RENESAS

BIG IDEAS FOR EVERY SPACE

RX FAMILY

Renesas 32-Bit Microcontrollers

2018.02

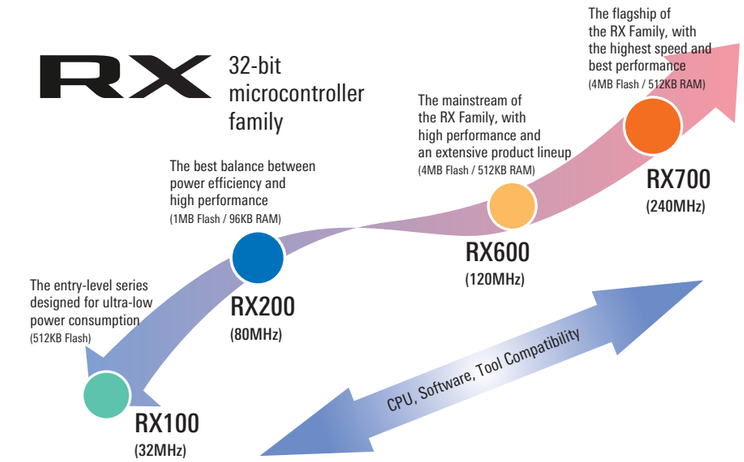
Maintaining and Advancing the Renesas Tradition

Mid-range 32-bit microcontrollers built around an exclusive CPU core developed by Renesas

CONTENT

- New products added:
  RX600 Series: RX65N Group and RX651 Group
  RX200 Series: RX24U Group and RX24T Group
- Product lineup expanded
  RX100 Series: RX130 Group
- Information on solutions added:
  Security solutions
  Human-machine interface (HMI) solutions
- RX Family motor control

The RX microcontroller (MCU) family is designed around a cutting-edge CPU core that is exclusive to Renesas. Built on differentiated technologies perfected over many years, RX MCUs deliver superior performance with excellent power efficiency. The 32-bit enhanced Harvard architecture provides very high code density, with sizes typical of 16-bit CPUs.



Power and functionality poised to dominate the market: The four powerful product series that compose the RX Family

The RX Family of 32-bit microcontrollers are built around Renesas' exclusive RXv1/RXv2 CPU core and combine excellent operation performance with superior power efficiency.
It consists of four product series: the flagship RX700 Series, with the fastest performance and most advanced functions; the standard RX600 Series; the RX200 Series, which delivers an optimal balance of power efficiency and high performance; and the entry-level RX100 Series, with extremely low power consumption. These four series encompass a range of products that provide seamless scalability from small-scale to large-scale applications.

RX Family Product Evolution

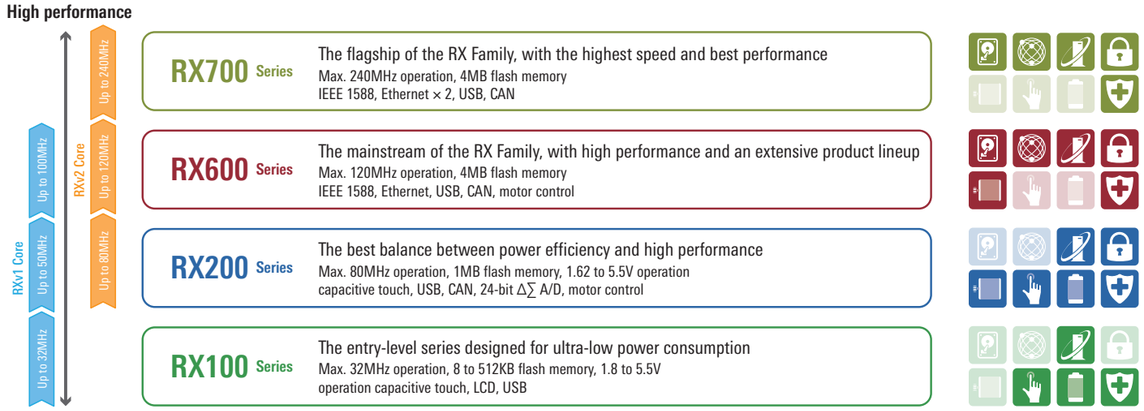
About the RX Family

The RX Family is the new generation of microcontrollers built around the revolutionary RX core, which combines the strengths of RISC and CISC architectures. It is the mainstay 32-bit family within the range of microcontroller products offered by Renesas. Products in the RX Family feature integrated digital signal processor (DSP) and floating point arithmetic processor modules. The RX700 and RX600 Series are optimized for high speed and superior performance. The ultra-low-power RX200 and RX100 Series are designed to deliver excellent power efficiency.

RX Family: Lineup

Unified architecture covering the low end to the high end

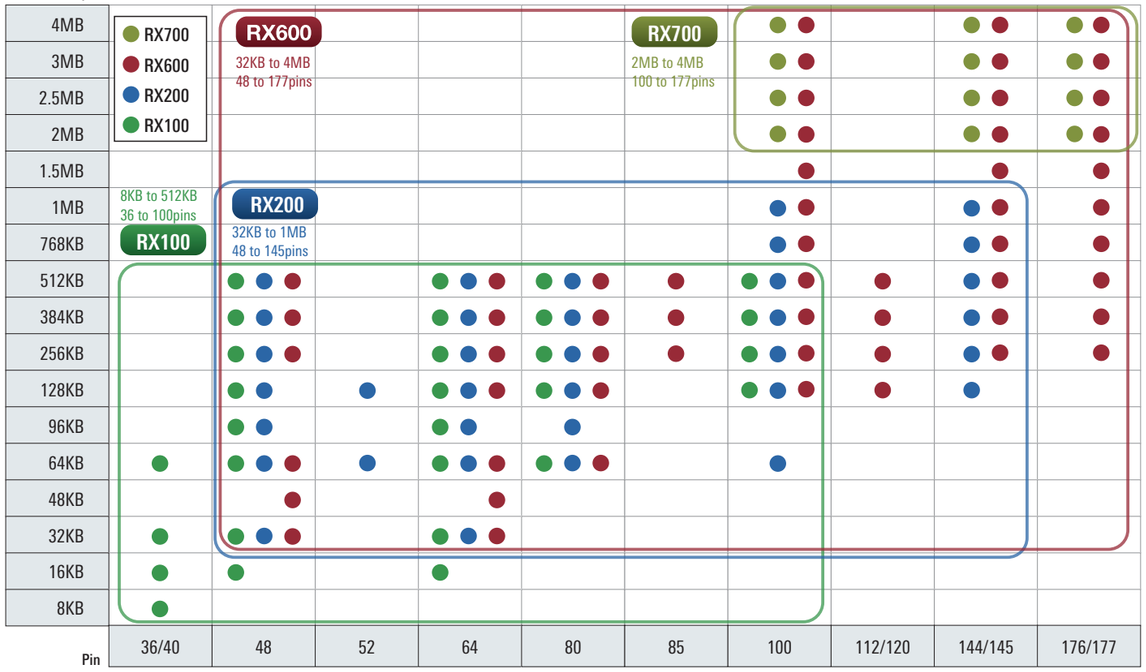
High performance



Low Power

- Large memory capacity, High performance
- Ethernet
- Connectivity
- Security functions
- ASSP for Motor control
- Touch functions
- Power efficient/battery
- Hardware support for safety functions

Flash memory



RX700 Series

Top Series in the RX Family: RX700 Series

The RX700 Series is the top product series in the RX family. It combines up to 4MB of flash memory that can operate at up to max.120MHz and an on-chip advanced fetch unit (AFU) to deliver excellent real-time performance even at the maximum operating frequency of 240MHz. In addition, it employs a 40nm process, the most advanced in the industry, to achieve a 70% reduction in current consumption relative to operating frequency. This makes possible excellent performance and low power consumption during high-speed operation at 240MHz. It also provides integrated support for numerous communication interfaces, including USB 2.0 High Speed, Ethernet, and SD Host, making it ideal for applications requiring network connectivity. Security features include hardware encryption functionality to prevent data leaks by means of AES, DES, SHA, and RNG authentication and data encryption, as well as the ability to use a special area of the on-chip flash memory as trusted memory from which code cannot be read (copied).

- High-performance 32-bit RX CPU 1044 CoreMark@240MHz
- High speed, large-capacity flash memory Max. 120MHz flash access Max. 4MB
- Numerous peripheral functions Ethernet, USB HS/FS, timers and ADC for motor control
- Safety functions Security

RX600 Series

RX Family High-Speed, High-Performance Series: RX600 Series

The RX600 Series is optimized for high speed and excellent performance. In addition to the RXv2 core operating at up to 120MHz, it is available with up to 4MB of zero-wait access flash memory to realize the full performance potential of the CPU. It is provided with a single-precision FPU, 32-bit multiplier and divider, and 32-bit multiply-and-accumulate (MAC) unit. These enable the fast execution and real-time performance required for filtering operation or motor feedback control. In addition to peripheral functions compatible with earlier products, such as timers, A/D converters, and serial interfaces, the RX600 Series includes products with enhanced communication functions, such as USB modules (Host/Function), CAN interface, Ethernet, and IEEE 1588 support; products with timer functions designed for AC servo or inverter motor control; products with LCD functionality; and products optimized for applications such as security using AES encryption. The extensive product lineup provides support for a broad range of applications.

- High-performance 32-bit RX CPU Up to 4.55 CoreMark/MHz
- High speed, large-capacity flash memory Max. 120MHz flash access Max. 4MB
- Extensive lineup Wide range of products for applications involving Ethernet, motor control, LCD, etc.
- Safety functions Security

RX200 Series

RX Family Balance of Power Efficiency and Performance: RX200 Series

The RX200 Series provides a balance between power efficiency and performance. In addition to conventional system control applications in fields such as industrial equipment, home appliances, office equipment, healthcare products, meters, and digital consumer products, it is suitable for use in systems requiring power efficiency or IoT capabilities. Current consumption is low, at only 0.12mA/MHz during operation and 0.8µA (RAM contents retained) in the standby state. The CPU operates at up to 80MHz and delivers high performance of 4.33 CoreMark/MHz. A wide operating voltage range from 1.62V to 5.5V is supported. The lineup ranges from general-purpose products with functions covering communication, capacitive touch, security, and functional safety to specialized motor control products with support for operation at up to 80MHz and products equipped with a 24-bit ΔΣ A/D converter module specifically for use in measuring equipment.

- High-performance 32-bit RX CPU Up to 4.33 Core Mark/MHz
- Low power consumption 0.12mA/MHz (operation) 0.8µA (standby)
- Numerous peripheral functions Communication, touch, motors, analog, 5V interface
- Safety functions Security

RX100 Series

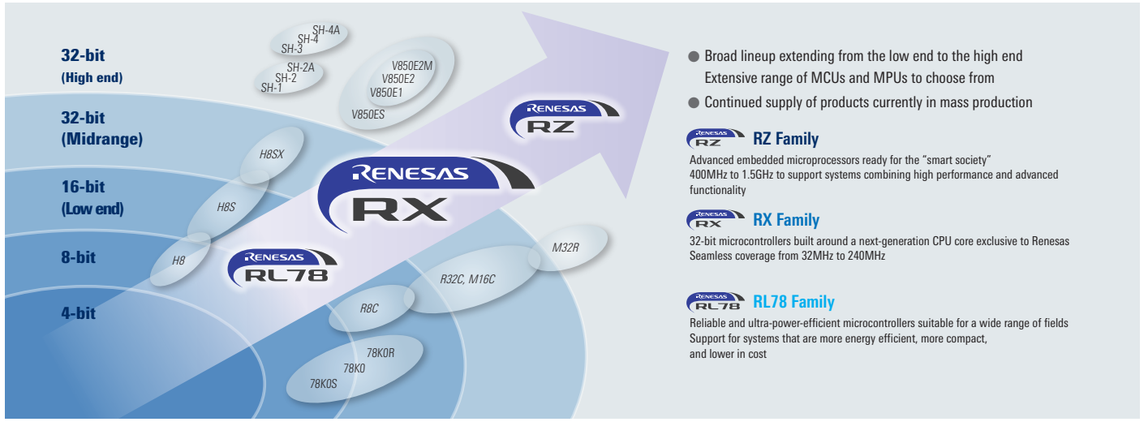
RX Family Ultra-Power-Efficient Series: RX100 Series

The RX100 Series delivers the lowest power consumption in the RX Family. Current consumption is among the lowest in the industry at 0.1mA/MHz during operation and 0.35µA in standby mode (with RAM contents retained). Wakeup from standby requires as little as 4.8µs. The maximum operating frequency is 32MHz. The RX100 Series lineup offers memory capacities from 8KB to 512KB and compact packages with pin counts from 36 to 100 pins. All product versions include timers with many channels, 12-bit A/D converter, and serial interfaces, while support for USB, LCD, and touch panel interfaces is also available. The RX100 Series is suitable for system control or user interface applications in systems such as healthcare devices, communication devices, home appliances, office equipment, and measuring equipment.

- High-performance 32-bit RX CPU 3.08 Core Mark/MHz
- Ultralow power consumption 0.1mA/MHz (operation) 0.35µA (standby)
- Numerous peripheral functions LCD, touch, 5V interface
- Safety functions Excellent cost/performance ratio

RX Family Roadmap and Extensibility

Positioning of the RX Family



- Broad lineup extending from the low end to the high end
  Extensive range of MCUs and MPUs to choose from
- Continued supply of products currently in mass production

RZ Family

Advanced embedded microprocessors ready for the "smart society"
400MHz to 1.5GHz to support systems combining high performance and advanced functionality

RX Family

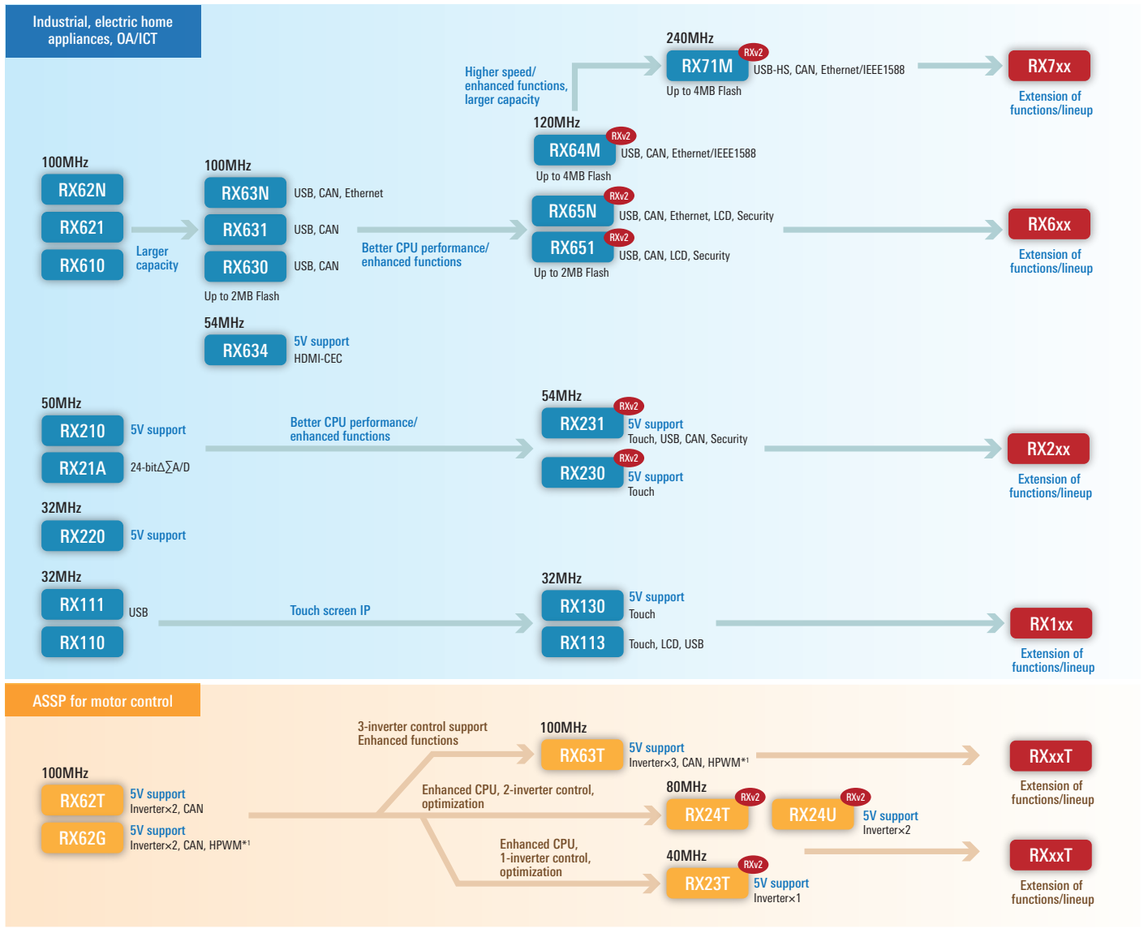
32-bit microcontrollers built around a next-generation CPU core exclusive to Renesas
Seamless coverage from 32MHz to 240MHz

RL78 Family

Reliable and ultra-power-efficient microcontrollers suitable for a wide range of fields
Support for systems that are more energy efficient, more compact, and lower in cost

RX Family Roadmap

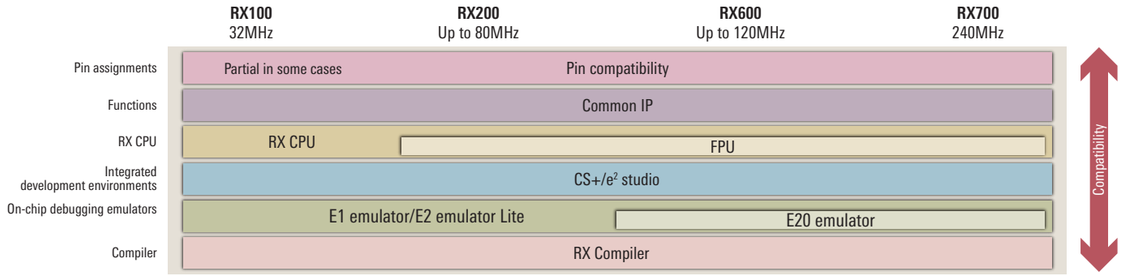
Plans to further extend the RX100, RX200, RX600, and RX700 Series



Note: 1. HPWM: High-resolution PWM

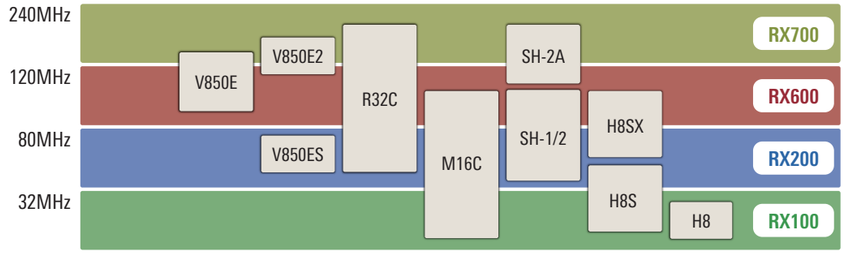
RX Family Compatibility

The RX Family is designed to maintain compatibility between the CPU instructions, pin assignments, and functions of the various product versions. The instruction set of the RXv2 core is downward compatible with the instruction set of the RXv1 core. In addition, the functions of the RX Family are based on common IP to allow easy migration among RX products. The RX pin assignments retain the basic pin assignments of earlier products. Finally, the pin positions of the digital peripheral functions are selectable among multiple alternatives to simplify the process of developing printed circuit boards. Some product series provide complete pin compatibility, allowing the developer to switch to a new RX product without making other modifications to the system. In addition to compatibility between products, the RX Family offers enhanced compatibility with the development environment. This allows customers to select the RX product with the performance best suited to their applications while lightening the development burden, reducing the cost of tools, and simplifying program management.



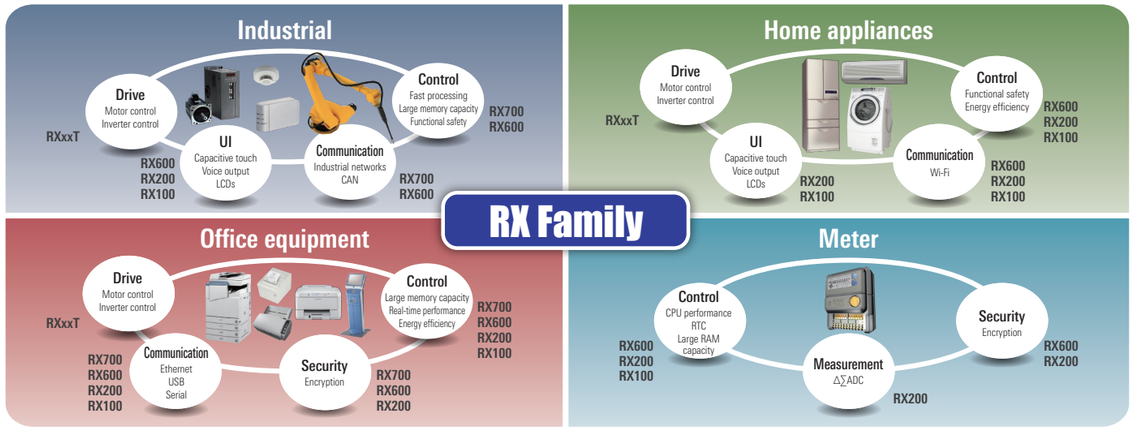
Existing Products and RX Extensibility

The RX Family covers with a single CPU core the performance ranges of a variety of existing CPU cores. This makes it possible to boost software reusability and the use of common development tools. The RX Family offers seamless scalability from the bottom to the top of the product line.



Contributing to the development of platforms in a variety of fields

Wide performance range from 32MHz to 240MHz, abundant peripheral functions for many applications, and excellent compatibility

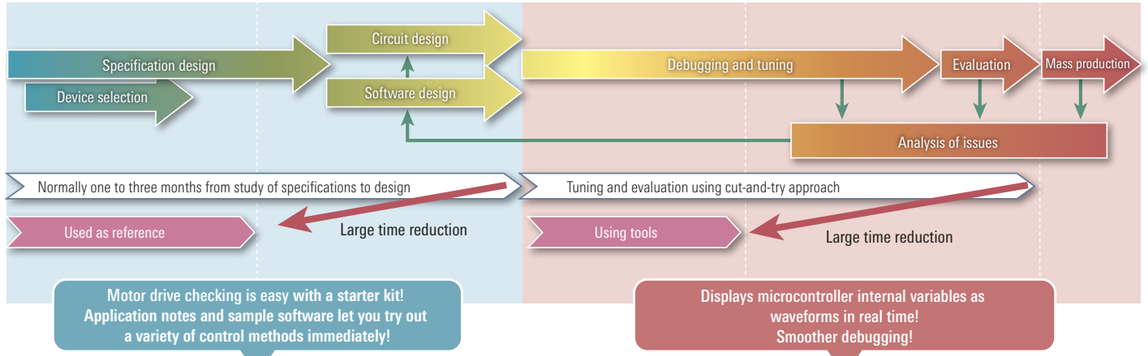


RX Family Solutions

Motor Control Solutions

Renesas offers motor control solutions incorporating microcontrollers and analog products that are designed to enable reduced power consumption and quieter operation when driving AC induction motors and brushless DC motors. Development tools optimized for each stage in the customer's development workflow are available. They help shorten the time needed for development.

Development Workflow



Motor Control Starter Kit (Renesas Solution Starter Kit)

Just connect a power supply to get started checking your motor drive application.
This kit consists of a motor and an inverter board.*1
The provided "sample programs" are ideal for leaning about different control methods.

RX23T motor control starter kit
(24V Motor Control Evaluation System for RX23T)

RX24U CPU card (option)

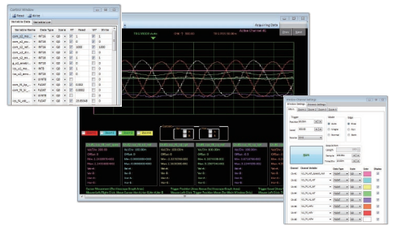
RX24T CPU card (option)

- Motor control board (populated with MCU, power elements, etc.)
  Target MCUs: RX62T, RX23T, RX24T, RX24U
- Brushless DC motor (permanent-magnet synchronous motor, 24V)*2
- Kit user's manual and sample software are available on the website.
  Available on website: Kit user's manual, circuit diagrams, parts lists, application notes, sample software

Note: The above are supplied on a DVD-ROM with the RX62T kit.

Motor Control Development Support Tool Renesas Motor Workbench

Analyzer function reduces the debugging workload. Tuner function enables simple vector control, even if you have no specialized knowledge.



Analyzer Function
- Realtime debugging tool that does not require halting the CPU
- Provides oscilloscope-like display for monitoring internal microcontroller information.

Tuner Function
- Automated measurement of motor-specific parameters
- Allows manual fine adjustment of PI gain after parameter identification

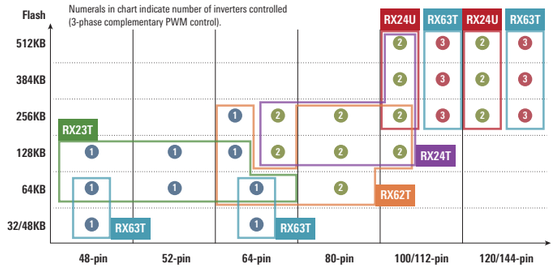
Related URL

Renesas motor control solutions: www.renesas.com/solutions/motor

Notes: 1. The RX23T kit does not include the E1 or a power supply. These must be provided by the customer. The RX62T kit includes the E1.
2. The specifications of the supplied motor differ depending on the kit. For details, refer to the product specifications of specific kit.

RX Family Lineup for Motor Control

- A seamless range of products is available ranging from 48 to 144 pins and 32KB to 512KB of memory, and offering control of one to three inverters. Choose the product that best matches your requirements.
- All advanced timer functions for motor control are upward compatible, so it is easy to switch devices to achieve improved performance.



Capacitive Touch Solutions

RX Capacitive Touch Functionality

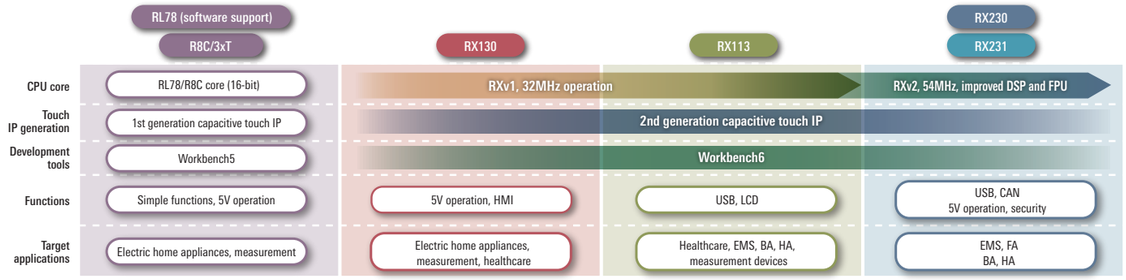
- Support for two capacitive touch technologies on a single chip: self-capacitance, which provides high sensitivity and proximity sensing, and self-capacitance, which provides superior water resistance.
- Accurate touch input even in harsh environments and excellent design flexibility.
- The Workbench6 program simplifies development by letting you easily adjust the sensitivity of touch sensors, previously a complex task, and control system operation.

Features	Advantages for the User
High sensitivity/improved noise tolerance	Support for thick overlay panels or wood panels, operation when wearing gloves, and air gaps.
Improved water resistance	Enables capacitive touch operation in wet environments or outdoors.
Sample development	The development tool can generate detection programs automatically, provides self-calibration functions to shorten development time, and reduces resource requirements.

	Self-capacitance	Mutual-capacitance
Noise tolerance	○	○
High sensitivity	○	—
Water resistance	—	○

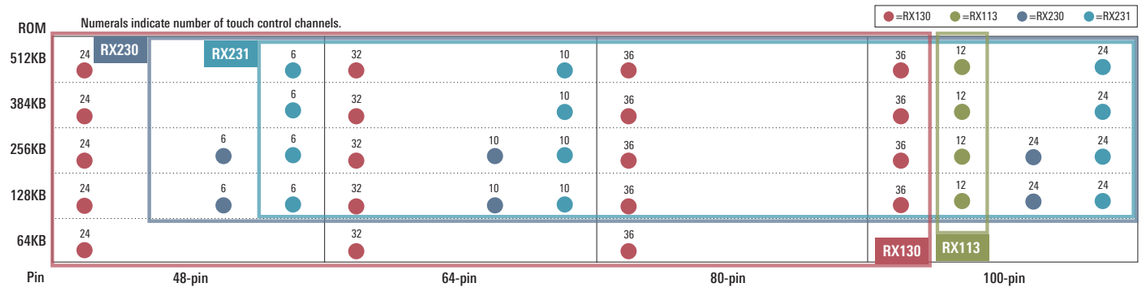
Roadmap

- More products with capacitive touch functions will be added to the RX Family moving forward.
- The RX130 group with small ROM capacity and low pin count can handle input from multiple touch controls.
- The RX113 Group has integrated LCD functions that can be combined with a touch panel to create an HMI.
- The RX231 and RX230 Groups combine the RXv2 core with enhanced DSP and FPU with low-power-consumption technology for superior power efficiency.



Product Lineup

- Lineup of packages with pin counts from 48 to 100 pins to accommodate the number of touch controls required by the system and the mounting area
- Many ROM size options ranging from 64KB to 512KB to match the required scale of system control



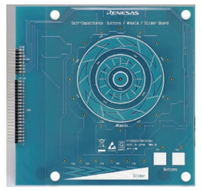
Capacitive Touch Evaluation System with RX130 (RTK0EG0003S02001BJ)

Start evaluating your capacitive touch system right away. Evaluation of custom electrodes can be accomplished easily through development on the application board side. For details, refer to www.renesas.com/RTK0EG0003S02001BJ.

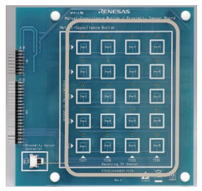
Product configuration
- CPU board populated with RX130
- Touch application board
  Self-capacitance evaluation board
  Allows evaluation of controls such as wheels, sliders, and buttons employing self-capacitance.
  Mutual-capacitance matrix key + self-capacitance proximity sensor evaluation board
  Self-capacitance and mutual-capacitance controls can operate at the same time, opening up possibilities for a wide range of applications.
- USB cable
- Quick start guide

The following items are available on the Renesas website:
Workbench6, sample software, user's manual, application notes, circuit diagrams, pattern diagrams

RX130 CPU board



Self-capacitance evaluation board



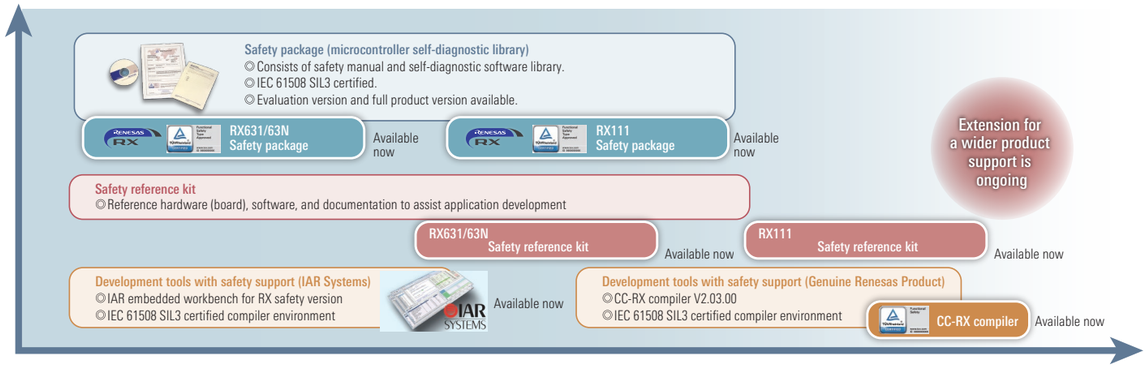
Mutual-capacitance matrix key + self-capacitance proximity sensor evaluation board

RX Family Solutions

Functional Safety Solutions for the Industrial Field

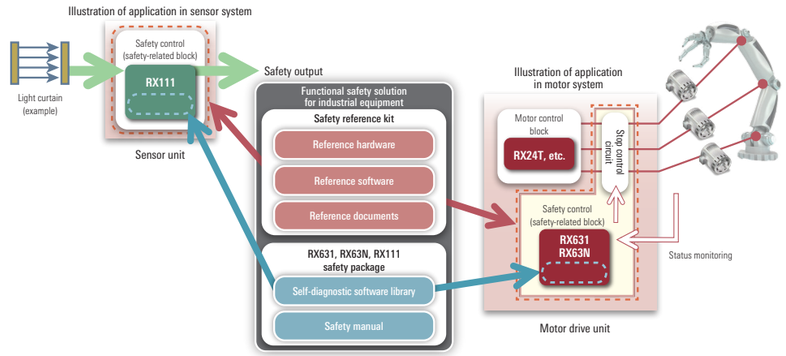
In the industrial equipment field the importance of "functional safety," which aims to maintain safety even when malfunctions occur, is increasing as a way to prevent the adverse effect of breakdowns and accidents on plant operation, the adverse effect of injuries to personnel on society, and the associated economic losses. The European Union's Machinery Directive also requires that equipment meet functional safety standards. To reduce the development burden on customers as the application of functional safety standards expands within many industrial fields, Renesas offers as functional safety solutions safety packages, safety reference kits, and development tools with safety support.

Solution Roadmap



Renesas safety packages each include a safety manual and self-diagnostic software library, based on a previously completed safety analysis of the RX microcontroller. System developers can select the information they require from the safety manual and make use of the self-diagnostic software library, thereby reducing the development burden associated with providing functional safety support. Safety packages are available for the RX631 and RX63N, and for the RX111. To further lighten the development burden for customers, Renesas safety reference kit offers industrial safety system specifications, hardware, and software which customers developed conventionally. Documentation needed for authentication is also available. Renesas is working to extend the range of industrial solutions moving forward.

Solution Application Example



Functional Safety Solution Products for the Industrial Field

Safety package

For IAR tool
- RX631/63N product version: RTK5631NSPF04000SJ
- RX631/63N evaluation version: RTK5631NSPF02001SJ
- RX111 product version: RTK51110SPF01000SJ
- RX111 evaluation version: RTK51110SPF02000SJ

For CC-RX compiler
- RX631/63N product version: RTK0EF0040F01001SJ
- RX111 evaluation version: RTK0EF0041F01001SJ

Reference hardware

RX631/63N: RTK0EF0002D01001BJ
RX111: RTK0EF0011D01001BJ

Reference software

RX631/63N: RTK0EF0004F01001SJ
RX111: RTK0EF0017F01001SJ

Reference documents

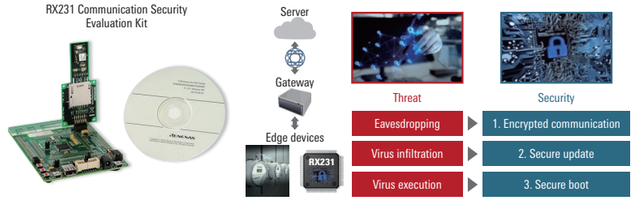
Full documentation set (total 18 documents)
- Common documentation for RX631, RX63N, and RX111: RTK0EF0005Z01001ZJ

Concept phase documentation set (selection of 4 from the full set)
- Common documentation for RX631, RX63N, and RX111: RTK0EF0031Z01001ZJ

Security Solutions

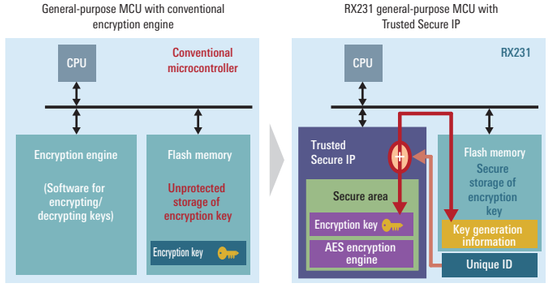
Features of RX231 Communication Security Evaluation Kit

Protect IoT edge devices from eavesdropping and from the infiltration and execution of viruses. Start evaluating encrypted communication, secure boot, and secure update functionality in your wireless LAN and USB communication applications right away.



Robust Security with Trusted Secure IP

The Trusted Secure IP creates a secure area inside the IP module by monitoring for unauthorized access attempts. It ensures that the encryption engine and encryption key can be utilized safely.
The encryption key, the most important element in reliable and secure encryption, is linked to a unique ID and stored in the flash memory in a safe, undecipherable format.



Functions of AES* encryption engine of Trusted Secure IP
- Key length: 128 bits/256 bits
- Encryption modes used:
  Encryption/decryption: ECB, CBC, GCM
  Tampering detection: CMAC

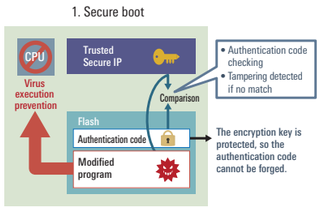
* AES: Advanced Encryption Standard.
An encryption method, established by the National Institute of Standards and Technology (NIST), that is the standard in the United States.

RX231 Communication Security Evaluation Kit Configuration

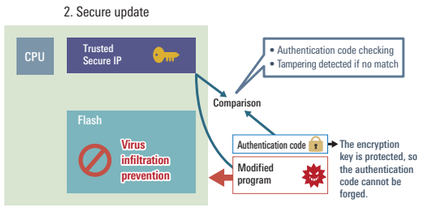
Renesas provides a one-stop source for communication hardware, software, and security solutions, which previously were available only from separate sources, making them difficult to obtain.

Solution	Hardware		Software				
	No.1	No.2	No.3				No.4
	RX231 CPU board	Wireless LAN expansion board	Protocol stack				Trusted Secure IP driver
	Renesas RX231 RSK with security	d-broad wireless LAN (Uses Broadcom wireless LAN chip.)	FreeRTOS	Renesas TCP/IP	Renesas SDHI (wireless LAN interface control)	d-broad wireless LAN Driver	Encryption, decryption, secure boot, secure update
Seller	Renesas	Renesas	Renesas				Renesas
Product No.	R0K505231S010BE (with E1) R0K505231S910BE (without E1)	RTK0ZZZZZZP00000BR	R0MRX60PT0020RRC				RTM0RX0000SMWT0000RP

Secure Boot and Secure Update Functions to Guard Against Viruses



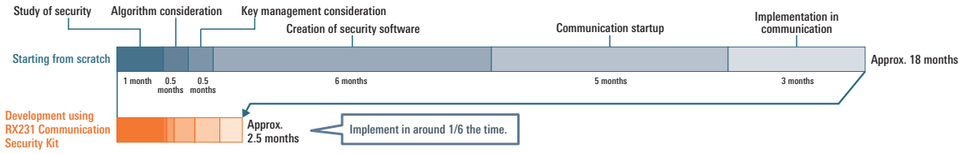
Immediately after startup the secure boot program runs to verify whether or not the user program has been tampered with. If modification is detected, execution of the user program is prohibited to prevent the possibility of a virus running. An authentication code generated with AES-CMAC is used for tampering detection. The AES-CMAC key is protected by the Trusted Secure IP module to prevent the authentication code from being forged.



When a user program is downloaded via a data transfer route in order to perform an update, verification is performed to determine whether or not the user program has been tampered with. If modification is detected, updating of the user program is prohibited to prevent the possibility of virus infiltration. An authentication code generated with AES-CMAC is used for tampering detection. The AES-CMAC key is protected by the Trusted Secure IP module to prevent the authentication code from being forged.

Effectiveness in Shortening Development Time

You can get started using the security evaluation kit immediately, making it possible to dramatically shorten the development time needed to incorporate security features into your system.



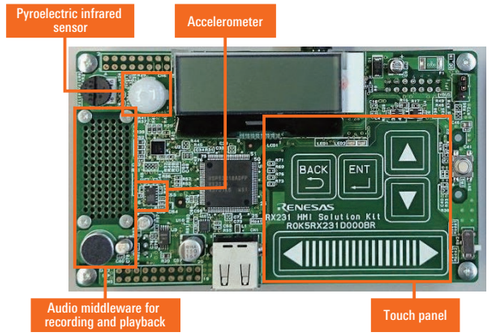
Human-Machine Interface (HMI) Solutions

RX231 HMI Evaluation Kit (R0K5RX231D000BR)

This reference solution simplifies the process of developing user interfaces for home appliances, industrial equipment, healthcare equipment, or office equipment. It enables you to create attractive designs and user-friendly interfaces.

