

[Featured Tool]

R20TS0637EJ0100

Rev.1.00

Dec. 01, 2020

Reduce the Program Data Size with Ease!

## Introducing Half-Precision Floating-Point Feature in Renesas Compiler Professional Edition

### Overview

Here we introduce one of the additional functions of Renesas compiler professional edition: half-precision floating-point format. [Applicable compilers: C Compiler Package for RH850 Family (CC-RH) V1.05.00 or above]

By using half-precision floating-point format data, you can reduce data size in programs containing a lot of floating-point data.

### 1. Features

#### 1.1 Reduction in Program Data Size

CC-RH supports 2-byte floating-point format (in addition to the typical 4- and 8-byte floating-point type formats). This data type is called half-precision floating-point, and can be defined as `__fp16` type.

Using half-precision floating-point data can greatly reduce the data size of a program.

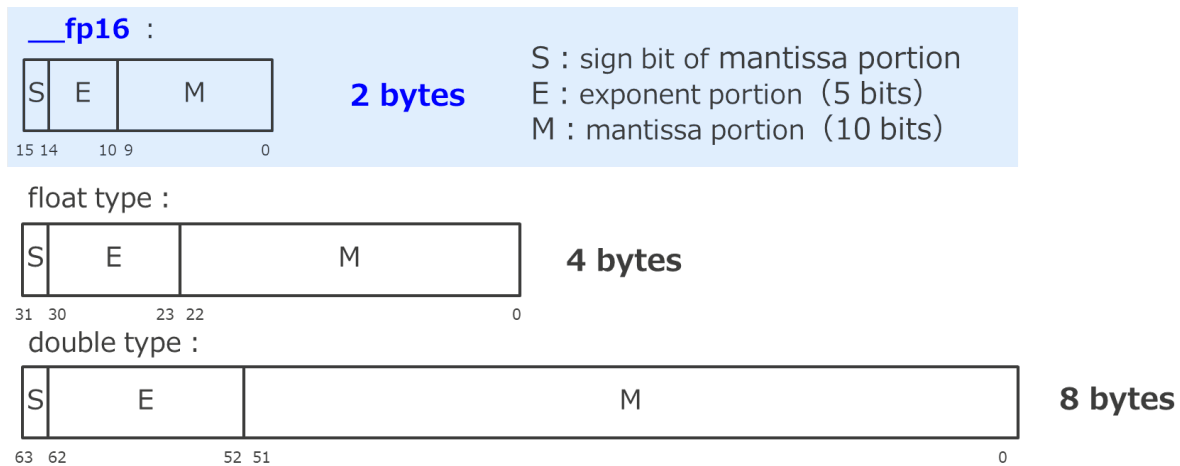


Figure 1. Data Size Comparison between `__fp16`, float, and double Types.

## 1.2 Ease of Use: Just Define Floating-point Type as \_\_fp16 type

\_\_fp16 type half-precision floating-point format uses FPU instructions to convert data from half-precision to single-precision to compute the data as single-precision floating-point data. It then uses FPU instructions again to convert the data back from single-precision to half-precision. These codes are automatically generated by CC-RH, so all you need to do to reduce the size of floating-point data is to replace float or double type in your C code with \_\_fp16 type.

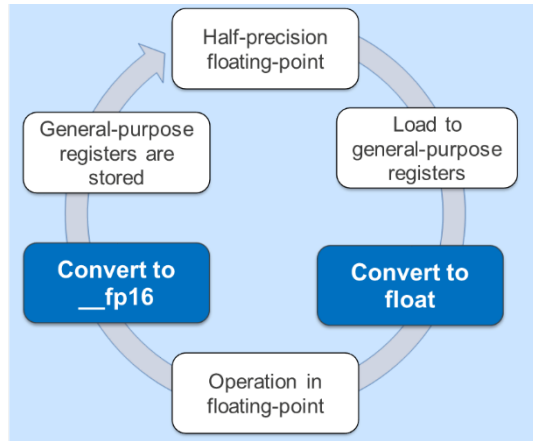


Figure 2. CC-RH Generated Code

## 2. How to Specify Options

If you are using the CS+ Integrated Development Environment, you can specify options on the GUI.

You can easily enable or disable the half-precision floating-point type from the following property:

[Compile Options] tab > [Output Code] category > [Enable half precision floating-point type] property.

