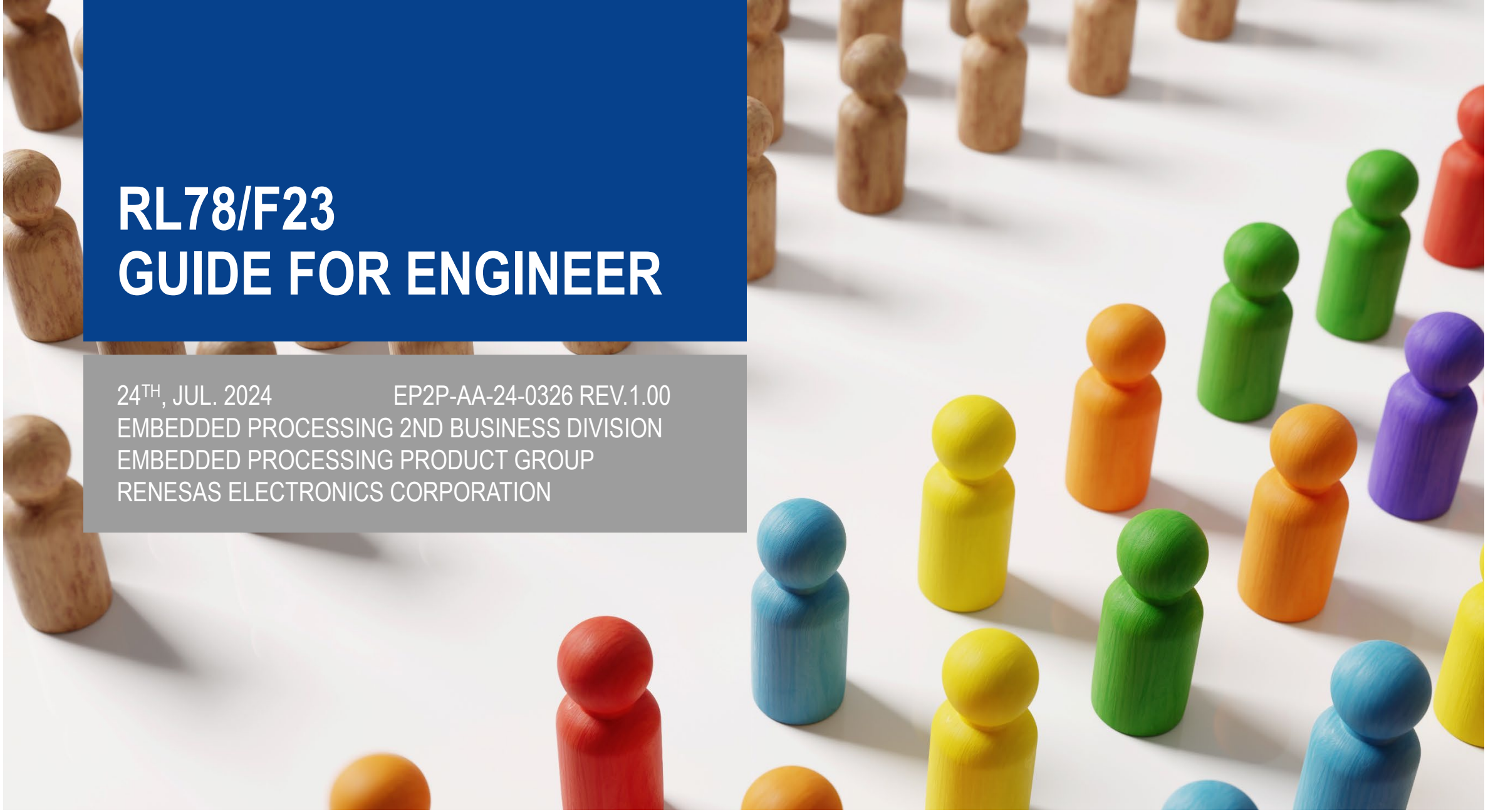
RL78/F23
GUIDE FOR ENGINEER



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EMBEDDED PROCESSING 2ND BUSINESS DIVISION
EMBEDDED PROCESSING PRODUCT GROUP
RENESAS ELECTRONICS CORPORATION

CONTENT

We summarized and listed up various information and materials required at the time of product development by each development phase.

Also, You can select what you need for your application from our rich selection of application notes that describing how to use a peripheral punction, example applications, how to create a program, and more.

Please use these information, materials and application notes as a guidebook when developing.

