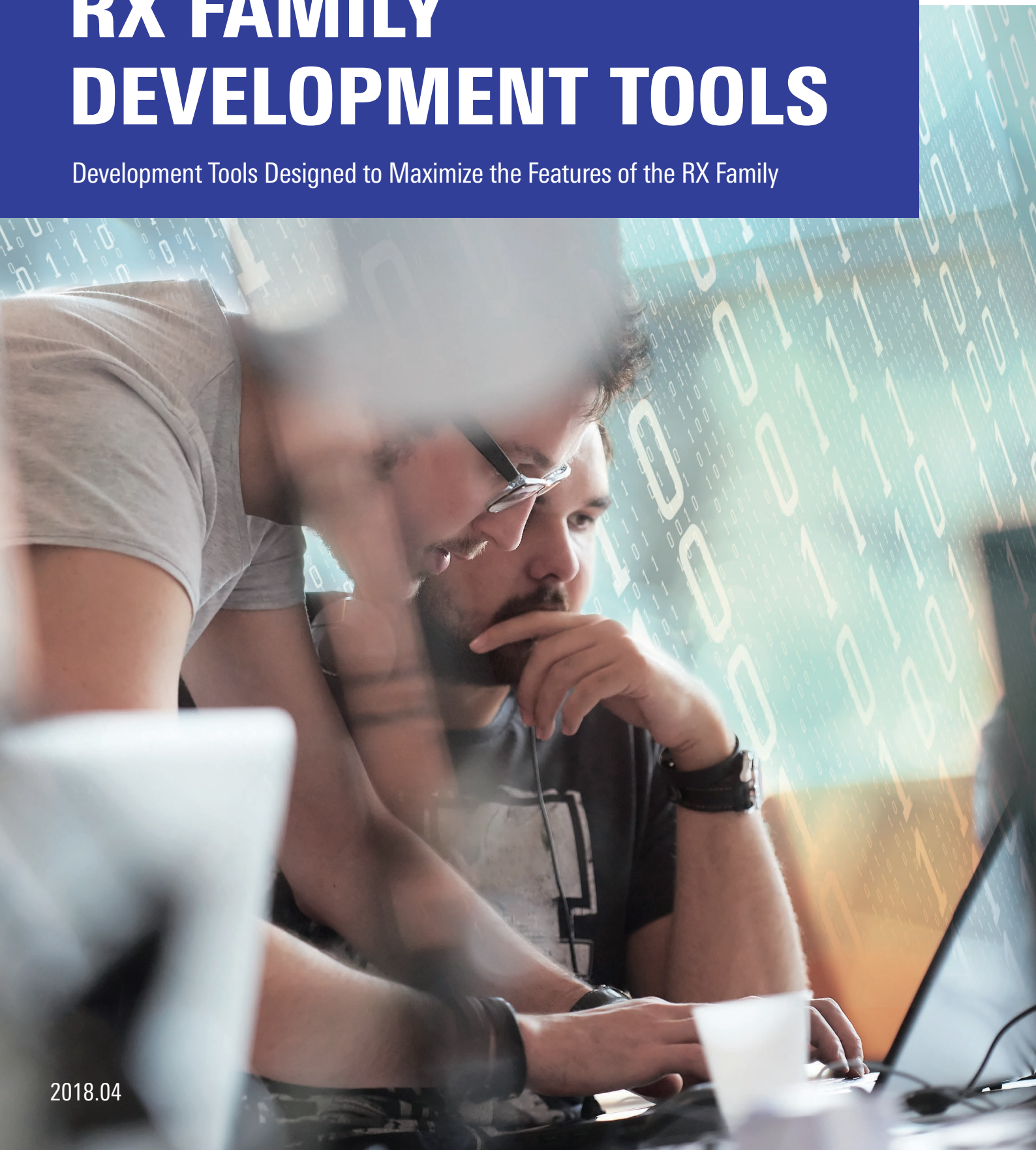
RENESAS
BIG IDEAS FOR EVERY SPACE

RX FAMILY DEVELOPMENT TOOLS

Development Tools Designed to Maximize the Features of the RX Family



2018.04

RX Family Development Tools

Development Tools Designed to Maximize the Features of the RX Family

Renesas supports all stages of the development of RX applications by supplying integrated development environments, real-time OSes, middleware, and programming tools that dramatically enhance the development process. Renesas integrated development environments enable you to accomplish coding, building, and debugging tasks quickly and easily, helping to reduce system development time.

