To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

Send any inquiries to http://www.renesas.com/inquiry.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of 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. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. 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 of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may 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.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.

   "Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, 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, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be 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, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

M16C/62

Programming the M16C/62 in Flash Parallel Mode

1.0 Abstract

The following article describes using the ATC (Advanced Transdata) PGM1000 programmer to parallel program the flash memory of the M16C/62 series of microcontrollers. The MCU mode of parallel flash programming is referred to in the M16C/62 data sheets as “Parallel I/O Mode”.

2.0 Introduction

The Renesas M16C/62 series of microcontrollers is a 16-bit family of MCUs, based on Renesas’ popular M16C CPU core. These parts provide high memory efficiency, power-saving ability, low noise emission, and improved noise immunity. The flash versions of the device contain flash memory that can be rewritten with a single voltage. The M16C/62 flash can be programmed using one of three methods: Parallel I/O Mode, Standard Serial I/O Mode, and CPU Rewrite Mode. It is the Parallel I/O Mode that is detailed in this article.

The flash memory is divided into two major blocks, a user program area and a boot ROM area. The user program area is for the normal application program and data. Any program in the boot ROM area is accessed only when a special hardware reset sequence is initiated. This boot ROM area has a control program stored in it when shipped from the factory. The program allows asynchronous or synchronous serial programming of the user area of the flash. Changes to the boot area of the flash can only be made using Parallel I/O Mode.

3.0 Setting Up the PGM1000 Programmer

Select the appropriate program adapter for the M16C device package that will be used. There are currently two adapters for the M16C/62 parts, as shown in Table 1.

Table 1 Adapters for M16C Device

Adapter Name	Number	Supported Devices
APT-MCP6S	M306XXXX-100P6S	M30620/M30624FP (100-pin SPFQ)
APT-MCP6Q	M306XXXX-100P6Q	M30620/M30624GP (100-pin QFP)

The adapters are marked to indicate J1 and J2.

To install the adapter onto the PGM1000 programmer, follow these steps:

1. Connect the DC power supply. The ACTIVE LED will blink several times and then stay on when the programmer is ready.
2. Connect the programmer to the parallel port of the host computer using the DB25 cable.

3. Install the software on the host computer if it is not already installed.

The PGM1000 has the following four windows that are used to display programming information:

- Boot ROM Memory
- Program Memory
- Device Configuration
- Verify Errors

A view of the screen with these four windows open is shown in Figure 1.

