F56517ExLF, R5F56517FxLF, R5F56514AxLF, R5F56514BxLF, R5F56514ExLF, R5F56514FxLF</td>
</tr>
<tr>
<td><strong>RX71M group</strong> (R01UH0493EJ0100)</td>
<td>100 pins</td>
<td>R5F571MLCxFP, R5F571MLDxFP, R5F571MLGxFP, R5F571MLHxFP, R5F571MCxFP, R5F571MDxFP, R5F571MGxFP, R5F571MHxFP, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MCxLJ, R5F571MDxLJ, R5F571MGxLJ, R5F571MHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MCxLJ, R5F571MDxLJ, R5F571MGxLJ, R5F571MHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MCxLJ, R5F571MDxLJ, R5F571MGxLJ, R5F571MHxLJ</td>
</tr>
<tr>
<td></td>
<td>144/145 pins</td>
<td>R5F571MLCxFP, R5F571MLDxFP, R5F571MLGxFP, R5F571MLHxFP, R5F571MCxFP, R5F571MDxFP, R5F571MGxFP, R5F571MHxFP, R5F571MCxFP, R5F571MDxFP, R5F571MGxFP, R5F571MHxFP, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MCxLJ, R5F571MDxLJ, R5F571MGxLJ, R5F571MHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MCxLJ, R5F571MDxLJ, R5F571MGxLJ, R5F571MHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MCxLJ, R5F571MDxLJ, R5F571MGxLJ, R5F571MHxLJ</td>
</tr>
<tr>
<td></td>
<td>176/177 pins</td>
<td>R5F571MLCxFC, R5F571MLDxLC, R5F571MLGxLC, R5F571MLHxLC, R5F571MLCxLF, R5F571MLDxLF, R5F571MLGxLF, R5F571MLHxLF, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ, R5F571MLCxLJ, R5F571MLDxLJ, R5F571MLGxLJ, R5F571MLHxLJ</td>
</tr>
</tbody>
</table>
Chapter 3. User’s Manuals

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

<table>
<thead>
<tr>
<th>Manual Name</th>
<th>Document Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code Generator RX API Reference</td>
<td>R20UT4324</td>
</tr>
<tr>
<td>CS+ Code Generator Peripheral Function Operation</td>
<td>R20UT3104</td>
</tr>
<tr>
<td>CS+ Code Generator Pin View</td>
<td>R20UT3105</td>
</tr>
<tr>
<td>CS+ V7.00.00 Message</td>
<td>R20UT4309</td>
</tr>
</tbody>
</table>

Chapter 4. Uninstallation

There are two ways to uninstall this product.

- Use the integrated uninstaller from Renesas (uninstalls all CS+ components)
- Use the Windows uninstaller (only uninstalls this product only)

To use the Windows uninstaller, select “CS+ Code Generator for RX” from “Programs and Feature” of the control panel.
Chapter 5. Changes

This chapter describes changes to the CS+ Code Generator for RX V1.16.00.

5.1 List of Changes

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Version *1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initialization of port direction register (PDR) of RX130</td>
<td>RX110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX113</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX230, RX231</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX24T, RX24U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX64M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX65N, RX651</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX71M</td>
</tr>
</tbody>
</table>

○: Applicable, /: Not applicable

*1: These version numbers are stated in the file headers of the source code which is generated by the code generator.

5.2 Details of the Changes

5.2.1 Initialization of port direction register (PDR) of RX130

The following points are no longer applicable.

To initialize the port direction register (PDR), the reserved bit needs to be set(Note) to "1" (output). However, even if it is set to "1", an initialization processing code is not generated.

For 64-pin package, PORTD initialization processing is not generated, and for 48-pin package, PORT0, PORT5, and PORTD initialization processing is not generated.

Note: The input-only P35 pin is set to "0" (input).

Refer to Tool News (R20TS0273) for the details.
# Chapter 6. History of Corrections Announced in Renesas Tool News

This section is a summary of corrections announced in Renesas Tool News.