Introduction

Free evaluation versions

Free evaluation versions of tools

Starter kit
you can use right away

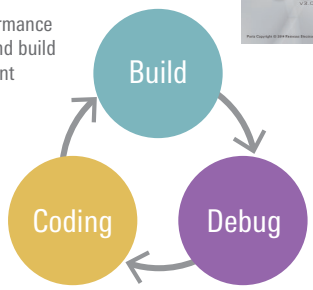
Development

Renesas integrated development environments

CS+

e²studio

High-performance compiler and build management functions



Easy-to-use editor and automated code generation function

Software

Middleware

Drivers

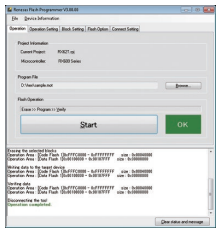
OSes

Sample code

E2 Lite, E1 and E20 on-chip debugging emulators that provide a low-cost and convenient debugging environment

Mass production

Renesas Flash Programmer
flash memory programming software



PG-FP6 standalone flash programmer

Note: CS+ is not generally promoted in the U.S. and Europe. For customers in the U.S. and Europe who are interested in CS+, please contact our regional marketing departments for details.

Introduction Development Mass production

Try out RX!!

Renesas Starter Kit

Want to dive right into evaluating RX microcontrollers? A Renesas Starter Kit is what you need. Each kit contains all the necessary components of a development environment for evaluation and initial introduction of an RX microcontroller product. The microcontroller's control signals are output to an expansion board of the CPU board. This can be connected to the system under development for easy debugging.

Envision Kit

A low-cost evaluation kit equipped with a promotional demo and an on-board emulator.

<Package contents>

- CPU board mounted with RX microprocessor
- E1 on-chip debugging emulator
- Evaluation version of C/C++ compiler package (with simulator)
- Free evaluation version of flash memory programming tool
- Integrated development environment

URL www.renesas.com/rsk

Rich environment to start using RX right away!!

Easy coding for peripheral functions

The e² studio and CS+ integrated development environments each feature built-in code generation functions to assist you with coding for peripheral functions. Simply select the desired functions using the GUI, and source code for initialization, etc., is generated automatically.

Sharing pin information between software and hardware designers

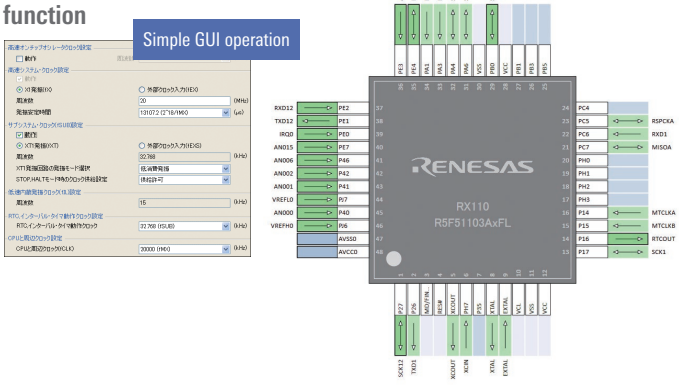
Lists of API functions output by the code generator and pin information settings applied to the microcontroller's peripheral functions can be output to a file in Excel or HTML format.

Numerous application notes, sample code, and middleware

A large number of documents explaining how to use RX peripheral functions as well as documented sample program code for example systems are available. Extensive middleware for implementing display system, file system, network, audio, and security functions in RX applications is also available. These resources constitute powerful support that can dramatically reduce the time needed to develop products incorporating RX microcontrollers.

