RL78/G14, H8/36109

Migration Guide from H8 to RL78: ROM (Flash memory)

Introduction

This application note describes how to migrate ROM of H8/36109 to Flash memory of RL78/G14.

Target Device

RL78/G14, H8/36109

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Contents

1. Differences in Function Overview

Table 1.1 summarizes the differences between ROM (Flash memory) of H8/36109 and Flash memory of the RL78/G14.

Table 1.1 Differences

Item	H8/36109 ROM	RL78/G14 Flash memory
Size	128K Byte	512K Byte (Max.)
Programming unit	128 Byte	Code flash memory: 4 Byte Data flash memory: 1 Byte
Erasing unit	1-block units (1K Byte x 4 block units, 28K Byte x 1 block unit, 32K Byte x 3 block units)	1-block units (1K Byte unit)
Reprogramming count	1000 times	Code flash memory: 1000 times Data flash memory: TYP. 1,000,000 times (Retained for 1 year)
Data flash memory	No	Yes (4K / 8K Byte)
Rewriting method	- Boot mode - User Mode - Programmer Mode	- Flash memory programmer - Serial Programming Using External Device (that Incorporates UART) - Self-Programming
Setting of flash operation mode (HS / LS / LV)	None	Yes
Protect / Security function	Yes	Yes

The flash memory of H8/36109 is programmed 128 bytes at a time. Erasure is performed in single-block units. The flash memory is configured as follows: four 1-kbyte blocks, one 28-kbyte block, and three 32-kbyte blocks. The flash memory is rewritable in boot mode, user mode, and writer mode.

RL78/G14 incorporates the flash memory to which a program can be written, erased, and overwritten while mounted on the board. The size of all blocks of the flash memory is 1K bytes. The flash memory includes the “code flash memory”, in which programs can be executed, and the “data flash memory”, an area for storing data. The code flash memory can be rewritten to through serial programming using a flash memory programmer or an external device (UART communication), or through self-programming.The data flash memory can be rewritten to by using the data flash library during user program execution. With the RL78/G14, set the flash operation mode by using an option byte according to the main system clock frequency (f_{MAIN}) and the power supply voltage (V_{DD}) used.

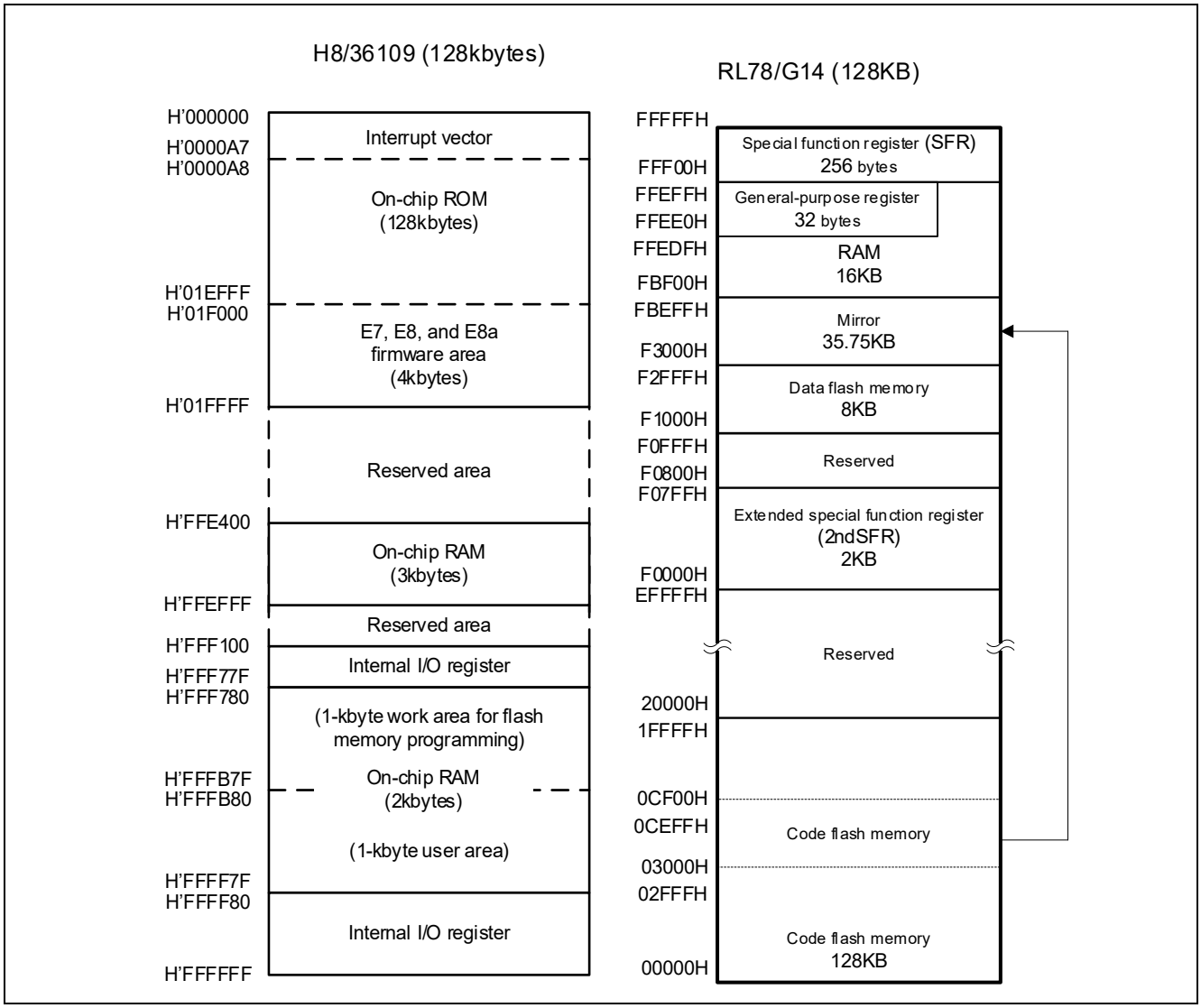
Table 1.2 shows the RL78/G14 flash operation mode setting.