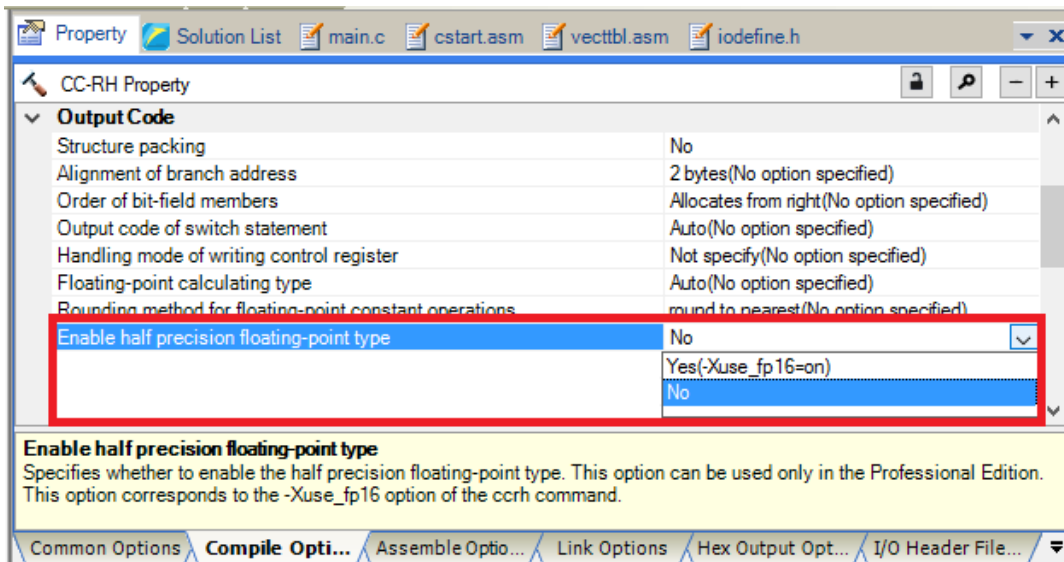


Figure 3. Specification in CS+

Note that Half-precision floating-point format cannot be specified in an MCU with a G3K core.

### 3. Other Functions of Professional Edition

The professional edition offers more additional features as below.

- Checking Source Code against MISRA-C:2004/2012 Rules  
The source code is checked against MISRA-C rules during compilation for efficient program development and quality improvement.
- Detection of Stack Smashing  
Stack overflow or security attack is prevented for safer program development.
- Enhancing the Safety of Dynamic Memory Management  
Double-freeing or overflow of a heap area is prevented for safer program development.
- Detection of Illegal Indirect Function Calls  
Indirect function calls to untrustworthy addresses are prevented for safer program development.
- Synchronization in the Updating of Control Registers  
Workload for determining if insertion of synchronization processing is required and for inserting it manually is reduced.

For details about the functions of the Renesas compiler professional edition, refer to the following application note. The application note describes the functions that enable better quality programs to be delivered to customers within shorter development periods. Example of C sources that you can immediately try by copying and pasting are also provided.

<https://www.renesas.com/document/apn/renesas-compilers-application-note-professional-editions>

Renesas compiler professional edition: Compiler

### 4. Purchasing the Product

For product ordering, contact your local Renesas Electronics marketing office or distributor.

Customers who have standard edition node-locked licenses can upgrade their compilers from Standard edition to Professional edition by additionally purchasing the upgrade (edition) license.



For product part names, refer to the web pages for the following compiler packages.

CC-RL: [https://www.renesas.com/rl78\\_c](https://www.renesas.com/rl78_c)

CC-RX: [https://www.renesas.com/rx\\_c](https://www.renesas.com/rx_c)

CC-RH: [https://www.renesas.com/rh850\\_c](https://www.renesas.com/rh850_c)

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Dec.01.20	-	First edition issued

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.

The past news contents have been based on information at the time of publication. Now changed or invalid information may be included.

The URL in the Tool News also may be subject to change or become invalid without prior notice.

**Corporate Headquarters**

TOYOSU FORESIA, 3- 2- 24 Toyosu,  
Koto-ku, Tokyo 135- 0061, Japan

[www.renesas.com](http://www.renesas.com)

**Trademarks**

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

**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/](http://www.renesas.com/contact/)