Code generation function

Simple GUI operation

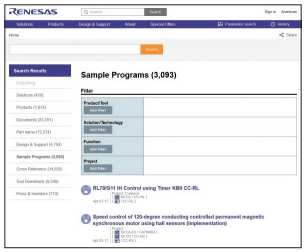


Easy confirmation of pin assignments

Introduction | Development | Mass production

Abundant application notes, sample code, and middleware

- A large selection of documented sample code is available, illustrating the use of peripheral functions and a variety of system examples.
- Extensive middleware covering areas such as the file system, networking, security, signal processing, and voice is available for use in application development.
- The abundant sample code and middleware enables customers to bring their products to market in less time.
- Some sample code (middleware and drivers) incorporates Firmware Integration Technology (FIT) that provides powerful support when migrating among RX products.



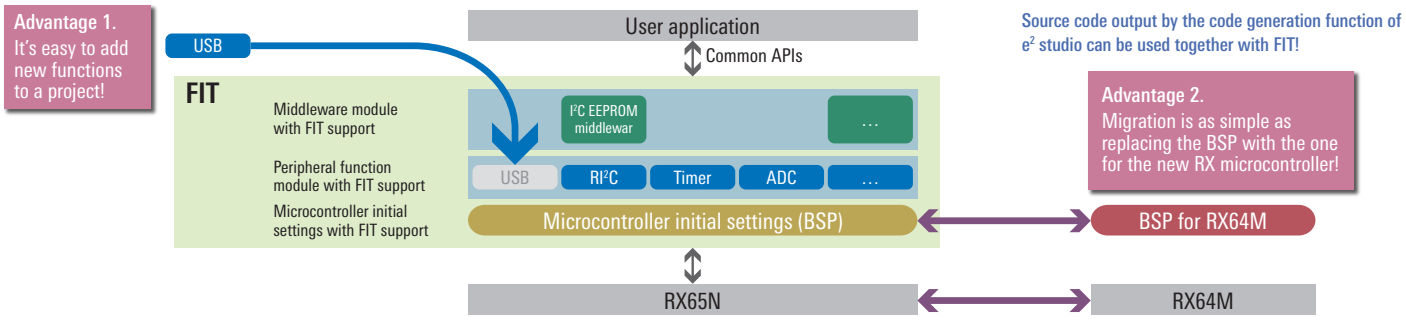
- **Image processing**
  - Graphics library
  - GUI builder
  - JPEG encoder
  - JPEG decoder
- **Audio**
  - MP3 decoder
- **Voice**
  - ADPCM encoder/decoder
- **Security (libraries)**
  - DES encryption library
  - Hash function library (SHA-1/SHA-256)
  - RSA encryption library
  - AES encryption library
- **USB drivers**
  - USB basic firmware
  - USB host device class drivers (mass storage, CDC, HID)
  - USB peripheral device class drivers (mass storage, CDC, HID)
- **Security (drivers)**
  - AES, SHA, DES, and RNG driver software for RX64M and RX71M
  - TSIP driver software for RX231
- **Communication**
  - TCP/IP protocol stack (T4)
  - DTMF encoder/decoder
- **Signal processing/numeric calculation**
  - FFT library
  - DSP library
  - Fixed-point library
- **File system**
  - Open source FAT file system (TFAT)
    (Supports short file names only (FAT12/16/32).)
  - FAT file system
    (Version with support for short file names (FAT12/16/32) and version with support for long file names (FAT12/16/32) available.)
- **Memory drivers**
  - SPI mode multimedia card driver
  - SPI mode multimedia card/SD memory card driver
  - SPI/QSPI serial flash memory driver
  - SPI single master driver (SCI/RSPI)
  - Renesas SPI serial EEPROM driver
  - Renesas I²C serial EEPROM driver
  - I²C single master driver
  - Data flash driver
  - E2 data flash driver
  - Flash memory data management driver
  - QSPI single master driver
  - SCIF single master driver
  - SD mode SD memory card driver
  - MMC mode MMCIF driver

URL www.renesas.com/software

Reducing the burden of software development and management of software resources: Firmware Integration Technology (FIT)

A range of software is available for the RX Family (middleware modules and peripheral function modules) that incorporates a new concept called Firmware Integration Technology (FIT).

- Easy integration into user applications
  Information used in common by the various peripheral function modules (clock settings, device information, etc.) is managed by a board support package (BSP). This makes it easy to add peripheral function modules to a project and easy to use them in combination with each other.
  By using the Smart Configurator function with the e² studio or CS+ integrated development environment, you can easily integrate FIT-compatible modules and code automatically generated by e² studio or CS+ into your own projects.
- Easy migration between RX microcontroller products
  Sample code (middleware and drivers) with FIT support shares a common application interface. This means that migration from one RX microcontroller product to another can be accomplished by simply replacing the BSP with the one for the new RX microcontroller.