- Highly power efficient 32-bit RX231 microcontroller with integrated capacitive touch and USB functionality
- SAIC101 Smart Analog IC for controlling 16-bit A/D converter, amplifier gain, etc., allowing evaluation of the following functions:
  - Capacitive touch functions
  - Audio recording and playback functions (audio middleware)
  - LCD panel (character)
  - Pyroelectric infrared sensor, accelerometer

Release notes (User's manual, circuit diagrams, parts lists, etc., are available for download on the Renesas website.)



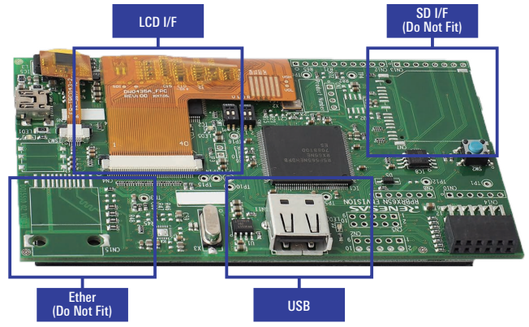
Home appliances | Industrial | Healthcare | Office equipment

RX65N HMI Evaluation Kit (Envision Kit RTK5RX65N2C00000BR)

This reference solution simplifies the process of developing user interfaces for household appliances, industrial equipment, or office equipment. It comes pre-programmed with demo software that allows you to experience high-speed processing and utilization of dual-bank flash memory for firmware updates and bank swapping. Just connect to power to immediately start exploring the functions of the RX65N.

- LCDC and 2D graphics engine allowing evaluation of image rendering performance
- Ability to evaluate firmware updates via USB or remote networks and bank swapping
- Availability at no charge of Envision Kit circuit diagrams and demo software code

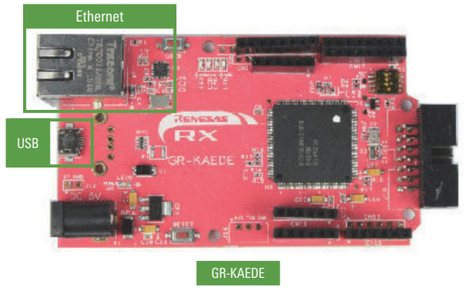
URL www.renesas.com/envision



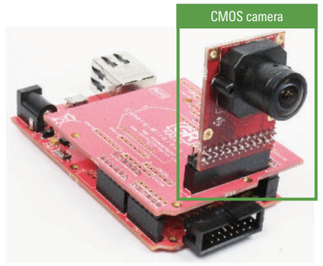
Home appliances | Industrial | Office equipment

GR-KAEDE (RX64M)

GR-KAEDE Gadget Renesas board populated with a RX64M Group microcontroller. Pin compatibility with the Arduino UNO and library availability mean that this board can be utilized even without specialized knowledge of microcontrollers. When combined with middleware for the RX64M's integrated image processing functions and an optional camera board, it can be used for evaluation of applications such as network cameras and motion sensors. Available from Marutsu Elec Co., Ltd. and Akizuki Denshi Tsusho Co., Ltd.
For details of the Gadget Renesas project, visit http://gadget.renesas.com.



Home appliances | Industrial



Topics

RX65N Evaluation Kit Entry Model (Target Board for RX65N)

URL www.renesas.com/rxtb

The RX65N evaluation board is available in three versions to match different user requirements: Renesas Starter Kit, Envision Kit, and Target Board for RX Family. Target Board for RX Family version is an entry-level model intended for users just getting started with RX microcontrollers. The board is equipped only with the MCU and an on-chip debugger. FIT and other sample code is available for download free of charge on the Renesas website. This is an inexpensive and easy way to start exploring the RX Family.

Rank	Premium	Special	Entry
Kit name	RSK+	Envision Kit	Target Board for RX Family
Target MCU	All RX MCU (except RX110/RX21A/RX634)	RX65N	RX130/RX231/RX65N
Image			
Features	Includes evaluation board as well as the E1 on-chip debugging emulator, evaluation version of the C/C++ compiler package, sample code, etc.	A reference kit for use in the development of HMI solutions	Entry-level model intended for users just getting started with RX microcontrollers. Includes MCU and on-chip debugger only.

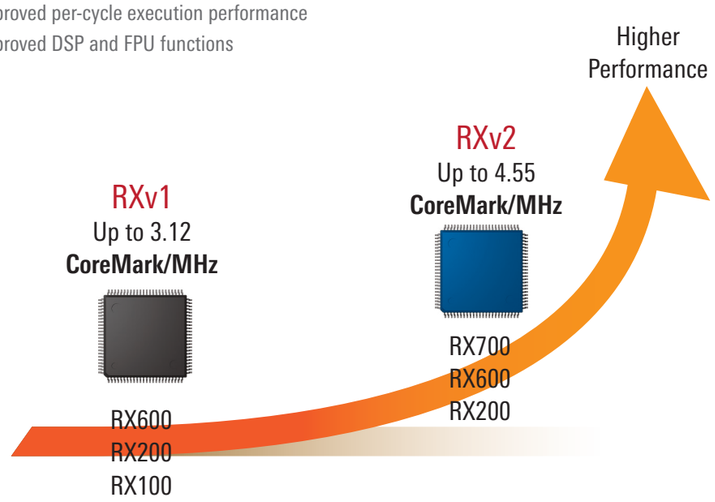
RX Core Features

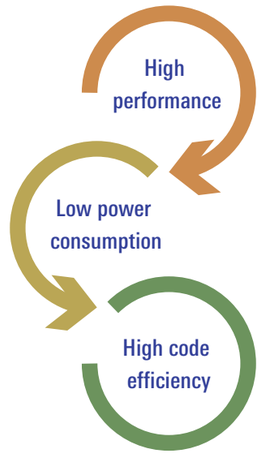
RX Core Roadmap

As products gain added value and systems become more complex, customers demand ever higher performance from microcontrollers. At the same time, they require microcontrollers with low power consumption to improve energy efficiency and extend battery life. The new RX core incorporates advances designed to meet these needs. It is called the RXv2 core.

RXv2 Core Enhancements

- Improved per-cycle execution performance
- Improved DSP and FPU functions





Five years after the appearance of the RXv1 core in 2008, the even more advanced RXv2 core has arrived. It maintains compatibility with existing RX instructions while adding powerful arithmetic capabilities and excellent power efficiency. The RXv2 takes the features of the earlier RXv1 still further:

- 1.46 times the operation performance (CoreMark equivalent) at the same operating frequency
- 40nm process for 40% lower power consumption
- Reduced memory usage thanks to high code efficiency

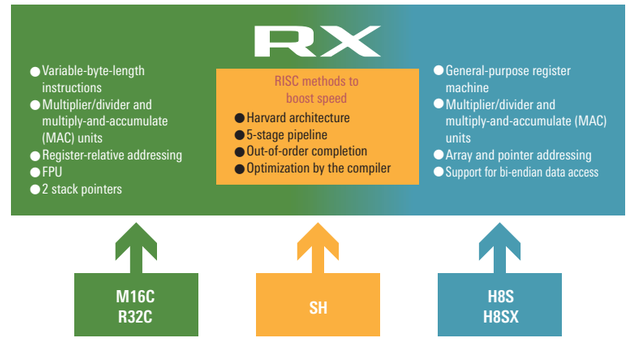
Comparison of RXv1 Core and RXv2 Core

RX core	RXv1	RXv2
Architecture	32-bit CISC, Harvard architecture	
General-purpose registers	32-bit × 16 channels	
Compatibility	RXv1	Downward compatible with RXv1
Instruction set	90 instructions	90 instructions of RXv1 + 19 instructions
Pipeline	5-stage	Improved 5-stage pipeline, enhanced performance through parallel execution of memory access and operations
DSP function instructions	Supported, accumulator × 1	Supported, single-cycle MAC instructions added (32-bit × 32-bit + 72-bit), accumulator added for a total of 2
FPU (single-precision)	Support for IEEE 754 conformant data types and exceptions, pipeline processing	
Operating frequency	Max. 100MHz	Max. 300MHz as architecture
Performance*1	Up to 3.12 CoreMark/MHz	Up to 4.55 CoreMark/MHz

Note: 1. Value current as of date of issue.

Feature 1: New-Generation CPU That Inherits the Strengths of Its Predecessors

The RX core combines the strengths of the CISC architecture of the H8S, H8SX, M16C, and R32C Families and the agility of the RISC architecture of the SuperH Family to achieve clearly superior performance. Specifically, it brings together CISC features such as variable-byte-length instructions and RISC features such as the general-purpose register machine, Harvard architecture, and five-stage pipeline in a "new-generation" CPU architecture. This fusion of the best of the CISC and RISC architectures is just the sort of innovation customers expect from Renesas.

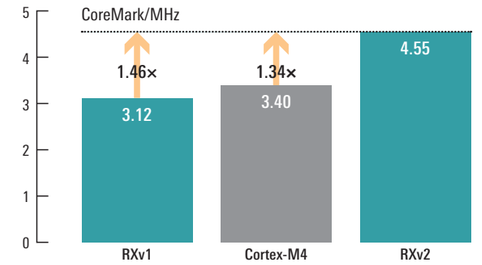


Feature 2: 32-bit class operation performance with 16-bit class code size

Exclusive Renesas CPU with highly efficient pipeline and improved FPU and DSP for excellent operation efficiency!!

The RX CPU core is exclusive to Renesas and employs a CISC architecture that enables more compact code and faster operation. Refinements such as relocation of frequently used instructions, improved instruction addressing, and a three-operand format contribute to higher code efficiency. Speed is increased through the use of a five-stage pipeline, Harvard architecture, and out-of-order completion, combined with a speedup of basic instructions and the integration of a multiply-and-accumulate (MAC) unit and FPU. The RX CPU core is compact, but it delivers powerful 32-bit class operation performance with 16-bit class code size. The RXv2 core incorporates enhancements to the pipeline and FPU/DSP, resulting in even better operation efficiency.

Improved pipeline and FPU/DSP instructions for better operation efficiency

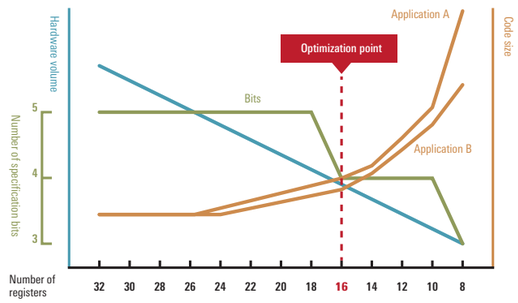


Note: CoreMark scores are published by EEMBC (www.eembc.org).

Feature 3: Optimal Number of Registers

In the study and development stage of the RX core there was a strong emphasis on identifying ways to optimize code efficiency and performance, though benchmark testing on application software for the office equipment, consumer, industrial, and automotive fields, and applying the results in the design of the RX core. The choice of 16 as the number of 32-bit general-purpose registers provides a suitable balance between overhead and performance.

- Performance is excellent when using general-purpose registers for both operation- and control-heavy applications.
- With eight registers performance suffers due to the frequency of save-restore processing, and the code size grows.
- As the number of registers increases, both the hardware volume and the number of specification bits in the instruction codes increase.

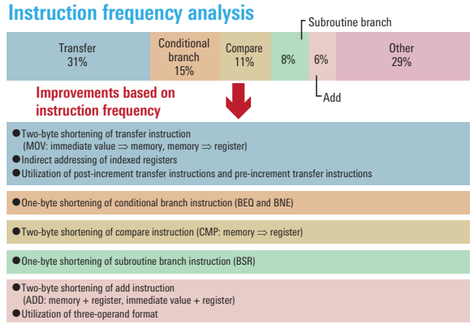


RX Core Features

Feature 4: Revised Instruction Set

With regard to basic instructions and addressing modes, the number of instructions and the code size where reduced by identifying the most frequently used instructions and addressing modes and assigning them the shortest formats. Also, additional enhancements to the addressing modes were made to increase the efficiency of table manipulation.

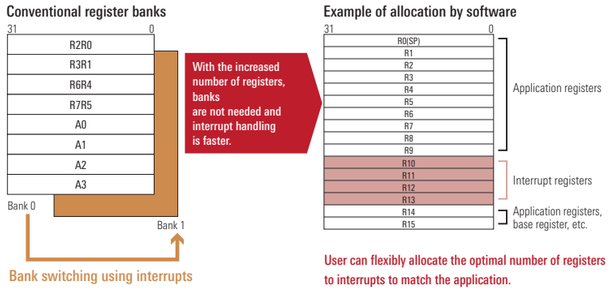
- Instructions have variable byte lengths, and the most frequently used instructions are assigned to the shortest instruction codes
- The most frequently used instructions were identified by analyzing actual application software.
- Some instructions were eliminated by adding addressing modes and adopting a three-operand format.
- Through benchmark testing of various types of application software, program size was reduced compared with earlier products.



Feature 5: Register Allocation for Faster Interrupts

With regard to the method of saving values to registers when interrupts occur, the conventional method employing register banks was dropped in favor of a register allocation method designed for efficient and rapid interrupt handling. This allows all registers to be used as table registers. In addition to faster interrupt handling, users can allocate registers freely to achieve better optimization.

- The increased number of general-purpose registers includes registers dedicated to interrupts for faster interrupt handling.

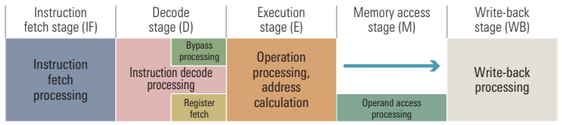


Feature 6: Pipeline Stage Configuration

Harvard architecture is used for the pipeline configuration to allow instruction fetching and data access to occur in parallel. A five-stage pipeline configuration is used in combination with out-of-order completion. This means that in cases where previously wait states would have been inserted into the pipeline, an instruction in a later stage can be executed before an instruction in an earlier stage, provided there is no dependency between the instructions, thereby eliminating the need to insert wait states and further speeding up processing.

Pipeline Stage Configuration

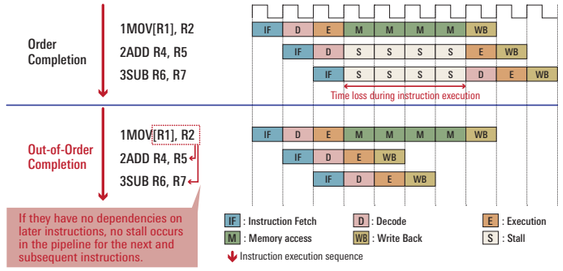
- 5-stage pipeline for faster processing
- Through benchmark testing of various types of application software, processing performance was more than doubled compared with earlier products.



The memory access stage is only used when accessing the memory.

Out-of-Order Completion

- Out-of-order completion boots the efficiency and speed of instruction execution.



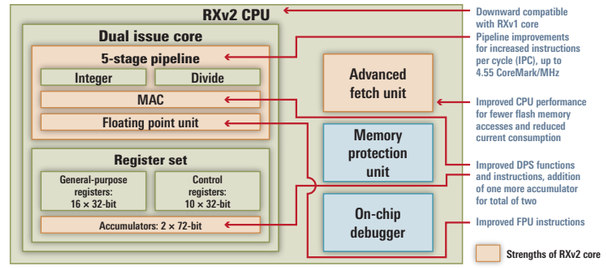
RXv2 Core Features

RXv2 Core: CPU Block Diagram

The RXv2 core maintains compatibility with the RXv1 core while providing the following enhancements:

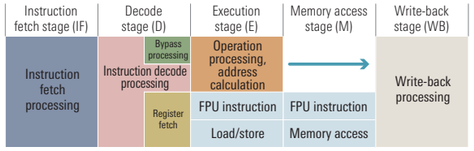
- Improved pipeline for substantial increase in the number of instructions per cycle (IPC)
- Advanced fetch unit with improved interface to on-chip flash memory. Reduces re-fetching of instructions due to penalty imposed by branch instructions and reduces the number of flash memory accesses. Achieves improved CPU performance alongside reduced power consumption.
- Improved instructions for DSP and FPU functions.

RXv2 CPU Block Configuration Diagram



Strengths of RXv2 Core: Pipeline

RXv2 Pipeline Processing Stage Configuration

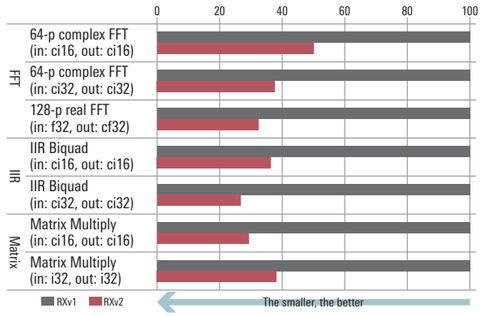


The memory access stage is only used when accessing the memory.

To enhance the pipeline processing of the RXv2 core beyond that of the RXv1 core, the execution stage and memory access stage have been configured to enable parallel execution of floating-point operations. This allows an integer operation instruction and an FPU instruction, or a memory access and an FPU instruction, to be executed at the same time. Not only do FPU instructions complete faster, but the hit on CPU performance caused by complex addressing modes, etc., is substantially reduced.

Strengths of RXv2 Core: Improved FPU and DSP

In addition to the revisions to the pipeline configuration of the RXv2 core, the functionality of the FPU and DSP have both been improved. The number of cycles required by existing instructions has been reduced and new instructions added.
Also, the number of accumulators (dedicated buffer registers) in the DSP has been increased from one to two to improve the efficiency of DSP operations. The performance of some filtering operations is now four times better than that of the RXv1 core. The improvements to the FPU and DSP functions show up clearly in the difference in filtering performance between the RXv1 and RXv2.



FPU functions (new instructions added, existing instructions speeded up)	
New instructions	FFSQRT($\sqrt{\ }$),FTOU,UTOF
	Three-operand format
Speed [cycles]	FADD/FSUB: 4 cycles → 2 cycles FMUL: 3 cycles → 2 cycles
Single-cycle throughput	Pipelined FPU

Improvements are shown in red.

DSP functions (new instructions added, accumulator for operations added)	
32×32=acc, acc ±32×32=acc	EMULA, EMACA, EMSBA
16×16=acc, acc ±16×16=acc	HULLH, MACLH, MSB (LH, HI, LO)
Accumulator rounding instructions (16-/32-bit, round off/down)	RDACW, RDACL, RACL
Accumulator added	1 → 2

RX Family Features

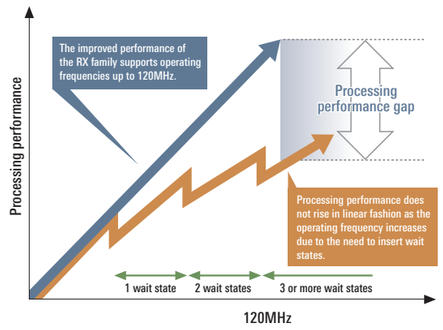
Feature 1: Up to 4MB of 120MHz Zero-Wait High-Speed Flash Memory

RX family microcontrollers come with high-speed flash memory and flash memory for data storage. Support for background operation (BGO) allows a program to run while erasing or programming take place in parallel.

The RX Family includes products utilizing the cutting-edge 40nm ultrafine fabrication process and on-chip flash memory employing MONOS*1 technology. This allows for fast reading of data with zero-wait access at speeds up to 120MHz, allowing the performance of the CPU to be used to the full. The ultrafine fabrication process allows up to 4MB of flash memory to be integrated on-chip. RX Family products with on-chip flash memory also include flash memory for data storage. These two types of flash memory support background operation (BGO), so a user's program can run while the flash memory for data storage is being erased or programmed at the same time. This can provide a substantial boost to system performance.

Note: 1. Metal Oxide Nitride Oxide Silicon

Renesas High-Speed Flash Memory



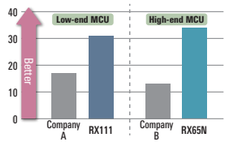
Feature 2: Variety of Package Types to Match Different Applications

Each series within the RX Family includes a variety of package options. The RX100 Series is available in packages with pin counts ranging from 36 to 100 pins, while the RX200 Series is available in packages with pin counts ranging from 48 to 145 pins. In addition to the basic LQFP, the compact LGA is also available in the lineup. There are also plans to add ASSP products to the lineup for some specialized fields. The RX600 Series has a particularly wide variety of package options, with pin counts from 48 to 177 pins and LQFP, LGA, and BGA as the available package types. The RX700 Series is available in packages with pin counts ranging from 100 to 177 pins. The pin assignments of RX Family microcontrollers were selected to provide backward compatibility with the well-established M16C Family. This simplifies the task of adapting the board layout when switching microcontroller products.

Feature 3: Excellent Power Efficiency: Improved Operating Performance and Reduced Power Consumption

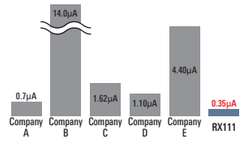
The unique RX CPU core combines a design optimized for power efficiency and an exclusive fabrication process to achieve excellent operation performance and low power consumption. In particular, the new RX65N and RX651 Groups deliver ultrahigh efficiency of 34.4 CoreMark/mA. The standby power consumption of RX is also among the best anywhere in this class of microcontroller. This translates into reduced power consumption by the system overall and extended battery life, contributing to more eco-friendly products.

CoreMark/mA



Calculation based on CPU's CoreMark value and typical current value on datasheet.

Standby current (CPU and RAM contents retained)



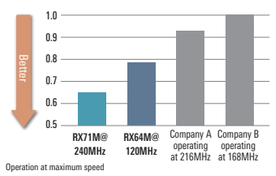
Renesas research based on datasheets of competing products.

Note: Renesas research based on information from competing companies.

Feature 4: Fast Interrupt Response Performance

Interrupt response performance and standby time are substantially improved by the use of technologies developed for earlier products, such as high-speed flash memory that enables zero-wait access, and optimized register assignment. RX Family microcontrollers are ideal for applications requiring a high level of responsiveness, such as fine positioning control for motors.

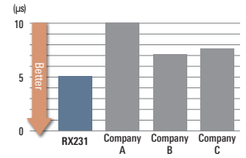
Interrupt response time ratio: CPU comparison*1



Operation at maximum speed

Time from interrupt request generation to end of interrupt handling

Standby recovery time (CPU and RAM contents retained)



Renesas research based on datasheets of competing products.

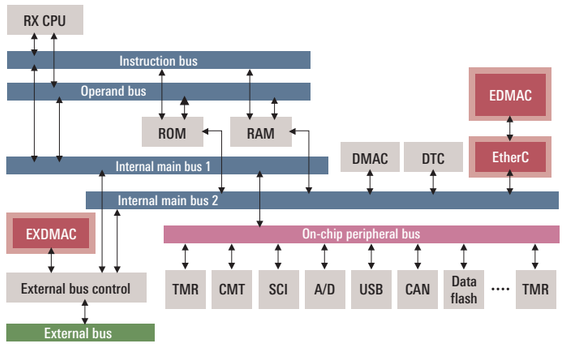
Note: 1. Renesas research based on information from competing companies.
Interrupt handler processing for each company is equivalent.

Feature 5: Efficient Bus Configuration That Boosts System Performance

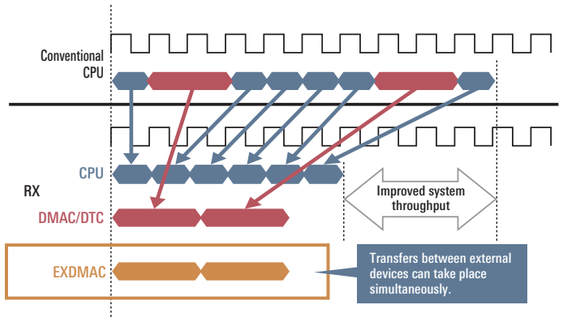
The separate internal high-speed bus allows parallel processing of DMAC/DTC data transfers while a program runs on the CPU.

The hierarchical bus configuration of the RX Family comprises main bus 1, which is used exclusively by the CPU; main bus 2, which is used exclusively by the DMAC and DTC; and peripheral and external buses. Parallel processing on different buses is supported. In addition, some products incorporate a dedicated DMAC (EXDMAC) for external bus transfers. This enables transfer of external data to take place alongside the parallel operation of the internal buses. This has the potential to significantly boost the system performance of embedded devices. It is particularly effective in systems with communication capabilities such as Ethernet, USB, and CAN.

RX600 Series Internal Bus Configuration Example



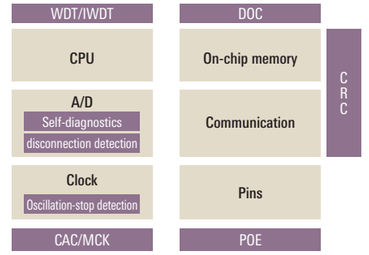
CPU, DMAC, DTC, and EXDMAC Operation Example



Feature 6: Hardware Safety Functions

The RX Family features hardware implementation of system safety functions, greatly reducing the load imposed by software. These safety functions can be used to build electric home appliances that comply with the IEC 60730 Class B safety standard.

RX Family Safety Functions



Function		Safety functions that use this function
CPU	Independent watchdog timer (IWDT)	CPU runaway detection using WDT based on clock other than CPU clock
Clock	Oscillation-stop detection	Oscillation-stop detection
	Clock frequency accuracy measurement function (CAC) Frequency measurement function (MCK)	Clock frequency error detection
On-chip memory	Data operation circuit (DOC)	System memory assist
	CRC calculation circuit (CRC)	Memory error detection
Serial		Communication data error detection
A/D	A/D self-diagnostics	A/D converter unit error detection
	A/D disconnection detection	Analog input disconnection detection assist
Pins	Port output enable (POE)	Protection of pins from overcurrent

RX Family Motor Control

Motor Types and Recommended Microcontrollers

	Consumer/office equipment				Industrial					
	Air conditioners	Washing machines	Refrigerators	Printers/ multifunction units	Pumps	Fans	Surveillance cameras	General-purpose inverters	Robots/ machine tools/ industrial motors	AC servos
Motors	BLDC IM	BLDC IM	BLDC IM	BLDC STM	BLDC IM	BLDC IM	BLDC STM	BLDC IM	BLDC STM	BLDC
Recommended microcontrollers	RX200	RX100 RX200	RL78 RX100 RX200	RL78 RX100 RX200	RL78 RX100 RX200	RL78 RX100 RX200	RL78 RX100 RX200	RX200 RX600 RX700	RX100 RX200 RX600 RX700 RZ/T1	RX600 RX700 RZ/T1

BLDC: Brushless DC motor, IM: AC induction motor, STM: Stepping motor

Motor Types, Control Methods, and Recommended RX Series

Motor type	Control method	Necessary functions	Performance required by application and recommended RX microcontroller			
			Up to 20MHz	Up to 50MHz	Up to 100MHz	Over 100MHz
			RX100	RX200	RX200 (RX24T/U) RX600	RX700 RX600
Brushless DC motor	Vector control (180-degree conducting control)	PWM × 6, dead time generation, POE, A/D converter (PWM link)	Compact industrial motors	Compact robots, surveillance cameras, general-purpose inverters, printers/multifunction units		General-purpose inverters, machine tools, industrial robots, AC servos
				Washing machines (1-motor), refrigerators (1-motor), pumps, compressors	Air conditioner outdoor units (2-motor), washing machines (2-motor)	
			Fans			
	Square wave control (120-degree conducting control)	PWM × 6, A/D converter	Refrigerators, fans, compact robots	Refrigerators, pumps, compressors		
AC induction motor	Vector control	PWM × 6, dead time generation, POE, A/D converter (PWM link)		Industrial pumps	General-purpose inverters (fans, pumps)	
	V/f control		Fans, refrigerators, washing machines pumps	Air conditioner outdoor units, pumps	General-purpose inverters (fans, pumps)	
Stepping motor	Pulse output	Port control or PWM control	Printers/multifunction units, surveillance cameras		Industrial motors	

ASSP Microcontrollers for Motor Control (RX63T, RX62T, RX62G, RX24T, RX24U, RX23T)

ASSP microcontrollers for motor control provide the features listed below, which are specifically applicable for motor control applications:

- Advanced-functionality timers optimized for motor control
- A/D converter (3-channel sample-and-hold per unit, PGA,*1 trigger support for 1-channel control, comparator, etc.) for feedback control
- 5V single power supply support

Note: 1. PGA: Programmable-gain amplifier

RX for Motor Control

RX delivers high-speed arithmetic performance alongside MTU2 or MTU3, GPT timer, 12-bit A/D converter, and POE functions to simplify the process of implementing motor control!

High-speed arithmetic operations (RX core)

High-speed vector calculations
- High-speed processing at 240MHz
- FPU for high-speed floating point operations
- On-chip MAC (multiply–accumulate unit)

Waveform control/feedback control (MTU2 and MTU3, GPT, etc.)

PWM waveform output
- PWM output with 0 to 100% duty
- 3-phase complementary PWM waveform output
- Automatic insertion of dead time
- A/D activation at user-defined timing for 1-shunt current detection

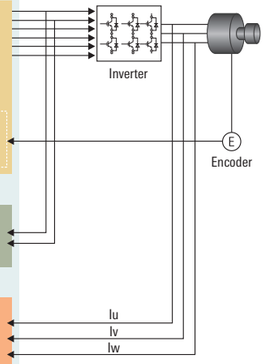
Feedback control
- Acquisition of feedback information (position/rotation rate) from encoder

Error detection/system protection (POE)

Abnormal wave detection and system protection
- Complementary PWM waveform error detection and protection

Feedback control (high-speed 12-bit A/D converter)

Acquisition of feedback information using motor current
- High-speed (1.0µs) 12-bit A/D converter
- Simultaneous sampling of three tracks for 3-shunt current detection



Examples of Motor Control Functions Provided by RX

Description		ASSPs for motor control			For general-purpose/network applications										
		RX23T/RX24T/RX24U	RX62T	RX62G/RX63T	RX110	RX111/RX113	RX130/RX220	RX210	RX21A	RX230/RX231	RX621/RX62N/RX631/RX63N	RX634	RX651/RX65N	RX64M/RX71M
Waveform output control	PWM output with 0 to 100% duty	○	○	○	○	○	○	○	○	○	○	○	○	○
	Synchronous output on multiple channels	○	○	○		○	○	○	○	○	○	○	○	○
	Chopping or level waveform output in AC synchronous motor drive mode	○	○	○		○	○	○	○	○	○	○	○	○
	3-phase complementary PWM output with dead time (left-right symmetric dead time amplitude)	○	○	○		○	○	○	○	○	○	○	○	○
	3-phase complementary PWM output with dead time (left-right asymmetric dead time amplitude)	○	○	○										○
	High-resolution PWM output			○										
Feedback detection	Phase counting mode	○	○	○	○	○	○	○	○	○	○	○	○	○
	High-speed 12-bit A/D converter using sequential conversion	○	○	○	○	○	○	○	○	○	○	○	○	○
	A/D converter activation requests at user-defined timing (for 1-shunt current detection)	○	○	○		○	○	○	○	○	○	○	○	○
	12-bit A/D converter double-trigger function (storage of data from two conversions in separate registers)	○	○	○	○	○	○	○		○		○	○	○
	12-bit A/D converter with simultaneous sampling of three tracks	○	○	○				○				○	○	○
Increased speed	Compare match and A/D conversion start request skipping function	○	○	○		○	○	○	○	○	○	○	○	○
	FPU for high-speed arithmetic operations	○	○	○						○	○	○	○	○
	Double buffering function (provision of two register buffer stages for compare match operation)	○	○	○									○	○
Safety functions	Error detection and PWM output auto-cutoff using port output enable	○	○	○	○	○	○	○	○	○	○	○	○	○
Other	Compare match/input capture	○	○	○	○	○	○	○	○	○	○	○	○	○
	5V power supply	○	○	○			○	○		○				
	32-bit counter support	○											○	○

RX700 Series

RX700 Series Features

High-performance 32-bit RX CPU
1,044 CoreMark/240MHz

Top microcontroller in the RX family
Max. 240MHz operation
for 1,044 CoreMark performance

High-speed/large-capacity flash
Max. 120MHz flash access
Max. 4MB

Large-capacity flash eliminates the need for external memory.
High-speed access for superior real-time performance.

Numerous peripheral functions
Ethernet, USB HS/FS, timers for A/D converter for motor control

Multiple communication interfaces including Ethernet × 2 channels, USB High Speed, and SD Host, and timers for advanced-functionality motor control

Security

Encryption functions such as AES and SHA for enhanced communication security

Main Applications of RX700 Series

Industrial

PLC
General-purpose inverters

Semiconductor fabrication equipment
LCD panel manufacturing equipment

machine tools
Industrial robot

Office equipment

Compact printers and copiers
POS terminals

RX71M

Max. 240MHz
2MB to 4MB flash
2.7V to 3.6V

RXv2 core*1	FPU	Safety functions	Ethernet	External bus	CAN
USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588

Note: 1. The RXv2 CPU core has advanced performance features such as a DSP.

Large memory capacity
High performance

Ethernet

Connectivity

ASSP for motor control

Hardware support for safety functions

Security functions

RXv2 Core and 40nm Process Flash Memory: Announcing the RX71M with Top Speed and Functionality

High speed and low current consumption

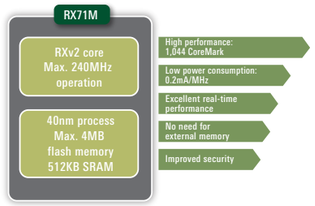
Performance is 1,044 CoreMark when operating at 240MHz, for shorter processing time even in increasingly complex systems. Cutting-edge 40nm process enables low current consumption of 0.2mA/MHz during operation, so system performance can be improved without concerns about current consumption.

Large-capacity, high-speed memory

Up to 4MB of on-chip flash memory and 512KB of on-chip SRAM reduce the need for external memory, for lower BOM cost and reduced mounting area. Both flash memory and SRAM support high-speed access, making it possible to extract the full potential of the CPU.

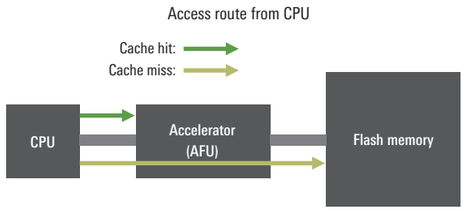
Security

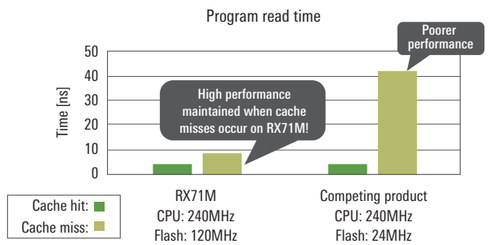
Encryption functions (AES, DES, SHA, and RNG) are implemented in hardware, reducing the CPU load while boosting the reliability of communication functions. The Trusted Memory function prevents unauthorized access to or copying of a special area in the on-chip flash memory to protect important algorithms.



Exclusive Renesas High-Speed On-Chip Flash Memory for Rock-Solid Performance

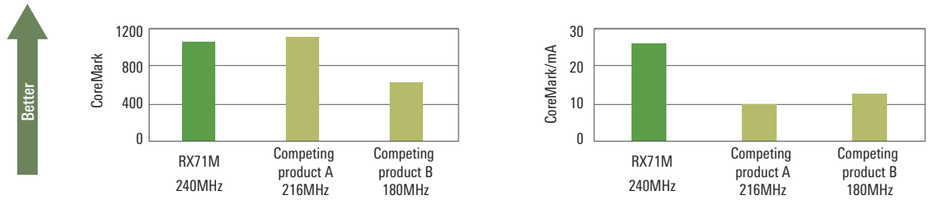
The RX71M Group incorporates an accelerator (advanced fetch unit: AFU) to accommodate the faster CPU. This enables no-wait access at up to 240MHz. The accelerator functions as cache memory for programs, but it is still necessary to access the flash memory when cache misses occur due to branch instructions or interrupts. In such cases program read accesses only require one wait state because the on-chip flash memory supports high-speed access at 120MHz. This allows the CPU to continue to perform at the highest level.





Renesas' Exclusive RXv2 Core and Industry-Leading 40nm Process for Superior Power Efficiency

Renesas' exclusive RXv2 core and the use of a 40nm fabrication process, among the most advanced in the industry, make possible a combination of high performance and low power consumption that were unattainable with earlier technology. Current consumption relative to operating frequency is approximately 70% less than that of earlier products, making it possible for developers to boost system performance without increasing power consumption.



Compatibility with RX600 Series and Enhanced Peripheral Functions

The RX71M Group retains the peripheral functions of the RX600 Series while adding new functions such as USB High-Speed, thereby ensuring a high level of backward compatibility. If you are currently using the RX600 Series, migrating to the RX700 Series provides an easy way to achieve a speed boost. This means that development of higher-level or next-generation products can be accomplished in less time. In particular, the RX64M Group retains the earlier peripheral functions alongside pin compatibility, making it possible to easily create a development platform based on reuse of existing software and hardware resources.

	CPU	Memory			Timer						Communications										Analog		Security			Others			
RX71M	240MHz RXv2 with FPU	Up to 4MB Flash	Up to 512KB RAM	64KB E2 Flash	3ph Motor MTU3	3ph Motor GPT	TMR TPU	CMT CMTW	WDT IWDT	RTC	USB 2.0OTG FS/HS w PHY	2ch Ether MAC	IEEE1588	3ch CAN	9ch SCI	4ch SCI w FIFO	2ch RSPI 2ch RIIC	QSPI	SDHI MMC IF	SSIF SRC	12-bit A/D 2Unit 3S/H	12-bit D/A	AES DES	SHA	TRNG	Trusted Memory	HOCO	VBAT	
RX64M	120MHz RXv2 with FPU	Up to 4MB Flash	Up to 512KB RAM	64KB E2 Flash	3ph Motor MTU3	3ph Motor GPT	TMR TPU	CMT CMTW	WDT IWDT	RTC	2xUSB 2.0OTG FS w PHY	2ch Ether MAC	IEEE1588	3ch CAN	9ch SCI	4ch SCI w FIFO	1ch RSPI 2ch RIIC	QSPI	SDHI MMC IF	SSIF SRC	12-bit A/D 2Unit 3S/H	12-bit D/A	AES DES	SHA	TRNG	Trusted Memory	HOCO	VBAT	
RX65N	120MHz RXv2 with FPU	Up to 2MB Flash	Up to 640KB RAM	32KB E2 Flash	3ph Motor MTU3		TMR TPU	CMT CMTW	WDT IWDT	RTC	USB 2.0OTG FS w PHY	Ether MAC		2ch CAN	11ch SCI	2ch SCI w FIFO	3ch RSPI 2ch RIIC	QSPI	SDHI MMC IF		12-bit A/D 2Unit 3S/H	12-bit D/A	AES DES	SHA RSA	TRNG	Trusted Memory	HOCO	VBAT	LCDC

Hardware Encryption Functions Allowing Simple Creation of Secure Systems with Low Processing Load

The RX71M Group implements multiple encryption functions in hardware. This means that the associated processing imposes no additional load on the CPU. Hash values generated using a Secure Hash Algorithm (SHA) enable detection of data tampering and malicious exploits by third parties. Support for the Advanced Encryption Standard (AES) and Data Encryption Standard (DES) makes possible fast encryption and decryption of data using your preferred method. Data can be transferred over a variety of interfaces, including Ethernet, USB, SD Host, UART, SPI, and I^2C, and protected using encryption to ensure secure communication.

