# RZ/T2, RZ/N2 Group

## EtherCAT Sample Program Package

### Introduction

This document is a release note for the EtherCAT® 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 |
| 17 | AoE | ADS over EtherCAT |

## 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 | r01an6434ej**** |

**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 | r20ut5164eg**** |
| User's Manual | Provides technical details of the RZ/T2L microprocessor. | RZ/T2L Group User's Manual Hardware | r01uh0985ej**** |

**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 | r20ut4984eg**** |
| User's Manual | Provides technical details of the RZ/N2L microprocessor. | RZ/N2L Group User's Manual Hardware | r01uh0955eg**** |

**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 | r20ut4939eg**** |
| User's Manual | Provides technical details of the RZ/T2M microprocessor. | RZ/T2M Group User's Manual Hardware | r01uh0916eg**** |
| User's Manual | Provides technical details of the RZ/T2ME microprocessor. | RZ/T2ME Group User's Manual Hardware | r01uh1062eg**** |

**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 | r20ut5405ej**** |
| User's Manual | Describes the technical details of the RZ/N2H EVB hardware. | RZ/N2H Evaluation Board User's Manual | r20ut5522ej**** |
| User's Manual | Provides technical details of the RZ/T2H and RZ/N2H microprocessor. | RZ/T2H and RZ/N2H Groups User's Manual: Hardware | r01uh1039eg**** |

## 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)
  - AoE (ADS 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®

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## 2.1 Package folder structure

After extracting the package, the following structure is obtained.

**Table 2.1 Sample package overview**

| Item | Description |
|---|---|
| r01an8274xx0410-rzt2-rzn2-ethercat-package | RZ/T2, N2 EtherCAT Sample Package |
| ├── RZT2M_RZT2ME_EtherCAT_RSK_rev0410.zip | Archive for RZ/T2M, RZ/T2ME (RSK board) |
| ├── RZT2L_EtherCAT_RSK_rev0410.zip | Archive for RZ/T2L (RSK board) |
| ├── RZT2H_EtherCAT_EVB_rev0410.zip | Archive for RZ/T2H (EVB board) |
| ├── RZN2L_EtherCAT_RSK_rev0410.zip | Archive for RZ/N2L (RSK board) |
| ├── RZN2H_EtherCAT_EVB_rev0410.zip | Archive for RZ/N2H (EVB board) |
| ├── r01an8274ej0410-rzt2-rzn2-ethercat-package.pdf | This release note |
| ├── r01an8275ej0410-rzt2-rzn2-ecat-cia402.pdf | The application note for CiA402 projects |
| ├── r01an8276ej0410-rzt2-rzn2-ecat-eoe.pdf | The application note for EoE projects |
| ├── r01an8277ej0410-rzt2-rzn2-ecat-etg5003.pdf | The application note for ETG5003 projects |
| └── r01an8376ej0400-rzt2-rzn2-ecat-aoe.pdf | The application note for AoE 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<br>RZ/T2M-RSK - Renesas Starter Kit Plus for RZ/T2M \| Renesas |
| | Renesas Starter Kit+ for RZ/T2ME | - | Renesas<br>RZ/T2ME-RSK - Renesas Starter Kit+ for RZ/T2ME \| Renesas |
| | Renesas Starter Kit+ for RZ/T2L | - | Renesas<br>RZ/T2L-RSK - Renesas Starter Kit+ for RZ/T2L \| Renesas |
| | RZ/T2H Evaluation Board | - | Renesas<br>RZ/T2H-EVKIT - Evaluation Board Kit for RZ/T2H \| Renesas |
| | Renesas Starter Kit+ for RZ/N2L | - | Renesas<br>RZ/N2L-RSK - Renesas Starter Kit+ for RZ/N2L \| Renesas |
| | RZ/N2H Evaluation Board | - | Renesas<br>RZ/N2H-EVKIT - Evaluation Board Kit for RZ/N2H \| Renesas |
| IDE | EWARM | 9.60.3 | IAR Systems<br>IAR Embedded Workbench for Arm \| IAR |
| | e² studio | 2025-12 | Renesas<br>Release v4.0.0 · renesas/rz-fsp · GitHub |
| 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<br>SEGGER - The Embedded Experts - Downloads - J-Link / J-Trace |
| | I-jet | - | IAR Systems<br>IAR debug probes \| IAR |
| Software | SSC Tool | 5.13 | Beckhoff Automation<br>ET9300 \| EtherCAT Slave Stack Code \| Beckhoff Worldwide |
| | TwinCAT3 | 4026.19 | Beckhoff Automation<br>TwinCAT 3.1 Build 4026 \| Beckhoff Worldwide |
| | Tera Term | 5.5.1 | Tera Term<br>Tera Term Open Source Project |

## Revision History

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 4.00 | Apr. 13, 2026 | - | First issued |
| 4.10 | Jul. 17, 2026 | - | Supported AoE. |

# 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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## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
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