URL www.renesas.com/fit

RX Family Development Tools

Introduction | Development | Mass production

Two integrated development environments designed to meet the needs of customers

CS+: Simple, convenient, reliable!

This integrated development environment includes support for Renesas microcontrollers ranging from 8 to 32 bits in a single package. It provides powerful backup for all aspects of application development, from coding and building through debugging. Even novices will find using CS+ simple, convenient, and reliable. CS+ is recommended for customers who use a wide range of Renesas microcontroller products.

URL www.renesas.com/cs+

e² studio: An integrated development environment based on Eclipse!

Based on Eclipse, an open source integrated development environment that has achieved widespread adoption worldwide, e² studio supports the main Renesas microcontroller products, including the RX Family. If you are already familiar with the Eclipse environment, or if you are interested in using some of the many open source plugins available, e² studio is the ideal choice.

URL www.renesas.com/e2studio

Realizing high-quality real-time multitasking systems

RI600V4 and RI600PX real-time OSes for the RX Family

Compliant with the industry standard µITRON4.0 standard. RI600PX with memory protection support is available for use with RX microcontrollers equipped with the memory protection function. The affinity with integrated development environments and easily configurable kernel architecture make it possible to develop applications that extract the full performance potential of RX microcontrollers in a short amount of time.

URL www.renesas.com/ri600v4

URL www.renesas.com/ri600px

Compilers that extract the full performance of RX

CC-RX compiler from Renesas: Also supports migration from older CPUs

The powerful optimization function enables this compiler to generate code that extracts the full performance potential of RX microcontrollers. Migration from older CPUs is supported in addition to a variety of embedded functions. A MISRA-C checking function that helps improve program reliability is included as a standard feature.

URL www.renesas.com/rx_c

Compilers from IAR Systems

- The compiler delivers code generation efficiency among the best in the industry (IAR-exclusive compiler).
- The integrated development environment includes a debugger with advanced functions.
- A functional safety version that has been certified under the IEC 61508/ISO 26262 international functional safety standard is available.
- Global tools that are used worldwide.

URL www.iar.com/ewrx

GNURX GNU tool

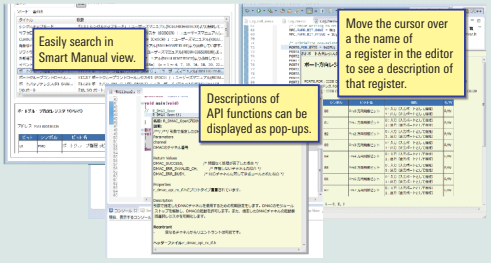
This open source compiler is available free of charge. It can be used in combination with the e² studio integrated development environment.

URL gcc-renesas.com

Note: CS+ is not generally promoted in the U.S. and Europe. For customers in the U.S. and Europe who are interested in CS+, please contact our regional marketing departments for details.

Convenient functions of e² studio 1: It is easy to display descriptions of peripheral I/O registers and API functions in the integrated development environment.

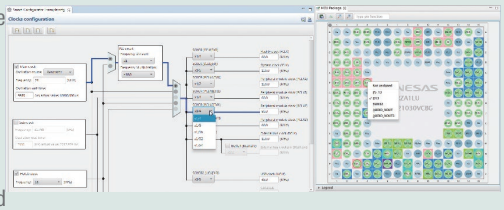
A function that provides easy reference to hardware manuals and information on APIs is included in e² studio. In Smart Manual view you can reference the hardware manual or search its contents by specifying a peripheral I/O register*1 or keyword.*2 In the editor simply hover the mouse cursor over the name of a peripheral I/O register or API function*3 to pop up a description of its specifications.



Notes: 1. You can search for information on peripheral I/O registers and their individual bits.
2. You can search the manual using topic keywords.
3. Popup information is available for functions output by automated code generation, FIT modules, and service calls of the Renesas real-time OS (RI600V4).

