

# RZ/T2, RZ/N2

## EtherCAT Sample Program Package

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### Introduction

This document is a release note for the EtherCAT<sup>®</sup> sample program package for RZ/T2, RZ/N2 series microprocessor. This release note describes the structures of this package and features of the sample programs.

### Target Device

RZ/T series: RZ/T2M, RZ/T2ME, RZ/T2L, RZ/T2H

RZ/N series: RZ/N2L, RZ/N2H

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## 1. Overview

This release note describes the structures of this package and features of the sample programs.

### 1.1 Abbreviations / Definitions

**Table 1.1 Abbreviations/Definitions**

Index	Abbreviations/Definitions	Description
1	CoE	CAN application protocol over EtherCAT
2	CiA	CAN in Automation
3	DC	Distributed Clock
4	EEPROM	Electrically Erasable Programmable Read-Only Memory
5	EoE	Ethernet Over EtherCAT
6	ESC	EtherCAT SubDevice Controller
7	ESI	EtherCAT SubDevice Information
8	ESM	EtherCAT State Machine
9	ETG	EtherCAT Technology Group
10	FoE	File Access Over EtherCAT
11	PDO	Process Data Object
12	SDO	Service Data Object
13	SSC	SubDevice Stack Code
14	FSP	Flexible Software Package
15	IDE	Integrated Development Environment
16	GCC	GNU Compiler Collection

## 1.2 Reference

### 1.2.1 About RZ/T2, RZ/N2

Technical information about EtherCAT is available via ETG member site, and information about RZ/T2 and RZ/N2 is available via Renesas.

**Table 1.2 Common Technical Inputs for RZ/T2, RZ/N2**

Document Type	Description	Document Title	Document No.
Application Note	Describes how to use the Renesas Flexible Software Package (FSP) for writing applications for the RZ/T2, RZ/N2 microprocessor series.	RZ/T2, RZ/N2 Getting Started with Flexible Software Package	<a href="#">r01an6434ej****</a>

**Table 1.3 Technical Inputs for RZ/T2L**

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK+RZT2L hardware.	Renesas Starter Kit+ for RZ/T2L User's Manual	<a href="#">r20ut5164eg****</a>
User's Manual	Provides technical details of the RZ/T2L microprocessor.	RZ/T2L Group User's Manual Hardware	<a href="#">r01uh0985ej****</a>

**Table 1.4 Technical Inputs for RZ/N2L**

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK+RZN2L hardware.	Renesas Starter Kit+ for RZ/N2L User's Manual	<a href="#">r20ut4984eg****</a>
User's Manual	Provides technical details of the RZ/N2L microprocessor.	RZ/N2L Group User's Manual Hardware	<a href="#">r01uh0955eg****</a>

**Table 1.5 Technical Inputs for RZ/T2M and RZ/T2ME**

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK+RZT2M and RSK+RZT2ME hardware.	Renesas Starter Kit+ for RZ/T2M, RZ/T2ME User's Manual	<a href="#">r20ut4939eg****</a>
User's Manual	Provides technical details of the RZ/T2M microprocessor.	RZ/T2M Group User's Manual Hardware	<a href="#">r01uh0916eg****</a>
User's Manual	Provides technical details of the RZ/T2ME microprocessor.	RZ/T2ME Group User's Manual Hardware	<a href="#">r01uh1062eg****</a>

**Table 1.6 Technical Inputs for RZ/T2H and RZ/N2H**

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RZ/T2H EVB hardware.	RZ/T2H Evaluation Board User's Manual	<a href="#">r20ut5405ej****</a>
User's Manual	Describes the technical details of the RZ/N2H EVB hardware.	RZ/N2H Evaluation Board User's Manual	<a href="#">r20ut5522ej****</a>
User's Manual	Provides technical details of the RZ/T2H and RZ/N2H microprocessor.	RZ/T2H and RZ/N2H Groups User's Manual: Hardware	<a href="#">r01uh1039eg****</a>

## 2. Features

This package includes the firmware for the EtherCAT SubDevice stack generated by SSC Tool on Renesas' RZ/T2 and RZ/N2 series processors.