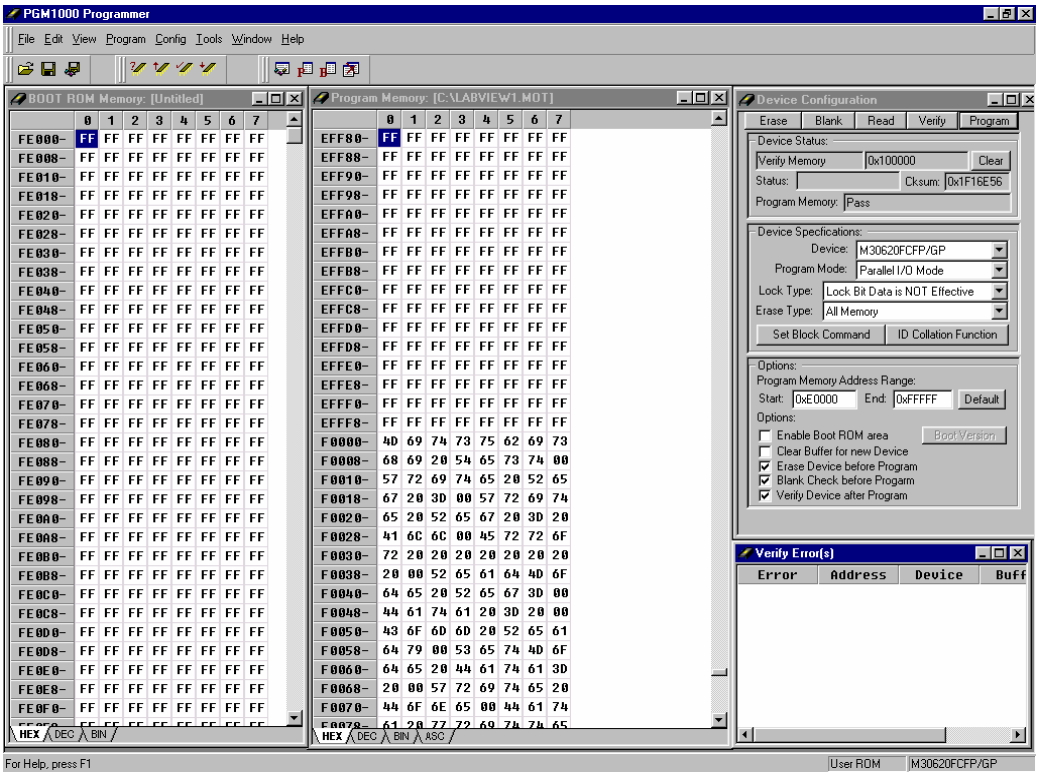

Figure 1 Screen View of Four Open Windows

Use the Device Specification window to select the M16/62 (M30624). Also use this window to select Parallel I/O Mode as the Program Mode.

Install the device to be programmed into the socket. Ensure that pin 1 is lined up with the triangle on the programming adapter that indicates pin 1.

4.0 Programming the Boot ROM Area

Note: The boot ROM area contains a factory-programmed boot ROM code used for “Serial I/O Mode” programming of the user flash area. If the boot ROM area is reprogrammed, the factory Serial I/O Mode programming modes can no longer be used.

To enable access to the boot ROM area, click the “Enable Boot ROM area” filed under Options in the Device Configuration. If this block is not checked, the Boot ROM area of the device cannot be accessed.

To select the file to be loaded to the boot ROM area, go to the File menu and select “Open File”. This will open a dialog box. Clicking on the down arrow next to “Files of type” will result in a dialog box as shown in Figure 2.

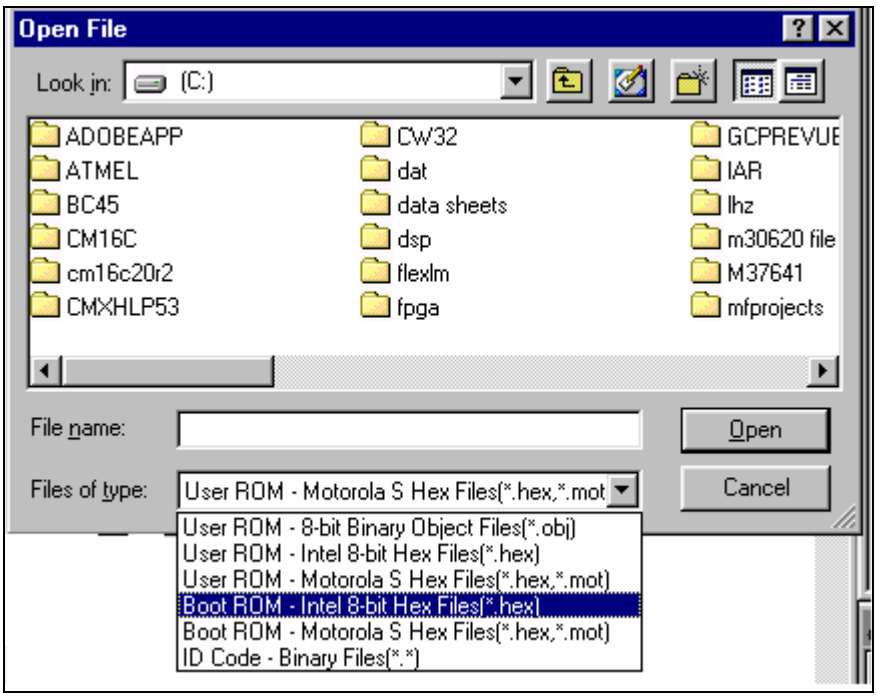

Figure 2 Open File Dialog Box

Select either “Boot ROM - Intel 8-bit Hex files (*.hex)” or the “Boot ROM - Motorola S Hex Files (*.hex,*.mot)” for the type of file to be opened. If one of the User ROM file types is used as a file type. the program selected will be loaded into the program ROM area buffer, not the boot ROM area buffer. This will result in errors when programming is attempted.

