

Linux Interface Specification Device Driver RTC

User's Manual: Software

RZ/V2N Group, RZ/V2H Group, RZ/G3E Group and
RZ/G3S Group

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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.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the hardware functions and electrical characteristics of the MPU. It is intended for users designing application systems incorporating the MPU.. It is intended for users developing software incorporating the processors. A basic knowledge of software development and Linux systems is necessary in order to use this document.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RZ/G3E Group, RZ/V2H Group, RZ/V2N Group and RZ/G3S Group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's manual for Hardware	Hardware specifications (pin assignments, memory maps, peripheral function specifications, electrical characteristics, timing charts) and operation description Note: Refer to the application notes for details on using peripheral functions.	RZ/V2N Group User's Manual: Hardware	---
		RZ/V2H Group User's Manual: Hardware	---
		RZ/G3E Group User's Manual: Hardware	---
		RZ/G3S Group User's Manual: Hardware	---
User's manual for Software	Description of RTC Linux Interface Specification	Linux Interface Specification Device Driver RTC	This user's manual
Application Note	Information on using peripheral functions and application examples Sample programs Information on writing programs in assembly language and C	Available from Renesas Electronics Web site.	
Renesas Technical Update	Product specifications, updates on documents, etc.		

2. Notation of Numbers and Symbols
3. Register Notation
4. List of Abbreviations and Acronyms

Abbreviation	Full Form
RTC	Real Time Clock

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1. Overview

1.1 Overview

This manual explains the Linux RTC device driver in RZ/V2N, RZ/V2H, RZ/G3E and RZ/G3S platforms.

1.2 Function

This device driver supports the following functions:

- Calendar count mode
- Binary count mode
- Alarm function

1.3 Reference

1.3.1 Standard

There is no reference document on standards.

1.3.2 Related documents

There is no related document.

1.4 Restrictions

There is no restriction in this module.

1.5 Notice

There is no restriction in this module.

2. Terminology

The following table shows the terminology related to this module.

Table 2-1 Terminology

Terms	Explanation
RTC	Real Time Clock

3. Operating Environment

3.1 Hardware Environment

The following table shows the hardware needed to use this module.

Table 3-1 Hardware environment (RZ/V2N, RZ/V2H, RZ/G3E and RZ/G3S)

Name	Product number
RZ/V2N Evaluation Board Kit V1.0	RTK0EF0186C03000BJ
RZ/V2N Evaluation Board Kit V2.0	RTK0EF0186C03001BJ
RZ/V2H Evaluation Board Kit	RTK0EF0168C04000BJ
RZ/G3E Evaluation Board Kit	RTK9947E57S01000BE
RZ/G3S Evaluation Board Kit	RTK9845S33C01000BE

3.2 Module Configuration

The following figure shows the configuration of this module.