List of information and materials required for product development

STEP1 MCU SELECTION

	Item	Content	Link
1	Introduction	RL78/F2X Introduction	Doc
2		RL78/F2x Flyer	Doc
2	Products & Solutions	RL78 Family Features	Web site
3		Video	Web site
4		Blog	Web site
5		Reference designs (Winning combination)	Web site
6	Product longevity program (PLP)	Overview of product longevity program (PLP)	Web site
7		Product selection (product selector) Note: Refer to PLP column in the chart.	Web site
8	Product Specification Comparison	Introductory Guide to RL78 Microcontrollers	Web site
9		RL78 FAMILY Selection Guide	Doc
10		Porting Guide from RL78/F13, F14 to RL78/F23, F24 Products	Doc

STEP2 DESIGNING AND EVALUATING (1/2)

	Item	Content	Link
Common			
1	Hardware	User's manual: Hardware	Doc
2		Hardware manual guide (Electrical Characteristic edition)	Doc
3		Technical update (errata information)	Web site
4		Part number guide for RL78 family product (the meaning of character in part number)	Doc
5		Semiconductor reliability handbook	Doc
6		RoHS　Product Options → Part Number →Package information → RoHS Info	Web site
7	Software information	RL78 Family User's Manual: Software	Doc
8	Partner information	Partner products (system solutions provider)	Web site
9		RL78 Partner Ecosystem	Web site
Hardware design			
1	Design guide	Hardware design guide	Doc
2	Board simulates	ECAD model Note: ECAD can be found by clicking on the respective part number of the product options.	Web site
3	Other	Package information (package outline information, mount manual, etc.)	Web site
4	Development environment	E1/E20/E2 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RL78)	Doc

STEP2 DESIGNING AND EVALUATING (2/2)

	Item	Content	Link
Software design			
1	Software information	Getting Started with the RL78 Family Development Environment	Web site
2		RL78 Family Development Environment — Development Tools	Web site
3		RL78 Family Development Environment — Software	Web site
4		RL78 Smart Configurator User's Guide: e² studio	Doc
5		RL78 Smart Configurator User's Guide: CS+	Doc
6		RL78 Smart Configurator User’s Guide: IAREW	Doc
7	Training information	RL78 Family Software & Tool Course (Video Collection)	Web site
8	System design	RL78 Low Power MCU	Doc
Support			
1	Support information	FAQ (frequently asked inquiries)	Web site
2		RL78 forum (community)	Web site
3		Ask to technical support Note: Please click login in the upper right corner	Web site

STEP3 MASS PRODUCTION

	Item		Content	Link
1	Writing a program	Programmer	PG-FP6	Web site
2		Writing tool	Renesas flash programmer (GUI tool for PC)	Web site

RL78/F23 APPLICATION NOTE

SUPPLEMENTARY INFORMATION: PLEASE REFER TO THE APPLICATION NOTE LIST AS NECESSARY.

#	Main items	Overview
1	Basic	Hardware Design/Clock/Voltage/Memory
2	Peripheral	MCU peripheral function
3	Safety	Safety function
4	Self programming	Flash writing
5	Security / Crypto	Security/Crypto
6	Flash program	Flash programming
7	Sensor	Sensor
8	Software relation	Software
9	Others	Other

RL78/F23 APPLICATION NOTE [BASIC]

Item	Title	Summary	Sample code
1	RL78/F23, F24 Hardware Design Guide	This document is intended to provide the hardware specific information and recommendations on RL78/F23, F24 usage.	-
2	RL78 Family Board Support Package Module Using Software Integration System	The Renesas board support package SIS module (r_bsp) forms the foundation of any project that uses Software Integration System (SIS) modules.	Download
3	RL78/F23, F24 List of Special Function Registers	The purpose of this application note is to show all special function registers (SFRs) used for each model of the RL78/F23 and F24 microcontrollers.	-
4	RL78/F23, F24 Option Byte Setting	This application note describes the setting of option byte (user option byte (000C0H to 000C2H), on-chip debug option byte (000C3H), and security option byte (000C4H)) and issues to be considered when setting them for the RL78/F23, RL78/F24 microcontrollers (MCUs)	-
5	RL78 Family RL78 Low Power MCU	The purpose of this application note is to show prospective users the advantages of the new Renesas RL78 low power 16bit MCU family over the major 8/16/32 low power MCU competitors, and how to utilize key RL78 low power features	-
6	Current Consumption Tuning Solution (E2 Emulator, e2 studio)	This application note introduces the current consumption tuning solution using the E2 emulator.	-
7	Current Consumption Tuning Solution(E2 Emulator, CS+)	This application note introduces the current consumption tuning solution using the E2 emulator.	-
8	RL78/F23, F24 Standby Function	This application note describes the standby function (HALT mode, STOP mode and SNOOZE mode) of the RL78/F23 and the RL78/F24 microcontrollers by providing examples for setting each of the modes.	-
9	RL78 Minimizing Power Consumption when Sensing Switch Inputs	This document describes methods to minimize power dissipation when monitoring switch inputs.	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [PERIPHERAL]