Once the file has been selected, a complete program cycle can be selected by choosing the program button with the “Erase Device before Program”, “Blank Check before Program”, and “Verify Device after Program” boxes checked in the Programmer Device Configuration window.

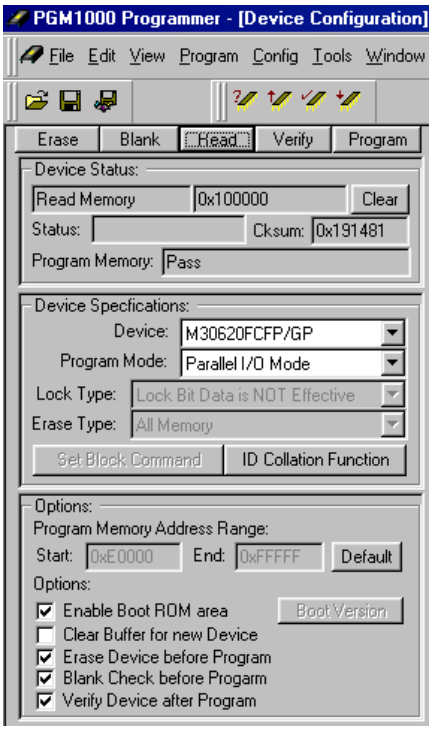

Figure 3 Device Configuration Window

The Programmer will then erase the flash area, check that the area is blank, program the device with the data from the file selected, and then read the flash memory area and verify it against the information stored in the buffer. If there are errors during the verify, they will be indicated in the Verify Error(s) window.

5.0 Programming the User Flash Area

To program the user flash area, ensure that the “Enable Boot ROM area” check box in the options section of the Device Configuration window is not checked. To allow programming of all areas of user memory, the following Device Specifications should also be selected in the Device Configuration window.

Program mode: Set to “Parallel I/O”
Lock Type: Set to “Lock Bit Data is NOT Effective”
Erase Type: Set to “All Memory”

Under the options section of the Device Configuration window, select the following boxes:

- “Erase Device before Programming”
- “Blank Check before Programming”
- “Verify Device after Programming”

Once the setup of those options is complete, the program file needs to be selected. To select the file go to the File menu and select “Open File”. A dialog box will open similar to the one shown in Figure 4. It is important to

select the correct file type in the “Files of type:” section of the window. One of the three “User ROM” selections must be selected. Do not use the “Boot ROM” selections. If ID codes are to be programmed, refer to section 6.0 Using ID Codes.