Module	Function	Application	Performance
AES	Encryption/decryption	Protection of communication data	Up to 12 times faster than software processing
DES	Encryption/decryption	Protection of communication data	Up to 32 times faster than software processing
SHA	Hash value generation	Authentication	Up to 65 times faster than software processing
TRNG	True random number generation	Secret key generation	True random number generation time: Typ. 3.6 ms

RX600 Series

RX600 Series Features

High-performance 32-bit RX CPU Up to 4.55 CoreMark/MHz
Up to 546 CoreMark at 120MHz
Substantially improved operation capacity

High-speed/large-capacity flash Max. 120MHz flash access Max. 4MB
Ability to extract 100% of CPU's performance potential
Fewer components for reduced power consumption

Extensive lineup Ethernet, motor control, LCD, etc. Many product versions for a variety of applications
Connectivity, motor control, LCD, etc.
Functions suitable for many applications
Many pin count and memory options

Safety functions Security
Support for industrial safety standards
Encryption functionality to protect communication
Enhanced system safety

Main Applications of RX600 Series

Industrial				Office equipment	Electric home appliances
Robots, machine tools	General-purpose inverters	Meter	Building automation	Copiers Printers	Air conditioners Refrigerators Washing machines

RX64M	max120MHz 2MB to 4MB Flash 2.7V to 3.6V	RXv2 core*1	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX651/ RX65N	max120MHz 512KB to 2MB Flash 2.7V to 3.6V	RXv2 core*1	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX631/ RX63N	max100MHz 256KB to 2MB Flash 2.7V to 3.6V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX621/ RX62N	max100MHz 256KB to 512KB Flash 2.7V to 3.6V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX63T	max100MHz 32KB to 512KB Flash 2.7V to 3.6V, 4.0V to 5.5V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX62T	max100MHz 64KB to 256KB Flash 2.7V to 3.6V, 4.0V to 5.5V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX62G	max100MHz 128KB to 256KB Flash 4.0V to 5.5V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX630	max100MHz 384KB to 2MB Flash 2.7V to 3.6V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX634	max 54MHz 1MB to 2MB Flash 2.7V to 3.6V, 4.0V to 5.5V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588
RX610	max100MHz 768KB to 2MB Flash 3.0V to 3.6V	RXv1 core	FPU	Safety functions	Ethernet	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	Power control	IEEE1588

Large memory capacity High performance
Ethernet
Connectivity
ASSPs for motor control
Hardware support for safety functions
Security functions

Note: 1. The RXv2 CPU core has advanced performance features such as a DSP.

Announcing the New RX65N and RX651 Groups, the Next-Generation Mainstream Microcontrollers of the RX Family

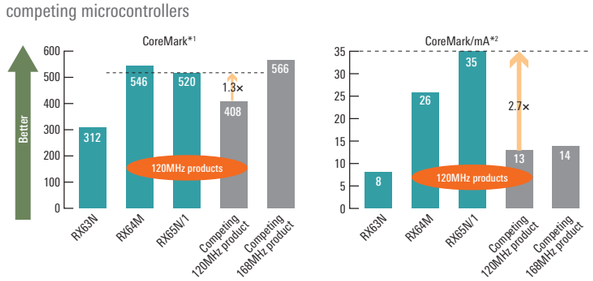
RX65N and RX651 Groups of next-generation 32-bit microcontrollers built around the RXv2 core

- Employs the same 40nm process as the RX64M. Optimized for high power efficiency, unlike the RX64M, which focuses on real-time performance. Processing power of 34.4 CoreMark/mA is four times that of earlier products.
- Retains the communication functions of its predecessors while supporting multiple communication interfaces, such as SD interface. This allow connection of a wireless module or SD card via the SD. In addition the AES hardware encryption engine protects communication data, preventing its deciphering or modification by third parties.
- Pin and function compatibility with earlier products simplifies migration. In addition, software resources can be made portable by utilizing FIT driver middleware, which supports common APIs. This helps reduce the time and cost associated with development.

Renesas RX65N and RX651 32-bit microcontrollers enable secure and safe communication and control in industrial applications.

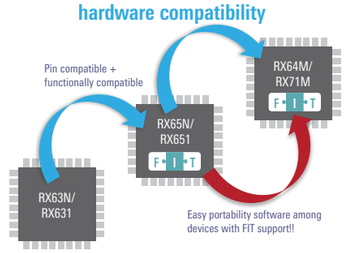
Benchmark Comparisons with Competing Microcontrollers

Better arithmetic performance (left graph) and vastly superior power efficiency (right graph) than competing microcontrollers



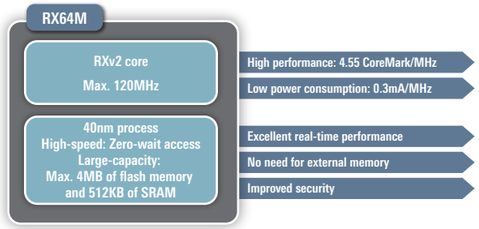
Notes: 1. Calculated from EEMBC nominal values and product data sheets.
2. Calculated based on CoreMark scores and typical current values from product data sheets.

High level of software and hardware compatibility



RXv2 Core, 40nm Process Flash Memory: High-Speed, Large-Capacity RX64M

The RX64M Group of 32-bit microcontrollers retains compatibility with the earlier RXv1 core while offering the more powerful RXv2 core. The RXv2 core delivers 1.7 times the performance of earlier RX products and reduces operating current consumption by some 40%, making it possible to build systems that combine high-speed operation and low current consumption. The RX64M Group is fabricated using the cutting-edge 40nm process. This makes it possible to integrate large on-chip memory capacity—up to 4MB of flash memory and 512KB or SRAM—operating at high speeds up to 120MHz. This high-speed, large-capacity memory enables storage of both user programs and data on a single chip. Excellent real-time performance is possible without the need for external memory, and security is enhanced as well.



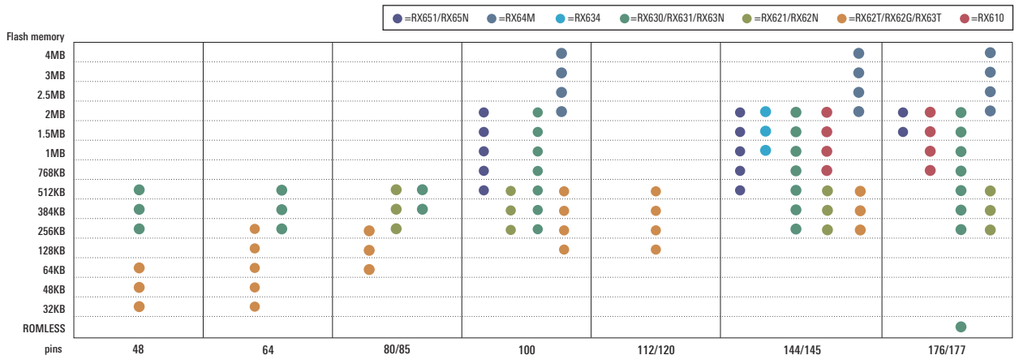
Substantially Enhanced Peripheral Functions and Compatibility with RX651, RX65N, and RX64M

The communication functions of the RX651, RX65N, and RX64M have been extended, and a new general-purpose PWM timer added. In addition, it retains the various functions of the earlier RX600 Series, providing a high level of compatibility. The RX651 and RX65N offer, first of all, improved CPU core performance (RXv1 core upgraded to RXv2 core), enhanced timer functionality for motor control (MTU2 upgraded to MTU3), extended communication functions (SD Host interface, QSPI, SCI with FIFO), and enhanced security (TRNG added, trusted memory area). The RX64M supports IEEE 1588, which is in high demand for industrial Ethernet applications, alongside enhanced security features such as SHA. This product lineup allows customers to select the microprocessor that optimally matches the intended application.

	CPU	Memory			Timer					Communications										Analog		Security			Others			
RX64M	120MHz RXv2 with FPU	Up to 4MB Flash	Up to 512KB RAM	64KB E2 Flash	3ph Motor MTU3	3ph Motor GPT	TMR TPU	CMT CMTW	WDT IWDT	RTC	2xUSB 2.0DTG FS w PHY	2ch Ethernet MAC	IEEE 1588	3ch CAN	9ch SCI	4ch SCI w/ FIFO	1ch RSPI 2ch RHC	QSPI	SDHI MMC IF	SSI SRC	12-bit A/D 2Unit 35ch	12-bit D/A	AES DES	SHA	TRNG	Trusted Memory	HOCO	VBAT
RX65N RX651	120MHz RXv2 with FPU	Up to 2MB Flash	Up to 640KB RAM	32KB E2 Flash	3ph Motor MTU3		TMR TPU	CMT CMTW	WDT IWDT	RTC	USB 2.0DTG FS w PHY	Ethernet MAC (N models only)		2ch CAN	11ch SCI	2ch SCI w/ FIFO	3ch RSPI 2ch RHC	QSPI	SDHI MMC IF		12-bit A/D 2Unit 35ch	12-bit D/A	AES DES	SHA RSA	TRNG	Trusted Memory	HOCO	VBAT
RX63N RX631	100MHz RXv1 with FPU	Up to 2MB Flash	Up to 256KB RAM	32KB E2 Flash	3ph Motor MTU2		TMR TPU	CMT	WDT IWDT	RTC	USB 2.0DTG FS w PHY	Ethernet MAC (N models only)		3ch CAN	12ch SCI		3ch RSPI 4ch RHC				12-bit A/D 10-bit A/D	10-bit D/A	DEU (AES)				HOCO	VBAT

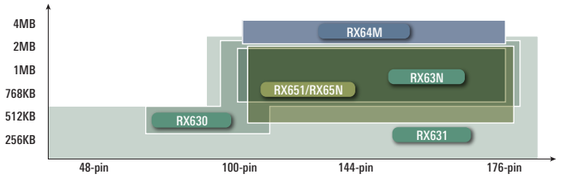
RX600 Series

RX600 Series Memory/Pin Configurations



Products for General-Purpose, Network, and Security Applications

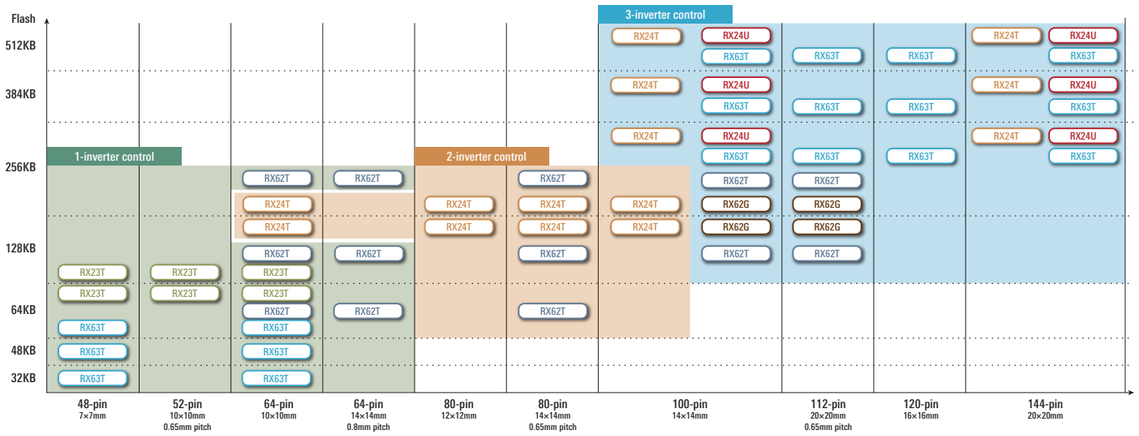
RX64M, RX65N, RX651, RX63N, RX631, RX630



RX64M, RX65N, RX651, RX63N, RX631, RX630: Supported Applications

	General-purpose applications	Network and security applications	
RX64M ● Ethernet/IEEE1588 ● USB Host/Function/OTG ● Security (encryption) ● Safety functions	Copiers Printers Audio equipment Programmable logic controllers Smart meters HVAC controllers Vending machines Machine tools	Security systems Encrypted communication applications Data protection applications Ingress/egress management systems POS terminals	Industrial network devices (real-time Ethernet)
RX65N ● Ethernet ● USB Host/Function/OTG ● Security (encryption) ● Safety functions ● LCD			Network support devices HEMS, gateway devices
RX63N ● Ethernet ● USB Host/Function/OTG ● Security (encryption) ● Safety functions			
RX651 ● USB Host/Function/OTG ● Security (encryption) ● Image capture ● Safety functions			
RX631 ● USB Host/Function/OTG ● Security (encryption) ● Image capture ● Safety functions			
RX630 ● USB Function ● Safety functions			

Lineup of RX Family Products for Motor Control

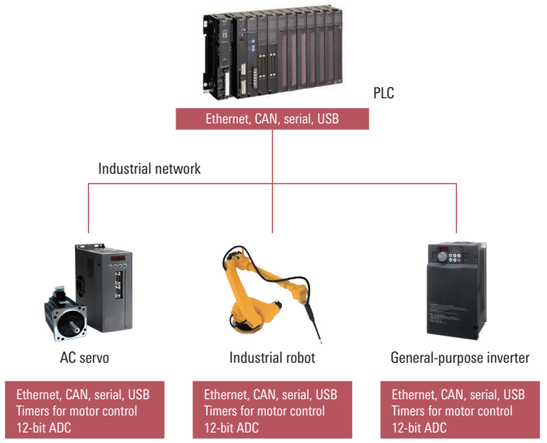


Note: When not otherwise indicated, the package pin pitch is 0.5mm.

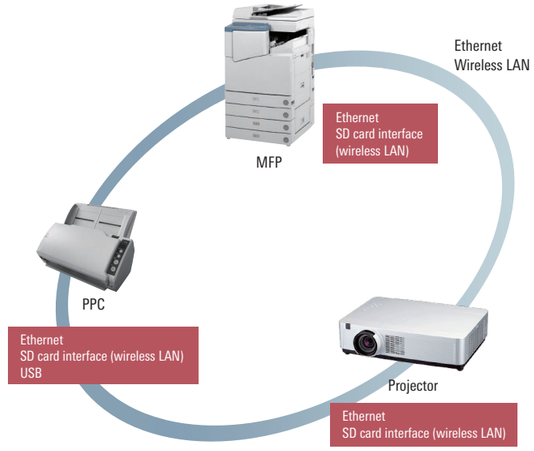
Simplifying Networking of Industrial Equipment

Integrated support for numerous communication interfaces, including USB 2.0 Full Speed (Host, Function, OTG), Ethernet controller, SDHI, and SDIO. In addition, drivers and middleware are available free of charge for functions such as TCP/IP, making it easy to add network connectivity to existing industrial and office equipment.

Industrial network



Office equipment network



Software Support for Development

	Drivers	Middleware	Sample code	Application notes
Ethernet	Available	TCP/IP protocol stack	Available	Available
USB	Available	—	Available	Available
CAN	Available	—	Available	Available
Serial	Available	—	Available	Available
File system	—	FAT file system	Available	Available
Encryption	Available	Encryption library	Available	Available

Security Using Hardware Encryption Functions

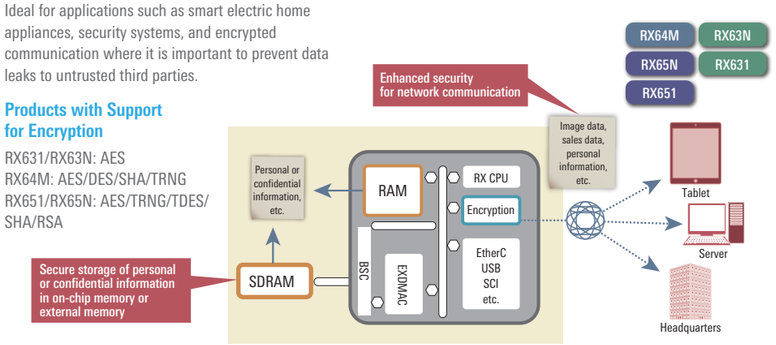
Some product versions in the RX600 Series have an on-chip hardware module that implements encryption and decryption standards such as AES and DES without imposing any additional load on the CPU. This is ideal for equipment that processes personal information or requires enhanced security.

Applications

Ideal for applications such as smart electric home appliances, security systems, and encrypted communication where it is important to prevent data leaks to untrusted third parties.

Products with Support for Encryption

RX631/RX63N: AES
RX64M: AES/DES/SHA/TRNG
RX651/RX65N: AES/TRNG/TDES/SHA/RSA



RX200 Series

RX200 Series Features

High-performance 32-bit RX CPU Up to 4.33 CoreMark/MHz
DSP and FPU with improved processing capacity

Low power consumption 0.12mA/MHz (operation) 0.8μA (standby)
Superior power efficiency through intermittent operation

Numerous peripheral functions Communication, touch, motors, analog, 5V interface
Simplified support for system control, motor control, and IoT

Safety functions Security
Simplified support for safety standards Protection against threats such as viruses

Main Applications of RX200 Series

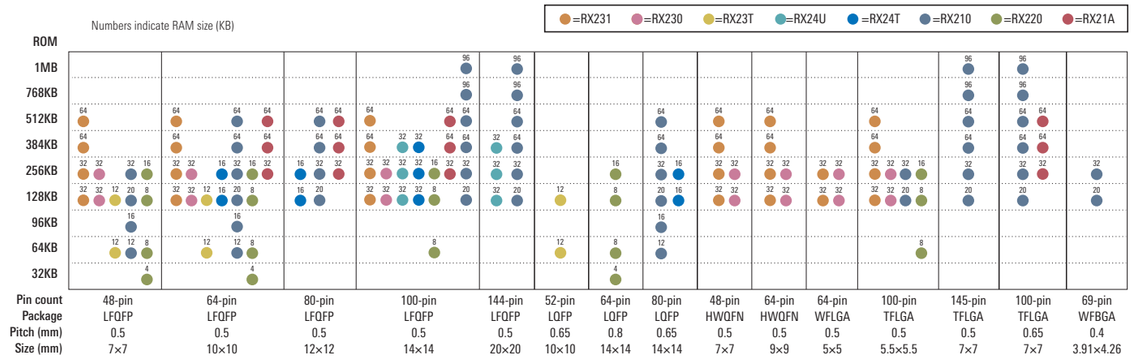
Consumer devices (battery drive)	Healthcare devices	Industrial	Electric home appliances
Digital cameras Gadgets	Wearable devices Blood sugar gauges	Power meters Pressure, temperature, and flow volume meters Inverters	Air conditioners Refrigerators Washing machines

RX24U	max 80MHz 256KB to 512KB 2.7V to 5.5V	RXv2 core*1	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX24T	max 80MHz 128KB to 512KB 2.7V to 5.5V	RXv2 core*1	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX23T	max 40MHz 64KB to 128KB 2.7V to 5.5V	RXv2 core*1	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX231	max 54MHz 128KB to 512KB 1.8V to 5.5V	RXv2 core*1	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX230	max 54MHz 128KB to 256KB 1.8V to 5.5V	RXv2 core*1	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX210	max 50MHz 64KB to 1MB 1.62V to 5.5V	RXv1 core	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX220	max 32MHz 32KB to 256KB 1.62V to 5.5V	RXv1 core	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	
RX21A	max 50MHz 256KB to 512KB 1.8V to 3.6V	RXv1 core	FPU	Safety functions	Touch	External bus	CAN
		USB Host/Func	SDHI	Motor control	Encryption	ΔΣA/D	

Note: 1. The RXv2 CPU core has advanced performance features such as a DSP.

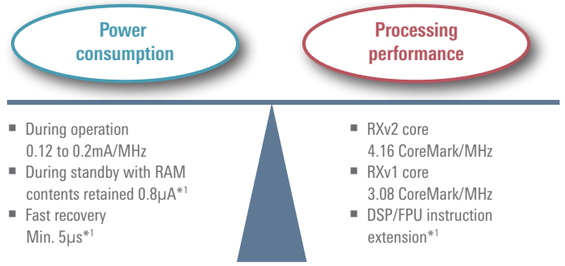
Connectivity · Power efficient/battery drive · Touch functions · ASSPs for motor control · Hardware support for safety functions · Security functions

RX200 Series Lineup



Excellent Balance of Low Power Consumption and High Performance

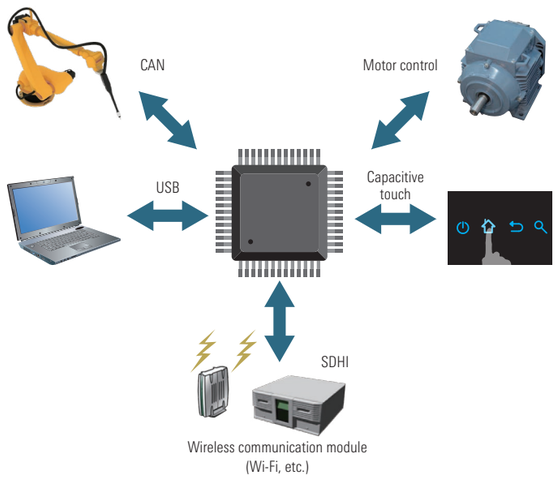
Excellent Balance of Low Power Consumption (0.12 to 0.2 mA/MHz) and High Performance (3.08 to 4.33 CoreMark/MHz)



Note: 1. Example of RX231, details of other products differ.

Numerous Peripheral Functions

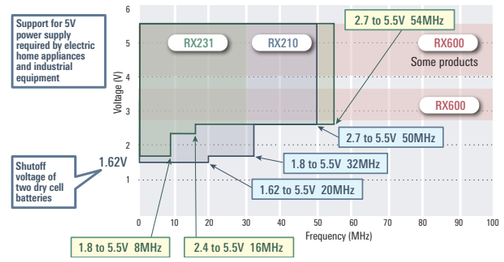
Equipped with functions suitable for capacitive touch, communication, and motor control applications. In addition to support for control and manipulation, implementation of IoT capabilities is simplified.



Wide Voltage Range

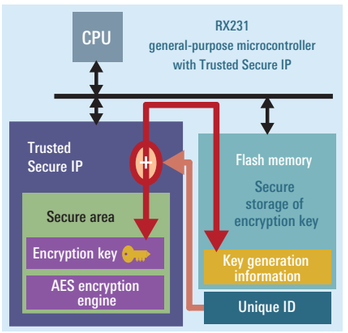
The RX200 can operate at the high speed of 20MHz even when the power supply voltage is as low as 1.62V, providing a 10% margin in systems designed for 1.8V. It also supports 5V operation in applications such as electric home appliances and industrial equipment.

RX200 Operating Voltage and Frequency



Robust Security

The RX231 is a general-purpose microcontroller that is equipped with a Trusted Secure IP module offering robust security. This module protects the encryption engine and encryption key from unauthorized access. The encryption key, which is the most important element in the encryption process, is linked to a unique ID and stored in a safe and undecipherable format in the flash memory.



Functions of AES encryption engine
- Key length: 128 bits/256 bits
- Encryption modes used: Encryption/decryption: ECB, CBC, GCM Tampering detection: CMAC

RX100 Series

RX100 Series Features

High-performance 32-bit RX CPU 3.08 CoreMark/MHz
High performance CPU for low power consumption through intermittent operation

Ultralow power consumption 0.1mA/MHz (operation) 0.35µA (standby)
Contributes to energy efficiency and longer battery life.

Numerous peripheral functions LCD, capacitive touch, 5V interface
Simplifies support for healthcare, industrial sensors, and home appliances.

Excellent cost/performance ratio
On-chip peripheral functions reduce BOM cost.

Main Applications of RX100 Series

Consumer devices (battery drive)	Healthcare	Electric home appliances	Industrial
Sensor hubs (smartphones, game consoles, PCs, tablets), digital cameras, digital camcorders	Healthcare devices, wearable devices	Cooking appliances, water heaters	Power meters, detectors (smoke detectors, etc.), pressure gauges, thermostats

RX100 Series Specifications

◎Common specifications

Low power
- Operating current: 0.1mA/MHz
- Software standby current: 0.35µA
- Deep sleep mode: 2.3µA

CPU
- 32-bit RXv1 CPU 3.08 CoreMark/MHz

Safety functions
- Data operation circuit (DOC) RAM tester
- Clock frequency accuracy measurement circuit (CAC) frequency error detection
- Oscillation-stop detection
- CRC calculator (CRC)
- Independent watchdog timer (IWDT)

System
- Data transfer controller (DTC)
- Interrupt controller (ICU)
- Power-on reset (POR), voltage detection circuit (LVD)

Clocks
- High-speed on-chip oscillator (HOCO)
- Low-speed on-chip oscillator (LOCO)
- Main clock generator
- Sub-clock generator

High usability
- Event link controller (ELC)*1 (peripheral startup without an interrupt)
- Multifunction pin controller (MPC) (pin assignment selection function)

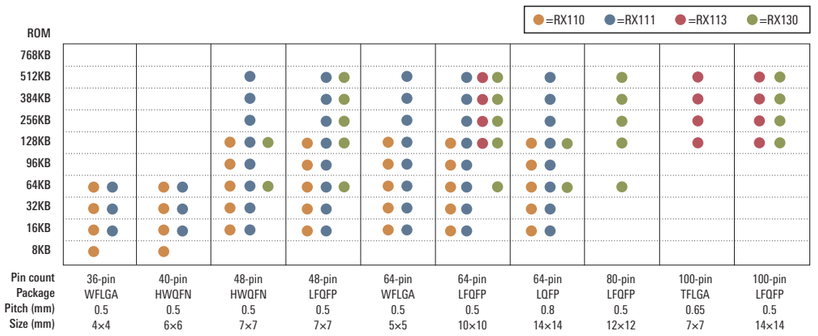
	RX110 Group Entry-level, 32MHz	RX111 Group USB 32MHz	RX113 Group LCD Capacitive touch USB 32MHz	RX130 Group Capacitive touch 32MHz
Operating voltage	1.8 to 3.6V	1.8 to 3.6V	1.8 to 3.6V	1.8 to 5.5V
On-chip memory	8KB to 128KB	16KB to 512KB	128KB to 512KB	64KB to 512KB
		E2 data flash: 8KB	E2 data flash: 8KB	E2 data flash: 8KB
Pin count	36-pin to 64-pin	36-pin to 64-pin	64-pin to 100-pin	48-pin to 100-pin
Communication	SCI × 3 channels	SCI × 3 channels	SCI × 8 channels	SCI × 7 channels
	RIIC × 1 channel	RIIC × 1 channel	RIIC × 1 channel	RIIC × 1 channel
	RSPI × 1 channel	RSPI × 1 channel	RSPI × 1 channel	RSPI × 1 channel
		USB2.0 (H/F/OTG)	USB2.0 (H/F/OTG)	Remote control signal reception function
			SSI × 1 channel	
Timers	MTU2 × 4 channels	MTU2 (16-bit 3-phase motor) × 6 channels	MTU2 (16-bit 3-phase motor) × 6 channels	MTU2 (16-bit 3-phase motor) × 6 channels
	CMT (16-bit) × 2 channels	CMT (16-bit) × 2 channels	CMT (16-bit) × 4 channels	CMP (16-bit) × 2 channels
			TMR (8-bit) × 4 channels	TMR (8-bit) × 4 channels
			LPT (16-bit) × 1 channel	LPT (16-bit) × 1 channel
Analog	12-bit A/D, 1.0µs	12-bit A/D, 1.0µs	12-bit A/D, 1.0µs	12-bit A/D, 1.0µs
	Temperature sensor	Temperature sensor	Temperature sensor	Temperature sensor
		8-bit D/A	12-bit D/A	8-bit D/A
			Comparator	Comparator
User interface			LCD: 40 seg. × 4 com.	
			Capacitive touch × 12 channels	Capacitive touch × 36 channels

Note: 1. Not available on RX110

Specifications differ according to product number.

RX100 Series Lineup

The microcontrollers in the RX100 Series range from products with only 36 pins and 8KB of memory to products with 100 pins and 512KB of memory. They are available in compact LGA and QFN packages that are suitable for applications such as healthcare devices, wearable devices, and communication equipment.



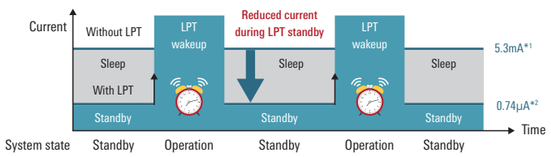
Power Consumption Among the Lowest in the Industry

Ultralow current consumption during standby and during operation

Standby current: 0.35µA
Normal operation current: 0.1mA/MHz
Recovery time: 4.8µs

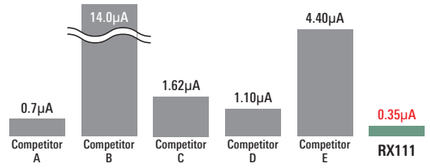
Low-Power Timer (LPT) for Reduced Standby Current During Intermittent Operation

- LPT generates wakeup events to recover from standby mode.
- Current can be transitioned to standby state in standby periods during intermittent operation.



Notes: 1. Current value during all-peripheral operation at 32MHz on the RX130.
2. Current value including LPT operating current (0.37µA) on the RX130.

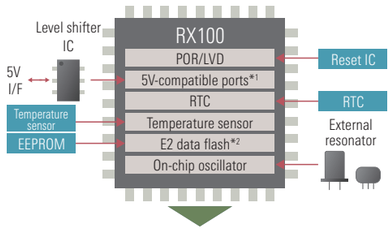
Current Consumption Comparison (RAM Contents Retained, Standby)



Superior Cost/Performance Ratio

- Performance reduced to cut power consumption and lower costs.
- Lineup includes low-cost products with low pin count and small ROM capacity.
- Integration of peripheral functions reduces BOM cost.

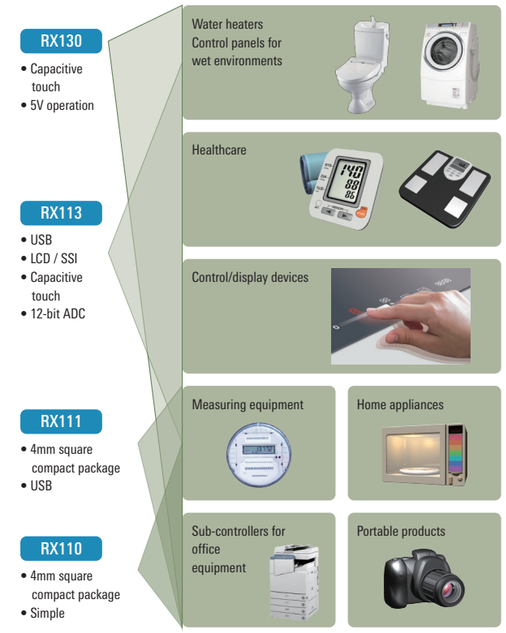
Integration of Peripheral Functions for Reduced Cost



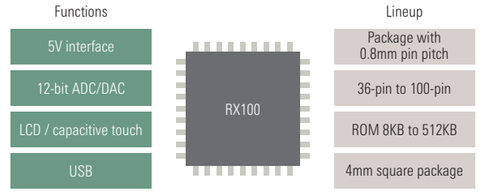
Notes: 1. The 5V-tolerant ports of the RX110, RX111, and RX113 are compatible. The RX130 has a maximum power supply voltage of 5.5V, so all its ports are compatible.
2. The RX110 has no E2 data flash.
3. Comparison with Renesas system product.

Essential Peripheral Functions for Measuring Equipment and Household Appliances

- Integrates peripheral functions suitable for measuring equipment and household appliances, such as capacitive touch/LCD, communication, and 12-bit ADC.
- Support for applications ranging from system control in household appliances or industrial equipment to user interfaces for wet environments.



Functions and Lineup Selected for Enhanced Flexibility

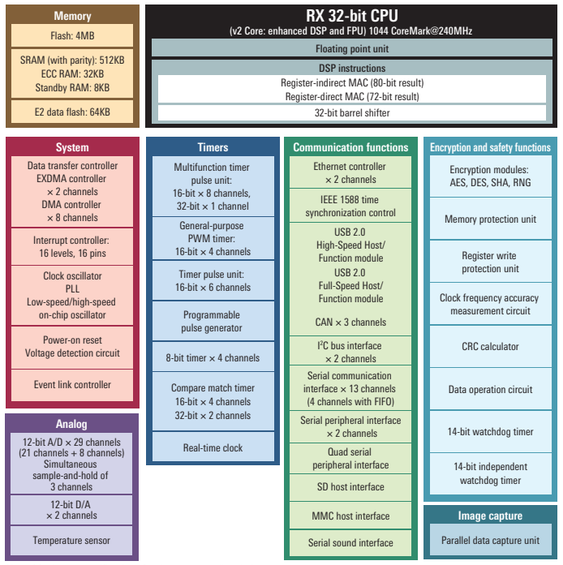


RX71M Group

240MHz Operation, Fastest in the RX Family, and 4MB On-Chip Flash Memory: The RX Flagship Product

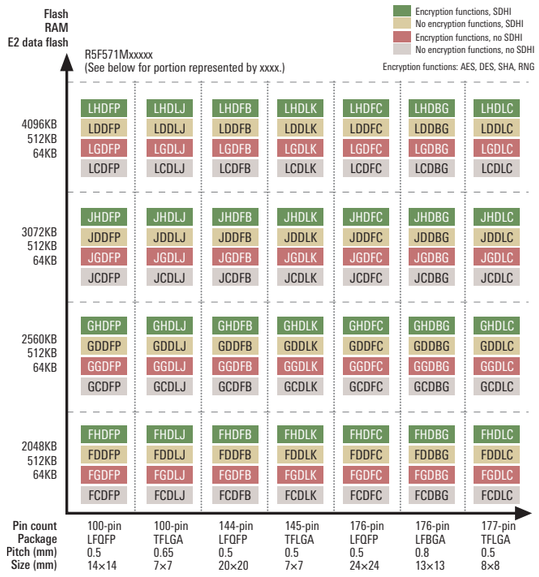
The RX71M Group's maximum operating frequency of 240MHz is twice that of the RX600 Series, making possible solid real-time performance suitable for industrial applications. A cache (AFU) optimized for flash memory enables access speeds equivalent to 240MHz, so the full potential of the CPU can be extracted. Up to 4MB of flash memory and 552KB of SRAM are available to accommodate the rapidly expanding code and work area requirements of IoT network control applications, and the like. AES, DES, SHA, and RNG functions are provided to protect data on the network, and the Trusted Memory function protects code located in a special area of the on-chip flash memory from unauthorized access. This makes it easier to build a secure system. Peripheral functions include Ethernet MAC with IEEE 1588 support, intelligent multifunction timers (MTU3 and GPT) suitable for motor control, and SD host interface enabling high-speed communication for SD card applications. In addition, for the first time in the RX Family USB High-Speed (Host/Function/OTG) support is provided. Package pin counts range from 100 to 177 pins, providing support for a broad range of applications not limited to the industrial field.

RX71M Group Block Diagram



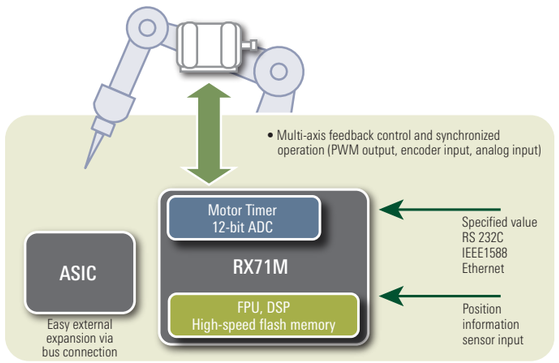
Note: Maximum specifications for the group are listed above.

RX71M Group Memory/Package Options



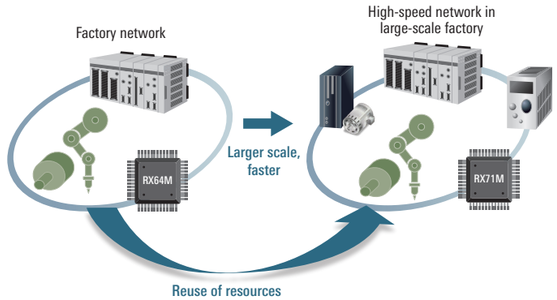
Industrial Robot: Application Example

- CPU performance for realizing multi-axis control
- High-speed flash memory for real-time performance
- Many timers and analog functions to control a variety of motors



Example Applications Supporting IoT and Industry 4.0

The RX71M Group is built around the RXv2 and when operating at 240MHz delivers twice the processing performance of the RX600 Series. Its on-chip peripheral functions are more powerful than those of the RX600 Series and include USB High Speed support as a new feature. A high level of compatibility is maintained with the RX64M in particular, so hardware and software resources developed for the RX64M can be reused. This makes it easy to quickly develop new product versions matched to specific performance ranges.



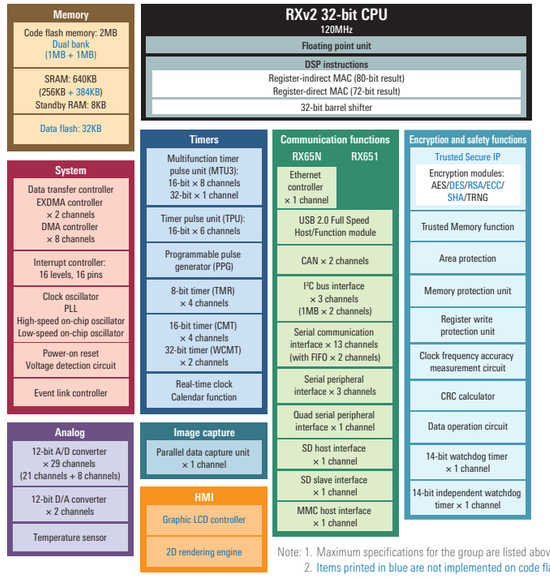
Making an existing factory network larger in scale and faster

RX65N Group and RX651 Group

Next-Generation Mainstream RX Microcontrollers with RXv2 Core, Large-Capacity RAM, and Enhanced Connectivity

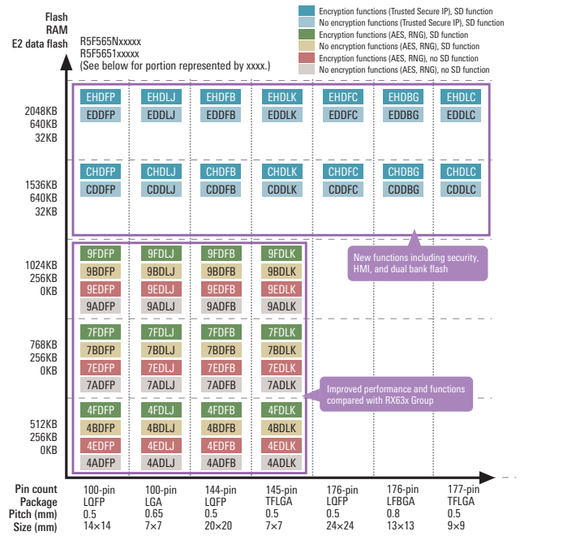
- A next-generation MCU that implements Roots of Trust (RoT) to strengthen the security of IoT edge devices
  New "Trusted Secure IP" and "Area Protection" functionality support encryption of communication data based on AES, etc., and protection of encryption keys. User programs stored in the on-chip memory are protected against tampering by third parties. This constitutes Roots of Trust (RoT) implementation to protect IoT edge devices.
- Single-chip solution combining graphic LCD controller, large-capacity SRAM, and HMI functionality ideal for IoT endpoints
  Functionality necessary for affordably priced color TFT LCD image display on a single chip. Separate internal buses for the SRAM for graphic data and regular SRAM boost efficiency of CPU access and display data transfers. 2D imaging engine for TFT LCD graphics is not limited to simple geometric shapes such as lines, triangles, and circles but supports geometry for all sorts of objects.
- Flash memory functionality to assure safe and secure firmware updates
  Area protection prevents unintended overwriting of data. Trusted Secure IP detects attempts to modify programs. Dual bank functionality allows one program to run while another in the other bank is being updated. Cumbersome address management is unnecessary.

RX65N/RX651 Group Product Block Diagram



Note: 1. Maximum specifications for the group are listed above.
2. Items printed in blue are not implemented on code flash memory is less than 1.0MB products.

RX65N/RX651 Group Memory/Package Options



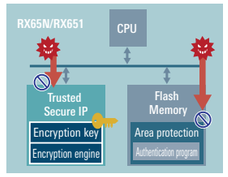
Hardware Implementation of Root of Trust Technologies Essential to Security

1. Trusted Secure IP to prevent leaking of "encryption keys"
2. "Area protection" to prevent modification of "authentication program"

Dedicated IP providing robust protection of "encryption keys"

Fast processing by encryption engine incorporated in IP

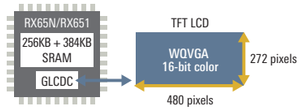
Encryption engine:
AES, DES, RSA, TRNG



Area protection protects the authentication program itself against modification.

Graphic LCD Controller (GLCDC) Support for TFT LCD Add-on, Enabling Max. WQVGA (480 × 272), 16-Bit Display Resolutions

Support for single-chip configuration using large-capacity SRAM as a display buffer. On-chip 2D rendering engine enables sophisticated GUI rendering with low CPU load.



Tools providing powerful support for GUI development

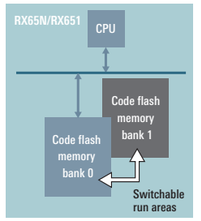
- GUI editing tools: Available from Renesas partner vendors
  A wealth of API functions that make GUI editing a breeze
- LCD adjustment tool: QE for Display
  Adjust timing and other settings while viewing the results on the LCD screen.

Dual Bank Functionality

The dual bank functionality supports switching of the startup bank.