<table>
<thead>
<tr>
<th>Issue Date</th>
<th>Document No.</th>
<th>Description</th>
<th>Device Concerned</th>
<th>Fixed Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 01, 2015</td>
<td>150301/tn2</td>
<td>1. Multifunction Timer Pulse Unit 3</td>
<td>RX64M</td>
<td>V1.06.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Serial Communications Interface</td>
<td>RX111, RX113, RX64M, RX71M</td>
<td></td>
</tr>
<tr>
<td>May 16, 2015</td>
<td>150516/tn1</td>
<td>1. Code Generated for the Clock Generation Circuit (PLL Circuit Operation)</td>
<td>RX111, RX113</td>
<td>V1.06.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Bus Settings</td>
<td>RX64M, RX71M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. 16-bit Timer Pulse Unit (TPUa) and Multifunction Timer Pulse Unit 3 (MTU3a)</td>
<td>RX64M, RX71M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. 12-bit A/D Converter (S12ADC)</td>
<td>RX64M, RX71M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. 12-bit D/A Converter (R12DA)</td>
<td>RX64M, RX71M</td>
<td>V1.08.00</td>
</tr>
<tr>
<td>Jul. 16, 2015</td>
<td>150716/tn1</td>
<td>1. Bus Settings</td>
<td>RX64M, RX71M</td>
<td>V1.08.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Code Generated for the Clock Generation Circuit (HOCO Operation)</td>
<td>RX111, RX113</td>
<td></td>
</tr>
<tr>
<td>Aug. 07, 2015</td>
<td>150807/tn3</td>
<td>Complementary PWM mode setting of the MTU</td>
<td>RX230, RX231</td>
<td>V1.08.00</td>
</tr>
<tr>
<td>Sep. 01, 2015</td>
<td>150901/tn2</td>
<td>Interrupts when the MTU is set for complementary PWM mode</td>
<td>RX110, RX111, RX113, RX23T, RX230, RX231</td>
<td>V1.08.00</td>
</tr>
<tr>
<td>Nov. 01, 2015</td>
<td>151101/tn4</td>
<td>1. Setting to permit or prohibit suspension of transfer in response to the reception of NACK over the I2C bus interface (RIIC)</td>
<td>RX110, RX111, RX113, RX23T, RX230, RX231, RX64M, RX71M</td>
<td>V1.09.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Settings for the output of RTCOUT from the real time clock (RTC)</td>
<td>RX110, RX111, RX113</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Setting of the data transfer controller (DTC)</td>
<td>RX110, RX111, RX113, RX23T, RX230, RX231, RX64M, RX71M</td>
<td>V1.08.00</td>
</tr>
<tr>
<td>Dec. 01, 2015</td>
<td>151201/tn3</td>
<td>Using the Multi-Function Pin Controller (MPC) to Select Functions of the PAn Pins</td>
<td>RX113</td>
<td>V1.08.00</td>
</tr>
<tr>
<td>Feb. 16, 2016</td>
<td>160216/tn4</td>
<td>FIFO embedded Serial Communications Interface SCIFA10</td>
<td>RX64M, RX71M</td>
<td>V1.09.00</td>
</tr>
<tr>
<td>Jun. 16, 2016</td>
<td>R20TS0039</td>
<td>1. Serial Communications Interface SCI6</td>
<td>RX231, RX230</td>
<td>V1.10.00</td>
</tr>
<tr>
<td>Nov. 01, 2016</td>
<td>R20TS0087</td>
<td>1. Selection of the MTOIC3 pin for MTU3 in Multi-Function Timer Pulse Unit 3</td>
<td>RX64M, RX71M</td>
<td>V1.11.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Low-speed On-chip Oscillator (LOCO) when Low Power Consumption (LPC) is Specified</td>
<td>RX64M, RX65N, RX651, RX71M</td>
<td>V1.11.00</td>
</tr>
<tr>
<td>Mar. 01, 2017</td>
<td>R20TS0140</td>
<td>1. Port Direction Register (PDR) Settings</td>
<td>RX231, RX230</td>
<td>V1.12.00</td>
</tr>
<tr>
<td>Issue Date</td>
<td>Document No.</td>
<td>Description</td>
<td>Device Concerned</td>
<td>Fixed Version</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Apr. 16, 2017</td>
<td>R20TS0161</td>
<td>1. Prohibition of Reading from and Writing to Registers Protected from Programming by Mistake in Multi-function Timer Pulse Unit 2 (MTU2) and 3 (MTU3)</td>
<td>RX110, RX111, RX113, RX23T, RX230, RX231, RX24T, RX24U, RX64M, RX71M</td>
<td>V1.14.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. LCD Initialization Code</td>
<td>RX113</td>
<td>V1.13.00</td>
</tr>
<tr>
<td>Sep. 01, 2017</td>
<td>R20TS0197</td>
<td>1. When Using the I2C Bus Interface in Slave Mode</td>
<td>All groups</td>
<td>V1.14.00</td>
</tr>
<tr>
<td>Feb. 16, 2018</td>
<td>R20TS0273</td>
<td>1. Initialization of Port Direction Register (PDR) of RX130</td>
<td>RX130</td>
<td>V1.15.00</td>
</tr>
</tbody>
</table>
Chapter 7. Points for Caution