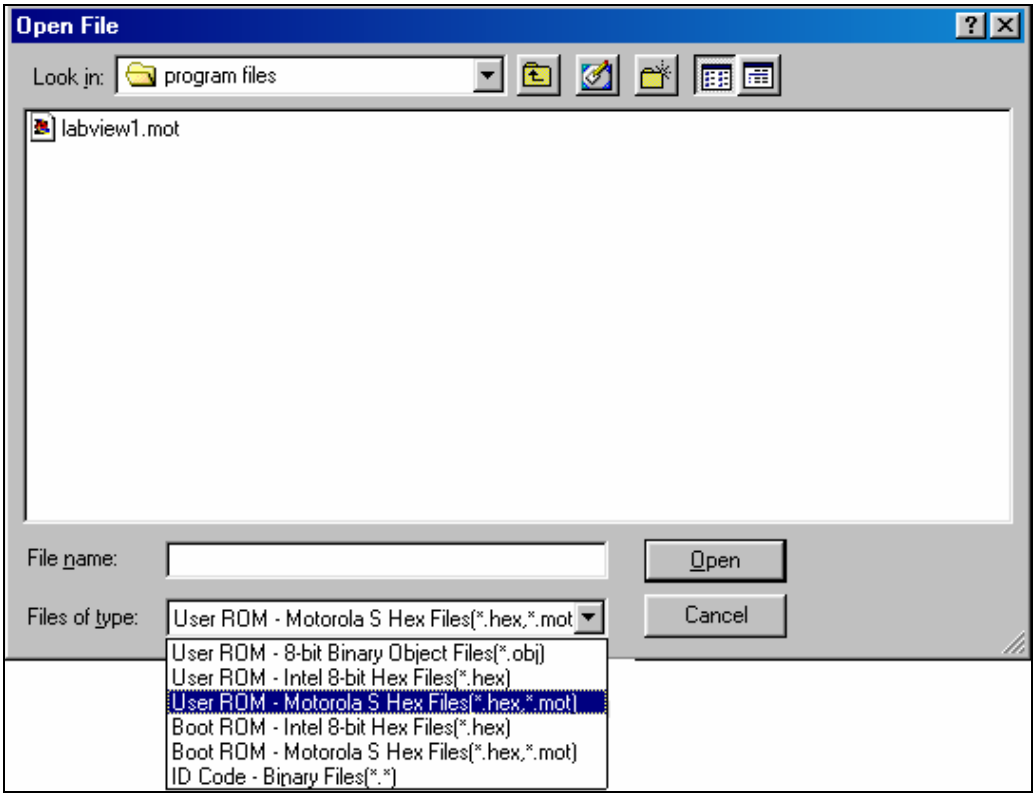

Figure 4 Open File Dialog Box

Once the file has been selected, a complete program cycle can be selected by choosing the program button with the “Erase Device before Program”, “Blank Check before Program”, and “Verify Device after Program” boxes checked in the Programmer Device Configuration window.

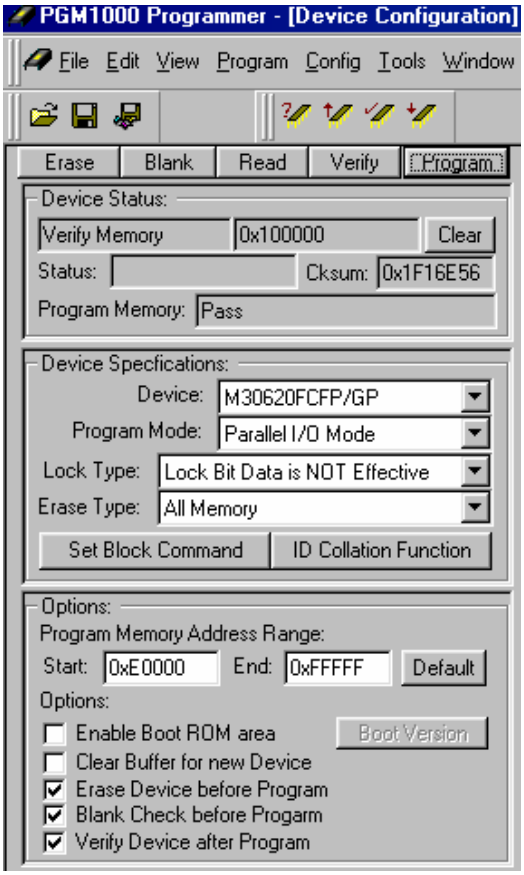

Figure 5 Device Configuration Window

The Programmer will then erase the flash area, check that the area is blank, program the device with the data from the file selected, and then read the flash memory area and verify it against the information stored in the buffer. If there are errors during the read and verify, they will be indicated in the Verify Error(s) window.