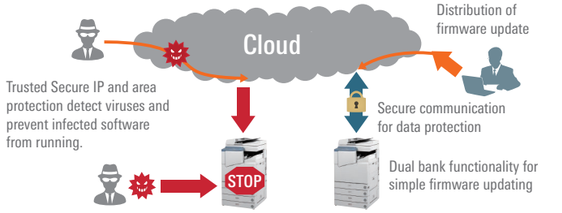
One program can run while another in the other bank is being updated. The two banks can be switched following the update.

Also, program overwrite and run addresses are fixed. Cumbersome address management is unnecessary.



Usage Example

- A single-chip solution that ensures safe and secure firmware updates through a combination of Trusted Secure IP, area protection, and dual bank functionality



Example applications

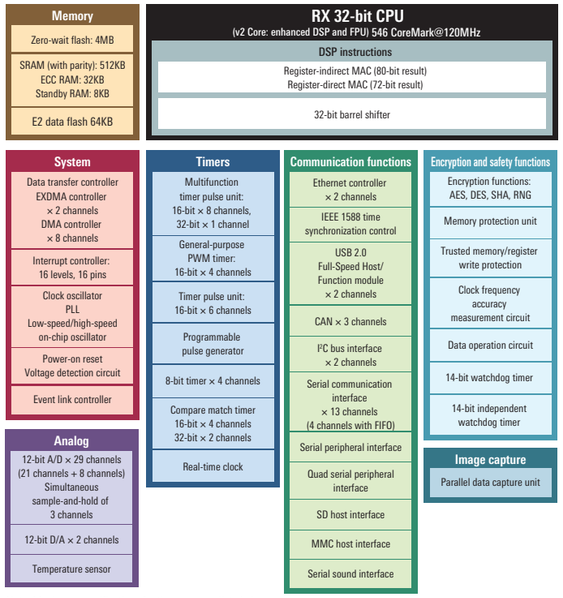
Industrial system controllers | Smart meter communication units | HVAC controllers
Printer system controllers | Industrial inverter controllers | etc.

RX64M Group

RXv2 Core for High Performance (120MHz Operation) and Low Power Consumption, Large-Capacity Flash Memory Up to 4MB

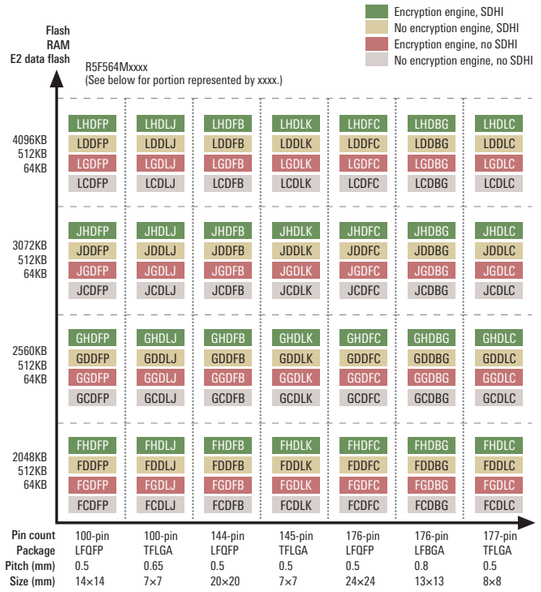
The RX64M Group occupies the highest position in the RX600 Series. Like the RX651 and RX65N Groups it is built around the RXv2 core running at 120MHz, but it offers beefed up real-time performance for industrial applications. It has up to 4MB of ROM supporting no-wait access at 120MHz, alongside 552KB of RAM for use as a work area. Like the RX71M Group it supports a wide variety of interfaces. Ethernet, USB 2.0 Full Speed, and SDHI are implemented on-chip as network interfaces with other devices, and QSPI and SDRAM interfaces are provided for external I/O. These peripheral functions and the large-capacity on-chip memory provide on a single chip the means to boost product functions, store middleware or drivers, or network with other devices. In addition, the on-chip hardware encryption engine with support for AES, DES, and SHA, and the 12-bit A/D and D/A converters, provide additional flexibility. Package pin counts range from 100 to 177 pins, providing support for a wide range of applications not limited to the industrial field or network devices.

RX64M Group Block Diagram

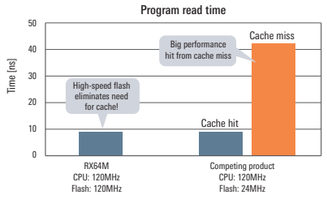


Note: Maximum specifications for the group are listed above.

RX64M Group Memory/Package Options



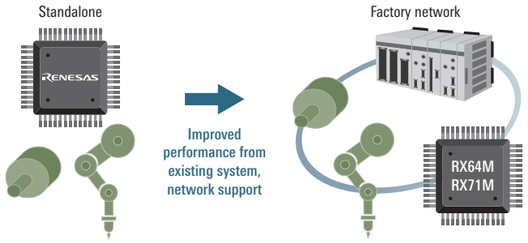
Zero-Wait Flash Memory for Excellent Real-Time Performance



The high-speed flash with 120MHz access eliminates the need for cache memory, assuring high CPU performance at all times.

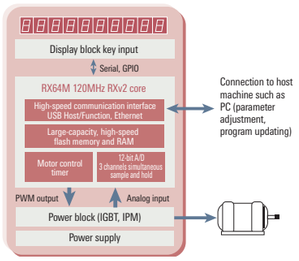
Example Applications Supporting IoT and Industry 4.0

- With the advance of Industry 4.0 and the Internet of Things (IoT), industrial devices that once operated independently now require network connectivity.
- Network connectivity means more storage capacity is needed for middleware and drivers, and CPU loads increase.
- Numerous peripheral functions, up to 4MB of ROM, and a high-speed CPU make it possible to easily boost the performance of existing systems and add network connectivity within the factory and in other locations.



General-Purpose Inverter: Application Example

High-speed RXv2 core and 120MHz zero-wait flash memory for agile real-time control



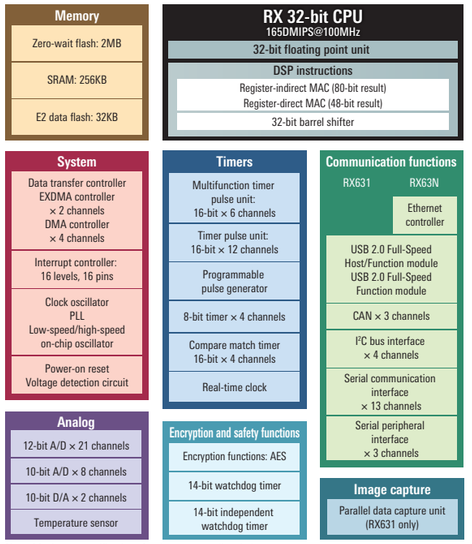
RX631 Group and RX63N Group

Extending the RX621/RX62N Lineup to Provide Enhanced Security, Image Capture, Etc.

The RX631 and RX63N Groups are available in an extensive range of package options to match the scale of each customer's system. Standard functions such as 12-bit A/D converter, timers for motor applications, SCI, RSPI, I²C, CAN, and safety functions are joined by improved connectivity functions such as Ethernet and USB with Host capability. Additional specialized features are available, including CMOS camera support for sensing and image display and security (hardware AES encryption). Product versions with support for high-temperature operation (105°C) are also available.

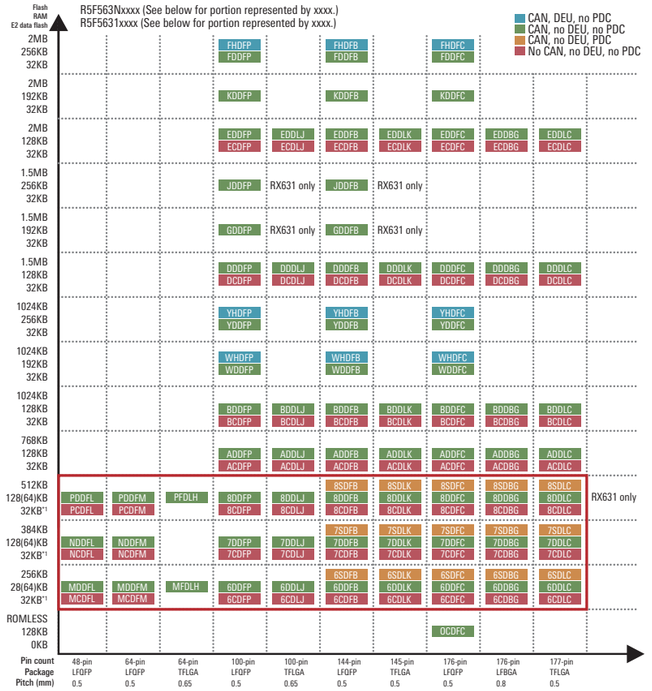
Applications: Copiers, audio components, large-scale systems, machine tools, security systems, POS terminals, HEMS, gateway devices, human sensors, monitor cameras, building interior sensors, etc.

RX631/RX63N Group Block Diagram



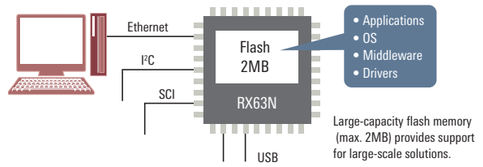
Note: Maximum specifications for the group are listed above.

RX631/RX63N Group (Products Supporting Operation at 85°C) Memory/Package Options

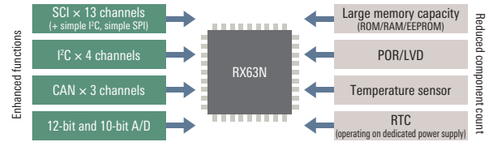


Notes: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.
1. The RAM size of the R5F5631Pxxxx, R5F5631Nxxxx, and R5F5631Mxxxx is 64KB.

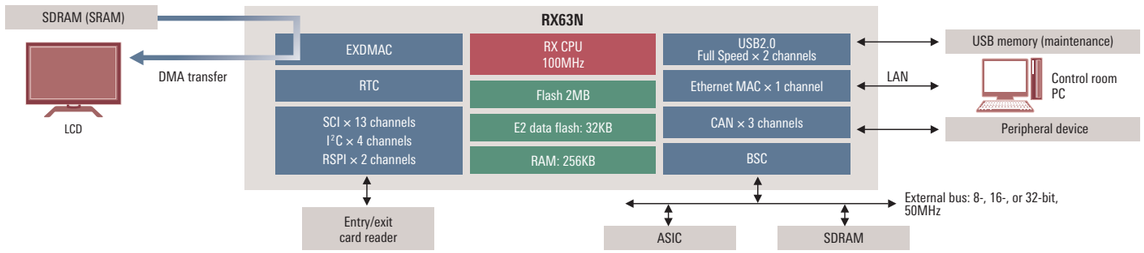
Support for Large-Scale Solutions



Enhanced Functions and Reduced Component Count



Application Example: Entry/Exit Control System

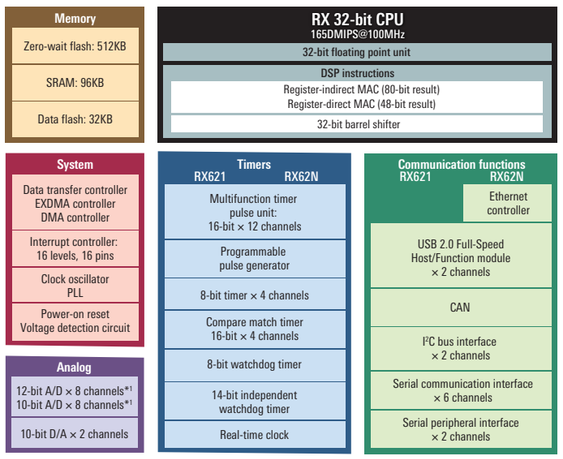


RX621 Group and RX62N Group

100MHz High-Speed Operation and Connectivity Functions Such as Ethernet and USB Host

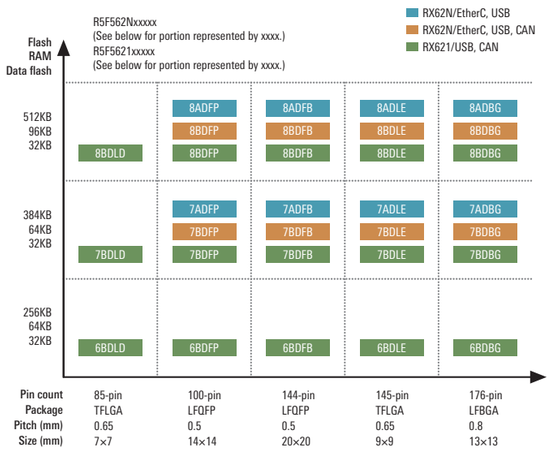
The RX621 and RX62N Groups combine 100MHz high-speed operation with enhanced communication functions. Ethernet and CAN are joined by two USB 2.0 Host/Function controller circuits. Also integrated into the single chip are peripheral functions including multifunction timers (MTU2: 2 units), 10-bit or 12-bit A/D converter, and DMA controller. Up to 512KB of flash memory and 96KB of RAM are available, in addition to 32KB of flash memory for data storage. Package pin counts range from 85 to 176 pins.
Applications: Inverters, AC servos, robots, NC machine tools, sequencers, measuring devices, POS peripheral devices, printers, etc.

RX621/RX62N Group Block Diagram

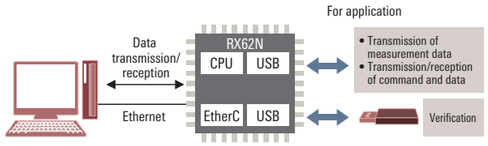


Note: 1. 10-bit A/D converter and 12-bit A/D converter cannot be used simultaneously.

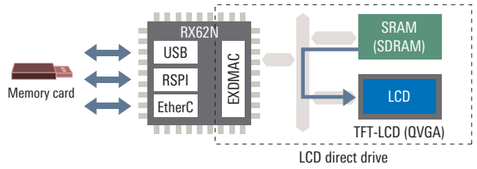
RX621/RX62N Group Memory/Package Options



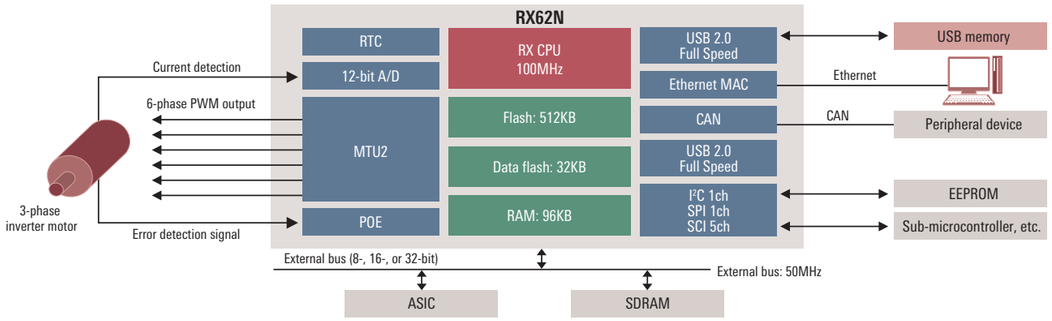
Integrated Communication Functions for Single-Chip Control



LCD Direct Drive Using EXDMAC



Application Example: Single-Chip Implementation of Motor Inverter Control and Ethernet, CAN, and USB Connectivity

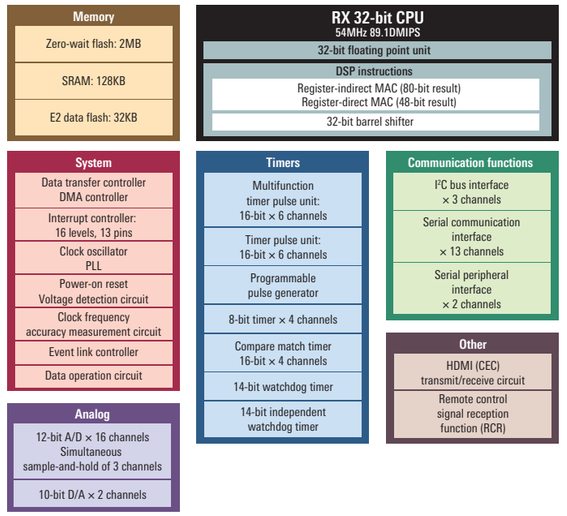


RX634 Group

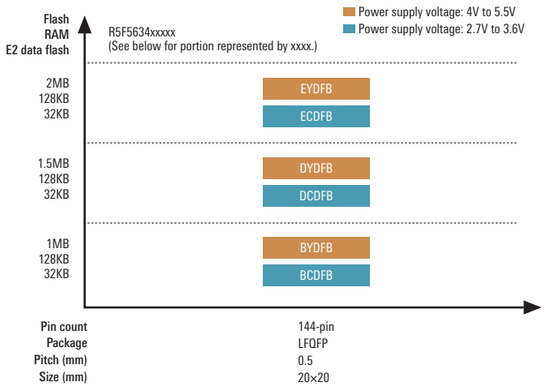
Max. Operating Frequency of 54MHz, Equipped with HDMI-CEC and Remote Control Reception Functions for Linking with Electric Home Appliances

The RX634 Group supports operation at both 3.3V and 5V, and the maximum operating frequency is 54MHz. The RX634 Group dispenses with some functions of the RX630 Group, such as CAN, USB, and RTC, and instead provides HDMI-CEC, which is essential for digital electric home appliances, and remote control reception. The RX634's on-chip HDMI-CEC module can operate more quickly than a software HDMI-CEC implementation, making this microcontroller ideal for multimedia devices.

RX634 Group Block Diagram



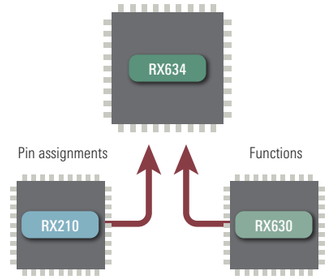
RX634 Group Memory/Package Options



Note: Maximum specifications for the group are listed above.

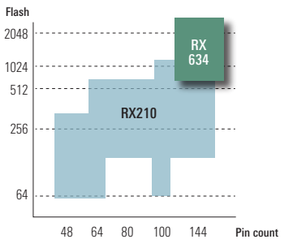
Excellent Extensibility from Other RX Family Products

Combines the pin assignments of the RX210 with the peripheral functions of the RX630 to provide an easy upgrade path.

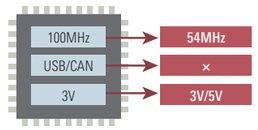


Product Lineup with Large-Capacity Flash Memory (2MB) for System Migration/Succession, 3V/5V Compatibility

Covers the top memory capacities of RX210 products

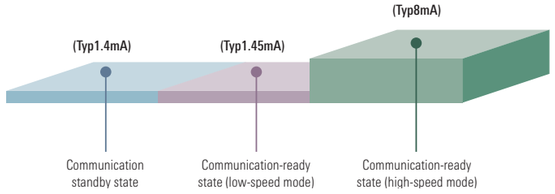


Slimmed-down upset of RX630 features 3V/5V support



Hardware HDMI-CEC and Remote Control Reception Function

- 1.4mA in communication standby state
- Ability to select low-speed mode when in communication-ready state
  ⇒ Power consumption of only 1.45mA Reduced standby power consumption



RX634 Applications

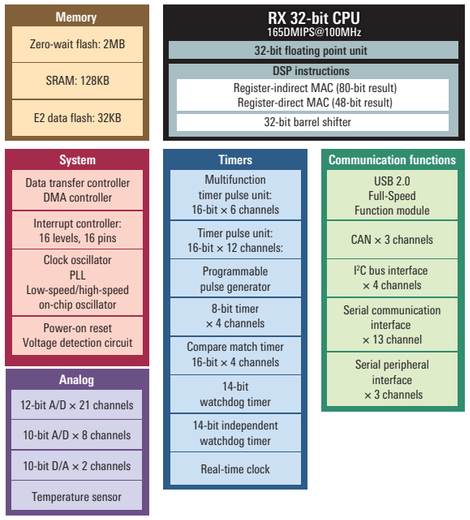
Digital multimedia devices | Industrial equipment | Electric home appliances (white goods)

RX630 Group

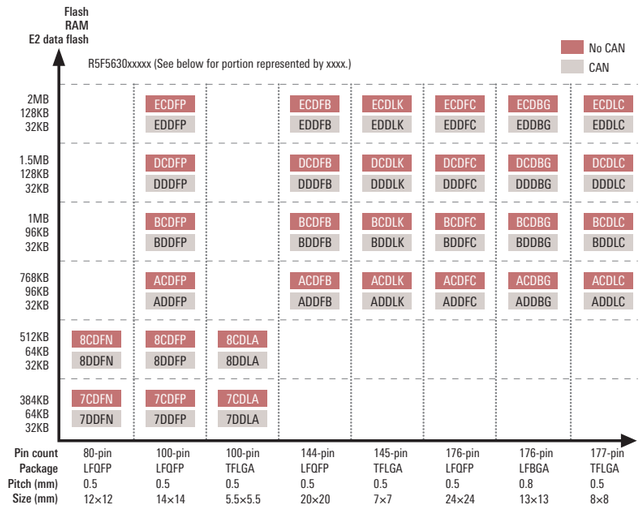
Extending the Memory and Package Options of the RX610 Group and Adding Enhanced Peripheral Functions such as USB and 12-Bit A/D

The RX630 Group is available in small to large flash memory capacities and packages with low to high pin counts to meet the requirements of a broad range of embedded devices. All product versions have E2 data flash supporting 100,000 erase/programming cycles. The many peripheral functions include timers, USB 2.0 Function module, serial communication interface, I²C bus interface, CAN, 10-bit and 12-bit A/D converters, and 10-bit D/A converter. These are enhanced with increased channel counts and improved functionality. Other functions such as RTC with time stamping, temperature sensor, independent WDT, and POR/LVD help reduce the need for external components. Product versions with support for high-temperature operation (105°C) are also available.
Applications: Copiers, printers, audio components, large-scale systems, vending machines, machine tools, etc.

RX630 Group Block Diagram

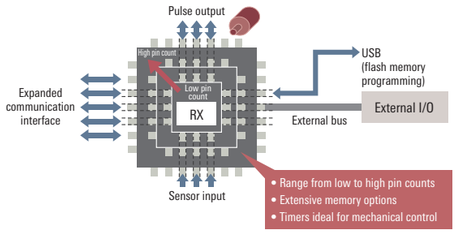


RX630 Group (Products Supporting Operation at 85°C) Memory/Package Options

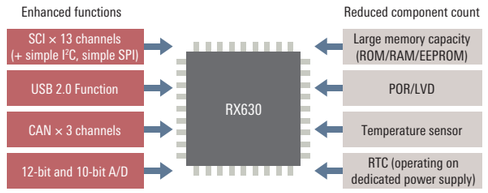


Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

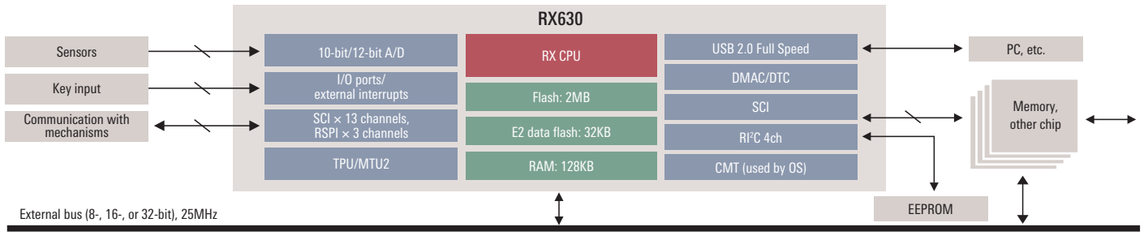
Extensive Lineup and Many Peripheral Functions



Enhanced Functions and Reduced Component Count



Block Diagram of Audio System Using RX630: Application Example

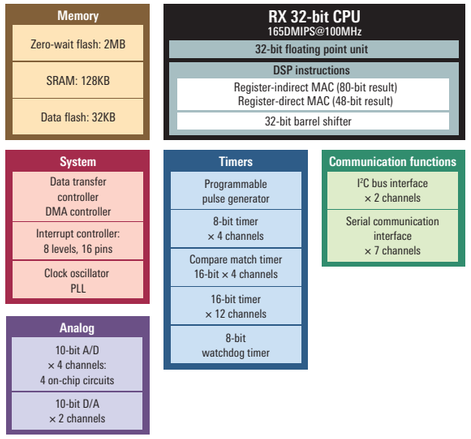


RX610 Group

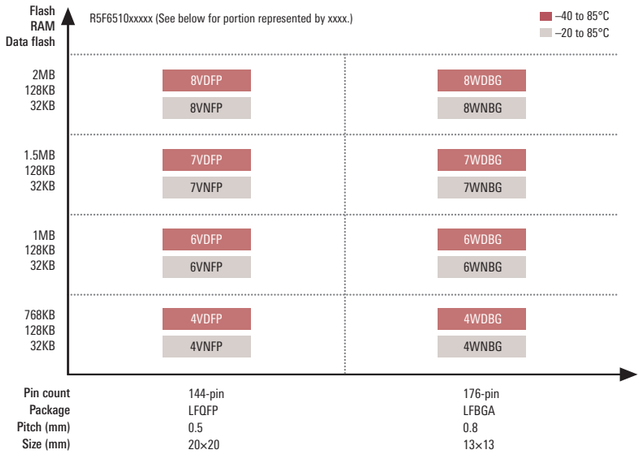
High Operating Speed (100MHz), Large Memory Capacity, High-Speed A/D On-Chip: The First General-Purpose RX Product

The RX610 Group combines 100MHz high-speed operation and large on-chip memory capacity. Basic functions such as timers and communication functions are joined by four independent A/D converter units supporting conversion speeds up to 0.8µs. The maximum memory capacity is 2MB of flash and 128KB of RAM. In addition, there is 32KB of flash memory for data storage. The ability to configure a system without the need for peripheral memory or other external devices helps reduce costs overall.
Applications: Copiers, laser printers, industrial equipment

RX610 Group Block Diagram

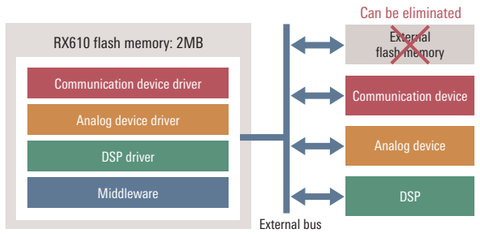


RX610 Group Memory/Package Options

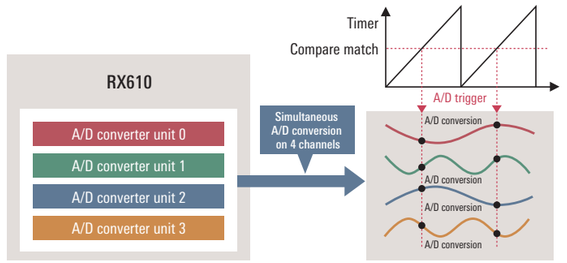


Large-Capacity Flash Memory: 2MB

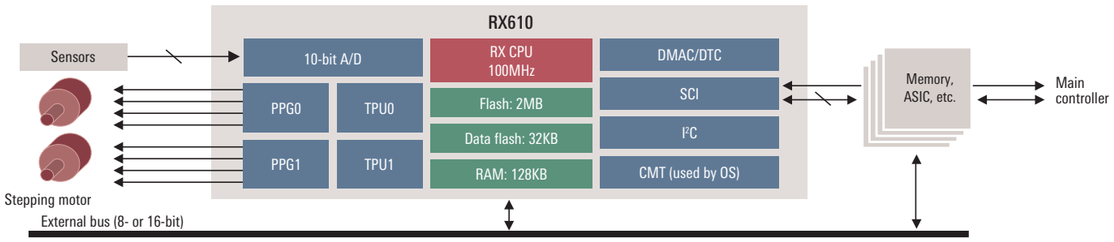
The on-chip flash memory can store drivers and middleware, eliminating the need for external flash memory.



High-Speed A/D Converter Capable of Simultaneous Conversion on 4 Channels



Application Example: Block Diagram of Laser Printer/Copier Mechanism Control Block



RX63T Group

Peripheral Functions Ideal for Motor Control or Digital Power Control, and Enhanced Safety Functions

The RX63T Group offers more package pin count and memory options, and better safety functions, than the RX62T Group. In addition, it provides a PWM delayed generation function (max. resolution: 312.5 ps), digital power supply controller (DPC), and many safety functions on-chip. In addition to motor control or inverter control, it is ideal for digital power supply and solar power supply applications.
The maximum on-chip memory capacity is 512KB of flash memory and 48KB of RAM, supplemented by up to 32KB of E2 data flash. Package pin counts range from 48 to 144 pins, and product versions supporting high-temperature operation (105°C) are available.
Applications: Office equipment/consumer devices: electric home appliances (white goods); industrial equipment: general-purpose inverters, AC servos, machine tools, sequencers, digital power supplies, solar power supplies

RX63T Group Block Diagram

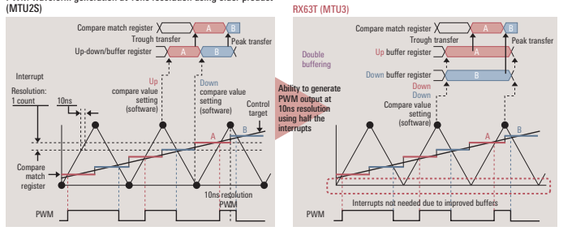
Notes: Maximum specifications for the group are listed above.
1. Available only on product versions with pin counts 100 or more.

RX63T Group (Products Supporting Operation at 85°C) Memory/Package Options

Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

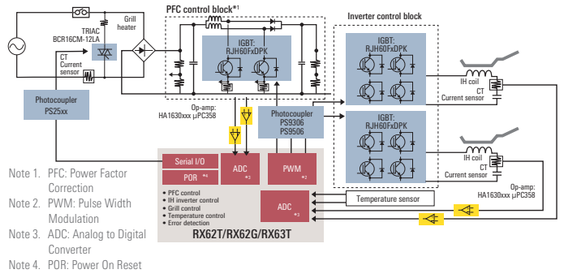
MTU3: Complementary PWM Mode with Low Software Load

Buffer register enhancements make it easy to generate PWM output at 10ns resolution using triangle waves.



Application Example: Single-Chip Control of IH Cooking Heater (2 Burners)

Block diagram of IH 2-burner cooking heater system



Note 1. PFC: Power Factor Correction
Note 2. PWM: Pulse Width Modulation
Note 3. ADC: Analog to Digital Converter
Note 4. POR: Power On Reset

Improved Safety Functions

RX-T63 Group microcontrollers incorporate hardware that supports the IEC 60730 safety standard for electric home appliances (white goods).

IEC 60730 item	Hardware support
Clock monitoring	Implementation in hardware of oscillation stop monitoring*1 and frequency error monitoring function*2
Monitoring of interrupt handling	Implementation in hardware of independent watchdog timer*3 (WDT with dedicated OCO) that is unaffected by the system clock
Improved quality of external communication	Implementation in hardware of cyclic redundancy check (CRC) calculator for improved serial communication quality
Monitoring of flash memory contents	Implementation in hardware of CRC calculator for checking of memory contents
I/O port monitoring	Implementation in hardware of function for reading pin state*4 of output ports
A/D converter monitoring	Implementation in hardware of self-test function*5, *6 employing internal reference level

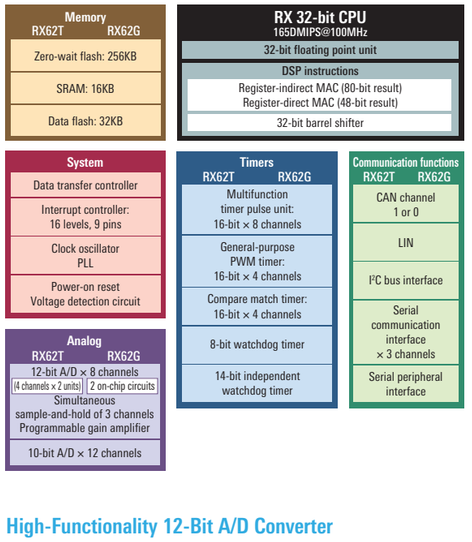
Notes: 1. Clock generation circuit/oscillation-stop detection control register (OSTDCR): Detects when oscillation by the main clock oscillator stops.
2. GPT/LOCO count function: Monitors the main clock period using the watchdog timer's dedicated low-speed on-chip oscillator.
3. Independent watchdog timer (IWDT): Counts using the watchdog timer's dedicated low-speed on-chip oscillator.
4. Port register (PORT): Read register that reflects the pin states.
5. 12-bit A/D/self-diagnostic mode: Self-diagnostics using VREFH0 × 0, × 1/2, and × 1.
6. 10-bit A/D/A/D self-diagnostic register (ADDIAGR): Self-diagnostics using × 0, × 1/2, and × 1.

RX62T Group and RX62G Group

On-Chip Peripheral Functions Ideal for Motor Control or Digital Power Control

The RX62T and RX62G Groups comprise general-purpose microcontrollers operating at up to 100MHz that are ideal for motor control or inverter control. On-chip functions such as multifunction timers (MTU3 and GPT), high-speed 10-bit A/D converter, and 12-bit A/D converter simplify motor control. In addition, the RX62G has a PWM delayed generation function (min. resolution: 312.5ps) that is ideal for digital power supply and solar power supply applications. These microcontrollers also support the IEC 60730 safety standard for electric home appliances. The maximum on-chip memory capacity is 256KB of flash memory and 16KB of RAM, supplemented by up to 32KB of flash memory for data storage. Package pin counts range from 64 to 112 pins, and product versions supporting high-temperature operation (105°C) are available.
Applications: Office equipment/consumer devices: electric home appliances (white goods); industrial equipment: general-purpose inverters, AC servos, machine tools, PLCs, digital power supplies, solar power supplies

RX62T/RX62G Group Block Diagram

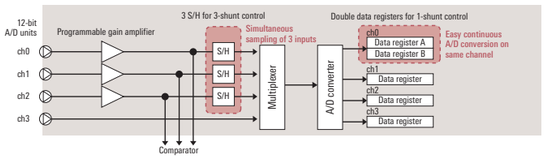


RX62T/RX62G Group (Products Supporting Operation at 85°C) Memory/Package Options

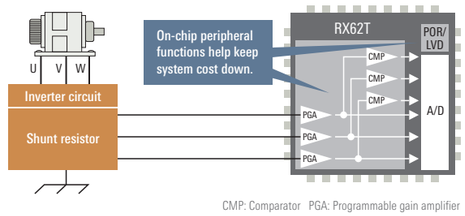
Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

High-Functionality 12-Bit A/D Converter

Two systems for one-shunt control, two systems for three-shunt control, and ability to combine one- and three-shunt control
Simultaneous sample and hold on seven channels using two 12-bit A/D units plus one 10-bit A/D unit

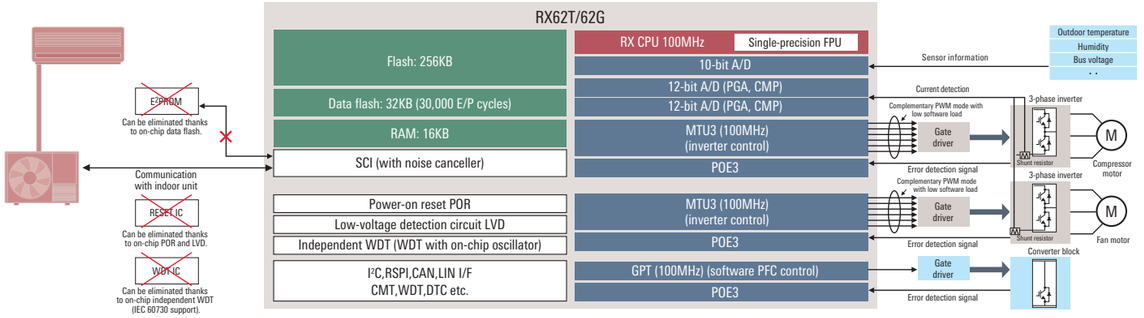


Reduction of Peripheral Components



CMP: Comparator PGA: Programmable gain amplifier

Application Example: Single-Chip Control of Air Conditioner Outdoor Unit



RX24T Group and RX24U Group

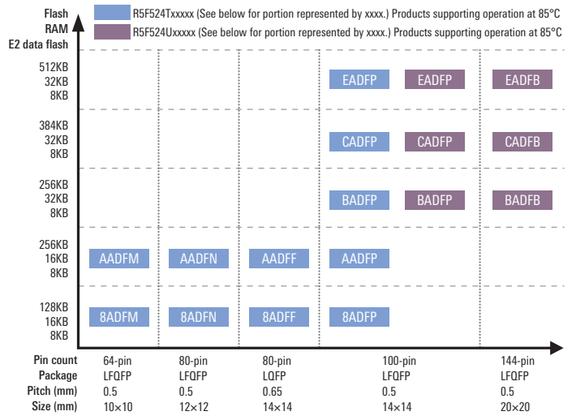
32-bit microcontrollers with 80MHz RXv2 core, three high-precision 12-bit A/D converters, and PGA, enabling simultaneous control of two inverters

The RX24T Group and RX24U Group comprise 32-bit microcontrollers that are capable of controlling two inverters at the same time. The RXv2 CPU core with enhanced DSP and FPU operates at 80MHz, twice the maximum speed of RX23T Group microcontrollers. This enables the high-speed floating-point operations required for inverter control and ensures high-precision processing. The supported power supply voltage range is from 2.7V to 5.5V, and timer and analog functions specifically designed for timer control are provided. Of these, the 12-bit A/D converter can be configured as a single unit that can simultaneously detect three shunt currents and supports simultaneous sample and hold functionality on three channels. When configured as two units, it can be used as a programmable gain amplifier (one unit with three channels and one unit with one channel) for amplifying inverter shunt currents. The RX24U Group has a differential programmable amplifier capable of signal amplification while eliminating the ground noise generated by inverter control systems. The RX24T Group provides a high level of pin and function compatibility with the RX62T Group to allow for easy migration.

RX24T/RX24U Group Block Diagram

Notes: Maximum specifications for the group are listed above.
1. The programmable gain amplifier of the RX24T Group is the single-end type.
2. The serial communication interface of the RX24T Group has three channels.

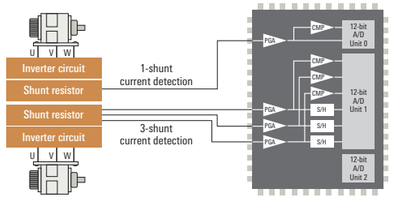
RX24T/RX24U Group Memory/Package Options



Advanced 12-Bit A/D Converter with Simultaneous Sample and Hold on Three Channels

This advanced A/D converter can control two motors at once!

- Sample and hold function allowing simultaneous sampling on three channels
- PGA for current detection using shunt resistors

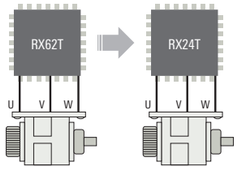


CMP: Comparator
PGA: Programmable gain amplifier
S/H: Sample and hold circuit

Migrating from Earlier Products

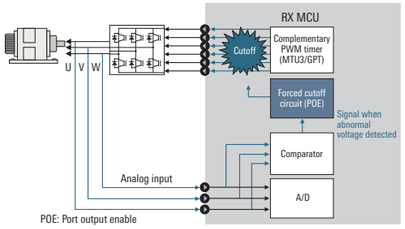
Pin and function compatible with RX62T Group!

High level of compatibility with pin assignments and functions of RX62T Group simplifies migration!

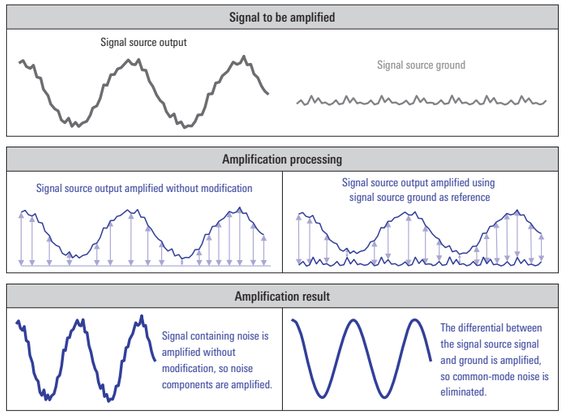


PWM Output Forced Cutoff Circuit (POE)

Immediate sensing of abnormal inverter drive voltages and forced cutoff of complementary PWM output used for inverter drive! Enables a failsafe system without the need for external components!