Table 1.2 RL78/G14 Setting of flash operation mode

Operation mode	Operating Frequency Range (f_{MAIN})	Operating Voltage Range (V_{DD})
LV (low voltage main) mode	1 MHz to 4 MHz	1.6 V to 5.5 V
LS (low speed main) mode	1 MHz to 8 MHz	1.8 V to 5.5 V
HS (high speed main) mode	1 MHz to 16 MHz	2.4 V to 5.5 V
	1 MHz to 32 MHz	2.7 V to 5.5 V

Figure 1.1 shows the memory maps of the 128Kbyte flash memory for the H8/36109 and the RL78/G14.

Figure 1.1 Memory maps of 128Kbyte flash memory for the H8/36109 and the RL78/G14



H8/36109 have an H8/300H CPU with an internal 32-bit architecture that is upward-compatible with the H8/300 CPU, and supports only advanced mode, which has a 16-Mbyte address space.

RL78/G14 can access a 1 MB address space. RL78/G14 can access 1Mbyte memory space (00000H - FFFFFH) by using the ES and CS registers. In addition, RL78/G14 has a mirror area containing the same content as the code flash memory, allowing the CPU to read the content of the code flash memory with short code.

Table 1.3 shows the correspondence between functions for rewriting the flash memory of H8/36109 and RL78/G14.

Table 1.3 Correspondence between Functions

H8/36109	RL78/G14
Boot mode	Serial Programming Using External Device (that Incorporates UART)
User Mode	Self-Programming
Programmer Mode	Flash memory programmer

2. Summary of Differences between Functions

2.1 Differences between Boot mode

Boot mode of the H8/36109 correspond to Serial Programming Using External Device (that Incorporates UART) of the RL78/G14.

Table 2.1 shows the differences between Boot mode.

Table 2.1 Differences between Boot mode

Item	H8/36109 Boot mode	RL78/G14 Serial Programming Using External Device (that Incorporates UART) (Note)
Power supply voltage	3.0 to 5.5V	- 2.7 to 5.5V (Full speed mode / Wide voltage mode) - 2.4 to 2.7V (Full speed mode / Wide voltage mode) - 1.8 to 2.4V (Wide voltage mode)
Communication Mode	Asynchronous mode	Asynchronous mode
Communication pin	RXD pin, TXD pin	- TOOL0 pin (single-line UART) - TOOLTxD pin, TOOLRxD pin
Communication Speed	9600bps, 4800bps, 2400bps	1Mbps, 500kbps, 250kbps, 115.2 kbps

Note. For details, refer to RL78 Microcontrollers (RL78 Protocol A) Programmer Edition (R01AN0815).

2.2 Differences between User Mode

User mode of the H8/36109 correspond to Self-Programming of the RL78/G14.

Table 2.2 shows the differences between User Mode.

Table 2.2 Differences between User Mode

Item	H8/36109 User Mode	RL78/G14 Self-Programming (Note)
Power supply voltage	3.0 to 5.5V	- 2.7 to 5.5V (Full speed mode / Wide voltage mode) - 2.4 to 2.7V (Full speed mode / Wide voltage mode) - 1.8 to 2.4V (Wide voltage mode)
Rewriting Method	Any software	Flash Self-programming Library
Protection	Yes	Yes

Note. For details, refer to RL78 Family Flash Self-Programming Library Type01 Japanese Release User's Manual (R01US0050).

3. Sample Code for Flash memory

The sample code for Flash memory is explained in the following application notes.

- RL78 Microcontrollers (RL78 Protocol A) Programmer Edition (R01AN0815)
- RL78/G13 Self-Programming (Received Data via UART) CC-RL (R01AN2761)
- RL78/G13 Self-Programming (Received Data via CSI) CC-RL (R01AN2849)

4. Documents for Reference

User's Manual:

- RL78/G14 User's Manual: Hardware (R01UH0186)
- RL78 Family Flash Self-Programming Library Type01 Japanese Release User's Manual (R01US0050)
- RL78 Family Data Flash Library Type04 Japanese Release (R01US0049)
- H8/36109 Group User's Manual: Hardware (R01UH0294)

The latest versions can be downloaded from the Renesas Electronics website.

Technical Update/Technical News:

The latest information can be downloaded from the Renesas Electronics website.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Nov.20, 2020	-	First edition issued

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 an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. 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} (Max.) and V_{IH} (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} (Max.) and V_{IH} (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.

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