

# RX13T Group

## Handbook for RX13T

### Introduction

This document compiles useful information for each stage of device selection, development, and Mass production. You can also select what you need for your application from our rich selection of application notes that describe how to use a peripheral function, example applications, how to create a program, and more.

Please utilize these information, materials and application notes as a handbook when developing.

### Target Device

RX13T Group

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## 1. The table of information and materials needed for Device Selection, Development and Mass production

### 1.1 Step1: Device Selection

This section summarizes the information that is useful for the preliminary survey phase (Step1-1) and for the evaluation phase of device performance and features (Step1-2) when selecting the device.

#### 1.1.1 Step1-1: Preliminary survey phase

#	Item	Content	Link
1	Hardware information	Datasheet	<a href="#">Doc</a>
2		RX Family Brochure	<a href="#">Doc</a>
3	Products & Solutions	Video & blog	<a href="#">Web site</a>
4		Product deatures, Application block diagram(Winning combination)	<a href="#">Web site</a>
5	Product longevity program (PLP)	Overview of product longevity program (PLP)	<a href="#">Web site</a>
6		Product selection (product selector) Note: Refer to Longevity column in the chart.	<a href="#">Web site</a>
7	Product Specification Comparison	RX Family Product Selector	<a href="#">Web site</a>
8		Motor Solution Brochure	<a href="#">Doc</a>
9		Differences of specification among RX products	<a href="#">Doc</a>
10		[SH/H8/H8S/H8SX/M16C/V850] → RX microcontroller migration guide	<a href="#">Doc</a>
11		Design guide for migration between RX family differences in package external form	<a href="#">Doc</a>

### 1.1.2 Step1-2: Evaluation phase of device performance and features

#	Item	Content	Link
<b>User's Manual / Documentation</b>			
1	Hardware information	User's manual: Hardware	<a href="#">Doc</a>
2		RX family hardware manual guidance - electrical characteristics (how to read user's manual: hardware)	<a href="#">Doc</a>
3		RX family hardware manual guidance - peripheral functions (how to read user's manual: hardware)	<a href="#">Doc</a>
4		Technical update (errata information)	<a href="#">Web site</a>
5		Product change notice (PCN)	<a href="#">Web site</a>
6		Part number guide for RX family product (the meaning of character in part number)	<a href="#">Doc</a>
7		Semiconductor reliability handbook	<a href="#">Doc</a>
8		RELIABILITY REPORT	<a href="#">Doc</a>
9		RoHS Note: Please refer to "RoHS" column on the respective part number of the product options.	<a href="#">Web site</a>
10	Software information	Instruction set for RXv1 core architecture (user's manual)	<a href="#">Doc</a>
<b>Evaluation board</b>			
11	Solution board	MC-COM Renesas flexible motor control communication board	<a href="#">Web site</a>
12		Evaluation system for BLDC motor	<a href="#">Web site</a>
13		CPU Card for motor control	<a href="#">Web site</a>
14		User's manual for CPU Card	<a href="#">Doc</a>
<b>Evaluation environment (set up method)</b>			
15	Setup method	Getting started with the RX family development environment	<a href="#">Web site</a>
16	Software tool	Development tools for RX family	<a href="#">Web site</a>
17		Software environment (OS, middleware, drivers)	<a href="#">Web site</a>
18		RX smart configurator user's guide (tools for code generation)	<a href="#">Doc</a>
<b>Solution</b>			
19	Motor and Inverter Control	Motor and inverter control solutions	<a href="#">Web site</a>
20		Renesas motor workbench	<a href="#">Web site</a>
21	GUI	Graphical user interface (GUI) solutions	<a href="#">Web site</a>
22	Functional safety	Functional safety solutions for Industrial automation	<a href="#">Web site</a>
23		Functional safety solution for industrial automation	<a href="#">Doc</a>
24		Introduction to Renesas functional safety for industrial appliance(video)	<a href="#">Web site</a>

#	Item	Content	Link
25		Functional safety solution for home appliances	<a href="#">Web site</a>
26		Introduction to Renesas functional safety for home appliance (video)	<a href="#">Web site</a>
<b>Training</b>			
27	Training information	Smart configurator tutorial - create a LED blinking program using RX family MCU	<a href="#">Web site</a>
28		How to use tools and solutions (video clips)	<a href="#">Web site</a>
<b>Partner</b>			
29	Partner information	Partner products (system solutions provider)	<a href="#">Web site</a>
30		Partner products (trusted technology partners that deliver commercial-grade building blocks)	<a href="#">Web site</a>

## 1.2 Step2: Product Design Development

This section summarizes useful information for product design and development.