Programmable Gain Amplifier with Differential Input: Effects of Differential Input



RX24T/RX24U Group Application Examples

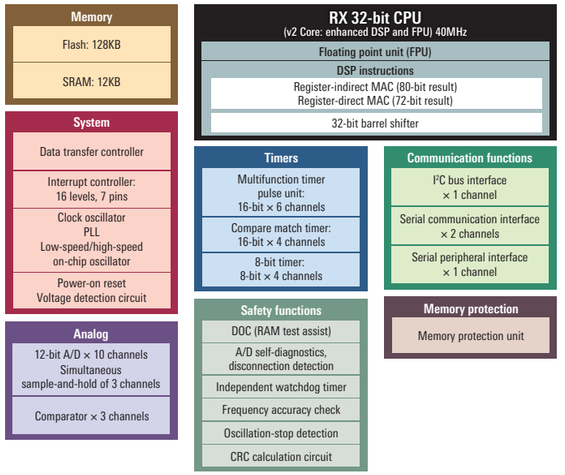
Washing machines | Air conditioners | Dishwashers | IH cooking heaters | Office equipment | Industrial equipment

RX23T Group

Microcontrollers for Inverter Control with FPU, 5V Power Supply, Highly Accurate 12-Bit A/D, and Functions Inherited from RX62T

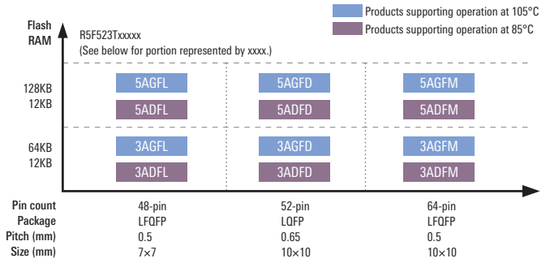
The RX23T Group of 32-bit microcontrollers are based on the RX62T Group and optimized for single-inverter control. The CPU is the RXv2 core, with enhanced DSP and FPU modules, and low-power-consumption technology provides an excellent balance between performance and power efficiency. It delivers fast floating-point arithmetic operations and high-precision processing needed for inverter control. The power supply and peripheral I/O operate at 5V, as required in the inverter control field, providing improved noise tolerance and enabling easy reuse of existing design assets. The RX23T Group maintains a high level of pin and function compatibility with the earlier RX62T Group to allow for easy migration.

RX23T Group Block Diagram



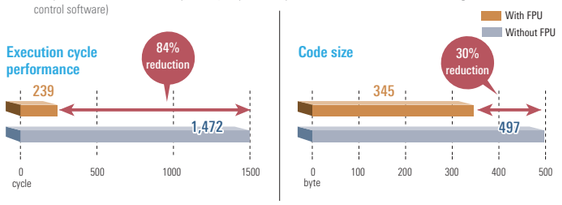
Note: Maximum specifications for the group are listed above.

RX23T Group Memory/Package Options

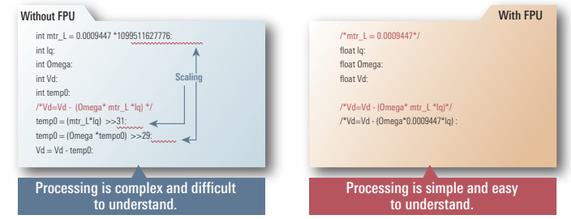


Comparison of Execution Cycle Performance and Code Size With and Without FPU

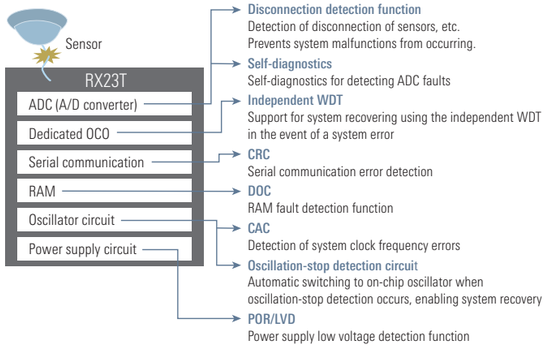
Note: Comparison with earlier Renesas product (comparison of performance with and without FPU using Renesas motor control software)



Scaling Unnecessary with FPU



Functions Supporting the Realization of Safe and Reliable Products



Disconnection detection function
Detection of disconnection of sensors, etc. Prevents system malfunctions from occurring.

Self-diagnostics
Self-diagnostics for detecting ADC faults

Independent WDT
Support for system recovering using the independent WDT in the event of a system error

CRC
Serial communication error detection

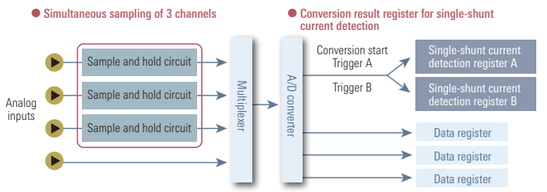
DOC
RAM fault detection function

CAC
Detection of system clock frequency errors

Oscillation-stop detection circuit
Automatic switching to on-chip oscillator when oscillation-stop detection occurs, enabling system recovery

POR/LVD
Power supply low voltage detection function

Functions Suitable for Sensor-less Vector Control 3-channel sample and hold circuit, double trigger mode



RX23T Group Application Examples

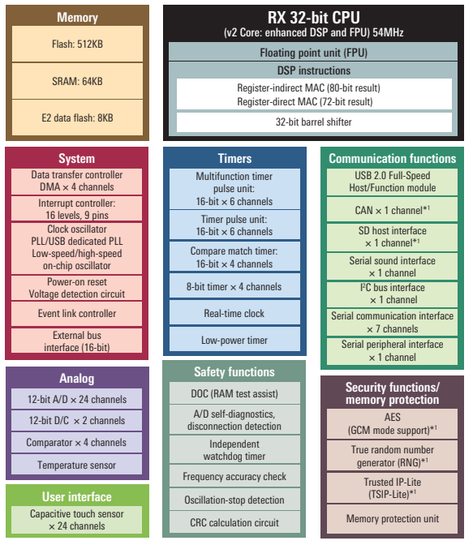
Refrigerators | Washing machines | Air conditioners | IH cooking heaters | Office equipment | Industrial equipment

RX231 Group

32-Bit Microcontrollers with DSP/FPU and Low-Power Operation for Communication, Security, and Touch Applications

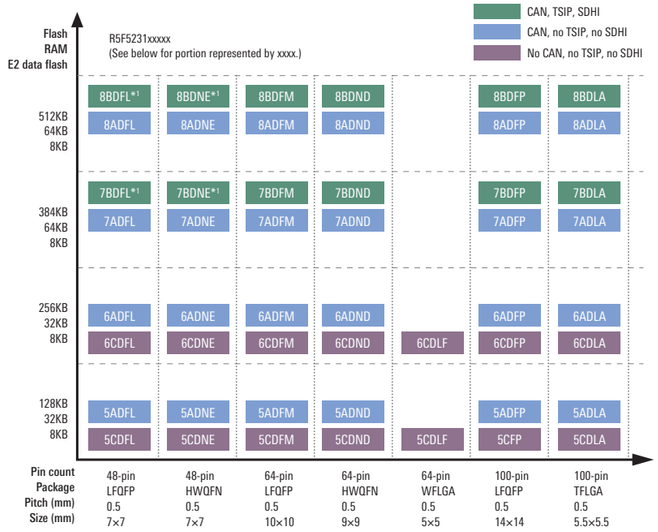
The RX231 Group combines the RXv2 core with enhanced DSP/FPU and technology for low power consumption to provide an optimal balance for high power efficiency. It can handle high-load processing such as digital filtering even in environments with low current supply capacity, making it suitable for applications such as industrial sensors, measuring devices, and healthcare devices. SDHI, CAN, and USB communication and security functions among the best in the industry simplify the task of supporting IoT applications. High noise tolerance and support for high-sensitivity capacitive touch sensors and 5V power supply make it possible to implement a robust user interface and system control using a single chip, making the RX231 suitable as a controller for both industrial equipment and electric home appliances. High compatibility with the earlier RX210 in both pin assignments and peripheral functions eases the migration process.

RX231 Group Block Diagram



Notes: Maximum specifications for the group are listed above.
1. Not available on all product versions.

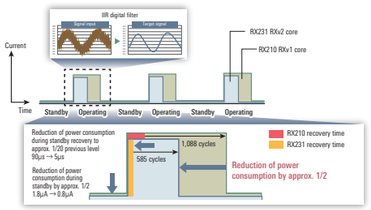
RX231 Group Memory/Package Options



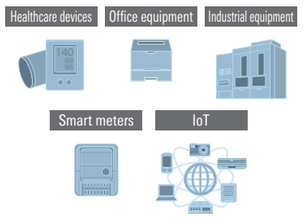
Notes: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.
1. 48-pin products do not support SDHI.

High Power Efficiency

- RXv2 core with enhanced DSP and FPU delivers twice the power efficiency in processing such as digital filtering.
- Standby current with RAM and register contents retained is 0.8µA, among the best in the industry.
- Fast recovery from the standby state in as little as 5µs (when using LOCO at 4MHz).

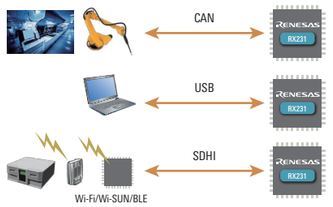


RX231 Group Application Examples



Communication

A variety of communication functions for the age of IoT.



Security

Trusted Secure IP for robust security

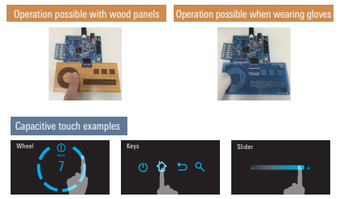
- Prevention of unauthorized access
- AES encryption engine
- Unique chip ID
- Memory protection unit (MPU)
- Flash ID code protection

RX231 communication security kit*1 simplifies implementation of security features.

Note: 1. Refer to the Security Solutions page for details.

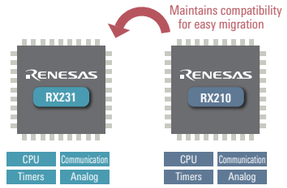
Capacitive Touch

Support for capacitive touch sensors with sensitivity and noise tolerance among the best in the industry



Migration from Earlier Products

Same pin assignments as RX210
Same IP modules as RX210



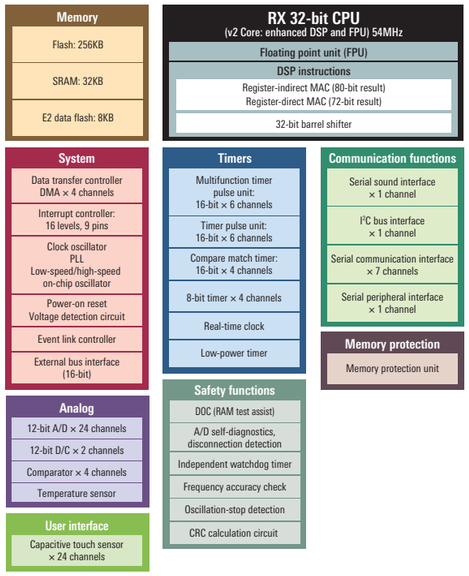
Vbatt and USB pins excluded.

RX230 Group

Highly Robust 32-bit Microcontrollers with 5V Power Supply Support, External Bus, and High-Sensitivity Capacitive Touch Functionality

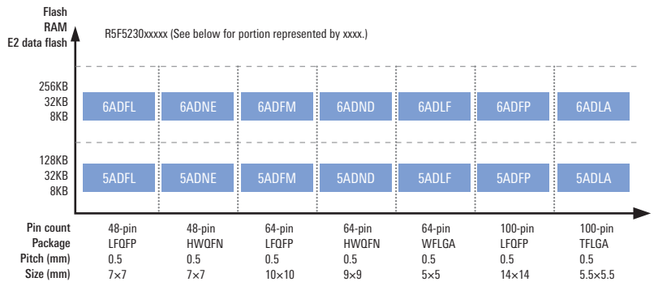
The RX230 Group is ideal for the home appliance and industrial fields, where 5V operation, external bus, and capacitive touch support are essential. The CPU is the RXv2 core, with enhanced DSP and FPU modules, and low-power-consumption technology provides an excellent balance between performance and power efficiency. This makes practical high-load processing such as digital filtering even with industrial sensors or measuring devices with a small current supply capacity. In addition to the safety functions of earlier predicts, the RX230 Group provides enhanced RAM protection for memory protection unit (MPU) support. A high level of pin and function compatibility with the earlier RX210 allows for easy migration.

RX230 Group Block Diagram



Note: Maximum specifications for the group are listed above.

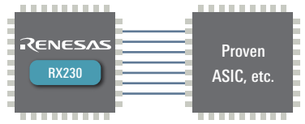
RX230 Group Memory/Package Options



Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

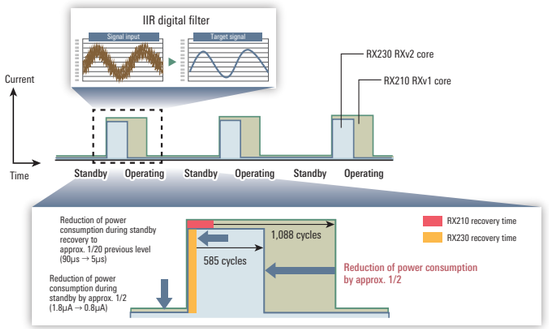
5V + External Bus

Support for 16-bit external bus interface
Support for 5V parallel bus such as older ASIC as well
Easy migration from M16C, H8, or RX200



High Power Efficiency

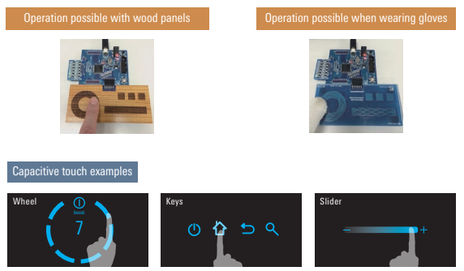
- RXv2 core with enhanced DSP and FPU delivers twice the power efficiency in processing such as digital filtering.
- Standby current with RAM and register contents retained is 0.8µA, among the best in the industry.
- Fast recovery from the standby state in as little as 5µs (when using LOCO at 4MHz).



RX230 Group Application Examples

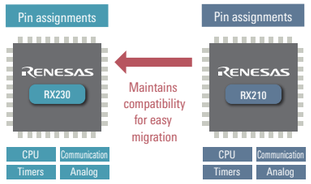
Capacitive Touch

Support for capacitive touch sensors with sensitivity and noise tolerance among the best in the industry



Migration from Earlier Products

Same pin assignments and IP modules as RX210



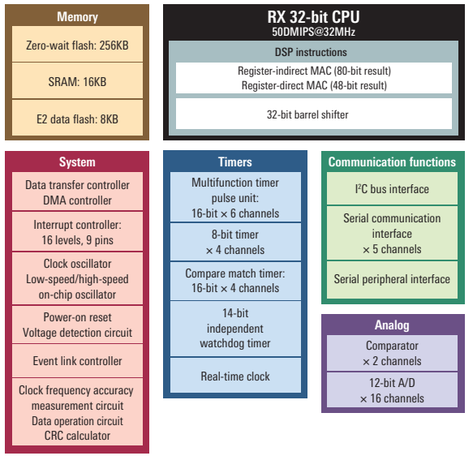
Vbatt and USB pins excluded.

RX220 Group

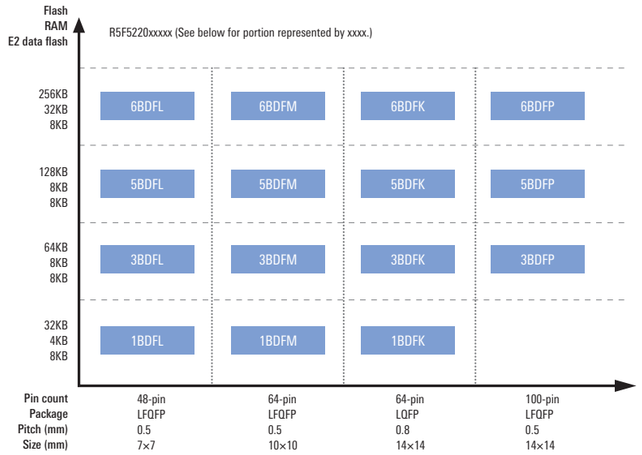
Slimmed Down Model with 32MHz Operation, Maintains Compatibility with More Powerful RX210 Group

The RX220 Group comprises the RX Family's entry-level power-efficient 32-bit microcontrollers. They deliver high performance of 50DMIPS at 32MHz and low power consumption at prices typical of 16-bit microcontrollers. Power consumption is less than half that of the RX210 Group in the low-frequency range down to 8MHz when only the CPU is operating. RX220 Group microcontrollers are slimmed down versions of their higher-end RX210 Group counterparts, and they provide a very high level of compatibility both in pin assignments and at the software level. This greatly simplifies the process of upgrading products incorporating RX220 Group microcontrollers. Product versions with support for high-temperature operation (105°C) are also available.

RX220 Group Block Diagram



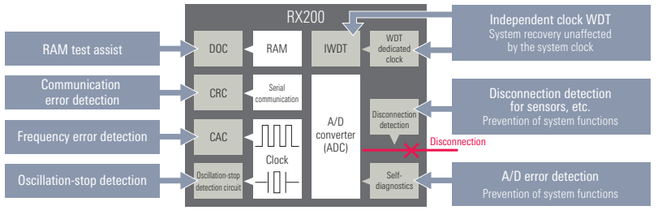
RX220 Group Memory/Package Options



Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

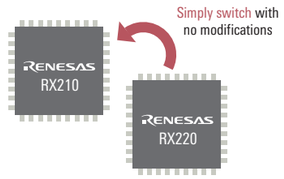
Enhanced Safety Functions

Ideal for applications where safety is a priority. Simplifies the task of supporting the IEC 60730 safety standard for electric home appliances!!

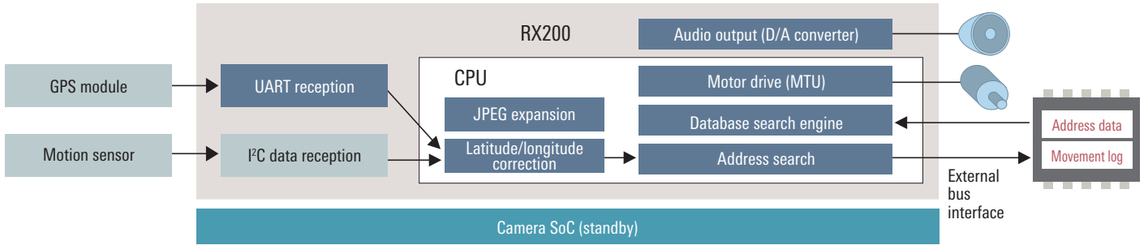


Compatibility with RX210

RX210 and RX220 microcontrollers are completely pin compatible. This makes it a simple task to upgrade products incorporating these microcontrollers.



Application Example: System Block Diagram of Digital Camera Demo Using RX210/RX220

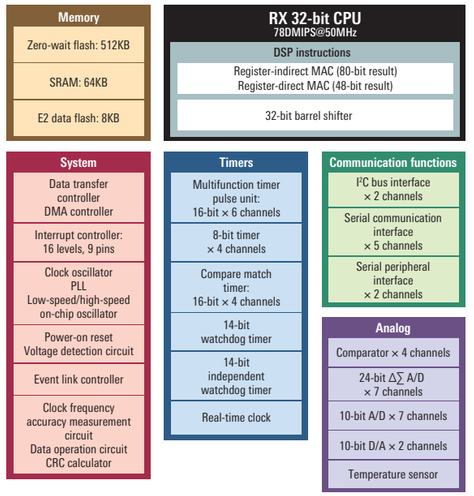


RX21A Group

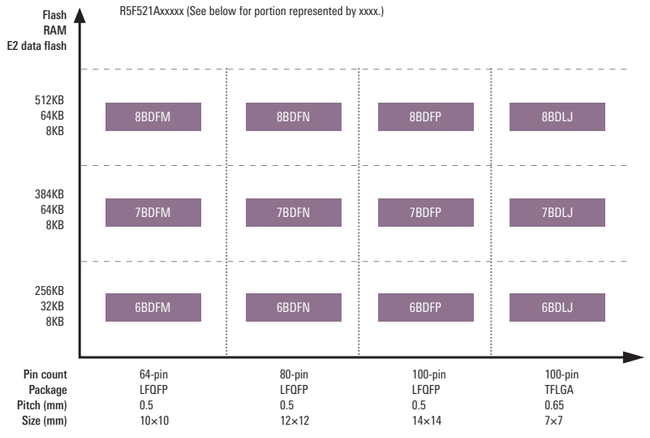
50MHz Operation and Key Smart Meter Functions Such as ΔΣ A/D Converter and Encryption

The RX21A Group of 32-bit microcontrollers provides key functions required by smart meters, including 24-bit ΔΣ A/D converter (SNDR = 85dB), encryption engine, RTC, and IrDA. The lineup spans 12 product versions with a variety of options for number of ΔΣ A/D converter channels, flash memory capacity, and package type. This ensures support for a wide range of smart meters, from single-phase models mainly for home use to three-phase models primarily for industrial applications. The high-performance RX CPU and large-capacity 512KB flash memory make the RX21A Group suitable for general-purpose applications requiring high-resolution A/D conversion as well. Product versions with support for high-temperature operation (105°C) are also available.

RX21A Group Block Diagram

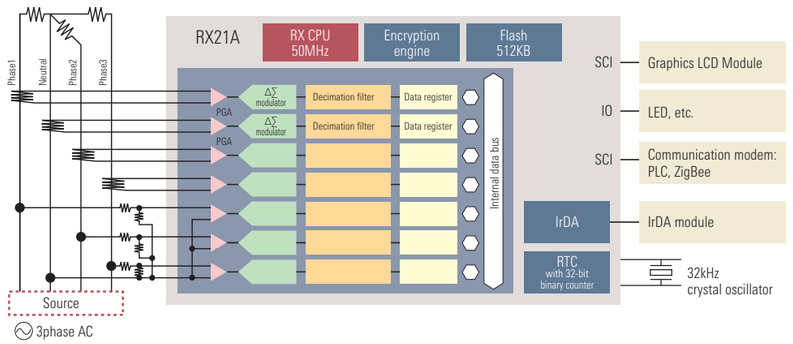


RX21A Group Memory/Package Options



Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

Application Example: Block Diagram of RX21A Power Meter System



Advantages of RX21A

1. Reduced system cost
2. Single chip for improved security
3. Reduced software flash programming workload
4. Reduced mounting area and cost

RX21A Application Examples

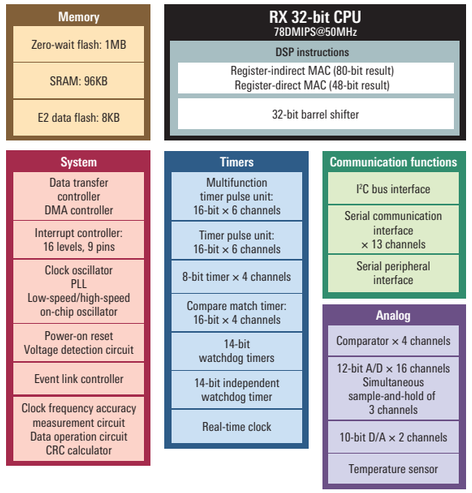
Power meters	Measuring devices, healthcare devices	HEMS, power monitoring	Industrial equipment

RX210 Group

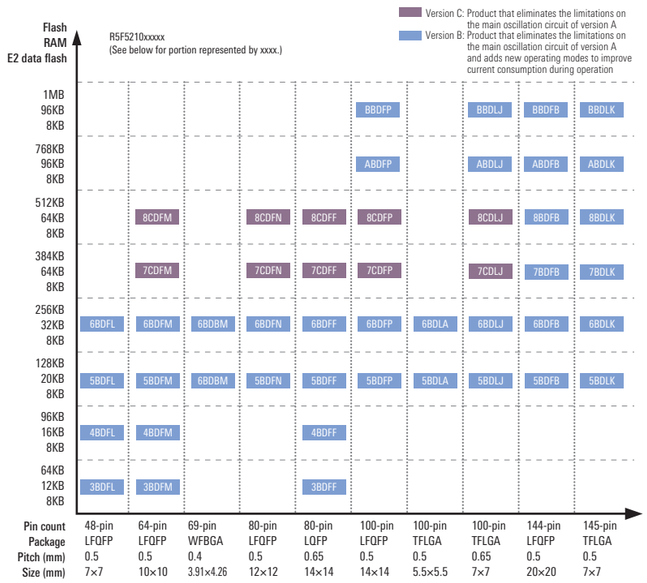
High Performance (50MHz Operation) and Low Power Consumption, Wide Voltage Range, External Bus Support

The RX210 Group supports a wide range of power supply voltages extending from 1.62V to 5.5V, delivers operation performance of 78DMIPS when running at 50MHz, and low power consumption of 0.2mA/MHz. Current consumption in deep software standby mode is only 0.4µA. The maximum available on-chip memory is 1MB of flash memory, 96KB of RAM, and 8KB of E2 data flash. Usability is increased by functions such as the event link controller (ELC), which allows peripheral modules to activate other peripheral modules while bypassing the CPU, and the multi-function pin controller (MPC), which enables flexible selection of functions by allowing the same pins to be allocated to a variety of functions. Other powerful peripheral functions include the 12-bit A/D converter with a conversion time of 1µs and the MTU2, which enables a wide variety of PWM control methods. Package pin counts range from 48 to 145 pins, and the TFLGA compact package and WLBGA ultracompact package (3.91 × 4.26mm) are also available. Product versions with support for high-temperature operation (105°C) are also available.

RX210 Group Block Diagram

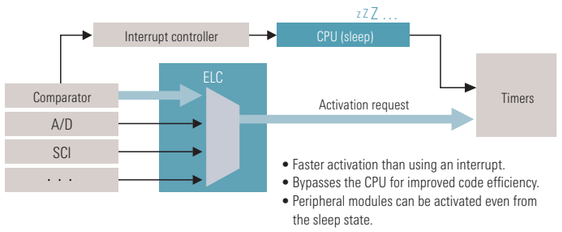


RX21A Group Memory/Package Options



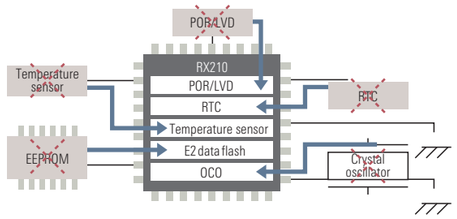
Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

Event Link Controller (ELC)



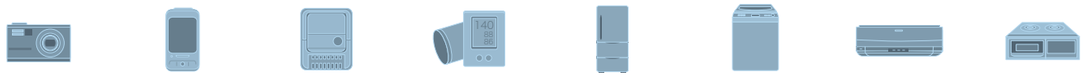
- Faster activation than using an interrupt.
- Bypasses the CPU for improved code efficiency.
- Peripheral modules can be activated even from the sleep state.

Incorporation of External Components



RX210 Application Examples

Digital cameras | Smartphones | Power meters | Healthcare devices | Refrigerators | Washing machines | Air conditioners | IH cooking heaters

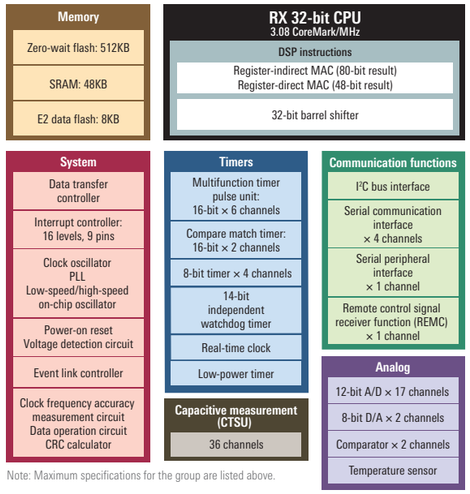


RX130 Group

32-Bit Microcontrollers Supporting Capacitive Touch Sensors with Up to 36 Channels

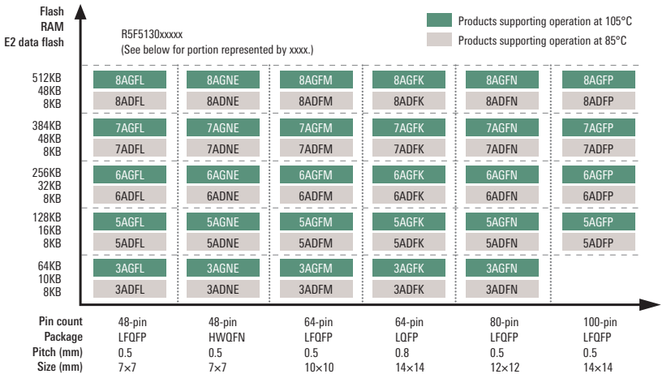
The RX130 Group has on-chip support for up to 36 capacitive touch sensor (CTSU) channels, the most in the RX Family. The lineup includes products with low ROM capacity and low pin count. The high-performance 32-bit RX core makes it easy to control a human-machine interface (HMI) for an electric home appliance such as a washing machine and implement system control using a single chip. The on-chip capacitive touch sensor functionality supports capacitive touch free of detection errors even when wet. In addition, the need for external components for sensitivity calibration is reduced substantially, and noise tolerance is greatly improved. The RX130 Group is also the first in the RX100 Series to support 5V operation and interfaces. This makes it possible to ensure a wider dynamic range and to build systems that are unaffected by noise from sources such as IF heaters and microwave ovens.

RX130 Group Block Diagram



Note: Maximum specifications for the group are listed above.

RX130 Group Memory/Package Options



Capacitive Touch

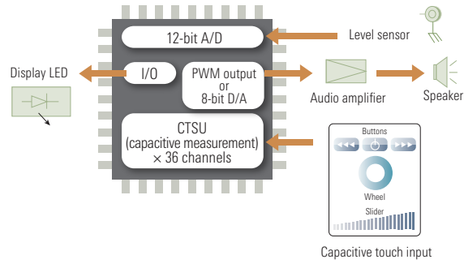
Support for capacitive touch sensors with sensitivity and noise tolerance among the best in the industry

Operation possible with wood panels

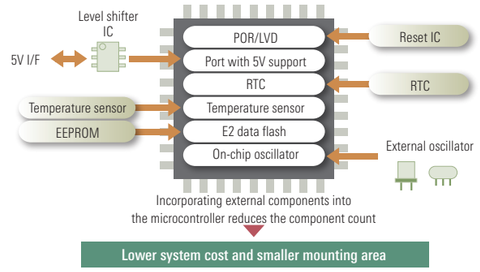
Operation possible when wearing gloves

Capacitive touch examples

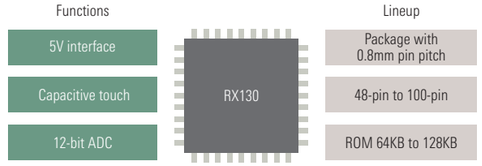
Application Example: Block Diagram of Washing Machine UI Using RX130



Many Peripheral Functions



Functions and Lineup Selected for Enhanced Flexibility



RX130 Application Examples

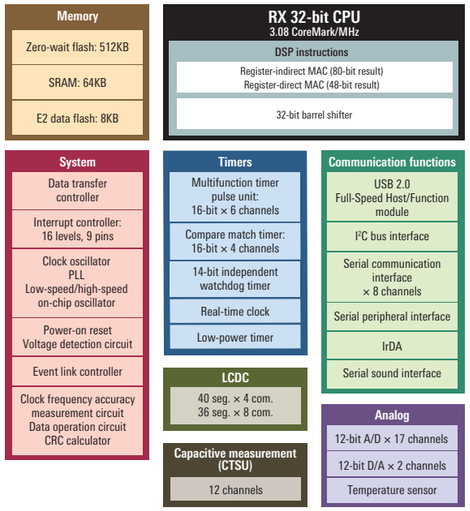
Healthcare devices | Office equipment | Electric home appliances (white goods) | Home equipment

RX113 Group

User Interface (LCD Capacitive Touch) and Communication (USB, IrDA) Functions

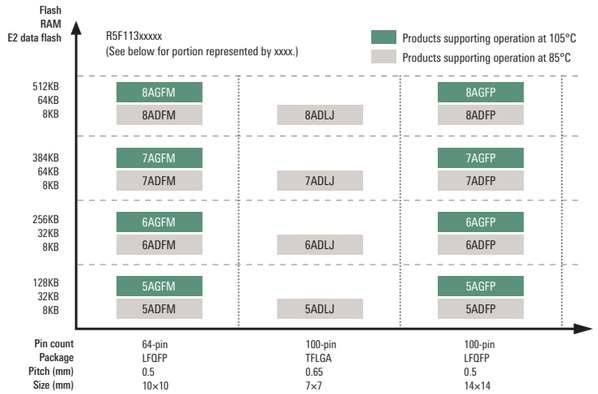
The RX113 Group provides UI functions such as LCD and capacitive touch, and communication functions such as USB and IrDA. It is suitable for systems requiring single-chip implementation of a bidirectional human-machine interface (HMI) or interfaces with a variety of peripheral devices in application fields such as healthcare, home automation, building automation, and energy management systems. For the first time in the RX Family, the HMI functions include support for 12 capacitive touch sensor (CTSU) channels and an LCD controller for up to 40 seg. × 4 com. Two CTSU detection methods are supported: self-capacitance, which builds on the proven implementation on the R8C with improved noise tolerance, and mutual-capacitance. To the features of the RX111 are added functions that improve ease of use, such as an ultra-energy-efficient low-power timer (LPT) that is ideal for generating standby recovery events and a 12-bit D/A converter that supports highly accurate external sensor calibration.

RX113 Group Block Diagram



Note: Maximum specifications for the group are listed above.

RX113 Group Memory/Package Options



Capacitive Touch

Support for capacitive touch sensors with sensitivity and noise tolerance among the best in the industry

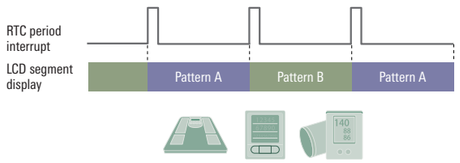
Operation possible with wood panels

Operation possible when wearing gloves

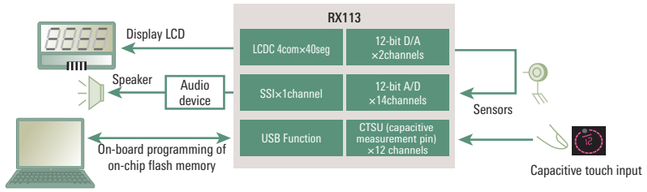
Capacitive touch examples

Ultralow-Power LCD Controller

Supports switching between A and B patterns using the RTC period interrupt and flashing operation if inverted A and B patterns are prepared. Flashing operation is also possible during standby by operating the RTC and LCD only. The internal voltage step-up circuit provides support for LCD display panels with a 5V interface and for 16-step display contrast adjustment.



Application Example: Block Diagram of Measuring Device Using RX113



USB Functions

The RX113 group supports USB 2.0 Full Speed (12Mbps) and Low Speed (1.5Mbps) modes. Class drivers are available for HID, CDC, and MSC. The microcontroller can be programmed via USB using tools from Renesas.

<Specifications>

Standards	■ USB 2.0 Host, Function, OTG Full Speed (12Mbps) Low Speed (1.5Mbps) ■ Battery Charging Specification Revision 1.2
Device class drivers	■ HID, CDC, MSC

RX113 Application Examples

Healthcare devices

Measuring devices

Electric home appliances (white goods)

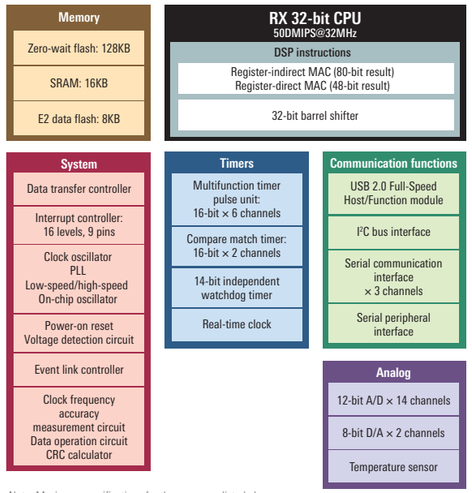
HEMS, power monitoring

RX111 Group

RX100 Series Microcontrollers with USB 2.0 (Full Speed/Low Speed) Support

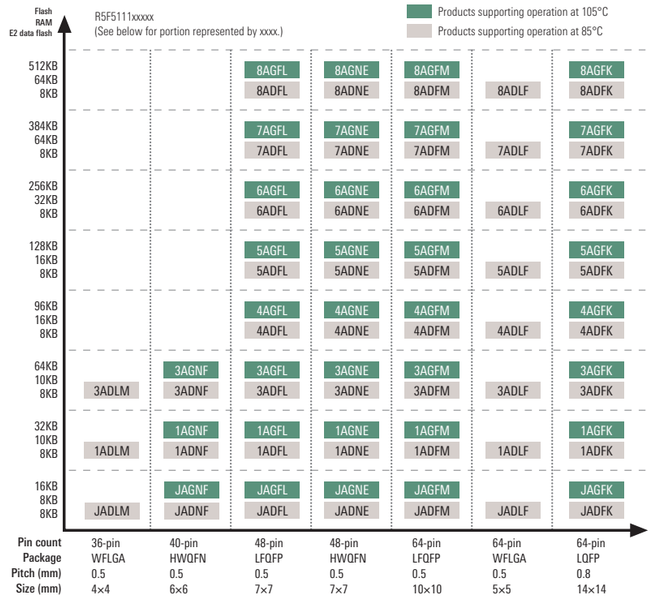
The RX111 Group has an extensive product lineup at the low end of the ROM capacity and pin count range of the RX Family. It implements USB 2.0 functionality with battery charger (BC1.2) support. With the low current consumption typical of the RX100 Series, and fast standby recovery in as little as 4.8µs, RX111 Group microcontrollers are suitable for applications such as PC peripheral devices, healthcare devices, and wearable devices. To the standard functions of the RX110 Group it adds, in addition to USB, 3-phase motor control functionality, event link controller (ELC), and E2 data flash. This makes it easy to support the requirements of both electric home appliances and industrial equipment. Product versions with support for high-temperature operation (105°C) are also available.

RX111 Group Block Diagram



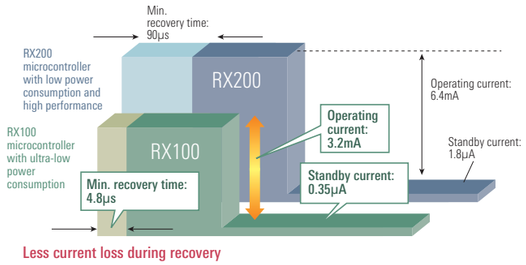
Note: Maximum specifications for the group are listed above.

RX111 Group Memory/Package Options



Fast Standby Recovery for Reduced Current Consumption during Intermittent Operation

When the RX100 Series is in the standby state current consumption is limited while RAM contents are retained, and fast recovery from standby occurs in as little as 4.8µs. Current loss during recovery is minimized, and intermittent operation with repeated standby states helps keep current consumption low.



USB Functions

The RX111 Group supports USB 2.0 Full Speed (12Mbps) and Low Speed (1.5Mbps) modes. Class drivers are available for HID, CDC, and MSC. The microcontroller can be programmed via USB using tools from Renesas.

