

# RL78/G13, 78K0/Kx2

## Migration Guide from 78K0 to RL78: Port Functions

### Introduction

This application note describes how to migrate the port functions from the 78K0/Kx2 to the RL78/G13.

### Target Device

RL78/G13, 78K0/Kx2

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. Differences in Function Overview

Table 1.1 summarizes the differences between the port functions of the 78K0/Kx2 and the RL78/G13.

Table 1.1 Differences

Item	78K0/Kx2	RL78/G13
Pin I/O Buffer Power Supplies	AVREF, EV <sub>DD</sub> <sup>(Note1)</sup> , V <sub>DD</sub>	EV <sub>DD0</sub> <sup>(Note2)</sup> , EV <sub>DD1</sub> <sup>(Note2)</sup> , V <sub>DD</sub>
Pin configuration	<ul style="list-style-type: none"> <li>- CMOS I/O</li> <li>- CMOS output</li> <li>- N-ch open drain I/O [6V tolerance]</li> </ul>	<ul style="list-style-type: none"> <li>- CMOS I/O (N-ch open drain I/O [EV<sub>DD</sub> tolerance <sup>(Note1)</sup>])</li> <li>- CMOS input</li> <li>- CMOS output</li> <li>- N-ch open drain I/O [6V tolerance]</li> </ul>

Note1. With products not provided with an EV<sub>DD</sub> pin, replace EV<sub>DD</sub> with V<sub>DD</sub>.

Note2. For the products that do not have an EV<sub>DD0</sub> or EV<sub>DD1</sub> pin, replace EV<sub>DD0</sub> and EV<sub>DD1</sub> with V<sub>DD</sub>.

The 78K0/Kx2 has three types of pins: CMOS input/output, CMOS output, and N-ch open drain input/output ports. The RL78/G13 has four types of pins: CMOS input/output, CMOS input, CMOS output, and N-ch open drain input/output ports.

The CMOS input/output ports in the RL78/G13 have a function for switching between the normal input buffer and the transistor-transistor logic (TTL) input buffer. When the TTL input buffer is selected, the input voltage used to distinguish between the high level and low level in the RL78/G13 can be lowered and the RL78/G13 can receive signals from an external device operating at a lower power-supply voltage than the RL78/G13. When the N-ch open drain output (VDD voltage-tolerant or EVDD voltage-tolerant) mode is selected, the RL78/G13 can output signals through an external pull-up resistor to an external device operating at a lower power-supply voltage than the RL78/G13.

In addition, the assignment of multiplexed pin functions can be changed through the peripheral I/O redirection register (PIOR) in the RL78/G13. For example, the number of serial communication channels available at the same time can be increased or the timer output can be assigned to adjacent pins.

## 2. Register Compatibilities

Table 2.1 shows the compatibilities of the registers for the port functions between the 78K0/Kx2 and the RL78/G13.

Table 2.1 Register Compatibilities

Item	78K0/Kx2	RL78/G13
Port mode registers	PMmn register	PMmn register
Port registers	Pmn register	Pmn register
Pull-up resistor option registers	PUmn register	PUmn register
A/D port configuration register <sup>(Note1)</sup>	ADPC register	ADPC register
Port input mode registers	None	PIMm register
Port output mode registers	None	POMM register
Port mode control registers	None	PMCmn register
Peripheral I/O redirection register	None	PIOR register
Global digital input disable register	None	GDIDIS register <sup>(Note2)</sup>

Note1. The register setting for switching from digital input/output (D) to analog input (A) is applied to the A/D ports in descending order of pin name (from ANI7 to ANI0) in the 78K0/Kx2 but in ascending order (from ANI0 to ANI14) in the RL78/G13.

Note2. The GDIDIS register is equipped with 64-, 80-, 100-, 128-pin products

Remark1. For 78K0/Kx2, m = 0-7, 12, 14; n = 0-7

For RL78/G13, m = 0-15; n = 0-7

Remark2. Different products are provided with different functions. For details, refer to the appropriate user's manuals (hardware).

### 3. Sample Code for Port Functions

Sample codes for the port functions are explained in the following application notes.

- RL78/G13 Initialization CC-RL (R01AN2575)

### 4. Reference Documents

User's Manual:

- RL78/G13 User's Manual: Hardware (R01UH0146)
- 78K0/Kx2 User's Manual: Hardware (R01UH0008)

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	May. 16, 2019	-	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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