Smart Configurator: A Convenient Function of e² studio and CS+

Both e² studio and CS+ come with Smart Configurator, a function that makes it simple to incorporate Renesas drivers into your projects. The following driver integration functions are supported:



- Driver code generation
  You enter settings for peripheral functions via a GUI, and driver source code is generated automatically.
- Importing of FIT modules
  You can easily download and install FIT modules and use them in combination with the generated driver code.
- Pin conflict checking
  This function checks in real time for conflicts among the pins used by the driver code and FIT modules.

URL www.renesas.com/smart-configurator

Introduction | Development | Mass production

Low-cost and convenient debugging environment!!

E2 Lite, E1 and E20 on-chip debugging emulators (also usable as flash programmers)

- Simple connection. Debug by connecting to the RX microcontroller mounted in the system under development. USB bus powered, so no external power supply is needed.
- Provides an array of functions needed for debugging.*1

URL www.renesas.com/e2lite

URL www.renesas.com/e1

URL www.renesas.com/e20

E1 emulator

Suitable for evaluating basic debugging functions. Supports on-chip trace.

E20 emulator*2

The more advanced sibling of the E1. Supports sophisticated debugging functions such as enhanced trace and real-time RAM monitoring.

E2 emulator Lite*3

A more affordably priced alternative to the E1 emulator. Suitable for a range of applications from study or hobby use to full-scale development work.

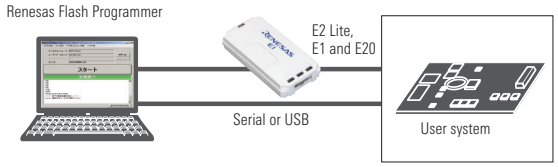
Notes: 1. The supported functions differ depending on the emulator and microcontroller used.
2. On the RX200 and RX100, the usable functions are equivalent to those of the E1.
3. Supports e² studio integrated development environment only.

Programming tools from Renesas to match your usage scenario

Renesas Flash Programmer: Suitable for development, prototyping, and small-quantity programming

- Simple GUI optimized for programming devices.
- Automated programming using scripting function.
- Uses E1, E2 Lite, or E20 as the programmer unit.

URL www.renesas.com/rfp

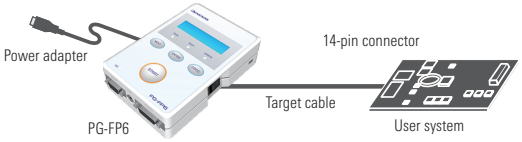


Programmers and flash programming services are also available from Renesas partner companies.

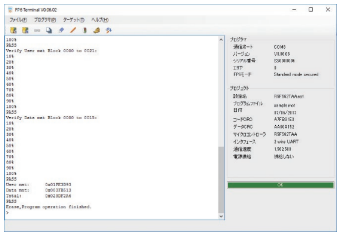
PG-FP6: Support for Programming with No PC

- Successor to the PG-FP5, designed with an emphasis on compatibility
- Improved support for high-speed programming and large-capacity flash memory
- PC-controlled or standalone programming: Suitable for a broad range of use cases from development through mass production
- Ability to store settings for up to eight programming environments
- Specialized for use on production lines (command control via serial communication, remote control using signals from an external device)
- Ability to write a unique code to a specified area of flash memory

System configuration example: Standalone (offline) setup



Easily create a programming environment and program flash memory



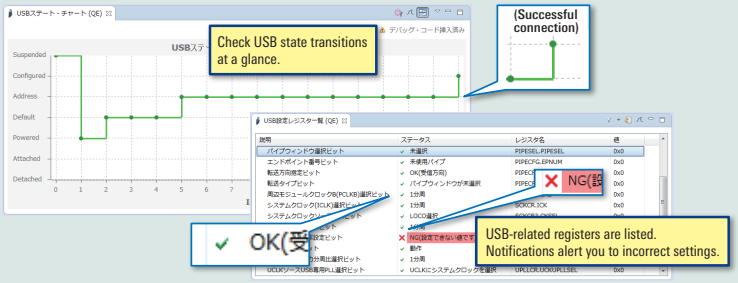
QE Development Support Tools for Various Applications (Quick and Effective Tool Solutions)