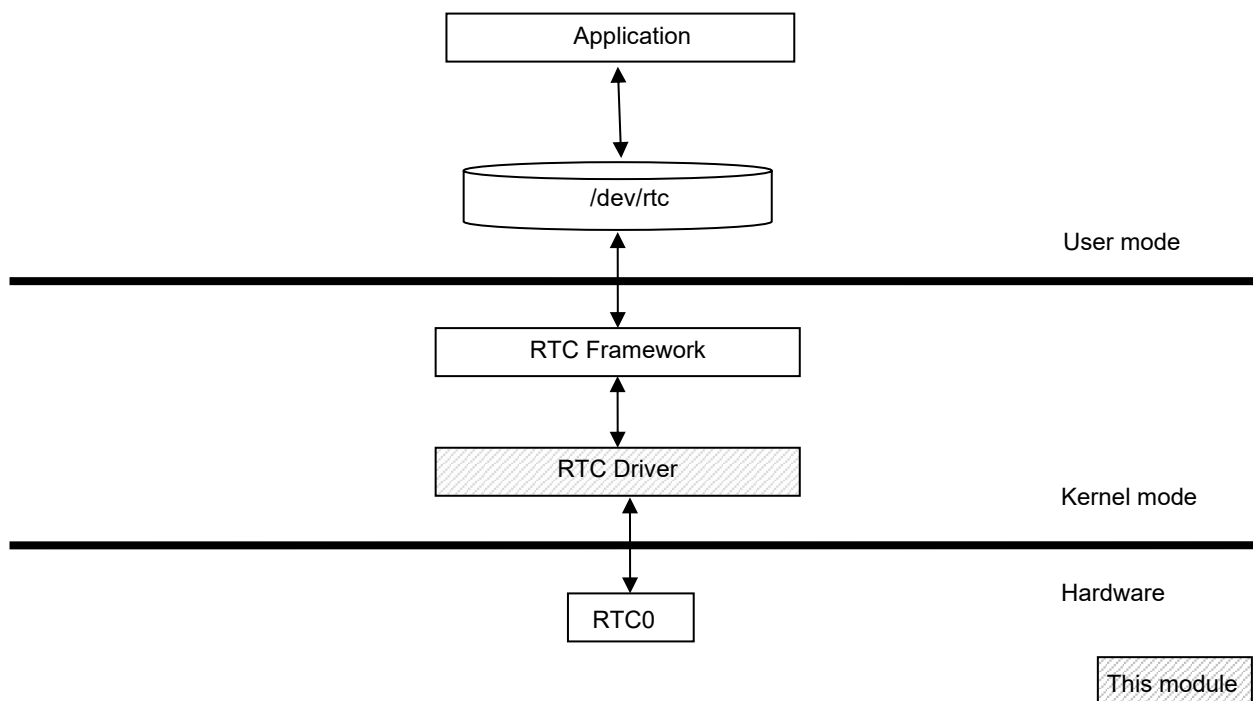


Figure 3-1 Module Configuration (RZ/V2N, RZ/V2H, RZ/G3E and RZ/G3S)

3.3 State Transition Diagram

There is no state transition diagram for this module.

4. External Interface

4.1 Device node

The following table shows the device node of this module.

Table 4-1 RTC device node

Channel	Device node	Major number	Minor number
RTC0	/dev/rtc0	253	0

An RTC device will create a `rtc<id>` directory under `/sys/class/rtc`. That directory contains a set of read-only attributes, the most important of which are:

- Date: This file prints the current date of the RTC interface:

```
$ cat /sys/class/rtc/rtc0/date
2017-08-28
```

- Time: This prints the current time of the RTC

```
$ cat /sys/class/rtc/rtc0/time
14:54:20
```

4.2 Definitions

4.2.1 Device information in Device Tree

The RTC device properties are shown below of RZ/V2N, RZ/V2H and RZ/G3E:

It is location in: `arch/arm64/boot/dts/renesas/r9a09g056.dtsi`

```
rtc: rtc@11c00800 {
    compatible = "renesas,r9a09g056-rtc", "renesas,rz-rtca3";
    reg = <0 0x11C00800 0 0x400>;
    interrupts = <GIC_SPI 525 IRQ_TYPE_EDGE_RISING>,
                <GIC_SPI 526 IRQ_TYPE_EDGE_RISING>,
                <GIC_SPI 524 IRQ_TYPE_EDGE_RISING>;
    interrupt-names = "period", "carry", "alarm";
    clocks = <&cpg CPG_MOD 0x53>, <&rtc_clk>;
    clock-names = "fck", "counter";
    resets = <&cpg 0x79>, <&cpg 0x7a>;
    reset-names = "rtc", "rtc_v";
    power-domains = <&cpg>;
    status = "disabled";
};
```

Note: All of the information in above device tree is used for RZ/V2N, RZ/V2H and RZ/G3E.

The RTC device required properties:

compatible:

- Must be set to "renesas,r9a09g047-rtc" for R9A09G047 (RZ/G3E)
- Must be set to "renesas,r9a09g056-rtc" for R9A09G056 (RZ/V2N).
- Must be set to "renesas,r9a09g057-rtc" for R9A09G057 (RZ/V2H).

reg:

Base address and length of the memory resource used by the RTC CH0.

clocks:

The 1st clock specifier is for the module clock supplied by CPG:

The 1st cell is a node or label of CPG clock to be used.

The 2nd cell must be set to CPG_MOD.

The 3rd cell must be set to clock index (0x53 for RZ/V2N, RZ/V2H and RZ/G3E).

The 2nd clock specifier is for the 32.768 kHz clock supplied by rtc_clk.

interrupt:

slot 1: GIC_SPI 525 IRQ_TYPE_EDGE_RISING

slot 2: GIC_SPI 526 IRQ_TYPE_EDGE_RISING

slot 3: GIC_SPI 524 IRQ_TYPE_EDGE_RISING

reset:

slot 1: Reset index for RTC (0x79 for RZ/V2N, RZ/V2H and RZ/G3E).

slot 2: Reset index for the RTEST registers (0x7a for RZ/V2N, RZ/V2H and RZ/G3E).

power domain: Must be set to always on.