<Specifications>

Standards	USB 2.0 Host, Function, OTG Full Speed (12Mbps) Low Speed (1.5Mbps) Battery Charging Specification Revision 1.2
Transfer modes	Control transfer, bulk transfer, interrupt transfer, isochronous transfer
Device class drivers	HID, CDC, MSC

RX111 Group Applications Examples

PC peripherals

Electric home appliances (white goods)

Office equipment

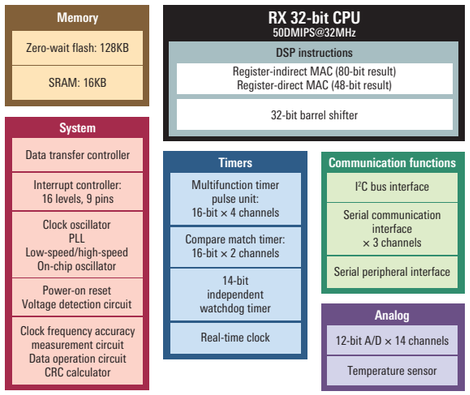
Healthcare devices

RX110 Group

Simple Functionality and Extensive ROM/RAM Capacity and Package Options

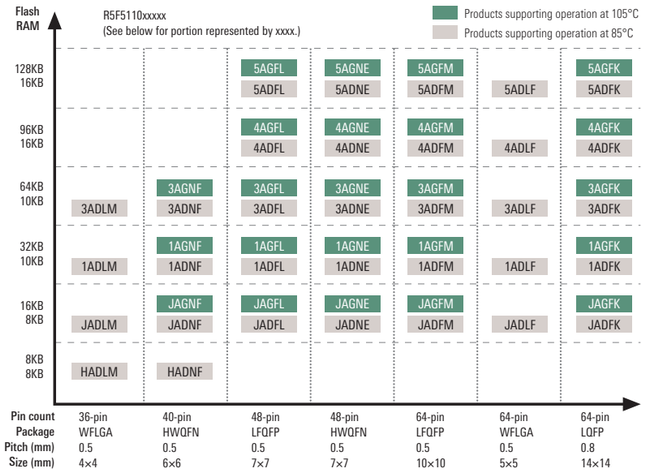
RX110 Group microcontrollers have the simplest configurations in the RX100 Series. The product lineup includes small ROM/RAM memory capacities from 8KB/8KB to 128KB/16KB and low pin counts from 36 to 64 pins. Built around a 32-bit RX core operating at 32MHz and with on-chip functions such as 12-bit A/D converter, 16-bit timer, I²C, SCI, and RSPI, RX110 microcontrollers are available in packages as small as 4mm × 4mm. This makes them suitable for applications such as sensor hubs where both compact size and processing performance are needed. In fields such as electric home appliances, industrial equipment, and office equipment they can also serve as sub-microcontrollers in systems where the more powerful RX700, RX600, or RX200 Series is used as the main microcontroller. In such cases the common CPU core, peripheral functions, and development environment contribute to development efficiency. Product versions with support for high-temperature operation (105°C) are also available.

RX110 Group Block Diagram



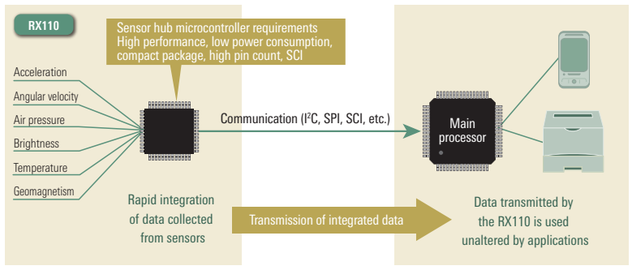
Note: Maximum specifications for the group are listed above.

RX110 Group Memory/Package Options



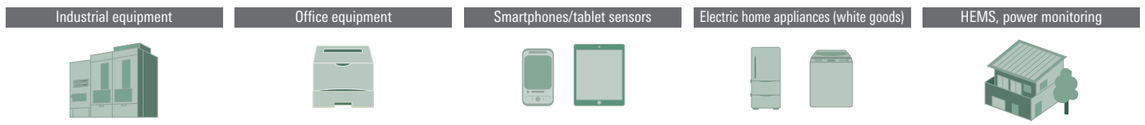
Sensor Hub Application Example

Devices such as smartphones and tablets obtain information required by their application software via sensors. Office equipment also uses information from sensors for control. The job of the sensor hub microcontroller is to gather all of this information together in one place.



Sensor hub microcontroller requirements	RX110 support
High performance	1.56DMIPS/MHz
Low current consumption	3.2mA (32MHz during normal operation)
Compact, high-pin-count package	4 × 4mm, 36-pin LGA 5 × 5mm, 64-pin LGA
SCI	SCIe × 2, SCIf × 1 RSPI × 1, RI²C × 1

RX110 Group Application Examples



MEMO

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 | **Development** | **Mass production**

Free evaluation versions

Free evaluation versions of tools

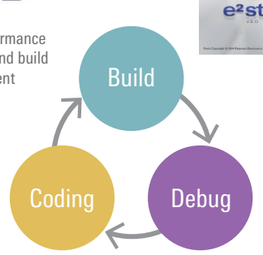
Starter kit
you can use right away

Renesas integrated development environments

CS+

High-performance compiler and build management functions

e²studio

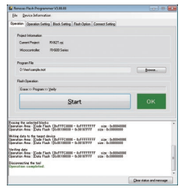


Easy-to-use editor and automated code generation function

Software: Middleware, Drivers, OSes

Sample code

Renesas Flash Programmer
flash memory programming software



PG-FP6 standalone flash programmer

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

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

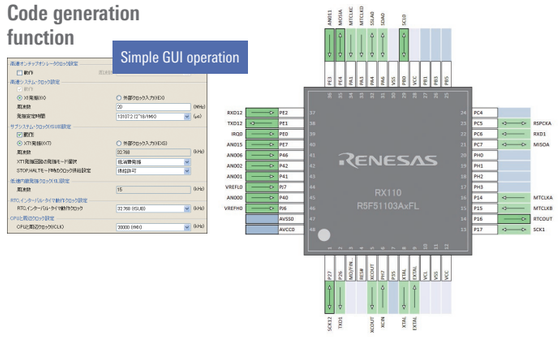
Lists of API functions output by the code generator and pin information settings applied to the microcontroller's peripheral functions can be output to a file in Excel or HTML format.

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

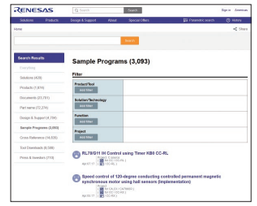


Easy confirmation of pin assignments

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

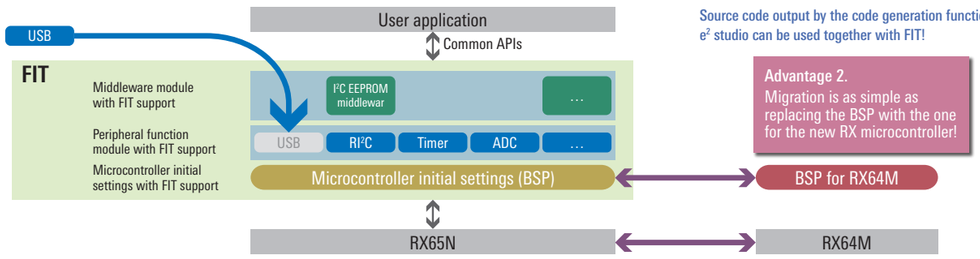
URL www.renesas.com/software

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.

Advantage 1.
It's easy to add new functions to a project!



Source code output by the code generation function of e² studio can be used together with FIT!

Advantage 2.
Migration is as simple as replacing the BSP with the one for the new RX microcontroller!

URL www.renesas.com/fit

RX Family Development Tools

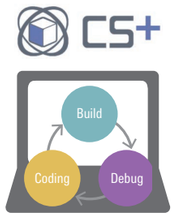
Introduction | Development | Mass production

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.

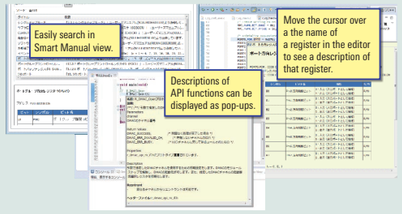
URL gcc-renesas.com

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).

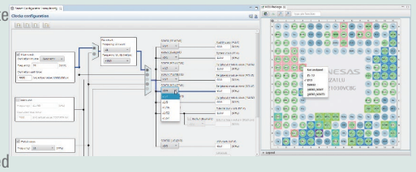


Smart Configurator: A Convenient Function of e² studio and CS+

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

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.

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.

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

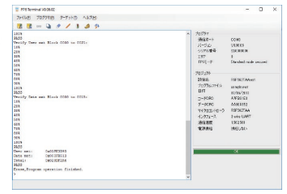
- Successor to the PG-FP5, designed with an emphasis on compatibility
- Improved support for high-speed programming and large-capacity flash memory
- PC-controlled or standalone programming: Suitable for a broad range of use cases from development through mass production
- Ability to store settings for 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

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.

Easily create a programming environment and program flash memory

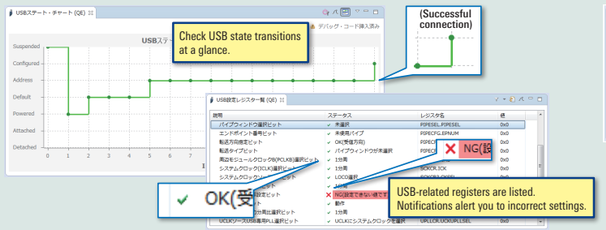


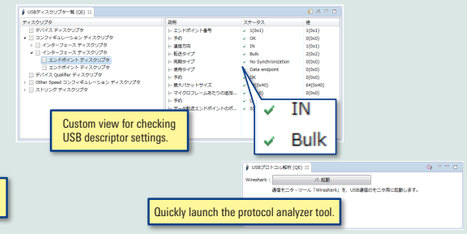
QE for USB — A Solution Toolkit Specifically Designed for Making USB System Development More Efficient

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.

QE for USB
Specifically for USB development
www.renesas.com/qe

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*13 (RTE0T0002LKCE00000R) or E1 (R0E000010KCE00)	E20 (R0E000200KCT00) *2 Note: Debugging functions equivalent E1 emulator only	For 176-pin 0.5 mm pin pitch products: R0E5571MLDMB00 *3 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 For E2 Lite or E1: R0E000010ACB10	Renesas Flash Programmer (R0C00000FDW13R) *5 *7	PG-FP5*6 or E2 Lite or E1 or E20
RX600	RX610	Renesas Starter Kit for RX610 (Part No.: R0K55610OS000BE)	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 *8	
	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.: R0K50563OS000BE)					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: R0E55630NEDMB00 For 100-pin 0.5 mm pin pitch products: R0E55630NEDMB01			
	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.: R0K55630HS000BE (with CS+) or YR0K55630HS000BE (with e² studio))					For 120-pin 0.5 mm pin pitch products: R0E55630TEDMB00 *4 For 112-pin 0.65 mm pin pitch products: R0E55630TEDMB01 For 100-pin 0.5 mm pin pitch products: R0E55630TEDMB02		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX634	–							Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX64M	Renesas Starter Kit+ for RX64M (Part No.: R0K50564MS000BE (with CS+) or YR0K50564MS000BE (with e² studio))	CS+ support e² studio support	CS+ support e² studio support					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.: RTK50565NZS10000BE)				E20 (R0E000200KCT00) *2 Note: Debugging functions equivalent E1 emulator only		For E2 Lite or E1: R0E000010ACB10		
RX200	RX210	Renesas Starter Kit for RX210B (Part No.: R0K50521OS003BE)	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.: R0K50220OS000BE)								
	RX21A	–								
	RX230 RX231	Renesas Starter Kit for RX231 (Part No.: R0K50523 1S000BE (with CS+) or YR0K505231S000BE (with e² studio)) Renesas Starter Kit for RX231 (B Mask: built-in Trusted Secure IP) (with CS+) ★★							Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX23T	Renesas Starter Kit for RX23T (Part No.: RTK500523TS00000BE (with CS+) or YRTK500523TS00000BE (with e² studio))	CS+ support e² studio support	CS+ support e² studio support					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 Starter 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))								
	RX130	Renesas Starter Kit for RX130 (Part No.: RTK5005130S00000BE (with CS+ and E1) or YRTK5005130S00000BE (with e² studio and E2 Lite)) Renesas Stater Kit for RX130-512KB (Part No.: RTK5051308S00000BE) ★							Renesas Flash Programmer (R0C00000FDW13R) *5 *6	

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

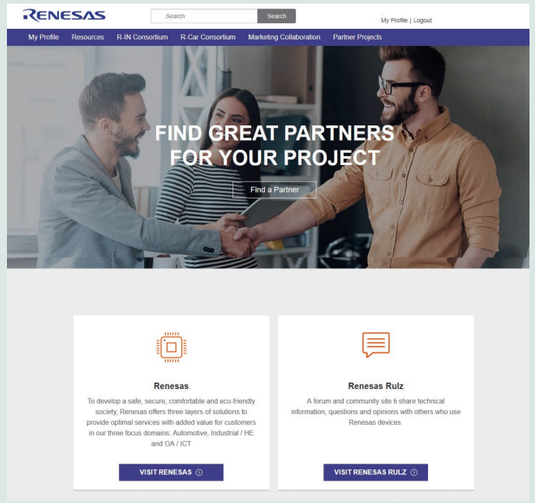
Solutions from Partner Vendors for RX Family

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

Visit the following page to search for partner companies and their products, register as a new partner, or log in if your company is already a partner.

www.renesaspartners.com/



RX Family Group Lineup

RX700 Series and RX600 Series

Group			RX71M	RX64M	RX65N	RX63N	RX62N	RX651	RX631	RX621
CPU core			RXv2	RXv2	RXv2	RXv1	RXv1	RXv2	RXv1	RXv1
Operating voltage		Vcc	2.7 to 3.6 V	2.7 to 3.6 V	2.7 to 3.6 V	2.7 to 3.6 V	2.7 to 3.6 V	2.7 to 3.6 V	2.7 to 3.6 V	2.7 to 3.6 V
Maximum operating frequency (MHz)		CPU	240	120	120	100	100	120	100	100
		BCLK/BCLK pin	120/60	120/60	120/60	100/50	100/50	120/60	100/50	100/50
Code flash memory			4 MB	4 MB	2,048 KB (dual bank)	2 MB	512 KB	2,048 KB (dual bank)	2 MB	512 KB
Data flash memory			64 KB	64 KB	32 KB	32 KB	32 KB	32 KB	32 KB	32 KB
SRAM			512 KB + 8 KB + 32 KB	512 KB + 8 KB + 32 KB	640 KB	256 KB	96 KB	640 KB	256 KB	96 KB
External bus	External bus width/SDRAM interface		8, 16, 32/Yes	8, 16, 32/Yes	8, 16, 32/Yes	8, 16, 32/Yes	8, 16, 32/Yes	8, 16, 32/Yes	8, 16, 32/Yes	8, 16, 32/Yes
Data transfer	DMAC/DTC/EXDMAC		8 channels/Yes/2 channels	8 channels/Yes/2 channels	8 channels/Yes/2 channels	4 channels/Yes/2 channels	4 channels/Yes/2 channels	8 channels/Yes/2 channels	4 channels/Yes/2 channels	4 channels/Yes/2 channels
Peripheral functions	Serial interfaces	Ethernet	2 channels	2 channels	1 channel	1 channel	1 channel	—	—	—
		Time sync control (IEEE1588)	Yes	Yes	—	—	—	—	—	—
		USB	HS: 1 channel (Host/Function/OTG) FS: 1 channel (Host/Function/OTG)	FS: 2 channels (Host/Function/OTG)	FS: 1 channel (Host/Function/OTG)	FS: 1 channel (Host/Function/OTG) FS: 1 channel (Function)	FS: 2 channels (Host/Function/OTG)	FS: 1 channel (Host/Function/OTG)	FS: 1 channel (Host/Function/OTG) FS: 1 channel (Function)	FS: 2 channels (Host/Function/OTG)
		USB-LS Host	Yes	Yes	Yes	—	—	Yes	—	—
		CAN	3 channels	3 channels	2 channels	3 channels	1 channel	2 channels	3 channels	1 channel
		SCI/RSPI/I²C	9 channels + 4 channels (with FIFO)/ 2 channels/2 channels	9 channels + 4 channels (with FIFO)/ 1 channel/2 channels	13 channels/3 channels/ 2 channels	13 channels/3 channels/ 4 channels	6 channels/2 channels/ 2 channels	13 channels/3 channels/ 2 channels	13 channels/3 channels/ 4 channels	6 channels/2 channels/ 2 channels
		QSPI/SSI	1 channel/2 channels	1 channel/2 channels	1 channel/—	—/—	—/—	1 channel/—	—/—	—/—
	Timers	32-bit timer	3 channels	3 channels	3 channels	—	—	3 channels	—	—
		16-bit timer	22 channels	22 channels	18 channels	22 channels	16 channels	18 channels	22 channels	16 channels
		8-bit timer	4 channels	4 channels	4 channels	4 channels	4 channels	4 channels	4 channels	4 channels
		Watchdog timer/ independent watchdog timer	Yes (14-bit)/Yes (14-bit)	Yes (14-bit)/Yes (14-bit)	Yes (14-bit)	Yes (14-bit)/Yes (14-bit)	Yes (8-bit)/Yes (14-bit)	Yes (14-bit)	Yes (14-bit)/Yes (14-bit)	Yes (8-bit)/Yes (14-bit)
		Real-time clock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Analog	A/D	12-bit × 8 channels (sample-and-hold of 3 channels) 12-bit × 21 channels	12-bit × 8 channels (sample-and-hold of 3 channels) 12-bit × 21 channels	12-bit × 8 channels (sample-and-hold of 3 channels) 12-bit × 21 channels	12-bit × 21 channels 10-bit × 8 channels	2 units: 12-bit × 8 channels and 10-bit × 4 channels (12-bit A/D and 10-bit A/D not usable simultaneously)	12-bit × 8 channels (sample-and-hold of 3 channels) 12-bit × 21 channels	12-bit × 21 channels 10-bit × 8 channels	2 units: 12-bit × 8 channels and 10-bit × 4 channels (12-bit A/D and 10-bit A/D not usable simultaneously)
		D/A	12-bit × 2 channels	12-bit × 2 channels	12-bit × 2 channels	10-bit × 2 channels	10-bit × 2 channels	12-bit × 2 channels	10-bit × 2 channels	10-bit × 2 channels
	Security		AES/DES/SHA/TRNG	AES/DES/SHA/TRNG	Trusted Secure IP (AES/DES/SHA/RSA/TRNG)	(AES)	—	Trusted Secure IP (AES/DES/SHA/RSA/TRNG)	(AES)	—
	Other	LCD	—	—	Yes	—	—	Yes	—	—
		SDHI/MMC	1 channel/1 channel	1 channel/1 channel	1 channel/1 channel	—	—	1 channel/1 channel	—	—
		SD slave	—	—	1 channel	—	—	1 channel	—	—
		Image capture (PDC)	1 channel	1 channel	1 channel	—	—	1 channel	1 channel	—
		Other functions	LVD, POR, CRC, CAC, DOC, ELC, temperature sensor	LVD, POR, CRC, CAC, DOC, ELC, temperature sensor	LVD, POR, CRC, DOC, ELC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, DOC, ELC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor
Operating ambient temperature			–40 to 85 °C	–40 to 85 °C	–40 to 85 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C	–40 to 85 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C
Packages	TFLGA-177 (8 × 8)		Yes	Yes	Yes	Yes	—	Yes	Yes	—
	LFQFP-176 (24 × 24)		Yes	Yes	Yes	Yes	—	Yes	Yes	—
	LFBGA-176 (13 × 13)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	TFLGA-145 (9 × 9)		—	—	Yes	—	Yes	Yes	—	Yes
	TFLGA-145 (7 × 7)		Yes	Yes	Yes	Yes	—	Yes	Yes	—
	LFQFP-144 (20 × 20)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	LFQFP-100 (14 × 14)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	TFLGA-100 (7 × 7)		Yes	Yes	Yes	Yes	—	Yes	Yes	—
	TFLGA-85 (7 × 7)		—	—	—	—	—	—	—	Yes
	LFQFP-64 (10 × 10)		—	—	—	—	—	—	Yes	—
	TFLGA-64 (6 × 6)		—	—	—	—	—	—	Yes	—
	LFQFP-48 (7 × 7)		—	—	—	—	—	—	Yes	—

Group			RX630	RX634	RX610
CPU core			RXv1	RXv1	RXv1
Operating voltage		Vcc	2.7 to 3.6 V	2.7 to 3.6 V or 4.0 to 5.5 V	3.0 to 3.6 V
Maximum operating frequency (MHz)		CPU	100	54	100
		BCLK/BCLK pin	50/25	54/27	25/25
Code flash memory			2 MB	2 MB	2 MB
Data flash memory			32 KB	32 KB	32 KB
SRAM			128 KB	128 KB	128 KB
External bus	External bus width/SDRAM interface		8, 16, 32/—	8, 16/—	8, 16/—
Data transfer	DMAC/DTC/EXDMAC		4 channels/Yes/—	4 channels/Yes/—	4 channels/Yes/—
Peripheral functions	Serial interfaces	USB-FS	FS: 1 channel (Function)	—	—
		CAN	3 channels	—	—
		SCI/RSPI/I²C	13 channels/3 channels/4 channels	13 channels/2 channels / 3 channels	7 channels/—/2 channels
	Timers	16-bit timer	22 channels	16 channels	16 channels
		8-bit timer	4 channels	4 channels	4 channels
		Watchdog timer/ independent watchdog timer	Yes (14-bit)/Yes (14-bit)	Yes (14-bit)/Yes (14-bit)	Yes (8-bit)/—
		Real-time clock	Yes	—	—
	Analog	A/D	12-bit × 21 channels 10-bit × 8 channels	12-bit × 16 channels	10-bit × 16 channels
		D/A	10-bit × 2 channels	—	10-bit × 2 channels
	Other	HDMI-CEC/ remote control reception	—	Yes/Yes	—
		Other functions	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, CAC, DOC, ELC, temperature sensor	CRC
Operating ambient temperature			–40 to 85 °C, –40 to 105 °C	–40 to 85 °C	–20 to 85 °C, –40 to 85 °C
Packages	TFLGA-177 (8 × 8)		Yes	—	—
	LFQFP-176 (24 × 24)		Yes	—	—
	LFBGA-176 (13 × 13)		Yes	—	Yes
	TFLGA-145 (7 × 7)		Yes	—	—
	LFQFP-144 (20 × 20)		Yes	Yes	Yes
	LFQFP-100 (14 × 14)		Yes	—	—
	TFLGA-100 (5.5 × 5.5)		Yes	—	—
	LFQFP-80 (12 × 12)		Yes	—	—

RX63T, RX62T, RX62G, RX24U, RX24T, RX23T

Group			RX63T	RX62T	RX62G	RX24U	RX24T	RX23T
CPU core			RXv1	RXv1	RXv1	RXv2	RXv2	RXv2
Operating voltage		Vcc	2.7 to 3.6 V or 4.0 to 5.5 V	2.7 to 3.6 V or 4.0 to 5.5 V	4.0 to 5.5 V	2.7 to 5.5 V	2.7 to 5.5 V	2.7 to 5.5 V
Maximum operating frequency (MHz)		CPU	100	100	100	80	80	40
		BCLK/BCLK pin	50/50	—	—	—	—	—
Code flash memory			512 KB	256 KB	256 KB	512 KB	512 KB	128 KB
Data flash memory			32 KB	32 KB	32 KB	8 KB	8 KB	—
SRAM			48 KB	16 KB	16 KB	32 KB	32 KB	12 KB
External bus	External bus width/SDRAM interface		8, 16/—	—/—	—/—	—/—	—/—	—/—
Data transfer	DMAC/DTC/EXDMAC		4 channels/Yes/—	—/Yes/—	—/Yes/—	—/Yes/—	—/Yes/—	—/Yes/—
Peripheral functions	Serial interfaces	USB-FS	1 channel (Host/Function/OTG)	—	—	—	—	—
		CAN	1 channel	1 channel	1 channel	1 channel	1 channel	—
		SCI/RSPI/I²C	5 channels/2 channels/2 channels	3 channels/1 channel/1 channel	3 channels/1 channel/1 channel	6 channels/1 channel/1 channel	3 channels/1 channel/1 channel	2 channels/1 channel/1 channel
	Timers	16-bit timer	20 channels	16 channels	16 channels	17 channels	13 channels	10 channels
		Watchdog timer/ independent watchdog timer	Yes (8-bit)/Yes (14-bit)	Yes (8-bit)/Yes (14-bit)	Yes (8-bit)/Yes (14-bit)	—/Yes (14-bit)	—/Yes (14-bit)	—/Yes (14-bit)
		3-phase PWM outputs	3	2	2	3	2	1
		PWM delay generation function	Yes	—	Yes	—	—	—
		Digital power supply control unit	Yes	—	—	—	—	—
	Analog	A/D	2 units: 12-bit × 4 channels (sample-and-hold of 3 channels), 10-bit × 20 channels	2 units: 12-bit × 4 channels (sample-and-hold of 3 channels), 10-bit × 12 channels	2 units: 12-bit × 4 channels (sample-and-hold of 3 channels), 10-bit × 12 channels	1 unit: 12-bit × 5 channels (1 differential PGA, sample and hold channel) 1 unit: 12-bit × 5 channels (3 differential PGA, sample and hold channels) 1 unit: 12-bit × 12 channels	1 unit: 12-bit × 5 channels (1 sample and hold channel) 1 unit: 12-bit × 5 channels (sample-and-hold of 3 channels) 1 unit: 12-bit × 10 channels	12-bit × 10 channels (sample-and-hold of 3 channels)
		D/A	10-bit × 2 channels	—	—	8-bit × 2 channels	8-bit × 1 channel	—
	Other		LVD, POR, CRC, CAC, DOC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, CAC, DOC, temperature sensor	LVD, POR, CRC, CAC, DOC, temperature sensor	LVD, POR, CRC, CAC, DOC, temperature sensor
Operating ambient temperature			–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C	–40 to 85 °C	–40 to 85 °C, –40 to 105 °C
Packages	LFQFP-144 (20 × 20)		Yes	—	—	Yes	—	—
	LFQFP-120 (16 × 16)		Yes	—	—	—	—	—
	LQFP-112 (20 × 20)		Yes	Yes	Yes	—	—	—
	LFQFP-100 (14 × 14)		Yes	Yes	Yes	Yes	Yes	—
	LFQFP-80 (12 × 12)		—	—	—	—	Yes	—
	LQFP-80 (14 × 14)		—	Yes	—	—	Yes	—
	LQFP-64 (14 × 14)		—	Yes	—	—	—	—
	LFQFP-64 (10 × 10)		Yes	Yes	—	—	Yes	Yes
	LQFP-52 (10 × 10)		—	—	—	—	—	Yes
	LFQFP-48 (7 × 7)		Yes	—	—	—	—	Yes

RX200 Series

Group			RX231	RX230	RX210	RX220	RX21A
CPU core			RXv2	RXv2	RXv1	RXv1	RXv1
Operating voltage		Vcc	1.8 to 5.5 V	1.8 to 5.5 V	1.62 to 5.5 V	1.62 to 5.5 V	1.8 to 3.6 V
Maximum operating frequency (MHz)		CPU	54	54	50	32	50
		BCLK/BCLK pin	32/16	32/16	25/12.5	—	—
Code flash memory			512 KB	256 KB	1 MB	256 KB	512 KB
Data flash memory			8 KB	8 KB	8 KB	8 KB	8 KB
SRAM			64 KB	32 KB	96 KB	16 KB	64 KB
External bus	External bus width		8-bit, 16-bit	8-bit, 16-bit	8-bit, 16-bit	—	—
Data transfer	DMAC/DTC		4 channels/Yes	4 channels/Yes	4 channels/Yes	4 channels/Yes	4 channels/Yes
Peripheral functions	Serial	USB	FS: 1 channel (Host/Function/OTG)	—	—	—	—
		CAN	1 channel	—	—	—	—
		SCI/RSPI/I²C	7 channels/1 channel/1 channel	7 channels/1 channel/1 channel	13 channels/1 channel/1 channel	5 channels/1 channel/1 channel	5 channels/2 channels/2 channels
		SSI	1 channel	1 channel	—	—	—
	Timers	16-bit timer	17 channels	17 channels	16 channels	10 channels	10 channels
		8-bit timer	4 channels	4 channels	4 channels	4 channels	4 channels
		Watchdog timer/ independent watchdog timer	Yes (14-bit)/Yes (14-bit)	Yes (14-bit)/Yes (14-bit)	Yes (14-bit)/Yes (14-bit)	—/Yes (14-bit)	Yes (14-bit)/Yes (14-bit)
		Real-time clock	Yes	Yes	Yes	Yes	Yes
	Analog	A/D	12-bit × 24 channels	12-bit × 24 channels	12-bit × 16 channels (sample-and-hold of 3 channels)	12-bit × 16 channels	24-bitΔ∑ × 7 channels 10-bit × 7 channels
		D/A	12-bit × 2 channels	12-bit × 2 channels	10-bit × 2 channels	—	10-bit × 2 channels
	Security	Security functions	AES/TSIP–Lite	—	—	—	AES
	User interface	Capacitive touch sensor	24 channels	24 channels	—	—	—
	Other	SDHI	1 channel	—	—	—	—
		Memory protection	YES (MPU)	YES (MPU)	—	—	YES (MPU)
		Other functions	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC	LVD, POR, CRC, temperature sensor
Operating ambient temperature			–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C
Packages	TFLGA-145 (7 × 7)		—	—	Yes	—	—
	LFQFP-144 (20 × 20)		—	—	Yes	—	—
	LFQFP-100 (14 × 14)		Yes	Yes	Yes	Yes	Yes
	TFLGA-100 (7 × 7)		—	—	Yes	—	Yes
	TFLGA-100 (5.5 × 5.5)		Yes	Yes	Yes	—	—
	LQFP-80 (12 × 12)		—	—	Yes	—	Yes
	LQFP-80 (14 × 14)		—	—	Yes	—	—
	LQFP-64 (14 × 14)		—	—	—	Yes	—
	LFQFP-64 (10 × 10)		Yes	Yes	Yes	Yes	—
	WFLGA-64 (5 × 5)		Yes	Yes	—	—	—
	WFBGA-69 (3.91 × 4.26)		—	—	Yes	—	—
	WQFN-64 (9 × 9)		Yes	Yes	—	—	—
	LFQFP-48 (7 × 7)		Yes	Yes	Yes	Yes	—
	WQFN-48 (7 × 7)		Yes	Yes	—	—	—

RX Family Group Lineup

RX100 Series

Group			RX113	RX111	RX110	RX130
CPU core			RXv1	RXv1	RXv1	RXv1
Operating voltage		Vcc	1.8 to 3.6 V	1.8 to 3.6 V	1.8 to 3.6 V	1.8 to 5.5 V
Maximum operating frequency (MHz)		CPU	32	32	32	32
Code flash memory			512 KB	512 KB	128 KB	512 KB
Data flash memory			8 KB	8 KB	8 KB	8 KB
SRAM			64 KB	64 KB	16 KB	48 KB
Data transfer	DTC		Yes	Yes	Yes	Yes
Peripheral functions	Serial	USB	FS/LS: 1 channel (Host/Function/OTG)	FS/LS: 1 channel (Host/Function/OTG)	—	—
		SCI/RSPI/I²C	8 channels/1 channel/1 channel	3 channels/1 channel/1 channel	3 channels/1 channel/1 channel	4 channels/1 channel/1 channel
		SSI	1 channel	—	—	—
	Timers	16-bit timer	6 channels + 4 channels	6 channels + 2 channels	4 channels + 2 channels	6 channels + 2 channels
		8-bit timer	4 channels	—	—	4 channels
		independent watchdog timer	Yes (14-bit)	Yes (14-bit)	Yes (14-bit)	Yes (14-bit)
		Real-time clock	Yes	Yes	Yes	Yes
		Low-power timer (LPT)	Yes	—	—	Yes
	Analog	A/D	12-bit × 17 channels	12-bit × 14 channels	12-bit × 14 channels	12-bit × 17 channels
		comparator	2 channels	—	—	2 channels
		D/A	12-bit × 2 channels	8-bit × 2 channels	—	8-bit × 2 channels
	User interface	Capacitive touch sensor	12 channels	—	—	36 channels
		LCD driver	40 seg × 4 com	—	—	—
	Other		LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor	LVD, POR, CRC, temperature sensor
Operating ambient temperature			–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C, –40 to 105 °C
Packages	LFQFP-100 (14 × 14)		Yes	—	Yes	Yes
	TFLGA-100 (7 × 7)		Yes	—	—	—
	LFQFP-80 (12 × 12)		—	—	—	Yes
	LQFP-64 (14 × 14)		—	Yes	Yes	Yes
	LFQFP-64 (10 × 10)		Yes	Yes	Yes	Yes
	WFLGA-64 (5 × 5)		—	Yes	Yes	—
	LFQFP-48 (7 × 7)		—	Yes	Yes	Yes
	WQFN-48 (7 × 7)		—	Yes	Yes	Yes
	HWQFN-40 (6 × 6)		—	Yes	Yes	—
	WFLGA-36 (4 × 4)		—	Yes	Yes	—

RX Family Specifications

RX71M (100 to 177 pins)

Group		RX71M																			
Pin count		100																			
Product name		R5F571MFCDFP	R5F571MFDDFP	R5F571MFGDFP	R5F571MFHDFP	R5F571MGCDFP	R5F571MGDDFP	R5F571MGGDFP	R5F571MGHDFP	R5F571MJCDFP	R5F571MJDDFP	R5F571MJGDFP	R5F571MJHDFP	R5F571MLCDFP	R5F571MLDDFP	R5F571MLGDFP	R5F571MLHDFP	R5F571MFCDLJ	R5F571MFDDLJ	R5F571MFGDLJ	R5F571MFHDLJ
CPU	CPU core	RXv2																			
	Maximum operating frequency (MHz)	240																			
	FPU	YES																			
Memory	ROM (KB)	2048				2560				3072				4096				2048			
	RAM (KB)	552																			
	Data flash/E2 data flash (KB)	64																			
Clocks	Subclock (external: 32.768 kHz)	YES																			
	RTC	YES																			
	On-chip oscillator	YES (16/18/20 MHz)																			
Data transfer	DMAC (channels)	8																			
	EXDMAC (channels)	2																			
	DTC	YES																			
Bus	BSC	YES																			
Analog	A/D (resolution × channels)	12-bit × 22																			
	D/A (resolution × channels)	12-bit × 1																			
Timers	8-/16-/32-bit timers (channels)	4/22/3																			
	PWM outputs	57																			
	3-phase PWM output	YES																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	7+2 (with FIFO)																			
	SPI/QSPI (clock-synchronous only) (channels)	9/1																			
	I²C (channels)	9																			
	CAN (channels)	2																			
	SSI (channels)	2																			
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1																			
	IEEE1588	YES																			
	USB Host/Function/High Speed support	YES/YES/—																			
Security	Encryption	—	YES*1	—	YES*1	—	YES*1	—	YES*1	—	YES*1										
I/O	I/O ports	79																			
Other functions	ELC	YES																			
	Safety functions	YES																			
	PDC	YES																			
	External interrupts (pins)	16																			
Other	Power supply voltage (V)	2.7 V to 3.6 V																			
	Operating ambient temperature (℃)	–40 to 85 ℃																			
	Package	100-LQFP (14 × 14 mm)																100-TFLGA (7 × 7 mm)			

Note: 1. AES/DES/SHA/TRNG

RX71M (100 to 177 pins)

Group		RX71M																																																								
Pin count		100												144																	145																176											
Product name		R5F571MGCDLJ	R5F571MGDDLJ	R5F571MGGDLJ	R5F571MGHDLJ	R5F571MJCDLJ	R5F571MJDDLJ	R5F571MJGDLJ	R5F571MJHDLJ	R5F571MLCDLJ	R5F571MLDDLJ	R5F571MLGDLJ	R5F571MLHDLJ	R5F571MFCDFB	R5F571MFDDFB	R5F571MFGDFB	R5F571MFHDFB	R5F571MGCDFB	R5F571MGDDFB	R5F571MGGDFB	R5F571MGHDFB	R5F571MJCDFB	R5F571MJDDFB	R5F571MJGDFB		R5F571MJHDFB	R5F571MLCDFB	R5F571MLDDFB	R5F571MLGDFB	R5F571MLHDFB	R5F571MFCDLK	R5F571MFDDLK	R5F571MFGDLK	R5F571MFHDLK	R5F571MGCDLK	R5F571MGDDLK	R5F571MGGDLK	R5F571MGHDLK	R5F571MJCDLK	R5F571MJDDLK	R5F571MJGDLK	R5F571MJHDLK	R5F571MLCDLK	R5F571MLDDLK	R5F571MLGDLK	R5F571MLHDLK	R5F571MFCDBG	R5F571MFDDBG	R5F571MFGDBG	R5F571MFHDBG	R5F571MGCDBG	R5F571MGDDBG	R5F571MGGDBG	R5F571MGHDBG	R5F571MJCDBG	R5F571MJDDBG	R5F571MJGDBG	R5F571MJHDBG
CPU	CPU core	RXv2																																																						
	Maximum operating frequency (MHz)	240																																																							
	FPU	YES																																																							
Memory	ROM (KB)	2560				3072				4096				2048				2560				3072					4096				2048				2560				3072				4096				2048				2560				3072			
	RAM (KB)	552																																																							
	Data flash/E2 data flash (KB)	64																																																							
Clocks	Subclock (external: 32.768 kHz)	YES																																																							
	RTC	YES																																																							
	On-chip oscillator	YES (16/18/20 MHz)																																																							
Data transfer	DMAC (channels)	8																																																							
	EXDMAC (channels)	2																																																							
	DTC	YES																																																							
Bus	BSC	YES																																																							
Analog	A/D (resolution × channels)	12-bit × 22												12-bit × 29																																											
	D/A (resolution × channels)	12-bit × 1												12-bit × 2																																											
Timers	8-/16-/32-bit timers (channels)	4/22/3																																																							
	PWM outputs	57												66																																		63											
	3-phase PWM output	YES																																																							
Communications	SCI (clock-synchronous/asynchronous) (channels)	7 + 2 (with FIFO)												9 + 4 (with FIFO)																																											
	SPI/QSPI (clock-synchronous only) (channels)	9/1												11/1																																											
	I²C (channels)	9												11																																											
	CAN (channels)	2												3																																											
	SSI (channels)	2																																																							
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1		1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1																																												2											
	IEEE1588	YES																																																							
	USB Host/Function/High Speed support	YES/YES/—																																												YES/YES/YES											
Security	Encryption	—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1			—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1	
I/O	I/O ports	79												112																																		128											
Other functions	ELC	YES																																																							
	Safety functions	YES																																																							
	PDC	YES																																																							
	External interrupts (pins)	16																																																							
Other	Power supply voltage (V)	2.7 V to 3.6 V																																																							
	Operating ambient temperature (℃)	–40 to 85 ℃																																																							
	Package	100-TFLGA (7 × 7 mm)												144-LQFP (20 × 20 mm)																	145-TFLGA (7 × 7 mm)																176-LFBGA (13 × 13 mm)											

Note: 1. AES/DES/SHA/TRNG

RX71M (100 to 177 pins)

Group		RX71M																																			
Pin count		176																				177															
Product name		R5F571MLCDBG	R5F571MLDDBG	R5F571MLGDBG	R5F571MLHDBG	R5F571MFCDFC	R5F571MFDDFC	R5F571MFGDFC	R5F571MFHDFC	R5F571MGCDFC	R5F571MGDDFC	R5F571MGGDFC	R5F571MGHDFC	R5F571MJCDFC	R5F571MJDDFC	R5F571MJGDFC	R5F571MJHDFC	R5F571MLCDFC	R5F571MLDDFC	R5F571MLGDFC	R5F571MLHDFC	R5F571MFCDLC	R5F571MFDDLC	R5F571MFGDLC	R5F571MFHDLC	R5F571MGCDLC	R5F571MGDDLC	R5F571MGGDLC	R5F571MGHDLC	R5F571MJCDLC	R5F571MJDDLC	R5F571MJGDLC	R5F571MJHDLC	R5F571MLCDLC	R5F571MLDDLC	R5F571MLGDLC	R5F571MLHDLC
CPU	CPU core	RXv2																																			
	Maximum operating frequency (MHz)	240																																			
	FPU	YES																																			
Memory	ROM (KB)	4096				2048				2560				3072				4096				2048				2560				3072				4096			
	RAM (KB)	552																																			
	Data flash/E2 data flash (KB)	64																																			
Clocks	Subclock (external: 32.768 kHz)	YES																																			
	RTC	YES																																			
	On-chip oscillator	YES (16/18/20 MHz)																																			
Data transfer	DMAC (channels)	8																																			
	EXDMAC (channels)	2																																			
	DTC	YES																																			
Bus	BSC	YES																																			
Analog	A/D (resolution × channels)	12-bit × 29																																			
	D/A (resolution × channels)	12-bit × 2																																			
Timers	8-/16-/32-bit timers (channels)	4/22/3																																			
	PWM outputs	63																																			
	3-phase PWM output	YES																																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	9 + 4 (with FIFO)																																			
	SPI/QSPI (clock-synchronous only) (channels)	11/1																																			
	I²C (channels)	11																																			
	CAN (channels)	3																																			
	SSI (channels)	2																																			
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	2																																			
	IEEE1588	YES																																			
	USB Host/Function/High Speed support	YES/YES/YES																																			
Security	Encryption	—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1	
I/O	I/O ports	128																																			
Other functions	ELC	YES																																			
	Safety functions	YES																																			
	PDC	YES																																			
	External interrupts (pins)	16																																			
Other	Power supply voltage (V)	2.7 V to 3.6 V																																			
	Operating ambient temperature (℃)	–40 to 85 ℃																																			
	Package	176-LFBGA (13 × 13 mm)				176-LQFP (24 × 24 mm)																177-TFLGA (8 × 8 mm)															

