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# RL78/G14, R8C/36M Group

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## Migration Guide from R8C to RL78: D/A converter

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### Introduction

This application note describes how to migrate from the D/A converter of the R8C/36M Group to the D/A converter of the RL78/G14 (with 96-KB or larger flash memory ROM).

Note that a D/A converter is incorporated only in the RL78/G14 products that have 96-KB or larger flash memory ROM. If you are thinking of employing a D/A converter in the RL78 Family product with 64-KB or smaller flash memory ROM, the RL78/G1F or RL78/G11 is recommended.

### Target Device

RL78/G14, R8C/36M Group

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

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## 1. Migration Method from R8C Family to RL78 Family

The following sections describe how to implement the D/A converter of the R8C/36M Group by using the D/A converter of the RL78/G14 with 96-KB or larger flash memory ROM.

Table 1.1 shows the specifications of the D/A converter of the R8C/36M Group.

Table 1.2 shows the specifications of the D/A converter of the RL78/G14.

**Table 1.1 D/A Converter in R8C/36M**

Item	Specification
D/A conversion method	R-2R method
Resolution	8-bit
Analog output pins	2
Reference voltage	Vref

**Table 1.2 D/A Converter in RL78/G14 (with 96-KB or larger flash memory ROM)**

Item	Specification
D/A conversion method	R-2R ladder method
Resolution	8-bit
Analog output pins	1 or 2 <small>Note</small>
Reference voltage	V <sub>DD</sub>
Operation mode	Normal mode, Real-time output mode

Note: Depends on the package type.

To allow the D/A converter of the RL78/G14 to operate similarly to the D/A converter of the R8C/36M Group, select normal mode for the D/A converter of the RL78/G14.

One of the major differences is the reference voltage of the analog voltage output by the D/A converters.

With the R8C/36M Group, the voltage on the Vref (reference voltage input) pin is used as the reference voltage in determining the analog voltage to be output.

With the RL78/G14, the voltage on the V<sub>DD</sub> (supply voltage) pin is used as the reference voltage in determining the analog voltage to be output.

## 2. Differences between RL78/G14 and the R8C/36M Group

This chapter describes the differences of D/A converter between the RL78/G14 and R8C/36M group.

### 2.1 Differences in D/A converter

Table 2.1 shows the differences between the D/A converter of the R8C/36M Group and D/A converter (normal mode) of the RL78/G14.

**Table 2.1 Differences between D/A converter of R8C/36M group and D/A converter (Normal mode) of RL78/G14**

Item	R8C/36M group D/A converter	RL78/G14 D/A converter Normal mode
Reference voltage	Vref (Reference voltage input) pin	V <sub>DD</sub> (Power Supply) pin
Output Pins	DA0, DA1	ANO0, ANO1 <sup>Note</sup>

Note: Provided on the products having 32 or more pins.

### 2.2 Comparison between Registers

Table 2.2 compares the registers for the D/A converter of the R8C/36M group to the corresponding registers for the D/A converter of the RL78/G14.

**Table 2.2 Comparison between Registers**

Setting Items	R8C/36M group D/A converter	RL78/G14 D/A converter Normal mode
Enabling clock supply to peripheral hardware	-	PER1 Register DACEN bit
Output value of D/A conversion	DA <sub>i</sub> Register	DACS <sub>i</sub> Register
Output enable	DACON Register DA0E bit, DA1E bit	DAM Register DACE <sub>i</sub> bit
Operation mode selection	-	DAM Register DAMD <sub>i</sub> bit

Remark

-: There are no corresponding registers.

i = 0, 1

### 3. Related Application Note

- RL78/G14 Setting the D/A Converter's Normal Mode CC-RL (R01AN2672)

### 4. Documents for Reference

User's Manual:

RL78/G14 User's Manual: Hardware (R01UH0186)

R8C/36M Group User's Manual: Hardware (R01UH0259)

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.

Migration Guide:

Migration to CubeSuite+ Integrated Development Environment for RL78 Family  
(On-chip Debug) - Migration from R8C, M16C to RL78 (R20UT2150)

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## Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep. 26, 2018	-	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. Handling of Unused Pins

Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

¾ 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

### 2. Processing at Power-on

The state of the product is undefined at the moment when power is supplied.

¾ The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

### 3. Prohibition of Access to Reserved Addresses

Access to reserved addresses is prohibited.

¾ The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

### 4. Clock Signals

After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

¾ 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. Moreover, 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.

### 5. Differences between Products

Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

¾ The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the 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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