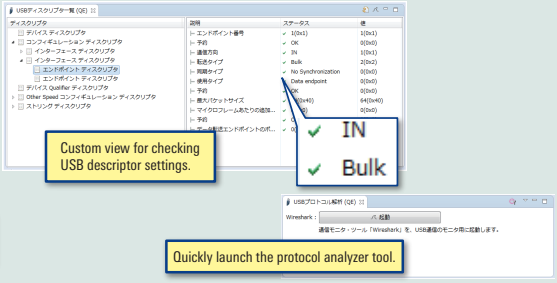
Targeted at applications using protocols such as USB, BLE, or TCP/IP, these tools support system-level debugging. Support for additional applications will be added moving forward.

QE for USB — A Solution Toolkit Specifically Designed for Making USB System Development More Efficient

QE for USB boosts development efficiency by providing four functions that solve problems that can arise in the initial stage of USB system development. A solution toolkit that runs on top of the e² studio integrated development environment, QE for USB is an embedded software development tool specifically designed for the development of USB systems using RX Family microcontrollers (some microcontroller products not supported). QE for USB with the e² studio integrated development environment can simplify the development and debugging of USB systems and help shorten the time and reduce the cost required for development.

Technical preview edition currently available free of charge





RX Family Development Tools

List of RX Family Development Tools

Microcontroller		Low-cost evaluation/ development toolkits	Software tools		Hardware tools				Programming tools	
					On-chip debugging emulators					
Series	Group	Starter kit*1	Real-time OSes (µITRON) (See information in lower margin.)	Integrated development environments, compilers, and simulators (See information in lower margin.)	Low-cost version	High-functionality version	Debugging MCU boards	Isolators	Flash programming software	Programmer units
RX700	RX71M	Renesas Starter Kit+ for RX71M (Part No.: R0K50571MS000BE (with CS+) or YR0K50571MS000BE (with e² studio))	CS+ support e² studio support	CS+ support e² studio support	E2 Lite*10 (RTE0T0002LKCE00000R) or E1 (R0E000010KCE00)	E20 (R0E000200KCT00) *2	For 176-pin 0.5 mm pin pitch products: R0E5571MLDMB00 *9 For 144-pin 0.5 mm pin pitch products: R0E5571MLDMB01 For 100-pin 0.5 mm pin pitch products: R0E5571MLDMB02	For E2 Lite or E1: R0E000010ACB10 For E20: R0E000200ACB10	Renesas Flash Programmer (R0C00000FDW13R) *5 *7	PG-FP5*8 or E2 Lite or E1 or E20
RX600	RX610	Renesas Starter Kit for RX610 (Part No.: R0K556100S000BE)	CS+ support e² studio support High-performance Embedded Workshop support	CS+ support e² studio support High-performance Embedded Workshop support			—		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX621 RX62N	Renesas Starter Kit+ for RX62N (Part No.: R0K5562N0S000BE)					For 144-pin 0.5 mm pin pitch products: R0E5562N8PFK00 For 100-pin 0.5 mm pin pitch products: R0E5562N8PFK10 *3		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX62G	Renesas Starter Kit for RX62G (Part No.: R0K50562GS000BE)					For 100-pin 0.5 mm pin pitch products: R0E5562GAPFK00		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX62T	Renesas Starter Kit for RX62T (Part No.: R0K5562T0S000BE)					For 100-pin 0.5 mm pin pitch products: R0E5562GAPFK00 For 80-pin 0.65 mm pin pitch products: R0E5562GAPFJ00 For 64-pin 0.5 mm pin pitch products: R0E5562GAPFK10			
	RX630	Renesas Starter Kit for RX630 (Part No.: R0K505630S000BE)					For 144-pin 0.5 mm pin pitch products: R0E55630EDMB00 For 100-pin 0.5 mm pin pitch products: R0E55630EDMB01		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX631 RX63N	Renesas Starter Kit+ for RX63N-256K (Part No.: R0K50563NS010BE (with CS+) or YR0K50563NS010BE (with e² studio))					For 144-pin 0.5 mm pin pitch products: R0E5563NEDMB00 For 100-pin 0.5 mm pin pitch products: R0E5563NEDMB01			