6.0 Using ID Codes

The M16C/62 devices have 7 bytes of flash memory mapped to be used as ID codes. These ID codes are checked as part of the initialization of the “Standard Serial I/O Mode” of programming. The ID codes provide protection against reading or modifying the flash memory. The data to be written to these locations can be written as fixed data in the program file or added to the buffer prior to programming the device. To add the ID code as part of the programming, load the original program file as outlined in section 5.0 Programming the User Flash Area. After the program has been loaded to the memory buffer, select the ID Collation Function from the Device Specifications section of the Device Configuration window. Clicking on this button will open the dialog box shown in Figure 6.

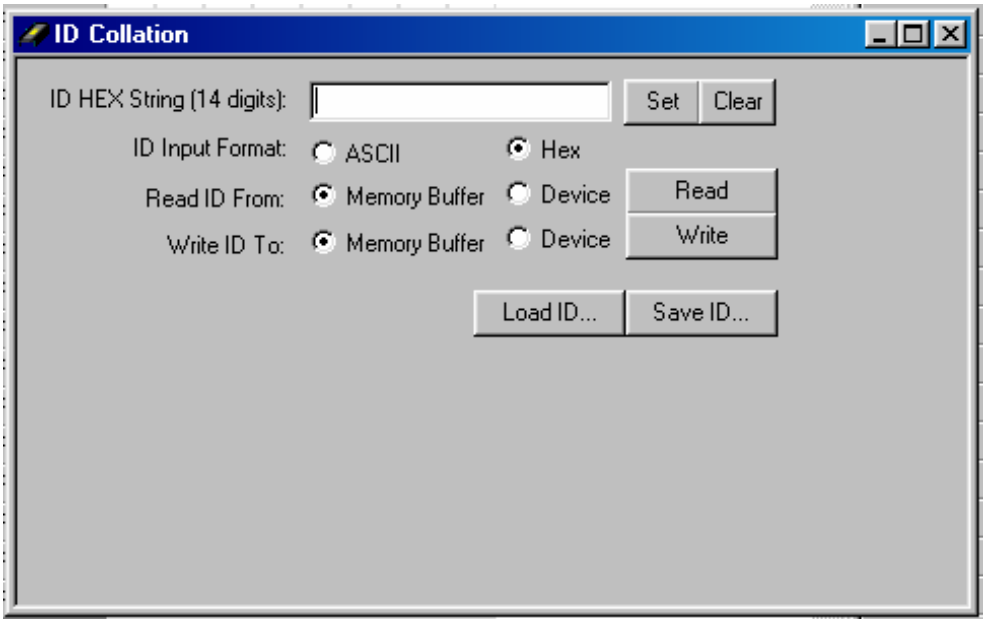

Figure 6 ID Collation Dialog Box

A 14-character hex string or 7-character ASCII string can be input into the dialog box. If a standard ID file has been created, it can be loaded using the "Load ID…" button. After the ID string is entered select the Memory Buffer option in the "Write ID To" section of the dialog box. Then clicking the Write button will place the ID string into the appropriate locations in the memory buffer. Programming the device at this point will transfer the original program with the ID bytes added. The contents of the memory buffer can be saved as a *.hex of *.obj file using the Save option under the File menu. This allows subsequent programming with the ID bytes to be accomplished by simply loading the file that was saved.

7.0 Reference

Renesas Technology Corporation Semiconductor Home Page

http://www.renesas.com

E-mail Support

support_apl@renesas.com

Data Sheets

- M16C/62 datasheets, 62aeds.pdf

User's Manual

- ATC (Advanced Transdata) PGM1000 Manual

Keep safety first in your circuit designs!

- Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
  Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

- These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corporation product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corporation or a third party.
- Renesas Technology Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor for the latest product information before purchasing a product listed herein.
  The information described here may contain technical inaccuracies or typographical errors.
  Renesas Technology Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
  Please also pay attention to information published by Renesas Technology Corporation by various means, including the Renesas Technology Corporation Semiconductor home page (http://www.renesas.com).
- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
- Renesas Technology Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of Renesas Technology Corporation is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
  Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
- Please contact Renesas Technology Corporation for further details on these materials or the products contained therein.