This section describes points for caution regarding the CS+ Code Generator for RX V1.16.00. Refer to the documents for the individual modules for points for caution regarding the FIT modules.

### 7.1 List of Points for Caution

#### Table 4 List of Points for Caution

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>RX110</th>
<th>RX111</th>
<th>RX113</th>
<th>RX130</th>
<th>RX230, RX231</th>
<th>RX23T</th>
<th>RX24T, RX24U</th>
<th>RX64M</th>
<th>RX65N, RX651</th>
<th>RX71M</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Online help</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2</td>
<td>USB</td>
<td>/</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>/</td>
<td>/</td>
<td>○</td>
<td>○</td>
<td>/</td>
<td>○</td>
</tr>
<tr>
<td>3</td>
<td>Serial communications interface asynchronous mode</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4</td>
<td>Processor mode</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5</td>
<td>I²C bus interface</td>
<td>/</td>
<td>/</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6</td>
<td>Initial operation with low power consumption</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>7</td>
<td>Setting when the USB clock is not to be used</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>8</td>
<td>How to specify slave addresses of an SCI running in simple I²C mode</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>9</td>
<td>Setting the system clock (ICLK) to a Frequency Higher than 32 MHz</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>10</td>
<td>Dead-time compensation</td>
<td>/</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>11</td>
<td>Realtime clock</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>12</td>
<td>SPI clock synchronous mode</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>13</td>
<td>SCI/SCIF clock synchronous mode</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>14</td>
<td>All-module clock-stop function</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>15</td>
<td>Using the Voltage Detection Circuits</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>16</td>
<td>When the LCD Controller/Driver and I/O Ports, PB3 and PB5 are Set</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

○: Applicable, /: Not applicable

*1: The version numbers are stated in the file headers of the source code which is generated by the code generator.

*2: Refer to FAQ when using previous version smart configurator.
7.2 Details of Points for Caution

7.2.1 Online help
AP4 for RX does not support online help.

7.2.2 USB
AP4 for RX does not support the USB interface.

7.2.3 Serial communications interface asynchronous mode
AP4 for RX does not support the input of a transfer rate clock from the TMR or MTU in the asynchronous mode of the Serial Communications Interface.

7.2.4 Processor mode
RX CPUs have two processor modes: supervisor and user. The API driver functions may be assumed to operate with the CPU in supervisor mode.
More information on the processor modes can be found in the RX Family software manual.

7.2.5 I²C bus interface
The code generator does not support detecting the host address in slave mode or the multi-master operation of the I²C bus interface (RIIC).

7.2.6 Initial operation with low power consumption
"Middle-speed mode" can be selected for the initial operation with low power consumption even if the system clock (ICLK) is set to a frequency above 12 MHz. In practice, however, be sure to set the initial operation with low power consumption to "High-speed mode" when ICLK is set to a frequency above 12 MHz.

7.2.7 Setting when the USB clock is not to be used
When the USB clock is not to be used, set the USB clock (UCLK) selection bits to "0001" (x1/2) after the code has been generated.

7.2.8 How to specify slave addresses of an SCI running in simple I²C mode
When an SCI is running in simple I²C mode, specify the slave address in the seven higher-order bits of the argument adr, and set the lowest-order bit to "1" for master transmission or to "0" for master reception.

<table>
<thead>
<tr>
<th>b7</th>
<th>b6</th>
<th>b5</th>
<th>b4</th>
<th>b3</th>
<th>b2</th>
<th>b1</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slave address</td>
<td>R/W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Readable =1, Writable = 0

Functions: R_SCIx_IIC_Master_Send, R_SCIx_IIC_Master_Receive
### 7.2.9 Setting the system clock (ICLK) to a Frequency Higher than 32 MHz

When the system clock (ICLK) is set to a frequency higher than 32 MHz, the AP4 for RX might not produce code for operating at the specified frequency, since the code does not correctly switch the operating power control mode or check the MEMWAIT register setting.