	RX63T (64 or fewer pins)	Renesas Starter Kit for RX63T (64-pin) (Part No.: R0K50563TS000BE)					—		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX63T (100 or more pins)	Renesas Starter Kit for RX63T (144-pin) (Part No.: R0K5563THS000BE (with CS+) or YR0K5563THS000BE (with e² studio))					For 120-pin 0.5 mm pin pitch products: R0E5563TEDMB00 *4 For 112-pin 0.65 mm pin pitch products: R0E5563TEDMB01 For 100-pin 0.5 mm pin pitch products: R0E5563TEDMB02		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX634	—	CS+ support e² studio support	CS+ support e² studio support			—		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX64M	Renesas Starter Kit+ for RX64M (Part No.: R0K50564MS000BE (with CS+) or YR0K50564MS000BE (with e² studio))							Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX65N RX651	Renesas Starter Kit for RX65N (Part No.: RTK500565NS00000BE (with CS+ and E1) or YRTK500565NS00000BE (with e² studio and E2 Lite)) Renesas Stater Kit+ for RX65N-2MB (Part No.: RTK50565N2S10000BE)								
RX200	RX210	Renesas Starter Kit for RX210B (Part No.: R0K505210S003BE)	CS+ support e² studio support High-performance Embedded Workshop support	CS+ support e² studio support High-performance Embedded Workshop support					Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX220	Renesas Starter Kit for RX220 (Part No.: R0K505220S000BE)								
	RX21A	—								
	RX230 RX231	Renesas Starter Kit for RX231 (Part No.: R0K505231S000BE (with CS+) or YR0K505231S000BE (with e² studio)) Renesas Starter Kit for RX231 (B Mask: built-in Trusted Secure IP) (with CS+) ★★	CS+ support e² studio support	CS+ support e² studio support		E20 (R0E000200KCT00) *2 Note: Debugging functions equivalent E1 emulator only	—	For E2 Lite or E1: R0E000010ACB10	Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX23T	Renesas Starter Kit for RX23T (Part No.: RTK500523TS00000BE (with CS+) or YRTK500523TS00000BE (with e² studio))							Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX24T	Renesas Starter Kit for RX24T (Part No.: RTK500524TS00000BE (with CS+ and E1) or YRTK500524TS00000BE (with e² studio and E2 Lite))								
	RX24U	Renesas Stater Kit for RX24U (Part No.: RTK500524US00000BE) ★								
RX100	RX110	—	CS+ support e² studio support	CS+ support e² studio support					Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX111	Renesas Starter Kit for RX111 (Part No.: R0K505111S000BE (with CS+) or YR0K505111S000BE (with e² studio))								
	RX113	Renesas Starter Kit for RX113 (Part No.: R0K505113S000BE (with CS+) or YR0K505113S000BE (with e² studio))							Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX130	Renesas Starter Kit for RX130 (Part No.: RTK500130S00000BE (with CS+ and E1) or YRTK5005130S00000BE (with e² studio and E2 Lite)) Renesas Stater Kit for RX130-512KB (Part No.: RTK5051308S00000BE) ★								

Software tools with CS+ support

Compiler: RX Family C/C++ compiler package (with integrated development environment) (includes integrated development environment, simulator, and debugger) The professional and standard edition, the floating license and node-lock License and packages with/without install media are available. For the detail, see www.renesas.com/rx_c.

Real-time OS: RI600 V4 or RI600PX (with memory protection function, supported by RX600 Series with memory protection unit (MPU))
Note: Evaluation license and mass production license available.

Software tools with e² studio support

Compiler: RX Family C/C++ compiler package (without integrated development environment) The professional and standard edition, the floating license and node-lock License and packages with/without install media are available. For the detail, see www.renesas.com/rx_c.

Note: The package does not include an integrated development environment, simulator, or emulator/debugger. Can be used in combination with e² studio. (Must be downloaded from the website and installed separately.)

Real-time OS: RI600 V4
Note: Evaluation license and mass production license available.

Software tools with High-performance Embedded Workshop support

Compiler: RX Family C/C++ compiler package (with High-performance Embedded Workshop) (includes integrated development environment and simulator) (R0C5RX00XSW01R)
Note: An emulator/debugger is bundled with each emulator system.