Note: 1. AES/DES/SHA/TRNG

RX651 (100 to 177 pins)

Group		RX651																																															
Pin count		144				100				145				100				144				100				145				100				144				100				145				100			
Product name		R5F56514ADFB	R5F56514BDFB	R5F56514EDFB	R5F56514FDFB	R5F56514ADFP	R5F56514BDFP	R5F56514EDFP	R5F56514FDFP	R5F56514ADLK	R5F56514BDLK	R5F56514EDLK	R5F56514FDLK	R5F56514ADLJ	R5F56514BDLJ	R5F56514EDLJ	R5F56514FDLJ	R5F56517ADFB	R5F56517BDFB	R5F56517EDFB	R5F56517FDFB	R5F56517ADFP	R5F56517BDFP	R5F56517EDFP	R5F56517FDFP	R5F56517ADLK	R5F56517BDLK	R5F56517EDLK	R5F56517FDLK	R5F56517ADLJ	R5F56517BDLJ	R5F56517EDLJ	R5F56517FDLJ	R5F56519ADFB	R5F56519BDFB	R5F56519EDFB	R5F56519FDFB	R5F56519ADFP	R5F56519BDFP	R5F56519EDFP	R5F56519FDFP	R5F56519ADLK	R5F56519BDLK	R5F56519EDLK	R5F56519FDLK	R5F56519ADLJ	R5F56519BDLJ	R5F56519EDLJ	R5F56519FDLJ
CPU	CPU core	RXv2																																													
	Maximum operating frequency (MHz)	120																																													
	FPU	YES																																													
Memory	ROM (KB)	512																768																1,048															
	RAM (KB)	256																																													
	Dual bank function	NO																																													
Clocks	Subclock (external: 32.768 kHz)	YES																																													
	RTC	YES																																													
	On-chip oscillator	YES (16/18/20 MHz, low speed oscillator 240 KHz)																																													
Data transfer	DMAC (channels)	8																																													
	EXDMAC (channels)	2																																													
	DTC	YES																																													
Bus	BSC	YES																																													
Analog	A/D (resolution × channels)	12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22			
	D/A (resolution × channels)	12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1			
Timers	8-/16-/32-bit timers (channels)	4/18/3																																													
	PWM outputs	48																																													
	3-phase PWM output	YES																																													
Communications	SCI (clock-synchronous/asynchronous) (channels)	13				11				13				11				13				11				13				11				13				11				13				11			
	SPI/QSPI (clock-synchronous only) (channels)	16/1				14/1				16/1				14/1				16/1				14/1				16/1				14/1				16/1				14/1				16/1				14/1			
	I²C (channels)	15				13				15				13				15				13				15				13				15				13				15				13			
	CAN (channels)	2																																													
	Ether (channels)	0																																													
	SD Host/SD Slave/MMC (channels)	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1
	USB Host/Func	YES/YES																																													
Graphics	Graphic LCD controller	NO																																													
	2D rendering engine	NO																																													
Security	Encryption	NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]		NO		YES*[1]	
I/O	I/O ports	112				79				112				79				112				79				112				79				112				79				112				79			
Other functions	ELC	YES																																													
	Safety functions	YES																																													
	PDC	YES				NO				YES				NO				YES				NO				YES				NO				YES				NO				YES				NO			
	External interrupts (pins)	16																																													
Other	Power supply voltage (V)	2.7 V to 3.6 V																																													
	Operating ambient temperature (℃)	–40 to 85 ℃																																													
	Package	144-LFQFP (20 × 20 mm)				100-LFQFP (14 × 14 mm)				144-TFLGA (7 × 7 mm)				100-TFLGA (7 × 7 mm)				144-LFQFP (20 × 20 mm)				100-LFQFP (14 × 14 mm)				144-TFLGA (7 × 7 mm)				100-TFLGA (7 × 7 mm)				144-LFQFP (20 × 20 mm)				100-LFQFP (14 × 14 mm)				144-TFLGA (7 × 7 mm)				100-TFLGA (7 × 7 mm)			

Notes: 1. AES/TRNG

2. Incorporates Trusted Secure IP (integrated AES, DES, RSA, SHA, and TRNG)

RX651 (100 to 177 pins)

Group		RX651																									
Pin count		176		144		100		177		145		100		176				144		100		177		145		100		176	
Product name		R5F5651CDDFC	R5F5651CHDFC	R5F5651CDDFB	R5F5651CHDFB	R5F5651CDDFP	R5F5651CHDFP	R5F5651CDDLC	R5F5651CHDLC	R5F5651CDDLK	R5F5651CHDFB	R5F5651CDDLJ	R5F5651CHDLJ	R5F5651CDDBG	R5F5651CHDBG	R5F5651EDDFC	R5F5651EHDFC	R5F5651EDDFB	R5F5651EHDFB	R5F5651EDDFP	R5F5651EHDFP	R5F5651EDDLC	R5F5651EHDLC	R5F5651EDDLK	R5F5651EHDFB	R5F5651EDDLJ	R5F5651EHDLJ	R5F5651EDDBG	R5F5651EHDBG
CPU	CPU core	RXv2																									
	Maximum operating frequency (MHz)	120																									
	FPU	YES																									
Memory	ROM (KB)	1,536																		2,096							
	RAM (KB)	640																									
	Dual bank function	YES																									
Clocks	Subclock (external: 32.768 kHz)	YES																									
	RTC	YES																									
	On-chip oscillator	YES (16/18/20 MHz, low speed oscillator 240 KHz)																									
Data transfer	DMAC (channels)	8																									
	EXDMAC (channels)	2																									
	DTC	YES																									
Bus	BSC	YES																									
Analog	A/D (resolution × channels)	12-bit × 29				12-bit × 22		12-bit × 29				12-bit × 22		12-bit × 29						12-bit × 22		12-bit × 29				12-bit × 22		12-bit × 29	
	D/A (resolution × channels)	12-bit × 2				12-bit × 1		12-bit × 2				12-bit × 1		12-bit × 2						12-bit × 1		12-bit × 2				12-bit × 1		12-bit × 2	
Timers	8-/16-/32-bit timers (channels)	4/18/3																									
	PWM outputs	48																									
	3-phase PWM output	YES																									
Communications	SCI (clock-synchronous/asynchronous) (channels)	13				11		13				11		13						11		13				11		13	
	SPI/QSPI (clock-synchronous only) (channels)	16/1				14/1		16/1				14/1		16/1						14/1		16/1				14/1		16/1	
	I²C (channels)	16				13		16				13		16						13		16				13		16	
	CAN (channels)	2																									
	Ether (channels)	0																									
	SD Host/SD Slave/MMC (channels)	1/1/1																									
	USB Host/Func	YES/YES																									
Graphics	Graphic LCD controller	YES																									
	2D rendering engine	YES																									
Security	Encryption	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2
I/O	I/O ports	137																									
Other functions	ELC	YES																									
	Safety functions	YES																									
	PDC	YES				NO		YES				NO		YES						NO		YES				NO		YES	
	External interrupts (pins)	16																									
Other	Power supply voltage (V)	2.7 V to 3.6 V																									
	Operating ambient temperature (℃)	–40 to 85 ℃																									
	Package	176-LQFP (24 × 24 mm)		144-LQFP (20 × 20 mm)		100-LQFP (14 × 14 mm)		177-TFLGA (9 × 9 mm)		145-TFLGA (7 × 7 mm)		100-TFLGA (7 × 7 mm)		176-LFBGA (13 × 13 mm)		176-LQFP (24 × 24 mm)		144-LQFP (20 × 20 mm)		100-LQFP (14 × 14 mm)		177-TFLGA (9 × 9 mm)		145-TFLGA (7 × 7 mm)		100-TFLGA (7 × 7 mm)		176-LFBGA (13 × 13 mm)	

Notes: 1. AES/TRNG

2. Incorporates Trusted Secure IP (integrated AES, DES, RSA, SHA, and TRNG)

RX65N (100 to 177 pins)

Group		RX65N																																															
Pin count		144				100				145				100				144				100				145				100				144				100				145				100			
Product name		R5F565N4ADFB	R5F565N4BDFB	R5F565N4EDFB	R5F565N4FDFB	R5F565N4ADFP	R5F565N4BDFP	R5F565N4EDFP	R5F565N4FDFP	R5F565N4ADLK	R5F565N4BDLK	R5F565N4EDLK	R5F565N4FDLK	R5F565N4ADLJ	R5F565N4BDLJ	R5F565N4EDLJ	R5F565N4FDLJ	R5F565N7ADFB	R5F565N7BDFB	R5F565N7EDFB	R5F565N7FDFB	R5F565N7ADFP	R5F565N7BDFP	R5F565N7EDFP	R5F565N7FDFP	R5F565N7ADLK	R5F565N7BDLK	R5F565N7EDLK	R5F565N7FDLK	R5F565N7ADLJ	R5F565N7BDLJ	R5F565N7EDLJ	R5F565N7FDLJ	R5F565N9ADFB	R5F565N9BDFB	R5F565N9EDFB	R5F565N9FDFB	R5F565N9ADFP	R5F565N9BDFP	R5F565N9EDFP	R5F565N9FDFP	R5F565N9ADLK	R5F565N9BDLK	R5F565N9EDLK	R5F565N9FDLK	R5F565N9ADLJ	R5F565N9BDLJ	R5F565N9EDLJ	R5F565N9FDLJ
CPU	CPU core	RXv2																																													
	Maximum operating frequency (MHz)	120																																													
	FPU	YES																																													
Memory	ROM (KB)	512																768																1,048															
	RAM (KB)	256																																													
	Dual bank function	NO																																													
	BGO function	NO																																													
Clocks	Subclock (external: 32.768 kHz)	YES																																													
	RTC	YES																																													
	On-chip oscillator	YES (16/18/20 MHz, low speed oscillator 240 KHz)																																													
Data transfer	DMAC (channels)	8																																													
	EXDMAC (channels)	2																																													
	DTC	YES																																													
Bus	BSC	YES																																													
Analog	A/D (resolution × channels)	12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22				12-bit × 29				12-bit × 22			
	D/A (resolution × channels)	12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1				12-bit × 2				12-bit × 1			
Timers	8-/16-/32-bit timers (channels)	4/18/3																																													
	PWM outputs	48																																													
	3-phase PWM output	YES																																													
Communications	SCI (clock-synchronous/asynchronous) (channels)	13				11				13				11				13				11				13				11				13				11				13				11			
	SPI/QSPI (clock-synchronous only) (channels)	16/1				14/1				16/1				14/1				16/1				14/1				16/1				14/1				16/1				14/1				16/1				14/1			
	I^{2}C (channels)	15				13				15				13				15				13				15				13				15				13				15				13			
	CAN (channels)	2																																													
	Ether (channels)	1																																													
	SD Host/SD Slave/MMC (channels)	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1	0/0/1	1/1/1
	USB Host/Func	YES/YES																																													
Graphics	Graphic LCD controller	NO																																													
	2D rendering engine	NO																																													
Security	Encryption	NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1		NO		YES*1	
I/O	I/O ports	112				79				112				79				112				79				112				79				112				79				112				79			
Other functions	ELC	YES																																													
	Safety functions	YES																																													
	PDC	YES				NO				YES				NO				YES				NO				YES				NO				YES				NO				YES				NO			
	External interrupts (pins)	16																																													
Other	Power supply voltage (V)	2.7 V to 3.6 V																																													
	Operating ambient temperature (℃)	–40 to 85 ℃																																													
	Package	144-LFQFP (20 × 20 mm)				100-LFQFP (14 × 14 mm)				144-TFLGA (7 × 7 mm)				100-TFLGA (7 × 7 mm)				144-LFQFP (20 × 20 mm)				100-LFQFP (14 × 14 mm)				144-TFLGA (7 × 7 mm)				100-TFLGA (7 × 7 mm)				144-LFQFP (20 × 20 mm)				100-LFQFP (14 × 14 mm)				144-TFLGA (7 × 7 mm)				100-TFLGA (7 × 7 mm)			

Notes: 1. AES/TRNG

2. Incorporates Trusted Secure IP (integrated AES, DES, RSA, SHA, and TRNG)

RX65N (100 to 177 pins)

Group		RX65N																									
Pin count		176		144		100		177		145		100		176				144		100		177		145		100		176	
Product name		R5F565NCDDFC	R5F565NCHDFC	R5F565NCDDFB	R5F565NCHDFB	R5F565NCDDFP	R5F565NCHDFP	R5F565NCDDLC	R5F565NCHDLC	R5F565NCDDLK	R5F565NCHDFB	R5F565NCDDLJ	R5F565NCHDLJ	R5F565NCDDBG	R5F565NCHDBG	R5F565NEDDFC	R5F565NEHDFC	R5F565NEDDFB	R5F565NEHDFB	R5F565NEDDFP	R5F565NEHDFP	R5F565NEDDLC	R5F565NEHDLC	R5F565NEDDLK	R5F565NEHDFB	R5F565NEDDLJ	R5F565NEHDLJ	R5F565NEDDBG	R5F565NEHDBG
CPU	CPU core	RXv2																									
	Maximum operating frequency (MHz)	120																									
	FPU	YES																									
Memory	ROM (KB)	1,536																2,096									
	RAM (KB)	640																									
	Dual bank function	YES																									
	BGO function	YES																									
Clocks	Subclock (external: 32.768 kHz)	YES																									
	RTC	YES																									
	On-chip oscillator	YES (16/18/20 MHz, low speed oscillator 240 KHz)																									
Data transfer	DMAC (channels)	8																									
	EXDMAC (channels)	2																									
	DTC	YES																									
Bus	BSC	YES																									
Analog	A/D (resolution × channels)	12-bit × 29				12-bit × 22		12-bit × 29				12-bit × 22		12-bit × 29						12-bit × 22		12-bit × 29				12-bit × 22		12-bit × 29	
	D/A (resolution × channels)	12-bit × 2				12-bit × 1		12-bit × 2				12-bit × 1		12-bit × 2						12-bit × 1		12-bit × 2				12-bit × 1		12-bit × 2	
Timers	8-/16-/32-bit timers (channels)	4/18/3																									
	PWM outputs	48																									
	3-phase PWM output	YES																									
Communications	SCI (clock-synchronous/asynchronous) (channels)	13				11		13				11		13						11		13				11		13	
	SPI/QSPI (clock-synchronous only) (channels)	16/1				14/1		16/1				14/1		16/1						14/1		16/1				14/1		16/1	
	I²C (channels)	16				13		16				13		16						13		16				13		16	
	CAN (channels)	2																									
	Ether (channels)	1																									
	SD Host/SD Slave/MMC (channels)	1/1/1																									
	USB Host/Func	YES/YES																									
Graphics	Graphic LCD controller	YES																									
	2D rendering engine	YES																									
Security	Encryption	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2			NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2	NO	YES*2
I/O	I/O ports	137																									
Other functions	ELC	YES																									
	Safety functions	YES																									
	PDC	YES				NO		YES				NO		YES						NO		YES				NO		YES	
	External interrupts (pins)	16																									
Other	Power supply voltage (V)	2.7 V to 3.6 V																									
	Operating ambient temperature (℃)	–40 to 85 ℃																									
	Package	176-LQFP (24 × 24 mm)		144-LQFP (20 × 20 mm)		100-LQFP (14 × 14 mm)		177-TFLGA (9 × 9 mm)		145-TFLGA (7 × 7 mm)		100-TFLGA (7 × 7 mm)		176-LFBGA (13 × 13 mm)		176-LQFP (24 × 24 mm)		144-LQFP (20 × 20 mm)		100-LQFP (14 × 14 mm)		177-TFLGA (9 × 9 mm)		145-TFLGA (7 × 7 mm)		100-TFLGA (7 × 7 mm)		176-LFBGA (13 × 13 mm)	

Notes: 1. AES/TRNG
2. Incorporates Trusted Secure IP (integrated AES, DES, RSA, SHA, and TRNG)

RX64M (100 to 177 pins)

Group		RX64M															
Pin count		100															
Product name		R5F564MFCDFP	R5F564MFDDFP	R5F564MFGDFP	R5F564MFHDFP	R5F564MGCDFP	R5F564MGDDFP	R5F564MGGDFP	R5F564MGHDFP	R5F564MJCDFP	R5F564MJDDFP	R5F564MJGDFP	R5F564MJHDFP	R5F564MLCDFP	R5F564MLDDFP	R5F564MLGDFP	R5F564MLHDFP
CPU	CPU core	RXv2															
	Maximum operating frequency (MHz)	120															
	FPU	YES															
Memory	ROM (KB)	2048				2560				3072				4096			
	RAM (KB)	552															
	Data flash/E2 data flash (KB)	64															
Clocks	Subclock (external: 32.768 kHz)	YES															
	RTC	YES															
	On-chip oscillator	YES (16/18/20 MHz)															
Data transfer	DMAC (channels)	8															
	EXDMAC (channels)	2															
	DTC	YES															
Bus	BSC	YES															
Analog	A/D (resolution × channels)	12-bit × 22															
	D/A (resolution × channels)	12-bit × 1															
Timers	8-/16-/32-bit timers (channels)	4/22/3															
	PWM outputs	57															
	3-phase PWM output	YES															
Communications	SCI (clock-synchronous/asynchronous) (channels)	7 + 2 (with FIFO)															
	SPI/QSPI (clock-synchronous only) (channels)	8/1															
	I²C (channels)	9															
	CAN (channels)	2															
	SSI (channels)	2															
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1															
	IEEE1588	YES															
	USB Host/Func	YES/YES															
Security	Encryption	—		YES*1		—		YES*1		—		YES*1		—		YES*1	
I/O	I/O ports	79															
Other functions	ELC	YES															
	Safety functions	YES															
	PDC	—															
	External interrupts (pins)	16															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Package	100-LQFP (14 × 14 mm)															

Group		RX64M															
Pin count		100															
Product name		R5F564MFCDLJ	R5F564MFDDLJ	R5F564MFGDLJ	R5F564MFHDLJ	R5F564MGCDLJ	R5F564MGDDLJ	R5F564MGGDLJ	R5F564MGHDLJ	R5F564MJCDLJ	R5F564MJDDLJ	R5F564MJGDLJ	R5F564MJHDLJ	R5F564MLCDLJ	R5F564MLDDLJ	R5F564MLGDLJ	R5F564MLHDLJ
CPU	CPU core	RXv2															
	Maximum operating frequency (MHz)	120															
	FPU	YES															
Memory	ROM (KB)	2048				2560				3072				4096			
	RAM (KB)	552															
	Data flash/E2 data flash (KB)	64															
Clocks	Subclock (external: 32.768 kHz)	YES															
	RTC	YES															
	On-chip oscillator	YES (16/18/20 MHz)															
Data transfer	DMAC (channels)	8															
	EXDMAC (channels)	2															
	DTC	YES															
Bus	BSC	YES															
Analog	A/D (resolution × channels)	12-bit × 22															
	D/A (resolution × channels)	12-bit × 1															
Timers	8-/16-/32-bit timers (channels)	4/22/3															
	PWM outputs	57															
	3-phase PWM output	YES															
Communications	SCI (clock-synchronous/asynchronous) (channels)	7 + 2 (with FIFO)															
	SPI/QSPI (clock-synchronous only) (channels)	8/1															
	I²C (channels)	9															
	CAN (channels)	2															
	SSI (channels)	2															
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1															
	IEEE1588	YES															
	USB Host/Func	YES/YES															
Security	Encryption	—		YES*1		—		YES*1		—		YES*1		—		YES*1	
I/O	I/O ports	79															
Other functions	ELC	YES															
	Safety functions	YES															
	PDC	—															
	External interrupts (pins)	16															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Package	100-TFLGA (7 × 7 mm)															

Group		RX64M															
Pin count		144															
Product name		R5F564MFCDFB	R5F564MFDDFB	R5F564MFGDFB	R5F564MFHDFB	R5F564MGCDFB	R5F564MGDDFB	R5F564MGGDFB	R5F564MGHDFB	R5F564MJCDFB	R5F564MJDDFB	R5F564MJGDFB	R5F564MJHDFB	R5F564MLCDFB	R5F564MLDDFB	R5F564MLGDFB	R5F564MLHDFB
CPU	CPU core	RXv2															
	Maximum operating frequency (MHz)	120															
	FPU	YES															
Memory	ROM (KB)	2048				2560				3072				4096			
	RAM (KB)	552															
	Data flash/E2 data flash (KB)	64															
Clocks	Subclock (external: 32.768 kHz)	YES															
	RTC	YES															
	On-chip oscillator	YES (16/18/20 MHz)															
Data transfer	DMAC (channels)	8															
	EXDMAC (channels)	2															
	DTC	YES															
Bus	BSC	YES															
Analog	A/D (resolution × channels)	12-bit × 29															
	D/A (resolution × channels)	12-bit × 2															
Timers	8-/16-/32-bit timers (channels)	4/22/3															
	PWM outputs	66															
	3-phase PWM output	YES															
Communications	SCI (clock-synchronous/asynchronous) (channels)	9 + 4 (with FIFO)															
	SPI/QSPI (clock-synchronous only) (channels)	10/1															
	I²C (channels)	11															
	CAN (channels)	3															
	SSI (channels)	2															
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1															
	IEEE1588	YES															
	USB Host/Func	YES/YES															
Security	Encryption	—		YES*1		—		YES*1		—		YES*1		—		YES*1	
I/O	I/O ports	112															
Other functions	ELC	YES															
	Safety functions	YES															
	PDC	YES															
	External interrupts (pins)	16															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Package	144-LQFP (20 × 20 mm)															

Group		RX64M							
Pin count		145							
Product name		R5F564MFCDLK	R5F564MFDDLK	R5F564MFGDLK	R5F564MFHDLK	R5F564MGCDLK	R5F564MGDDLK	R5F564MGGDLK	R5F564MGHDLK
CPU	CPU core	RXv2							
	Maximum operating frequency (MHz)	120							
	FPU	YES							
Memory	ROM (KB)	2048				2560			
	RAM (KB)	552							
	Data flash/E2 data flash (KB)	64							
Clocks	Subclock (external: 32.768 kHz)	YES							
	RTC	YES							
	On-chip oscillator	YES (16/18/20 MHz)							
Data transfer	DMAC (channels)	8							
	EXDMAC (channels)	2							
	DTC	YES							
Bus	BSC	YES							
Analog	A/D (resolution × channels)	12-bit × 29							
	D/A (resolution × channels)	12-bit × 2							
Timers	8-/16-/32-bit timers (channels)	4/22/3							
	PWM outputs	66							
	3-phase PWM output	YES							
Communications	SCI (clock-synchronous/asynchronous) (channels)	9 + 4 (with FIFO)							
	SPI/QSPI (clock-synchronous only) (channels)	10/1							
	I²C (channels)	11							
	CAN (channels)	3							
	SSI (channels)	2							
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1							
	IEEE1588	YES							
	USB Host/Func	YES/YES							
Security	Encryption	—		YES*1		—		YES*1	
I/O	I/O ports	112							
Other functions	ELC	YES							
	Safety functions	YES							
	PDC	YES							
	External interrupts (pins)	16							
Other	Power supply voltage (V)	2.7 V to 3.6 V							
	Operating ambient temperature (℃)	–40 to 85 ℃							
	Package	145-TFLGA (7 × 7 mm)							

Note: 1. AES/DES/SHA/TRNG

RX64M (100 to 177 pins)

Group		RX64M																																																					
Pin count		145								176																																177															
Product name		R5F564MJCDLK	R5F564MJDDLK	R5F564MJGDLK	R5F564MJHDLK	R5F564MLCDLK	R5F564MLDDLK	R5F564MLGDLK	R5F564MLHDLK	R5F564MFCDBG	R5F564MFDDBG	R5F564MFGDBG	R5F564MFHDBG	R5F564MGCDBG	R5F564MGDDBG	R5F564MGGDBG	R5F564MGHDBG	R5F564MJCDBG	R5F564MJDDBG	R5F564MJGDBG	R5F564MJHDBG	R5F564MLCDBG	R5F564MLDDBG	R5F564MLGDBG	R5F564MLHDBG	R5F564MFCDFC	R5F564MFDDFC	R5F564MFGDFC	R5F564MFHDFC	R5F564MGCDFC	R5F564MGDDFC	R5F564MGGDFC	R5F564MGHDFC	R5F564MJCDFC	R5F564MJDDFC	R5F564MJGDFC	R5F564MJHDFC	R5F564MLCDFC	R5F564MLDDFC	R5F564MLGDFC	R5F564MLHDFC	R5F564MFCDLC	R5F564MFDDLC	R5F564MFGDLC	R5F564MFHDLC	R5F564MGCDLC	R5F564MGDDLC	R5F564MGGDLC	R5F564MGHDLC	R5F564MJCDLC	R5F564MJDDLC	R5F564MJGDLC	R5F564MJHDLC	R5F564MLCDLC	R5F564MLDDLC	R5F564MLGDLC	R5F564MLHDLC
CPU	CPU core	RXv2																																																					
	Maximum operating frequency (MHz)	120																																																					
	FPU	YES																																																					
Memory	ROM (KB)	3072				4096				2048				2560				3072				4096				2048				2560				3072				4096				2048				2560				3072				4096			
	RAM (KB)	552																																																					
	Data flash/E2 data flash (KB)	64																																																					
Clocks	Subclock (external: 32.768 kHz)	YES																																																					
	RTC	YES																																																					
	On-chip oscillator	YES (16/18/20 MHz)																																																					
Data transfer	DMAC (channels)	8																																																					
	EXDMAC (channels)	2																																																					
	DTC	YES																																																					
Bus	BSC	YES																																																					
Analog	A/D (resolution × channels)	12-bit × 29																																																				
	D/A (resolution × channels)	12-bit × 2																																																					
Timers	8-/16-/32-bit timers (channels)	4/22/3																																																					
	PWM outputs	66								63																																													
	3-phase PWM output	YES																																																					
Communications	SCI (clock-synchronous/asynchronous) (channels)	9 + 4 (with FIFO)																																																				
	SPI/QSPI (clock-synchronous only) (channels)	10/1																																																					
	I²C (channels)	11																																																					
	CAN (channels)	3																																																					
	SSI (channels)	2																																																					
	SD Host/MMC (channels)	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1	—/1	1/1
	Ether (channels)	1								2																																													
	IEEE1588	YES																																																					
	USB Host/Func	YES/YES																																																					
Security	Encryption	—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1		—		YES*1	
I/O	I/O ports	112								128																																													
Other functions	ELC	YES																																																					
	Safety functions	YES																																																					
	PDC	YES																																																						
	External interrupts (pins)	16																																																					
Other	Power supply voltage (V)	2.7 V to 3.6 V																																																					
	Operating ambient temperature (℃)	–40 to 85℃																																																					
	Package	145-TFLGA (7 × 7 mm)								176-LFBGA (13 × 13 mm)																176-LQFP (24 × 24 mm)																177-TFLGA (8 × 8 mm)															

Note: 1. AES/DES/SHA/TRNG

RX631 (48 to 176 pins)

<table>
<tr><td colspan="2">Group</td><td colspan="57">RX631</td></tr>
<tr><td colspan="2">Pin count</td><td colspan="6">48</td><td colspan="8">64</td><td colspan="37">100</td><td colspan="6">144</td></tr>
<tr><td colspan="2">Product name</td><td>R5F5631MCDFL</td><td>R5F5631MDDFL</td><td>R5F5631NCDFL</td><td>R5F5631NDDFL</td><td>R5F5631PCDFL</td><td>R5F5631PDDFL</td><td>R5F5631MCDFM</td><td>R5F5631MDDFM</td><td>R5F5631NCDFM</td><td>R5F5631NDDFM</td><td>R5F5631PCDFM</td><td>R5F5631PDDFM</td><td>R5F5631MFDLH</td><td>R5F5631PFDLH</td><td>R5F56316CDFP</td><td>R5F56316DDFP</td><td>R5F56317CDFP</td><td>R5F56317DDFP</td><td>R5F56318CDFP</td><td>R5F56318DDFP</td><td>R5F5631ACDFP</td><td>R5F5631ADDFP</td><td>R5F5631BCDFP</td><td>R5F5631BDDFP</td><td>R5F5631WDDFP</td><td>R5F5631WHDFP</td><td>R5F5631YDDFP</td><td>R5F5631YHDFP</td><td>R5F5631DCDFP</td><td>R5F5631DDDFP</td><td>R5F5631GDDFP</td><td>R5F5631JDDFP</td><td>R5F5631ECDFP</td><td>R5F5631EDDFP</td><td>R5F5631KDDFP</td><td>R5F5631FDDFP</td><td>R5F5631FHDFP</td><td>R5F56316CDLJ</td><td>R5F56316DDLJ</td><td>R5F56317CDLJ</td><td>R5F56317DDLJ</td><td>R5F56318CDLJ</td><td>R5F56318DDLJ</td><td>R5F5631ACDLJ</td><td>R5F5631ADDLJ</td><td>R5F5631BCDLJ</td><td>R5F5631BDDLJ</td><td>R5F5631DCDLJ</td><td>R5F5631DDDLJ</td><td>R5F5631ECDLJ</td><td>R5F5631EDDLJ</td><td>R5F56316CDFB</td><td>R5F56316DDFB</td><td>R5F56316SDFB</td><td>R5F56317CDFB</td><td>R5F56317DDFB</td><td>R5F56317SDFB</td></tr>
<tr><td rowspan="3">CPU</td><td>CPU core</td><td colspan="57">RXv1</td></tr>
<tr><td>Maximum operating frequency (MHz)</td><td colspan="57">100</td></tr>
<tr><td>FPU</td><td colspan="57">YES</td></tr>
<tr><td rowspan="3">Memory</td><td>ROM (KB)</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td>256</td><td>512</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">768</td><td colspan="6">1024</td><td colspan="4">1536</td><td colspan="5">2048</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">768</td><td colspan="2">1024</td><td colspan="2">1536</td><td colspan="2">2048</td><td colspan="3">256</td><td colspan="3">384</td></tr>
<tr><td>RAM (KB)</td><td colspan="14">64</td><td colspan="10">128</td><td colspan="2">192</td><td colspan="2">256</td><td colspan="2">128</td><td>192</td><td>256</td><td colspan="2">128</td><td>192</td><td colspan="2">256</td><td colspan="20">128</td></tr>
<tr><td>Data flash/E2 data flash (KB)</td><td colspan="57">32</td></tr>
<tr><td rowspan="3">Clocks</td><td>Subclock (external: 32.768 kHz)</td><td colspan="6">NO</td><td colspan="51">YES</td></tr>
<tr><td>RTC</td><td colspan="6">NO</td><td colspan="51">YES</td></tr>
<tr><td>On-chip oscillator</td><td colspan="57">YES (50 MHz, low speed oscillator 125 kHz)</td></tr>
<tr><td rowspan="3">Data transfer</td><td>DMAC (channels)</td><td colspan="57">4</td></tr>
<tr><td>EXDMAC (channels)</td><td colspan="14">—</td><td colspan="43">2</td></tr>
<tr><td>DTC</td><td colspan="57">YES</td></tr>
<tr><td>Bus</td><td>BSC</td><td colspan="14">—</td><td colspan="43">YES</td></tr>
<tr><td rowspan="2">Analog</td><td>A/D (resolution × channels)</td><td colspan="6">12-bit × 8</td><td colspan="8">12-bit × 12</td><td colspan="37">10-bit × 8, 12-bit × 14</td><td colspan="6">10-bit × 8, 12-bit × 21</td></tr>
<tr><td>D/A (resolution × channels)</td><td colspan="6">—</td><td colspan="45">10-bit × 1</td><td colspan="6">10-bit × 2</td></tr>
<tr><td rowspan="3">Timers</td><td>8-/16-/32-bit timers (channels)</td><td colspan="51">4/16/—</td><td colspan="6">4/22/—</td></tr>
<tr><td>PWM outputs</td><td colspan="51">32</td><td colspan="6">48</td></tr>
<tr><td>3-phase PWM output</td><td colspan="57">YES</td></tr>
<tr><td rowspan="5">Communications</td><td>SCI (clock-synchronous/asynchronous) (channels)</td><td colspan="6">5</td><td colspan="8">6</td><td colspan="37">9</td><td colspan="6">13</td></tr>
<tr><td>SPI/QSPI (clock-synchronous only) (channels)</td><td colspan="6">7/—</td><td colspan="8">8/—</td><td colspan="37">11/—</td><td colspan="6">16/—</td></tr>
<tr><td>I²C (channels)</td><td colspan="6">6</td><td colspan="8">7</td><td colspan="37">11</td><td colspan="6">17</td></tr>
<tr><td>CAN (channels)</td><td>—</td><td>1</td><td>—</td><td>1</td><td>—</td><td>1</td><td>—</td><td>1</td><td>—</td><td>1</td><td>—</td><td colspan="3">1</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td colspan="5">2</td><td>—</td><td colspan="3">2</td><td>—</td><td colspan="4">2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td colspan="2">2</td><td>—</td><td colspan="2">2</td></tr>
<tr><td>USB Host/Func</td><td colspan="57">YES/YES</td></tr>
<tr><td>Security</td><td>Encryption</td><td colspan="25">—</td><td>YES*1</td><td>—</td><td>YES*1</td><td colspan="8">—</td><td>YES*1</td><td colspan="20">—</td></tr>
<tr><td>I/O</td><td>I/O ports</td><td colspan="6">30</td><td colspan="6">42</td><td colspan="2">40</td><td colspan="37">79</td><td colspan="6">112</td></tr>
<tr><td rowspan="3">Other functions</td><td>Safety functions</td><td colspan="57">YES</td></tr>
<tr><td>PDC</td><td colspan="53">—</td><td>YES</td><td colspan="2">—</td><td>YES</td></tr>
<tr><td>External interrupts (pins)</td><td colspan="14">13</td><td colspan="43">16</td></tr>
<tr><td rowspan="3">Other</td><td>Power supply voltage (V)</td><td colspan="57">2.7 V to 3.6 V</td></tr>
<tr><td>Operating ambient temperature (℃)</td><td colspan="57">–40 to 85 ℃</td></tr>
<tr><td>Package</td><td colspan="6">48-LFQFP (7 × 7 mm)</td><td colspan="6">64-LFQFP (10 × 10 mm)</td><td colspan="2">64-TFLGA (6 × 6 mm)</td><td colspan="23">100-LFQFP (14 × 14 mm)</td><td colspan="14">100-TFLGA (7 × 7 mm)</td><td colspan="6">144-LFQFP (20 × 20 mm)</td></tr>
</table>

Note: 1. AES

RX631 (48 to 176 pins)

Group		RX631																			
Pin count		144																			
Product name		R5F56318CDFB	R5F56318DDFB	R5F56318SDFB	R5F5631ACDFB	R5F5631ADDFB	R5F5631BCDFB	R5F5631BDDFB	R5F5631WDDFB	R5F5631WHDFB	R5F5631YDDFB	R5F5631YHDFB	R5F5631DCDFB	R5F5631DDDFB	R5F5631GDDFB	R5F5631JDDFB	R5F5631ECDFB	R5F5631EDDFB	R5F5631KDDFB	R5F5631FDDFB	R5F5631FHDFB
CPU	CPU core	RXv1																			
	Maximum operating frequency (MHz)	100																			
	FPU	YES																			
Memory	ROM (KB)	512			768		1024						1536				2048				
	RAM (KB)	128							192		256		128		192	256	128		192	256	
	Data flash/E2 data flash (KB)	32																			
Clocks	Subclock (external: 32.768 kHz)	YES																			
	RTC	YES																			
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																			
Data transfer	DMAC (channels)	4																			
	EXDMAC (channels)	2																			
	DTC	YES																			
Bus	BSC	YES																			
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 21																			
	D/A (resolution × channels)	10-bit × 2																			
Timers	8-/16-/32-bit timers (channels)	4/22/—																			
	PWM outputs	48																			
	3-phase PWM output	YES																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	13																			
	SPI/QSPI (clock-synchronous only) (channels)	16/—																			
	I^{2}C (channels)	17																			
	CAN (channels)	—	2		—	2	—	2					—	3			—	3			
	USB Host/Func	YES/YES																			
Security	Encryption	—								YES*1	—	YES*1	—								YES*1
I/O	I/O ports	112																			
Other functions	Safety functions	YES																			
	PDC	—		YES	—																
	External interrupts (pins)	16																			
Other	Power supply voltage (V)	2.7 V to 3.6 V																			
	Operating ambient temperature (℃)	–40 to 85 ℃																			
	Package	144-LFQFP (20 × 20 mm)																			

Group		RX631																
Pin count		145																
Product name		R5F56316CDLK	R5F56316DDLK	R5F56316SDLK	R5F56317CDLK	R5F56317DDLK	R5F56317SDLK	R5F56318CDLK	R5F56318DDLK	R5F56318SDLK	R5F5631ACDLK	R5F5631ADDLK	R5F5631BCDLK	R5F5631BDDLK	R5F5631DCDLK	R5F5631DDDLK	R5F5631ECDLK	R5F5631EDDLK
CPU	CPU core	RXv1																
	Maximum operating frequency (MHz)	100																
	FPU	YES																
Memory	ROM (KB)	256			384			512			768		1024		1536		2048	
	RAM (KB)	128																
	Data flash/E2 data flash (KB)	32																
Clocks	Subclock (external: 32.768 kHz)	YES																
	RTC	YES																
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																
Data transfer	DMAC (channels)	4																
	EXDMAC (channels)	2																
	DTC	YES																
Bus	BSC	YES																
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 21																
	D/A (resolution × channels)	10-bit × 2																
Timers	8-/16-/32-bit timers (channels)	4/22/—																
	PWM outputs	48																
	3-phase PWM output	YES																
Communications	SCI (clock-synchronous/asynchronous) (channels)	13																
	SPI/QSPI (clock-synchronous only) (channels)	16/—																
	I^{2}C (channels)	17																
	CAN (channels)	—	2		—	2		—	2		—	2	—	2	—	3	—	3
	USB Host/Func	YES/YES			YES/YES													
Security	Encryption	—			—													
I/O	I/O ports	112																
Other functions	Safety functions	YES			YES													
	PDC	—		YES	—		YES	—		YES	—							
	External interrupts (pins)	16																
Other	Power supply voltage (V)	2.7 V to 3.6 V																
	Operating ambient temperature (℃)	–40 to 85 ℃																
	Package	145-TFLGA (7 × 7 mm)																

Group		RX631																
Pin count		176																
Product name		R5F56316CDBG	R5F56316DDBG	R5F56316SDBG	R5F56317CDBG	R5F56317DDBG	R5F56317SDBG	R5F56318CDBG	R5F56318DDBG	R5F56318SDBG	R5F5631ACDBG	R5F5631ADDBG	R5F5631BCDBG	R5F5631BDDBG	R5F5631DCDBG	R5F5631DDDBG	R5F5631ECDBG	R5F5631EDDBG
CPU	CPU core	RXv1																
	Maximum operating frequency (MHz)	100																
	FPU	YES																
Memory	ROM (KB)	256			384			512			768		1024		1536		2048	
	RAM (KB)	128																
	Data flash/E2 data flash (KB)	32																
Clocks	Subclock (external: 32.768 kHz)	YES																
	RTC	YES																
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																
Data transfer	DMAC (channels)	4																
	EXDMAC (channels)	2																
	DTC	YES																
Bus	BSC	YES																
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 21																
	D/A (resolution × channels)	10-bit × 2																
Timers	8-/16-/32-bit timers (channels)	4/22/—																
	PWM outputs	48																
	3-phase PWM output	YES																
Communications	SCI (clock-synchronous/asynchronous) (channels)	13																
	SPI/QSPI (clock-synchronous only) (channels)	16/—																
	I^{2}C (channels)	17																
	CAN (channels)	—	2		—	2		—	2		—	2	—	2	—	3	—	3
	USB Host/Func	YES/YES																
Security	Encryption	—																
I/O	I/O ports	134																
Other functions	Safety functions	YES																
	PDC	—		YES	—		YES	—		YES	—							
	External interrupts (pins)	16																
Other	Power supply voltage (V)	2.7 V to 3.6 V																
	Operating ambient temperature (℃)	–40 to 85 ℃																
	Package	176-LFBGA (13 × 13 mm)																