The RTC device properties are shown below of RZ/G3S:

It is location in: arch/arm64/boot/dts/renesas/r9a08g045.dtsi

```

rtc: rtc@1004ec00 {
    compatible = "renesas,r9a08g045-rtca3", "renesas,rz-rtca3";
    reg = <0 0x1004ec00 0 0x400>;
    interrupts = <GIC_SPI 315 IRQ_TYPE_LEVEL_HIGH>,
                <GIC_SPI 316 IRQ_TYPE_LEVEL_HIGH>,
                <GIC_SPI 317 IRQ_TYPE_LEVEL_HIGH>;
    interrupt-names = "alarm", "period", "carry";
    clocks = <&cpg CPG_MOD R9A08G045_VBAT_BCLK>, <&vbattb
VBATTB_VBATTCLK>;
    clock-names = "bus", "counter";
    power-domains = <&cpg>;
    resets = <&cpg R9A08G045_VBAT_BRESETN>;
    status = "disabled";
};

```

The RTC device required properties:

compatible:

Must be set to "renesas,rz-rtca3" for R9A08G045 (RZ/G3S)

reg:

Base address and length of the memory resource used by the RTC CH0.

clocks:

The 1st clock specifier is for the module clock supplied by CPG:

The 1st cell is a node or label of CPG clock to be used.

The 2nd cell must be set to CPG_MOD.

The 3rd cell must be set to the module clock index. (R9A08G045_VBAT_BCLK for RZ/G3S)

The 2nd clock specifier is for the 32.768 kHz clock supplied by the VBATTB domain.

The 1st cell is a phandle to the VBATTB clock provider node.

The 2nd cell must be set to VBATTB_VBATTCLK

interrupt:

slot 1: GIC_SPI 315 IRQ_TYPE_LEVEL_HIGH for alarm interrupt.

slot 2: GIC_SPI 316 IRQ_TYPE_LEVEL_HIGH for period interrupt.

slot 3: GIC_SPI 317 IRQ_TYPE_LEVEL_HIGH for carry interrupt.

reset:

The 1st cell is a phandle to the CPG reset controller node.

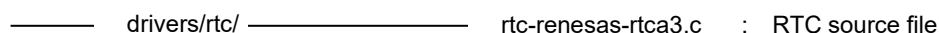
The 2nd cell must be set to the module reset index corresponding to the RTC block.

power domain: Must be set to always on.

5. Integration

5.1 Directory Configuration

The directory configuration is shown below.

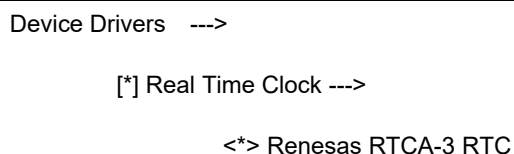


```
——— drivers/rtc/ ———— rtc-renesas-rtca3.c : RTC source file
```

Figure 5-1 Directory Configuration

5.2 Integration Procedure

To enable the function of this module, make the following setting with kernel configuration.



```
Device Drivers --->
    [*] Real Time Clock --->
        <*> Renesas RTCA-3 RTC
```

Figure 5-2 Kernel configuration

Lists the kernel config symbols to support RTC for RZ/V2N, RZ/V2H, RZ/G3E and RZ/G3S.



```
CONFIG_RTC_DRV_RENESAS_RTCA3=y
```

Figure 5-3 Kernel config symbols

5.3 Option Setting

5.3.1 Module parameters

There are no module parameters.

5.3.2 Kernel parameters

There are no kernel parameters.

REVISION HISTORY	Linux Interface Specification Device Driver RTC User's Manual: Software
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Rev.	Date	Description	
		Page	Summary
1.00	Jun. 30, 2025	—	First Edition issued
1.01	Jul. 22, 2025	—	Add RZ/G3E support information
1.02	Nov. 28, 2025	—	Add RZ/G3S support information
1.03	Dec. 19, 2025	—	Add RZ/V2H support information
1.04	Mar. 27, 2026	3	Add product number for RZ/V2N Version 2
		6	Update information for Devicetree of RZ/V2N

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