Renesas RA Family

MCK-RA8T2 EtherCAT Sample Program Package Guide

This application note serves as a guide for the EtherCAT® sample program package for RA Family microcontrollers. It describes the structure of the package and features of the sample programs.

Target Device

MCK-RA8T2

Contents

1. Overview

This guide describes the structure 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 RA8T2

Technical information about EtherCAT is available on the ETG member site, and information about RA8T2 is available from Renesas.

Table 1.2 Technical reference for RA8T2

Document Type	Description	Document Title	Document No.
User's Manual	RA8T2 Group User's Manual Hardware	RA8T2 User's Manual Hardware	r01uh1067ej****
Datasheet	RA8T2 Group Datasheet	RA8T2 Group Datasheet	r01ds0436ej****
Quick Start Guide	MCK-RA8T2 Quick Start Guide	Demonstration for the MCK-RA8T2 and instructions on how to customize it for application development.	r12qs0088ej****
User's Manual	MCK-RA8T2 User's Manual	MCK-RA8T2 User's Manual	r12uz0172ej****

2. Features

This package includes firmware for the EtherCAT SubDevice stack generated by the SSC Tool for Renesas RA8T2 series processors.

This package includes the following features:

- ESM (EtherCAT State Machine)
- Mailbox protocols:
  - CoE (CAN application protocol over EtherCAT)
  - FoE (File Access over EtherCAT)
- Synchronization modes:
  - Free Run
  - Sync Manager Synchronization
  - DC Synchronization
- I/O function:
  - DIP switch input (I/O)
  - LED output (I/O)
- ETG.5003 semiconductor device profiles:
  - Common Device Profile (CDP) [ETG.5003.1]
  - Firmware update functionality [ETG.5003.2]
- CiA402 drive profile:
  - CSP mode
  - CSV mode

2.1 Package Folder Structure

After extracting the package, the following structure is obtained.

Table 2.1 Sample package overview

Item	Description
r01an8326xx0100-mck-ra8t2-ethercat-package	MCK-RA8T2 EtherCAT Sample Package
├── RA8T2_EtherCAT_MCK_rev0100	Archive for RA8T2 (MCK board)
│ ├── common	Common resources for SSC Tool
│ │ ├── CiA402	For CiA402
│ │ │ ├── ESI	EtherCAT SubDevice Information
│ │ │ ├── Patch	Patch for this CiA402 project
│ │ │ └── SSCconfig	SSC Tool configuration file
│ │ ├── ETG5003	For ETG5003
│ │ │ ├── ESI	EtherCAT SubDevice Information
│ │ │ ├── Patch	Patch for this ETG5003 project
│ │ │ └── SSCconfig	SSC Tool configuration file
│ │ └── Replacement Files	Replacement Files
│ └── project	IDE project folder
│ ├── CiA402	For CiA402
│ │ └── e2studio	e^{2}studio project
│ └── ETG5003	For ETG5003
│ └── e2studio	e^{2}studio project
├── r01an8326ej0100-mck-ra8t2-ethercat-package.pdf	This guide
├── r01an8327ej0100-mck-ra8t2-ecat-cia402.pdf	Application note for CiA402 projects
└── r01an8328ej0100-mck-ra8t2-ecat-etg5003.pdf	Application note for ETG5003 projects

3. Requirements (Software and Hardware)

This project has been developed and tested in the following environment, using the boards and tools listed below.

3.1 Requirements for this Sample Package

Table 3.1 Requirements

Category	Name	Version	Description
Board	MCK-RA8T2 motor control kit	-	Renesas MCK-RA8T2 - Renesas Flexible Motor Control Kit for RA8T2 MCU Group
IDE	e² studio	2026-04.2	Renesas RA Flexible Software Package (FSP)
Configurator	FSP Smart Configurator	2026-04.2	
Flexible Software Package	FSP for Renesas	v6.5.0	
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 SEGGER - The Embedded Experts - Downloads - J-Link / J-Trace
Software	SSC Tool	5.13	Beckhoff Automation ET9300 | EtherCAT Slave Stack Code | Beckhoff Worldwide
	TwinCAT3	4026.19	Beckhoff Automation TwinCAT 3.1 Build 4026 | Beckhoff Worldwide
	Tera Term	5.5.1	Tera Term Tera Term Open Source Project

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jun.30.26	-	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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