Item	Title	Summary	Sample code
1	RL78 Family Real-Time-Clock Watch Error Correction function	TheRL78 RTC Watch error correction function can be used to correct the RTC count value, so the resulting “Time-of-day” results will be more accurate over a long term period compared to when not using Watch error correction function.	Download
2	RL78/F23, F24 Interrupt Source Determination Procedure	This application note describes how to determine the interrupt source when using both interrupt sources simultaneously.	-
3	RL78/F23, F24 Setting of port related register when using alternate function	The purpose of this application note is to describe the port settings on using peripheral functions of RL78/F23 and F24.	-
4	RL78/F23, F24 DC/DC control using Timer RDe and AAU	This application note describes the example of DC/DC power control operation for the RL78/F23, F24 using Timer RDe, and AAU.	-
5	RL78/F2x RLIN3 Module Software Integration System	LIN 2.1 software driver realize LIN communication on many microcomputers made by Renesas Electronics.	Download
6	RL78/F23, F24 Setup Procedure for LIN Communication in Slave Mode (Guidance)	This application note describes setup procedures for LIN communication, in which a device operates in slave mode of the UART/LIN module (hereinafter, RLIN3) in the RL78/F23, F24.	-
7	RL78/F23, F24 Setup Procedure for LIN Communication in Master Mode (Guidance)	This application note describes setup procedures for LIN communication, in which a device operates in master mode of the UART/LIN module (hereinafter, RLIN3) in the RL78/F23, F24.	-
8	RL78/F23, F24 SENT Communication using Timer Array Unit and DTC	This application note describes example implementations of Single Edge Nibble Transmission (SENT) Communication for the RL78/F23, RL78/F24 , using the DTC and PWM function. The explanations are for both SENT transmission and SENT reception.	-
9	RL78/F13, F14, F15, F23, F24 Setup Procedures for IICA Multi-Master Communication	This application note describes the setup procedures for transmission and reception in a multi-master environment employing the serial interface IICA (IICA) of the RL78/F13, F14, F15 and RL78/F23, F24 products.	-
10	RL78/F23, F24 Example of Using Application Accelerator Unit	The Application Accelerator Unit (AAU) of RL78/F23, F24 is the dedicated arithmetic assist hardware to reduce the software load for the algorithm processing on motor control and on DC/DC converter control.	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [SAFETY]

Item	Title	Summary	Sample code
1	RL78/F23, F24 Safety Function	This application note describes the safety functions implemented on the RL78/F23, RL78/F24 microcontrollers (MCUs).	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [SELF PROGRAMMING]

Item	Title	Summary	Sample code
1	RL78 Family Renesas Flash Driver RL78 Type 02 SC version (Flash Common)	This document explains Renesas Flash Driver RL78 Type 02 for the RL78/F2x group in the case of using Smart Configurator(SC). It is an outline about positioning of the Common file for RFD RL78 Type 02.	Download
2	Renesas Flash Driver RL78 Type 02 User's Manual for RL78/F23 and RL78/F24	Renesas Flash Driver RL78 Type 02 (hereafter called RFD RL78 Type 02) is software for reprogramming the flash memory in the RL78/F23 and RL78/F24.	Download
3	RL78 Family Renesas Flash Driver RL78 Type 02 SC version (Code Flash)	This document explains Renesas Flash Driver RL78 Type 02 for the RL78/F2x group in the case of using Smart Configurator(SC).	Download
4	RL78 Family Renesas Flash Driver RL78 Type 02 SC version (Extra Area)	This document explains Renesas Flash Driver RL78 Type 02 for the RL78/F2x group in the case of using Smart Configurator(SC).	Download
5	RL78 Family Renesas Flash Driver RL78 Type 02 SC version (Data Flash)	This document explains Renesas Flash Driver RL78 Type 02 for the RL78/F2x group in the case of using Smart Configurator(SC).	Download
6	Data Flash Access Library Type T02 (Tiny), European Release	This user's manual describes the overall structure, functionality and software interfaces (API) of the Data Flash Library T02 (Tiny) accessing the physical Data Flash separated and independent from the Code Flash. This library supports dual operation mode where the content of the Data Flash is accessible (read, write, erase) during instruction code execution.	-
7	Data FLASH Converter (Data FLASH memory image generation)	The Data FLASH Converter is a windows based tool that generates a Data FLASH memory image from EEPROM emulation data and/or from a program code file that is mapped to the Data FLASH area of a Renesas microcontroller.	-
8	EEPROM Emulation Library Type T02 (Tiny), European Release	This user manual describes the internal structure, the functionality and the application programming interface (API) of the Renesas RL78 EEPROM Emulation Library (EEL) Type 02, designed for RL78 flash devices with Data Flash based on the MF3 flash technology.	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [SECURITY / CRYPTO]