After the code has been generated, add processing to the initialization function to switch the operating power control mode and to check that the MEMWAIT register has been set.

Move the code in the blue box in [Before modification] to where the red box is in [After modification].

Modify the blue code in [Before modification] to the red code in [After modification].

Refer to Tool News (R20TS0426) when using previous version Smart Configurator.

**Function: R_CGC_Create**

**Example of correction: for RX230/RX231**

**Before modification:**

```c
void R_CGC_Create(void)
{
  ...
  /* Set memory wait cycle setting register */
  SYSTEM.MEMWAIT.BIT.MEMWAIT = 1U;
  memorywaitcycle = SYSTEM.MEMWAIT.BYTE;
  memorywaitcycle++;

  /* Set operating power control */
  SYSTEM.OPCCR.BIT.OPCM = _00_LPC_HIGH_SPEED_MODE;
  while (1U == SYSTEM.OPCCR.BIT.OPCMTSF);

  /* Set clock source */
  SYSTEM.SCKCR3.WORD = _0400_CGC_CLOCKSOURCE_PLL;
  ...
}
```

**After modification:**

```c
void R_CGC_Create(void)
{
  ...

  /* Set operating power control */
  SYSTEM.OPCCR.BIT.OPCM = _00_LPC_HIGH_SPEED_MODE;
  while (1U == SYSTEM.OPCCR.BIT.OPCMTSF);

  /* Set memory wait cycle setting register */
  SYSTEM.MEMWAIT.BIT.MEMWAIT = 1U;
  while(SYSTEM.MEMWAIT.BIT.MEMWAIT != 1U);

  /* Set clock source */
  SYSTEM.SCKCR3.WORD = _0400_CGC_CLOCKSOURCE_PLL;
  ...
}
```
Example of correction: for RX23T

Before modification:

```c
void R_CGC_Create(void)
{
    ...
    /* Set memory wait cycle setting register */
    SYSTEM.MEMWAIT.BIT.MEMWAIT = 1U;
    while(SYSTEM.MEMWAIT.BIT.MEMWAIT != 1U);

    /* Set operating power control */
    SYSTEM.OPCCR.BIT.OPCM = _00_LPC_HIGH_SPEED_MODE;
    while (1U == SYSTEM.OPCCR.BIT.OPCMTSF);

    /* Set clock source */
    SYSTEM.SCKCR3.WORD = _0400_CGC_CLOCKSOURCE_PLL;
    ...
}
```

After modification:

```c
void R_CGC_Create(void)
{
    ...
    /* Set operating power control */
    SYSTEM.OPCCR.BIT.OPCM = _00_LPC_HIGH_SPEED_MODE;
    while (1U == SYSTEM.OPCCR.BIT.OPCMTSF);

    /* Set memory wait cycle setting register */
    SYSTEM.MEMWAIT.BIT.MEMWAIT = 1U;
    while(SYSTEM.MEMWAIT.BIT.MEMWAIT != 1U);

    /* Set clock source */
    SYSTEM.SCKCR3.WORD = _0400_CGC_CLOCKSOURCE_PLL;
    ...
}
```

7.2.10 Dead-time compensation

External pulse width measurement is not available as a general register feature when the dead-time compensation of the multi-function timer pulse unit is to be used.

Add processing for initialization for the measurement of external pulse widths in the user-defined initialization processing for the multi-function timer pulse unit.

Functions: R_MTU2_Create_UserInit, R_MTU3_Create_UserInit

Example of correction: When capture for measurement of the high pulse width of an external input signal is to proceed at crests and troughs in complementary PWM mode

```c
void R_MTU3_Create_UserInit(void)
{
    /* Start user code. Do not edit comment generated here */
    MTU5.TIORU.BYTE = 0x1FU;
    MTU5.TIORV.BYTE = 0x1FU;
    MTU5.TIORW.BYTE = 0x1FU;
    /* End user code. Do not edit comment generated here */...
```
7.2.11 Realtime clock
When the realtime clock is to be used, the AP4 for RX might not set up correct operation, since there is no processing to wait for the circuit to become stable after setting the clock source.

After code has been generated, add processing to the initialization function to wait for six clock cycles of the clock source for the realtime clock to allow stabilization of the circuit.