#	Item	Content	Link
1	Board Design	Hardware design guide	<a href="#">Doc</a>
2		Design guide for main clock circuit and Sub-Clock circuit	<a href="#">Doc</a>
3		Notes regarding high-temperature operation	<a href="#">Doc</a>
4		CAD Model Note: When you click the link in the CAD model column in the "Product Options" table on the product page, the CAD model information for each part# is displayed.	<a href="#">Web site</a>
5		board simulation model (IBIS) *	<a href="#">Web site</a>
6		Resonator and matching circuit information	<a href="#">Doc</a>
7		Package information (package outline information, mount manual, etc.)	<a href="#">Web site</a>

\* It requires My Renesas account to access the content.

## 1.3 Step3: Mass Production

#	Item	Content	Link
1	Writing a program	PG-FP6	<a href="#">Web site</a>
2		Renesas flash programmer (GUI tool for PC)	<a href="#">Web site</a>
3	Memory protection	How to manage the access control for flash memory	<a href="#">Doc</a>

## 1.4 Supportive information

Get help from our technical staff and community.

#	Item	Content	Link
1	Support information	FAQ (frequently asked inquiries)	<a href="#">Website</a>
2		RX forum (community)	<a href="#">Website</a>
3		Ask technical/sales support (support tickets)	<a href="#">Website</a>

## 2. Highlighted Application Notes

This part presents the main application notes for this product. In addition to this list, many more application notes and sample code are available on the product website <[www.renesas.com/RX13T](http://www.renesas.com/RX13T)> for your reference. (Note: To access content of sample code, My Renesas account is required.)

#	Item	Content	Link
1	System design	Examples of transitioning to low power consumption modes Application note	<a href="#">Doc</a>
2		Examples of transitioning to low power consumption modes Sample code	<a href="#">Sample</a>
3	Motor and Inverter Control	Vector control for permanent magnet synchronous motor with encoder (algorithm)	<a href="#">Doc</a>
4		Sensor less vector control for permanent magnet synchronous motor (algorithm)	<a href="#">Doc</a>
5		Vector control for permanent magnet synchronous motor with encoder Application note for evaluation system for BLDC motor	<a href="#">Doc</a>
6		Vector control for permanent magnet synchronous motor with encoder for evaluation system for BLDC motor Sample code	<a href="#">Sample</a>
7		Sensorless vector control of a permanent magnet synchronous motor for the evaluation system for BLDC motor Application note	<a href="#">Doc</a>
8		Sensorless vector control of a permanent magnet synchronous motor for the evaluation system for BLDC motor Sample code	<a href="#">Sample</a>
9		Vector control for permanent magnet synchronous motor with magnet sensor and inductive sensor for the evaluation system for BLDC motor Application note	<a href="#">Doc</a>
10		Vector control for permanent magnet synchronous motor with magnet sensor and inductive sensor for the evaluation system for BLDC motor Sample code	<a href="#">Sample</a>
11		120-degree conducting control of a permanent magnet synchronous motor Application note for the evaluation system for BLDC motor	<a href="#">Doc</a>
12		120-degree conducting control of a permanent magnet synchronous motor Sample code for the evaluation system for BLDC motor	<a href="#">Sample</a>
13		PFC-Controlled and sensorless Vector-Controlled by ceiling FAN inverter board with RX13T Application note	<a href="#">Doc</a>
14		PFC-Controlled and sensorless Vector-Controlled by ceiling FAN inverter board with RX13T Sample code	<a href="#">Sample</a>

#	Item	Content	Link
15		Vector control of Three-Phase induction motor used in driving a fan Application note	<a href="#">Doc</a>
16		Vector control of Three-Phase induction motor used in driving a fan Sample code	<a href="#">Sample</a>
17		Vector control of Three-Phase induction motor used in driving a pump Application note	<a href="#">Doc</a>
18		Vector control of Three-Phase induction motor used in driving a pump Sample code	<a href="#">Sample</a>
19		PMBus Master-Slave communication using I2C bus interface (R1IC/I3C) Application note	<a href="#">Doc</a>
20		PMBus Master-Slave communication using I2C bus interface (R1IC/I3C) sample code	<a href="#">Sample</a>
21	GUI	QE for display GUI display application development guide using serial connection LCD	<a href="#">Doc</a>
22		GUI sample program using serial LCD and emWin library Application note	<a href="#">Doc</a>
23		GUI sample program using serial LCD and emWin library Sample code	<a href="#">Sample</a>
24		Module for image rendering (emWin) Application note	<a href="#">Doc</a>
25		Module for image rendering (emWin) Sample code	<a href="#">Sample</a>

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	May. 23,2024	-	First edition issued
4.00	Mar. 06,2026	All	Format revision, complete content review

This handbook incorporates information available as of its publication date. For the most up-to-date details, please refer to the product page on our official website: <[www.renesas.com/RX13T](http://www.renesas.com/RX13T)>

## 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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(Rev.5.0-1 October 2020)

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