Real-time OS: RI600 V4 or RI600PX (with memory protection function, supported by RX600 Series with memory protection unit (MPU))
Note: Evaluation license and mass production license available.

Notes:
1. Includes CPU board mounted with RX microcontroller, on-chip debugging emulator E1 or E2 Lite, software (integrated development environment, evaluation version of C/C++ compiler package, and free evaluation version of flash programming software), etc.
   Even more affordable starter kits that do not include an on-chip debugging emulator are available for some microcontroller products.
2. High-end extended version of the E1 with enhanced trace functions (approx. 2 million branches/cycle), real-time RAM monitoring functions, etc., to support more sophisticated debugging.
3. The microcontroller's D/A converter functionality is unavailable when using the debugging MCU board for 100-pin versions of RX621 and RX62N Group products.
4. Microcontroller ports PF0 and PF1 are unavailable when using the debugging MCU board for 120-pin versions of RX63T Group products.
5. Renesas Flash Programmer (product No.: R0C00000FDW13R) is available in a commercial edition (commercial product, support available) and a free-of-charge edition (free of charge, no support available). The support status can be checked on the following webpage by referring to the microcontroller product number.
   www.renesas.com/rfp
6. Renesas Flash Programmer can be used to program this microcontroller without employing the E2 Lite or E1 or E20 by making a direct connection to the microcontroller via the RS-232C interface.
7. Renesas Flash Programmer can be used to program this microcontroller without employing the E2 Lite or E1 or E20 by making a direct connection to the microcontroller via the RS-232C or USB interface.
8. Includes programming software. The power adapter (QB-COMMON-PW-xx) is not included and must be purchased separately. Standalone programming is supported.
9. Microcontroller ports PF0, PF1, PF2, PF3, and PF4 are unavailable when using the debugging MCU board for 176-pin versions of RX71M Group products.
10. Not supported by CS+ integrated development environment.

★: New product ★★: Under development

Solutions from Partner Vendors for RX Family

Compilers
IAR Systems AB
CyberTHOR Studios Limited
OS/Middleware
CMX Systems, Inc.
Express Logic, Inc.
FreeRTOS.org
GainSpan Corporation
Micrium
SEGGER Microcontroller
Emulators
SEGGER Microcontroller
Lauterbach GmbH

Programmers
Data I/O Corporation
DTS INSIGHT Corporation
E-Globaledge Corporation
Flash Support Group Company
Falcon Denshi K.K.
Minato Holdings Inc.
Sunny Giken Inc.
SMH Technologies
SUISEI ELECTRONICS SYSTEM CO., LTD.
TESSERA TECHNOLOGY INC.
Wave Technology Co., Ltd.
Programming Services
Falcon Denshi K.K. (Exclusive distributor of HI-LO SYSTEMS for Japanese customers)
Flash Support Group Company

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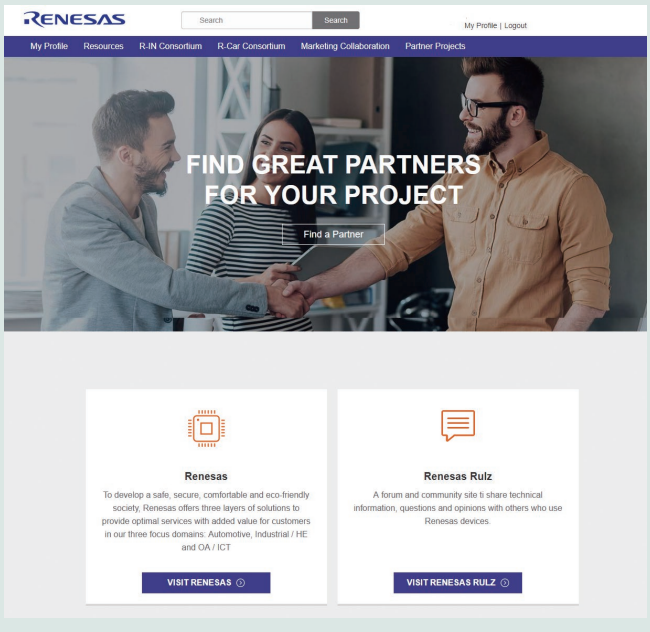

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