Function: R_RTC_Create

Example of correction: When the sub-clock is to be used as the source of the realtime clock and the system clock (ICLK) is running at 16 MHz

```c
void R_RTC_Create(void)
{
    uint32_t w_count;
    ...
    /* Set sub-clock oscillator */
    while (RTC.RCR3.BIT.RTCEN != 1U)
    {
        RTC.RCR3.BIT.RTCEN = 1U;
    }
    /* Wait for supply 6 clocks of count source */
    for (w_count = 0U; w_count < 267; w_count++)
    {
        nop()
    }
    ...
}
```

7.2.12 SPI clock synchronous mode
When an SPI’s clock synchronous mode is to be used, the AP4 for RX might not set up communications correctly, since there is no processing to read the SPCR register for checking the completion of the register setting.

Add processing to read the SPCR register in the user-defined initialization function.

Function: R_RSPIx_Create_UserInit

Example of correction: When RSPI0 is to be used

```c
void R_RSPI0_Create_UserInit(void)
{
    /* Start user code. Do not edit comment generated here */
    uint8_t w_dummy;
    w_dummy = RSPI0.SPCR.BYTE;
    /* End user code. Do not edit comment generated here */
}
```

7.2.13 SCI/SCIF clock synchronous mode
When the FIFO buffer is to be used in SCI or SCIF clock synchronous mode, unnecessary clock cycles might be output after transmission of data is completed if the bit rate is to be high (3 MHz or above).

Set the FIFO buffer to the maximum number of stages (15) when the bit rate is to be high.
7.2.14 All-module clock-stop function
When the all-module clock-stop function is to be used, the code produced by the AP4 for RX does not allow the initiation of return from the module-stop state even if an interrupt occurs, since the clock supply to the RAM module is also stopped.

After code has been generated, correct the setting value of module stop control register C (MSTPCRC) in the API function to the value after a reset which is stated in the hardware manual.

Function: R_LPC_AllModuleClockStop

Example of correction: RX64M

```c
MD_STATUS R_LPC_AllModuleClockStop(void)
{
    ...
    /* Set module stop for RAM and CAC. */
    SYSTEM.MSTPCRC.LONG = 0xFFFF0000U;
    ...
}
```

7.2.15 Using the Voltage Detection Circuits
When using the voltage detection circuits (LVDAa and LVDAb), “wait time” for the voltage monitoring 1 interrupt and the voltage monitoring 2 interrupt after code is not generated.

Refer to Tool News (R20TS0314) for the details.

Function: R_LPC_AllModuleClockStop

7.2.16 When the LCD Controller/Driver and I/O Ports, PB3 and PB5 are Set
Conflict checking is wrong when the LCD controller/driver and I/O Ports, PB3 and PB5 are set the same time. When the LCD controller/driver is used and SEG13, which is the shared pin of I/O port PB5, is configured, I/O port PB3, which avoid pin conflict, cannot be configured.

Refer to Tool News (R20TS0245) for the details.
## Revision History

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Apr. 22, 2019</td>
<td>- New release</td>
</tr>
<tr>
<td>2.00</td>
<td>Jun. 13, 2019</td>
<td>The whole document Restructured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Device number corrected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 Changes corrected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 History of correction announced corrected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11 to 16 Points for caution corrected and added.</td>
</tr>
<tr>
<td>2.01</td>
<td>June 28, 2019</td>
<td>1 Contents corrected.</td>
</tr>
</tbody>
</table>
General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit 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. **Precaution against Electrostatic Discharge (ESD)**
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. **Processing at power-on**
   The state of the product is undefined at the time 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 time 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 time 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 time when power is supplied until the power reaches the level at which resetting is specified.

3. **Input of signal during power-off state**
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. **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 the 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.

5. **Clock signals**
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with 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. Additionally, 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.

6. **Voltage application waveform at input pin**
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between $V_{IL} \text{(Max.)}$ and $V_{IH} \text{(Min.)}$ due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between $V_{IL} \text{(Max.)}$ and $V_{IH} \text{(Min.)}$.

7. **Prohibition of access to reserved addresses**
   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. **Differences between products**
   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of 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.
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 warrants 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 implants; etc.), or may cause serious property damage (space system; underwater 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.

(Note1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

Corporate Headquarters
TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact information
For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit: www.renesas.com/contact/

Trademarks
Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

© 2019 Renesas Electronics Corporation. All rights reserved.