This package includes the following features:

- ESM (EtherCAT State Machine)
- Mailbox protocols:
  - CoE (CAN application protocol over EtherCAT)
  - EoE (Ethernet Over EtherCAT)
  - FoE (File Access Over EtherCAT)
- Synchronization Modes:
  - Free Run
  - Sync Manager Synchronization
  - DC Synchronization
- I/O function:
  - I/O Input DIP SW
  - I/O Output LED
- CiA402 Drive Profile:
  - csp Mode
  - csv Mode
- TCP/IP stack for Ethernet over EtherCAT:
  - lwIP
- ETG.5003 Semiconductor Device Profiles:
  - Common Device Profile (CDP) [ETG.5003.1]
  - Firmware update functionality [ETG.5003.2]



EtherCAT is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

## 2.1 Package folder structure

After extracting the package, the following structure is obtained.

**Table 2.1 Sample package overview**

Item	Description
r01an8274xx0400-rzt2-rzn2-ethercat-package	RZ/T2, N2 EtherCAT Sample Package
├── RZT2M_RZT2ME_EtherCAT_RSK_rev0400.zip	Archive for RZ/T2M, RZ/T2ME (RSK board)
├── RZT2L_EtherCAT_RSK_rev0400.zip	Archive for RZ/T2L (RSK board)
├── RZT2H_EtherCAT_EVB_rev0400.zip	Archive for RZ/T2H (EVB board)
├── RZN2L_EtherCAT_RSK_rev0400.zip	Archive for RZ/N2L (RSK board)
├── RZN2H_EtherCAT_EVB_rev0400.zip	Archive for RZ/N2H (EVB board)
├── r01an8274ej0400-rzt2-rzn2-ethercat-package.pdf	This release note
├── r01an8275ej0400-rzt2-rzn2-ecat-cia402.pdf	The application note for CiA402 projects
├── r01an8276ej0400-rzt2-rzn2-ecat-eoe.pdf	The application note for EoE projects
└── r01an8277ej0400-rzt2-rzn2-ecat-etg5003.pdf	The application note for ETG5003 projects

### 3. Requirements (Software and Hardware)

This project has been developed and tested on these environments using the following boards and tools.

#### 3.1 Requirements for this sample package

Table 3.1 Requirements

Category	Name	Version	Description
Board	Renesas Starter Kit+ for RZ/T2M	-	Renesas <a href="#">RZ/T2M-RSK - Renesas Starter Kit Plus for RZ/T2M   Renesas</a>
	Renesas Starter Kit+ for RZ/T2ME	-	Renesas <a href="#">RZ/T2ME-RSK - Renesas Starter Kit+ for RZ/T2ME   Renesas</a>
	Renesas Starter Kit+ for RZ/T2L	-	Renesas <a href="#">RZ/T2L-RSK - Renesas Starter Kit+ for RZ/T2L   Renesas</a>
	RZ/T2H Evaluation Board	-	Renesas <a href="#">RZ/T2H-EVKIT - Evaluation Board Kit for RZ/T2H   Renesas</a>
	Renesas Starter Kit+ for RZ/N2L	-	Renesas <a href="#">RZ/N2L-RSK - Renesas Starter Kit+ for RZ/N2L   Renesas</a>
	RZ/N2H Evaluation Board	-	Renesas <a href="#">RZ/N2H-EVKIT - Evaluation Board Kit for RZ/N2H   Renesas</a>
IDE	EWARM	9.60.3	IAR Systems <a href="#">IAR Embedded Workbench for Arm   IAR</a>
	e <sup>2</sup> studio	2025-12	Renesas <a href="#">Release v4.0.0 · renesas/rz-fsp · GitHub</a>
Configurator	FSP Smart Configurator	2025-12	
Flexible Software Package	FSP for Renesas RZ	4.0.0	
GCC Compiler	GNU ARM Embedded Toolchain	13.3.Rel1	
	GNU ARM A-Profile (AArch64 bare-metal)	13.2.Rel1	
Emulator	J-Link™	8.60	SEGGER <a href="#">SEGGER - The Embedded Experts - Downloads - J-Link / J-Trace</a>
	I-jet	-	IAR Systems <a href="#">IAR debug probes   IAR</a>
Software	SSC Tool	5.13	Beckhoff Automation <a href="#">ET9300   EtherCAT Slave Stack Code   Beckhoff Worldwide</a>
	TwinCAT3	4026.19	Beckhoff Automation <a href="#">TwinCAT 3.1 Build 4026   Beckhoff Worldwide</a>
	Tera Term	5.5.1	Tera Term <a href="#">Tera Term Open Source Project</a>

**Revision History**

Rev.	Date	Description	
		Page	Summary
4.00	Apr. 13, 2026	-	First 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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