Item	Title	Summary	Sample code
1	RL78/F Series SHA Hash Function Library Installation Guide	This document explains SHA Library for the RL78/F Series	Download
2	RL78/F Series RSA Library Installation Guide	This document explains RSA Library for the RL78/F Series	Download
3	RL78/F2x Series ECDSA Library: Installation Guide	This document explains ECDSA Library for the RL78/F Series	Download

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [FLASH PROGRAM]

Item	Title	Summary	Sample code
1	RL78 Family RL78 Microcontroller (RL78 Protocol D) Serial Programming Guide	This application note describes the specifications of the boot firmware in RL78 microcontrollers. If the firmware is used in a way that does not conform with the descriptions in this document, correct operation is not guaranteed.	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [SENSOR]

Item	Title	Summary	Sample code
1	RL78 Family Sensor Control Modules Software Integration System	This application note explains the sensor control modules for HS300x and HS400x (Renesas high performance relative humidity and temperature sensor), FS2012, FS3000 and FS1015 (Renesas High Performance Flow Sensor Module), ZMOD4410 and ZMOD4510 (Digital Gas Sensors), OB1203 (Heart Rate, Blood Oxygen Concentration, Pulse Oximetry, Proximity, Light and Color Sensor) and I2C communication middleware for Renesas sensors using Software Integration System (SIS).	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [SOFTWARE RELATION]

Item	Title	Summary	Sample code
1	RL78/F23, RL78/F24 Porting Guide from RL78/F13, F14 to RL78/F23, F24 Products	This application note provides comparisons between RL78/F13, F14 products and RL78/F23, F24 products, and can be used as a general guide during the migration from RL78/F13, F14 products to RL78/F23, F24 products.	-
2	RL78 Debugging Functions Using the Serial Port	This application note describes how to use the RL78 debugging functions using the serial port.	-
3	RL78 Family C compiler CC-RL Programming Techniques	This application note describes how to reduce the code size, increase the execution speed, and programming techniques to avoid bugs when using the C compiler CC-RL.	-
4	RL78 Family C Compiler Package (CC-RL) Application Guide: Programming Techniques	This application note describes methods of programming for efficiency in terms of code size, speed of execution, and ROM size.	-
5	IAR Embedded Workbench for RL78 Programming Techniques	This application note describes how to reduce the code size, increase the execution speed, and programming techniques to avoid bugs when using IAR Embedded Workbench for RL78.	-
6	RL78 Family CS+ Debugging Using Hot Plug-in Function	This document describes the procedures of debugging using the hot plug-in function provided in some RL78 family microcontrollers such as RL78/Fxx (RL78/F12 MCU does not support hot plug-in function.	-
7	Integrated Development Environment e² studio How to use IAR Systems compiler in e² studio	This document describes the procedure for using the IAR Systems compiler on the e2 studio.	-
8	e² studio Creating and executing build CMake project	This document explains processes how to create CMake project in e2 studio and execute Build.	-
9	Integrated Development Environment e² studio: How to use EGit in e² studio	This application note guides user to use EGit in Renesas e2 studio environment.	-
10	RL78 Family CubeSuite+ Startup Guide	The purpose of this document is to help the user understand how to use the RL78 family sample code in CubeSuite+ and also understand basic operations of development tools for the RL78 family.	-

Return to the list of main items in the application note

RL78/F23 APPLICATION NOTE [OTHERS]

Item	Title	Summary	Sample code
1	RL78/F23, RL78/F24 Porting Guide from RL78/F13, F14 to RL78/F23, F24 Products	This application note provides comparisons between RL78/F13, F14 products and RL78/F23, F24 products, and can be used as a general guide during the migration from RL78/F13, F14 products to RL78/F23, F24 products.	-
2	RL78 Debugging Functions Using the Serial Port	This application note describes how to use the RL78 debugging functions using the serial port.	Download
3	RL78 Family C compiler CC-RL Programming Techniques	This application note describes how to reduce the code size, increase the execution speed, and programming techniques to avoid bugs when using the C compiler CC-RL.	Download

Return to the list of main items in the application note

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