Note: 1. AES

RX631 (48 to 176 pins)

Product name		R5S56310CDFC	R5F56316CDFC	R5F56316DDFC	R5F56316SDFC	R5F56317CDFC	R5F56317DDFC	R5F56317SDFC	R5F56318CDFC	R5F56318DDFC	R5F56318SDFC	R5F5631ACDFC	R5F5631ADDFC	R5F5631BCDFC	R5F5631BDDFC	R5F5631WDDFC	R5F5631WHDFC	R5F5631YDDFC	R5F5631YHDFC	R5F5631DCDFC	R5F5631DDDFC	R5F5631ECDFC	R5F5631EDDFC	R5F5631KDDFC	R5F5631FDDFC	R5F5631FHDFC
Group		RX631																								
Pin count		176																								
CPU	CPU core	RXv1																								
	Maximum operating frequency (MHz)	100																								
	FPU	YES																								
Memory	ROM (KB)	0	256			384			512			768		1024						1536		2048				
	RAM (KB)	128														192		256		128				192	256	
	Data flash/E2 data flash (KB)	0	32																							
Clocks	Subclock (external: 32.768 kHz)	YES																								
	RTC	YES																								
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																								
Data transfer	DMAC (channels)	4																								
	EXDMAC (channels)	2																								
	DTC	YES																								
Bus	BSC	YES																								
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 21																								
	D/A (resolution × channels)	10-bit × 2																								
Timers	8-/16-/32-bit timers (channels)	4/22/—																								
	PWM outputs	48																								
	3-phase PWM output	YES																								
Communications	SCI (clock-synchronous/asynchronous) (channels)	13																								
	SPI/QSPI (clock-synchronous only) (channels)	16/—																								
	I²C (channels)	17																								
	CAN (channels)	—		2		—	2		—	2		—	2	—	2					—	3	—	3			
	USB Host/Func	YES/YES																								
Security	Encryption	—															YES*1	—	YES*1	—						YES*1
I/O	I/O ports	134																								
Other functions	Safety functions	YES																								
	PDC	—			YES	—		YES	—		YES	—														
	External interrupts (pins)	16																								
Other	Power supply voltage (V)	2.7 V to 3.6 V																								
	Operating ambient temperature (℃)	–40 to 85 ℃																								
	Package	176-LFQFP (24 × 24 mm)																								

Product name		R5F56316CDLC	R5F56316DDLC	R5F56316SDLC	R5F56317CDLC	R5F56317DDLC	R5F56317SDLC	R5F56318CDLC	R5F56318DDLC	R5F56318SDLC	R5F5631ACDLC	R5F5631ADDLC	R5F5631BCDLC	R5F5631BDDLC	R5F5631DCDLC	R5F5631DDDLC	R5F5631ECDLC	R5F5631EDDLC
Group																		
Pin count		177																
CPU	CPU core																	
	Maximum operating frequency (MHz)																	
	FPU																	
Memory	ROM (KB)	256			384			512			768		1024		1536		2048	
	RAM (KB)	128																
	Data flash/E2 data flash (KB)																	
Clocks	Subclock (external: 32.768 kHz)																	
	RTC																	
	On-chip oscillator																	
Data transfer	DMAC (channels)																	
	EXDMAC (channels)																	
	DTC																	
Bus	BSC																	
Analog	A/D (resolution × channels)																	
	D/A (resolution × channels)																	
Timers	8-/16-/32-bit timers (channels)																	
	PWM outputs																	
	3-phase PWM output																	
Communications	SCI (clock-synchronous/asynchronous) (channels)																	
	SPI/QSPI (clock-synchronous only) (channels)																	
	I²C (channels)																	
	CAN (channels)	—	2		—	2		—	2		—	2	—	2	—	3	—	3
	USB Host/Func																	
Security	Encryption	—																
I/O	I/O ports																	
Other functions	Safety functions																	
	PDC			YES	—		YES	—		YES	—							
	External interrupts (pins)																	
Other	Power supply voltage (V)																	
	Operating ambient temperature (℃)																	
	Package	177-TFLGA (8 × 8 mm)																

Product name		R5F5631MDGFL	R5F5631NDGFL	R5F5631PDGFL	R5F5631MDGFM	R5F5631NDGFM	R5F5631PDGFM	R5F56316DGFP	R5F56317DGFP	R5F56318DGFP	R5F5631ADGFP	R5F5631BDGFP	R5F5631WDGFP	R5F5631YDGFP
Group														
Pin count		48			64			100						
CPU	CPU core													
	Maximum operating frequency (MHz)													
	FPU													
Memory	ROM (KB)	256	384	512	256	384	512	256	384	512	768	1024		
	RAM (KB)	64						128					192	256
	Data flash/E2 data flash (KB)													
Clocks	Subclock (external: 32.768 kHz)	NO			YES									
	RTC	NO			YES									
	On-chip oscillator													
Data transfer	DMAC (channels)													
	EXDMAC (channels)	—						2						
	DTC													
Bus	BSC	—						YES						
Analog	A/D (resolution × channels)	12-bit × 8			12-bit × 12			10-bit × 8, 12-bit × 14						
	D/A (resolution × channels)	—			10-bit × 1									
Timers	8-/16-/32-bit timers (channels)	4/16/—												
	PWM outputs	32												
	3-phase PWM output													
Communications	SCI (clock-synchronous/asynchronous) (channels)	5			6			9						
	SPI/QSPI (clock-synchronous only) (channels)	7/—			8/—			11/—						
	I²C (channels)	6			7			11						
	CAN (channels)	1						2						
	USB Host/Func													
Security	Encryption													
I/O	I/O ports	30			42			79						
Other functions	Safety functions													
	PDC													
	External interrupts (pins)	13						16						
Other	Power supply voltage (V)													
	Operating ambient temperature (℃)	–40 to 105 ℃												
	Package	48-LFQFP (7 × 7 mm)			64-LFQFP (10 × 10 mm)			100-LFQFP (14 × 14 mm)						

Note: 1. AES

RX631 (48 to 176 pins)

Group		RX631																																			
Pin count		100						144																176													
Product name		R5F5631DDGFP	R5F5631GDGFP	R5F5631JDGFP	R5F5631EDGFP	R5F5631KDGFP	R5F5631FDGFP	R5F56316DGFB	R5F56316SGFB	R5F56317DGFB	R5F56317SGFB	R5F56318DGFB	R5F56318SGFB	R5F5631ADGFB	R5F5631BDGFB	R5F5631WDGFB	R5F5631YDGFB	R5F5631DDGFB	R5F5631GDGFB	R5F5631JDGFB	R5F5631EDGFB	R5F5631KDGFB	R5F5631FDGFB	R5F56316DGFC	R5F56316SGFC	R5F56317DGFC	R5F56317SGFC	R5F56318DGFC	R5F56318SGFC	R5F5631ADGFC	R5F5631BDGFC	R5F5631WDGFC	R5F5631YDGFC	R5F5631DDGFC	R5F5631EDGFC	R5F5631KDGFC	R5F5631FDGFC
CPU	CPU core	RXv1																																			
	Maximum operating frequency (MHz)	100																																			
	FPU	YES																																			
Memory	ROM (KB)	1536			2048			256		384		512		768	1024			1536			2048			256		384		512		768	1024			1536	2048		
	RAM (KB)	128	192	256	128	192	256	128								192	256	128	192	256	128	192	256	128								192	256	128		192	256
	Data flash/E2 data flash (KB)	32																																			
Clocks	Subclock (external: 32.768 kHz)	YES																																			
	RTC	YES																																			
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																																			
Data transfer	DMAC (channels)	4																																			
	EXDMAC (channels)	2																																			
	DTC	YES																																			
Bus	BSC	YES																																			
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 14						10-bit × 8, 12-bit × 21																													
	D/A (resolution × channels)	10-bit × 1						10-bit × 2																													
Timers	8-/16-/32-bit timers (channels)	4/16/—						4/22/—																													
	PWM outputs	32						48																													
	3-phase PWM output	YES																																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	9						13																													
	SPI/QSPI (clock-synchronous only) (channels)	11/—						16/—																													
	I²C (channels)	11						17																													
	CAN (channels)	2																3						2													
	USB Host/Func	YES/YES																																			
Security	Encryption	—																																			
I/O	I/O ports	79						112																134													
Other functions	Safety functions	YES																																			
	PDC	—							YES	—	YES	—	YES	—											YES	—	YES	—	YES	—							
	External interrupts (pins)	16																																			
Other	Power supply voltage (V)	2.7 V to 3.6 V																																			
	Operating ambient temperature (℃)	–40 to 105 ℃																																			
	Package	100-LFQFP (14 × 14 mm)						144-LFQFP (20 × 20 mm)																176-LFQFP (24 × 24 mm)													

Note: 1. AES

RX63N (100 to 176 pins)

<table>
<tr><td colspan="2">Group</td><td colspan="54">RX63N</td></tr>
<tr><td colspan="2">Pin count</td><td colspan="23">100</td><td colspan="15">144</td><td colspan="8">145</td><td colspan="8">176</td></tr>
<tr><td colspan="2">Product name</td><td>R5F563NACDFP</td><td>R5F563NADDFP</td><td>R5F563NBCDFP</td><td>R5F563NBDDFP</td><td>R5F563NWDDFP</td><td>R5F563NWHDFP</td><td>R5F563NYDDFP</td><td>R5F563NYHDFP</td><td>R5F563NDCDFP</td><td>R5F563NDDDFP</td><td>R5F563NECDFP</td><td>R5F563NEDDFP</td><td>R5F563NKDDFP</td><td>R5F563NFDDFP</td><td>R5F563NFHDFP</td><td>R5F563NACDLJ</td><td>R5F563NADDLJ</td><td>R5F563NBCDLJ</td><td>R5F563NBDDLJ</td><td>R5F563NDCDLJ</td><td>R5F563NDDDLJ</td><td>R5F563NECDLJ</td><td>R5F563NEDDLJ</td><td>R5F563NACDFB</td><td>R5F563NADDFB</td><td>R5F563NBCDFB</td><td>R5F563NBDDFB</td><td>R5F563NWDDFB</td><td>R5F563NWHDFB</td><td>R5F563NYDDFB</td><td>R5F563NYHDFB</td><td>R5F563NDCDFB</td><td>R5F563NDDDFB</td><td>R5F563NECDFB</td><td>R5F563NEDDFB</td><td>R5F563NKDDFB</td><td>R5F563NFDDFB</td><td>R5F563NFHDFB</td><td>R5F563NACDLK</td><td>R5F563NADDLK</td><td>R5F563NBCDLK</td><td>R5F563NBDDLK</td><td>R5F563NDCDLK</td><td>R5F563NDDDLK</td><td>R5F563NECDLK</td><td>R5F563NEDDLK</td><td>R5F563NACDBG</td><td>R5F563NADDBG</td><td>R5F563NBCDBG</td><td>R5F563NBDDBG</td><td>R5F563NDCDBG</td><td>R5F563NDDDBG</td><td>R5F563NECDBG</td><td>R5F563NEDDBG</td></tr>
<tr><td rowspan="3">CPU</td><td>CPU core</td><td colspan="54">RXv1</td></tr>
<tr><td>Maximum operating frequency (MHz)</td><td colspan="54">100</td></tr>
<tr><td>FPU</td><td colspan="54">YES</td></tr>
<tr><td rowspan="3">Memory</td><td>ROM (KB)</td><td colspan="2">768</td><td colspan="6">1024</td><td colspan="2">1536</td><td colspan="5">2048</td><td colspan="2">768</td><td colspan="2">1024</td><td colspan="2">1536</td><td colspan="2">2048</td><td colspan="2">768</td><td colspan="6">1024</td><td colspan="2">1536</td><td colspan="5">2048</td><td colspan="2">768</td><td colspan="2">1024</td><td colspan="2">1536</td><td colspan="2">2048</td><td colspan="2">768</td><td colspan="2">1024</td><td colspan="2">1536</td><td colspan="2">2048</td></tr>
<tr><td>RAM (KB)</td><td colspan="4">128</td><td colspan="2">192</td><td colspan="2">256</td><td colspan="4">128</td><td>192</td><td colspan="2">256</td><td colspan="12">128</td><td colspan="2">192</td><td colspan="2">256</td><td colspan="4">128</td><td>192</td><td colspan="2">256</td><td colspan="16">128</td></tr>
<tr><td>Data flash/E2 data flash (KB)</td><td colspan="54">32</td></tr>
<tr><td rowspan="3">Clocks</td><td>Subclock (external: 32.768 kHz)</td><td colspan="54">YES</td></tr>
<tr><td>RTC</td><td colspan="54">YES</td></tr>
<tr><td>On-chip oscillator</td><td colspan="54">YES (50 MHz, low speed oscillator 125 kHz)</td></tr>
<tr><td rowspan="3">Data transfer</td><td>DMAC (channels)</td><td colspan="54">4</td></tr>
<tr><td>EXDMAC (channels)</td><td colspan="54">2</td></tr>
<tr><td>DTC</td><td colspan="54">YES</td></tr>
<tr><td>Bus</td><td>BSC</td><td colspan="54">YES</td></tr>
<tr><td rowspan="2">Analog</td><td>A/D (resolution × channels)</td><td colspan="23">10-bit × 8, 12-bit × 14</td><td colspan="31">10-bit × 8, 12-bit × 21</td></tr>
<tr><td>D/A (resolution × channels)</td><td colspan="23">10-bit × 1</td><td colspan="31">10-bit × 2</td></tr>
<tr><td rowspan="3">Timers</td><td>8-/16-/32-bit timers (channels)</td><td colspan="23">4/16/—</td><td colspan="31">4/22/—</td></tr>
<tr><td>PWM outputs</td><td colspan="23">32</td><td colspan="31">48</td></tr>
<tr><td>3-phase PWM output</td><td colspan="54">YES</td></tr>
<tr><td rowspan="6">Communications</td><td>SCI (clock-synchronous/asynchronous) (channels)</td><td colspan="23">9</td><td colspan="31">13</td></tr>
<tr><td>SPI/QSPI (clock-synchronous only) (channels)</td><td colspan="23">11/—</td><td colspan="31">16/—</td></tr>
<tr><td>I^{2}C (channels)</td><td colspan="23">11</td><td colspan="31">17</td></tr>
<tr><td>CAN (channels)</td><td>—</td><td>2</td><td>—</td><td colspan="5">2</td><td>—</td><td>2</td><td>—</td><td colspan="4">2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td colspan="5">2</td><td>—</td><td>3</td><td>—</td><td colspan="4">3</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>3</td><td>—</td><td>3</td><td>—</td><td>2</td><td>—</td><td>2</td><td>—</td><td>3</td><td>—</td><td>3</td></tr>
<tr><td>Ether (channels)</td><td colspan="54">YES</td></tr>
<tr><td>USB Host/Func</td><td colspan="54">YES/YES</td></tr>
<tr><td>Security</td><td>Encryption</td><td colspan="5">—</td><td>YES*1</td><td>—</td><td>YES*1</td><td colspan="6">—</td><td>YES*1</td><td colspan="13">—</td><td>YES*1</td><td>—</td><td>YES*1</td><td colspan="6">—</td><td>YES*1</td><td colspan="16">—</td></tr>
<tr><td>I/O</td><td>I/O ports</td><td colspan="23">79</td><td colspan="23">112</td><td colspan="8">134</td></tr>
<tr><td rowspan="2">Other functions</td><td>Safety functions</td><td colspan="54">YES</td></tr>
<tr><td>External interrupts (pins)</td><td colspan="54">16</td></tr>
<tr><td rowspan="3">Other</td><td>Power supply voltage (V)</td><td colspan="54">2.7 V to 3.6 V</td></tr>
<tr><td>Operating ambient temperature (℃)</td><td colspan="54">–40 to 85 ℃</td></tr>
<tr><td>Package</td><td colspan="15">100-LFQFP (14 × 14 mm)</td><td colspan="8">100-TFLGA (7 × 7 mm)</td><td colspan="15">144-LFQFP (20 × 20 mm)</td><td colspan="8">145-TFLGA (7 × 7 mm)</td><td colspan="8">176-LFBGA (13 × 13 mm)</td></tr>
</table>

Note: 1. AES

RX63N (100 to 176 pins)

Group		RX63N																																																					
Pin count		176															177								100											144											176										
Product name		R5F563NACDFC	R5F563NADDFC	R5F563NBCDFC	R5F563NBDDFC	R5F563NWDDFC	R5F563NWHDFC	R5F563NYDDFC	R5F563NYHDFC	R5F563NDCDFC	R5F563NDDDFC	R5F563NECDFC	R5F563NEDDFC	R5F563NKDDFC	R5F563NFDDFC	R5F563NFHDFC	R5F563NACDLC	R5F563NADDLC	R5F563NBCDLC	R5F563NBDDLC	R5F563NDCDLC	R5F563NDDDLC	R5F563NECDLC	R5F563NEDDLC	R5F563NADGFP	R5F563NBDGFP	R5F563NWDGFP	R5F563NWHGFP	R5F563NYDGFP	R5F563NYHGFP	R5F563NDDGFP	R5F563NEDGFP	R5F563NKDGFP	R5F563NFDGFP	R5F563NFHGFP	R5F563NADGFB	R5F563NBDGFB	R5F563NWDGFB	R5F563NWHGFB	R5F563NYDGFB	R5F563NYHGFB	R5F563NDDGFB	R5F563NEDGFB	R5F563NKDGFB	R5F563NFDGFB	R5F563NFHGFB	R5F563NADGFC	R5F563NBDGFC	R5F563NWDGFC	R5F563NWHGFC	R5F563NYDGFC	R5F563NYHGFC	R5F563NDDGFC	R5F563NEDGFC	R5F563NKDGFC	R5F563NFDGFC	R5F563NFHGFC
CPU	CPU core	RXv1																																																					
	Maximum operating frequency (MHz)	100																																																					
	FPU	YES																																																					
Memory	ROM (KB)	768		1024						1536		2048					768		1024		1536		2048		768	1024					1536	2048				768	1024					1536	2048				768	1024					1536	2048			
	RAM (KB)	128				192		256		128				192	256		128										192		256		128		192	256		128		192		256		128		192	256		128		192		256		128		192	256	
	Data flash/E2 data flash (KB)	32																																																					
Clocks	Subclock (external: 32.768 kHz)	YES																																																					
	RTC	YES																																																					
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																																																					
Data transfer	DMAC (channels)	4																																																					
	EXDMAC (channels)	2																																																					
	DTC	YES																																																					
Bus	BSC	YES																																																					
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 21																							10-bit × 8, 12-bit × 14											10-bit × 8, 12-bit × 21																					
	D/A (resolution × channels)	10-bit × 2																							10-bit × 1											10-bit × 2																					
Timers	8-/16-/32-bit timers (channels)	4/22/—																							4/16/—											4/22/—																					
	PWM outputs	48																							32											48																					
	3-phase PWM output	YES																																																					
Communications	SCI (clock-synchronous/asynchronous) (channels)	13																							9											13																					
	SPI/QSPI (clock-synchronous only) (channels)	16/—																							11/—											16/—																					
	I^{2}C (channels)	17																							11											17																					
	CAN (channels)	—	2	—	2					—	3	—	3				—	2	—	2	—	3	—	3	2																	3					2						3				
	Ether (channels)	YES																																																					
	USB Host/Func	YES/YES																																																					
Security	Encryption	—					YES*1	—	YES*1	—						YES*1	—											YES*1	—	YES*1	—				YES*1	—			YES*1	—	YES*1	—				YES*1	—			YES*1	—	YES*1	—				YES*1
I/O	I/O ports	134																							79											112											134										
Other functions	Safety functions	YES																																																					
	External interrupts (pins)	16																																																					
Other	Power supply voltage (V)	2.7 V to 3.6 V																																																					
	Operating ambient temperature (℃)	–40 to 85 ℃																							–40 to 105 ℃																																
	Package	176-LFQFP (24 × 24 mm)															177-TFLGA (8 × 8 mm)								100-LFQFP (14 × 14 mm)											144-LFQFP (20 × 20 mm)											176-LFQFP (24 × 24 mm)										

Note: 1. AES

RX621 (85 to 176 pins)

Group		RX621															
Pin count		85			100			144			145			176			
Product name		R5F56216BDLD	R5F56217BDLD	R5F56218BDLD	R5F56216BDFP	R5F56217BDFP	R5F56218BDFP	R5F56216BDFB	R5F56217BDFB	R5F56218BDFB	R5F56216BDLE	R5F56217BDLE	R5F56218BDLE	R5F56216BDBG	R5F56217BDBG	R5F56218BDBG
CPU	CPU core	RXv1															
	Maximum operating frequency (MHz)	100															
	FPU	YES															
Memory	ROM (KB)	256	384	512	256	384	512	256	384	512	256	384	512	256	384	512	
	RAM (KB)	64		96	64		96	64		96	64		96	64		96	
	Data flash/E2 data flash (KB)	32															
Clocks	Subclock (external: 32.768 kHz)	YES															
	RTC	YES															
	On-chip oscillator	YES (Low speed 125 kHz)															
Data transfer	DMAC (channels)	4															
	EXDMAC (channels)	—						2									
	DTC	YES															
Bus	BSC	YES															
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 8															
	D/A (resolution × channels)	10-bit × 2			10-bit × 1			10-bit × 2									
Timers	8-/16-/32-bit timers (channels)	4/16/—															
	PWM outputs	32															
	3-phase PWM output	YES															
Communications	SCI (clock-synchronous/asynchronous) (channels)	6															
	SPI/QSPI (clock-synchronous only) (channels)	2/—															
	I²C (channels)	2			1			2									
	CAN (channels)	1															
	USB Host/Func	YES/YES															
I/O	I/O ports	60			74			105						128			
Other functions	Safety functions	YES															
	External interrupts (pins)	16															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Package	85-TFLGA (7 × 7 mm)			100-LFQFP (14 × 14 mm)			144-LFQFP (20 × 20 mm)			145-TFLGA (9 × 9 mm)			176-LFBGA (13 × 13 mm)			

RX62N (100 to 176 pins)

Group		RX62N															
Pin count		100				144				145				176			
Product name		R5F562N7ADFP	R5F562N7BDFP	R5F562N8ADFP	R5F562N8BDFP	R5F562N7ADFB	R5F562N7BDFB	R5F562N8ADFB	R5F562N8BDFB	R5F562N7ADLE	R5F562N7BDLE	R5F562N8ADLE	R5F562N8BDLE	R5F562N7ADBG	R5F562N7BDBG	R5F562N8ADBG	R5F562N8BDBG
CPU	CPU core	RXv1															
	Maximum operating frequency (MHz)	100															
	FPU	YES															
Memory	ROM (KB)	384	512			384	512			384	512			384	512		
	RAM (KB)	64	96			64	96			64	96			64	96		
	Data flash/E2 data flash (KB)	32															
Clocks	Subclock (external: 32.768 kHz)	YES															
	RTC	YES															
	On-chip oscillator	YES (Low speed 125 kHz)															
Data transfer	DMAC (channels)	4															
	EXDMAC (channels)	—				2											
	DTC	YES															
Bus	BSC	YES															
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 8															
	D/A (resolution × channels)	10-bit × 1				10-bit × 2											
Timers	8-/16-/32-bit timers (channels)	4/16/—															
	PWM outputs	32															
	3-phase PWM output	YES															
Communications	SCI (clock-synchronous/asynchronous) (channels)	6															
	SPI/QSPI (clock-synchronous only) (channels)	2/—															
	I²C (channels)	1				2											
	CAN (channels)	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1
	Ether (channels)	1															
	USB Host/Func	YES/YES															
I/O	I/O ports	74				105								128			
Other functions	Safety functions	YES															
	External interrupts (pins)	16															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Package	100-LFQFP (14 × 14 mm)				144-LFQFP (20 × 20 mm)				145-TFLGA (9 × 9 mm)				176-LFBGA (13 × 13 mm)			

RX634 (144 pins)

Group		RX634					
Pin count		144					
Product name		R5F5634BCDFB	R5F5634BYDFB	R5F5634DCDFB	R5F5634DYDFB	R5F5634ECDFB	R5F5634EYDFB
CPU	CPU core	RXv1					
	Maximum operating frequency (MHz)	54					
	FPU	YES					
Memory	ROM (KB)	1024		1536		2048	
	RAM (KB)	128					
	Data flash/E2 data flash (KB)	32					
Clocks	On-chip oscillator	YES (Low speed oscillator 125 kHz)					
Data transfer	DMAC (channels)	4					
	DTC	YES					
Bus	BSC	YES					
Analog	A/D (resolution × channels)	12-bit × 16					
	D/A (resolution × channels)	10-bit × 2					
Timers	8-/16-/32-bit timers (channels)	4/16/—					
	PWM outputs	32					
	3-phase PWM output	YES					
Communications	SCI (clock-synchronous/asynchronous) (channels)	13					
	SPI/QSPI (clock-synchronous only) (channels)	15/—					
	I²C (channels)	16					
I/O	I/O ports	123					
Other functions	ELC	YES					
	Safety functions	YES					
	External interrupts (pins)	13					
	CEC/RCR	YES/YES	—	YES/YES	—	YES/YES	—
Other	Power supply voltage (V)	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V
	Operating ambient temperature (℃)	–40 to 85 ℃					
	Package	144-LFQFP (20 × 20 mm)					

RX630 (100 to 144 pins)

Group		RX630																	
Pin count		80				100													
Product name		R5F56307CDFN	R5F56307DDFN	R5F56308CDFN	R5F56308DDFN	R5F56307CDFP	R5F56307DDFP	R5F56308CDFP	R5F56308DDFP	R5F5630ACDFP	R5F5630ADDFP	R5F5630BCDFP	R5F5630BDDFP	R5F5630DCDFP	R5F5630DDDFP	R5F5630ECDFP	R5F5630EDDFP	R5F56307CDLA	R5F56307DDLA	R5F56308CDLA	R5F56308DDLA
CPU	CPU core	RXv1																	
	Maximum operating frequency (MHz)	100																	
	FPU	YES																	
Memory	ROM (KB)	384	512	384	512	768	1024	1536	2048	384	512								
	RAM (KB)	64				96		128		64									
	Data flash/E2 data flash (KB)	32																	
Clocks	Subclock (external: 32.768 kHz)	YES																	
	RTC	YES																	
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																	
Data transfer	DMAC (channels)	4																	
	DTC	YES																	
Bus	BSC	—				YES													
Analog	A/D (resolution × channels)	10-bit × 4, 12-bit × 11				10-bit × 8, 12-bit × 14													
	D/A (resolution × channels)	10-bit × 1																	
Timers	8-/16-/32-bit timers (channels)	4/16/—																	
	PWM outputs	32																	
	3-phase PWM output	YES																	
Communications	SCI (clock-synchronous/asynchronous) (channels)	6				9													
	SPI/QSPI (clock-synchronous only) (channels)	8/—				11/—													
	I²C (channels)	8				11													
	CAN (channels)	—	1	—	1	—	1	—	1	—	2	—	2	—	2	—	2	—	1	—	1
	USB Host/Func	—/YES																	
I/O	I/O ports	59				79													
Other functions	Safety functions	YES																	
	External interrupts (pins)	16																	
Other	Power supply voltage (V)	2.7 V to 3.6 V																	
	Operating ambient temperature (℃)	–40 to 105 ℃				–40 to 85 ℃													
	Package	80-LFQFP (12 × 12 mm)				100-LFQFP (14 × 14 mm)												100-TFLGA (5.5 × 5.5 mm)	

RX630 (100 to 144 pins)

Group		RX630																																																
Pin count		144								145								176																	177								80		100				144	
Product name		R5F5630ACDFB	R5F5630ADDFB	R5F5630BCDFB	R5F5630BDDFB	R5F5630DCDFB	R5F5630DDDFB	R5F5630ECDFB	R5F5630EDDFB	R5F5630ACDLK	R5F5630ADDLK	R5F5630BCDLK	R5F5630BDDLK	R5F5630DCDLK	R5F5630DDDLK	R5F5630ECDLK	R5F5630EDDLK	R5F5630ACDBG	R5F5630ADDBG	R5F5630BCDBG	R5F5630BDDBG		R5F5630DCDBG	R5F5630DDDBG	R5F5630ECDBG	R5F5630EDDBG	R5F5630ACDFC	R5F5630ADDFC	R5F5630BCDFC	R5F5630BDDFC	R5F5630DCDFC	R5F5630DDDFC	R5F5630ECDFC	R5F5630EDDFC	R5F5630ACDLC	R5F5630ADDLC	R5F5630BCDLC	R5F5630BDDLC	R5F5630DCDLC	R5F5630DDDLC	R5F5630ECDLC	R5F5630EDDLC	R5F56307DGFN	R5F56308DGFN	R5F56307DGFP	R5F56308DGFP	R5F5630ADGFP	R5F5630BDGFP	R5F5630ADGFB	R5F5630BDGFB
CPU	CPU core	RXv1																																																
	Maximum operating frequency (MHz)	100																																																
	FPU	YES																																																
Memory	ROM (KB)	768		1024		1536		2048		768		1024		1536		2048		768		1024			1536		2048		768		1024		1536		2048		768		1024		1536		2048		384	512	384	512	768	1024	768	1024
	RAM (KB)	96				128				96				128				96					128				96				128				96				128				64				96			
	Data flash/E2 data flash (KB)	32																																																
Clocks	Subclock (external: 32.768 kHz)	YES																																																
	RTC	YES																																																
	On-chip oscillator	YES (50 MHz, low speed oscillator 125 kHz)																																																
Data transfer	DMAC (channels)	4																																																
	DTC	YES																																																
Bus	BSC	YES																																								—		YES					
Analog	A/D (resolution × channels)	10-bit × 8, 12-bit × 21																																								10-bit × 4, 12-bit × 11		10-bit × 8, 12-bit × 14				10-bit × 8, 12-bit × 21	
	D/A (resolution × channels)	10-bit × 2																																								10-bit × 1						10-bit × 2	
Timers	8-/16-/32-bit timers (channels)	4/22/—																																								4/16/—						4/22/—	
	PWM outputs	48																																								32						48	
	3-phase PWM output	YES																																																
Communications	SCI (clock-synchronous/asynchronous) (channels)	13																																								6		9				13	
	SPI/QSPI (clock-synchronous only) (channels)	16/—																																								8/—		11/—				16/—	
	I²C (channels)	17																																								8		11				17	
	CAN (channels)	—	2	—	2	—	3	—	3	—	2	—	2	—	3	—	3	—	2	—	2		—	3	—	3	—	2	—	2	—	3	—	3	—	2	—	2	—	3	—	3	1				2			
	USB Host/Func	—/YES																																																
I/O	I/O ports	118																149																								59		79				118	
Other functions	Safety functions	YES																																																
	External interrupts (pins)	16																																																
Other	Power supply voltage (V)	2.7 V to 3.6 V																																																
	Operating ambient temperature (℃)	–40 to 85 ℃																																								–40 to 105 ℃							
	Package	144-LFQFP (20 × 20 mm)								145-TFLGA (7 × 7 mm)								176-LFBGA (13 × 13 mm)									176-LFQFP (24 × 24 mm)								177-TFLGA (8 × 8 mm)								80-LFQFP (12 × 12 mm)		100-LFQFP (14 × 14 mm)				144-LFQFP (20 × 20 mm)	

RX610 (144 to 176 pins)

Group		RX610															
Pin count		144								176							
Product name		R5F56104VDFP	R5F56104VNFP	R5F56106VDFP	R5F56106VNFP	R5F56107VDFP	R5F56107VNFP	R5F56108VDFP	R5F56108VNFP	R5F56104WDBG	R5F56104WNBG	R5F56106WDBG	R5F56106WNBG	R5F56107WDBG	R5F56107WNBG	R5F56108WDBG	R5F56108WNBG
CPU	CPU core	RXv1															
	Maximum operating frequency (MHz)	100															
	FPU	YES															
Memory	ROM (KB)	768		1024		1536		2048		768		1024		1536		2048	
	RAM (KB)	128															
	Data flash/E2 data flash (KB)	32															
Data transfer	DMAC (channels)	4															
	DTC	YES															
Bus	BSC	YES															
Analog	A/D (resolution × channels)	10-bit × 16															
	D/A (resolution × channels)	10-bit × 2															
Timers	8-/16-/32-bit timers (channels)	4/16/—															
	PWM outputs	32															
	3-phase PWM output	YES															
Communications	SCI (clock-synchronous/asynchronous) (channels)	7															
	I²C (channels)	2															
I/O	I/O ports	117								140							
Other functions	Safety functions	—															
	External interrupts (pins)	16															
Other	Power supply voltage (V)	3 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃	–40 to 85 ℃	–20 to 85 ℃
	Package	144-LFQFP (20 × 20 mm)								176-LFBGA (13 × 13 mm)							

RX63T (48 to 144 pins)

Group		RX63T																					
Pin count		48			64			100															
Product name		R5F563T4EDFL*1	R5F563T5EDFL*1	R5F563T6EDFL*1	R5F563T4EDFM*1	R5F563T5EDFM*1	R5F563T6EDFM*1	R5F563TBADFP*1	R5F563TBBDFP*1	R5F563TBDDFP	R5F563TBEDFP	R5F563TCADFP*1	R5F563TCBDFP*1	R5F563TCDDFP	R5F563TCEDFP	R5F563TEADFP*1	R5F563TEBDFP*1	R5F563TEDDFP	R5F563TEEDFP				
CPU	CPU core	RXv1																					
	Maximum operating frequency (MHz)	100																					
	FPU	YES																					
Memory	ROM (KB)	32	48	64	32	48	64	256			384			512									
	RAM (KB)	8						24			32			48									
	Data flash/E2 data flash (KB)	8						32															
Clocks	On-chip oscillator	YES (Low speed 125 kHz)																					
Data transfer	DMAC (channels)	4																					
	DTC	YES																					
Bus	BSC	—						YES															
Analog	A/D (resolution × channels)	12-bit × 6			12-bit × 8			10-bit × 12, 12-bit × 8															
	D/A (resolution × channels)	—						10-bit × 2															
Timers	8-/16-/32-bit timers (channels)	—/16/—						—/20/—															
	PWM outputs	32																					
	3-phase PWM output	YES																					
Communications	SCI (clock-synchronous/asynchronous) (channels)	3			4																		
	SPI/QSPI (clock-synchronous only) (channels)	4/—			6/—																		
	I²C (channels)	1			5																		
	CAN (channels)	—			1	—		1	—		1	—		1	—								
	USB Host/Func	—																					
I/O	I/O ports	32		48	78																		
Other functions	Safety functions	YES																					
	External interrupts (pins)	6			8																		
Other	Power supply voltage (V)	2.7 V to 3.6 V			4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V				
	Operating ambient temperature (℃)	–40 to 85 ℃																					
	Package	48-LFQFP (7 × 7 mm)		64-LFQFP (10 × 10 mm)	100-LFQFP (14 × 14 mm)																		

Note: 1. Products supporting operation at 105°C are available.
Product number: R5F563TxxGxx
Temperature range: –40 to 105°C

RX63T (48 to 144 pins)

Group		RX63T																																			
Pin count		112												120												144											
Product name		R5F563TBADFH*1	R5F563TBBDFH*1	R5F563TBDDFH	R5F563TBEDFH	R5F563TCADFH*1	R5F563TCBDFH*1	R5F563TCDDFH	R5F563TCEDFH	R5F563TEADFH*1	R5F563TEBDFH*1	R5F563TEDDFH	R5F563TEEDFH	R5F563TBADFA*1	R5F563TBBDFA*1	R5F563TBDDFA	R5F563TBEDFA	R5F563TCADFA*1	R5F563TCBDFA*1	R5F563TCDDFA	R5F563TCEDFA	R5F563TEADFA*1	R5F563TEBDFA*1	R5F563TEDDFA	R5F563TEEDFA	R5F563TBADFB*1	R5F563TBBDFB*1	R5F563TBDDFB	R5F563TBEDFB	R5F563TCADFB*1	R5F563TCBDFB*1	R5F563TCDDFB	R5F563TCEDFB	R5F563TEADFB*1	R5F563TEBDFB*1	R5F563TEDDFB	R5F563TEEDFB
CPU	CPU core	RXv1																																			
	Maximum operating frequency (MHz)	100																																			
	FPU	YES																																			
Memory	ROM (KB)	256				384				512				256				384				512				256				384				512			
	RAM (KB)	24				32				48				24				32				48				24				32				48			
	Data flash/E2 data flash (KB)	32																																			
Clocks	On-chip oscillator	YES (Low speed 125 kHz)																																			
Data transfer	DMAC (channels)	4																																			
	DTC	YES																																			
Bus	BSC	YES																																			
Analog	A/D (resolution × channels)	10-bit × 12, 12-bit × 8																								10-bit × 20, 12-bit × 8											
	D/A (resolution × channels)	10-bit × 2																																			
Timers	8-/16-/32-bit timers (channels)	—/20/—																																			
	PWM outputs	34																																			
	3-phase PWM output	YES																																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	5																																			
	SPI/QSPI (clock-synchronous only) (channels)	7/—																																			
	I²C (channels)	6												7																							
	CAN (channels)	1		—		1		—		1		—		1		—		1		—		1		—		1		—		1		—		1		—	
	USB Host/Func	—												YES/YES																							
I/O	I/O ports	90												93												110											
Other functions	Safety functions	YES																																			
	External interrupts (pins)	8																																			
Other	Power supply voltage (V)	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V	4 V to 5.5 V	2.7 V to 3.6 V
	Operating ambient temperature (℃)	–40 to 85 ℃																																			
	Package	112-LQFP (20 × 20 mm)												120-LFQFP (16 × 16 mm)												144-LFQFP (20 × 20 mm)											

Note: 1. Products supporting operation at 105°C are available.
Product number: R5F563TxxGxx
Temperature range: –40 to 105°C

RX62T (64 to 112 pins)

<table>
<tr><td colspan="2">Group</td><td colspan="54">RX62T</td></tr>
<tr><td colspan="2">Pin count</td><td colspan="24">64</td><td colspan="14">80</td><td colspan="8">100</td><td colspan="8">112</td></tr>
<tr><td colspan="2">Product name</td><td>R5F562T6ADFM*1</td><td>R5F562T6BDFM</td><td>R5F562T6DDFM</td><td>R5F562T6EDFM</td><td>R5F562T7ADFM*1</td><td>R5F562T7BDFM</td><td>R5F562T7DDFM</td><td>R5F562T7EDFM</td><td>R5F562TAADFM*1</td><td>R5F562TABDFM</td><td>R5F562TADDFM</td><td>R5F562TAEDFM</td><td>R5F562T6ADFK*1</td><td>R5F562T6BDFK</td><td>R5F562T6DDFK</td><td>R5F562T6EDFK</td><td>R5F562T7ADFK*1</td><td>R5F562T7BDFK</td><td>R5F562T7DDFK</td><td>R5F562T7EDFK</td><td>R5F562TAADFK*1</td><td>R5F562TABDFK</td><td>R5F562TADDFK</td><td>R5F562TAEDFK</td><td>R5F562T6ADFF*1</td><td>R5F562T6BDFF</td><td>R5F562T6DDFF</td><td>R5F562T6EDFF</td><td>R5F562T7ADFF*1</td><td>R5F562T7GDFF*1</td><td>R5F562T7BDFF</td><td>R5F562T7DDFF</td><td>R5F562T7EDFF</td><td>R5F562TAADFF*1</td><td>R5F562TAGDFF*1</td><td>R5F562TABDFF</td><td>R5F562TADDFF</td><td>R5F562TAEDFF</td><td>R5F562T7ADFP*1</td><td>R5F562T7BDFP</td><td>R5F562T7DDFP</td><td>R5F562T7EDFP</td><td>R5F562TAADFP*1</td><td>R5F562TABDFP</td><td>R5F562TADDFP</td><td>R5F562TAEDFP</td><td>R5F562T7ADFH*1</td><td>R5F562T7BDFH</td><td>R5F562T7DDFH</td><td>R5F562T7EDFH</td><td>R5F562TAADFH*1</td><td>R5F562TABDFH</td><td>R5F562TADDFH</td><td>R5F562TAEDFH</td></tr>
<tr><td rowspan="3">CPU</td><td>CPU core</td><td colspan="54">RXv1</td></tr>
<tr><td>Maximum operating frequency (MHz)</td><td colspan="54">100</td></tr>
<tr><td>FPU</td><td colspan="54">YES</td></tr>
<tr><td rowspan="3">Memory</td><td>ROM (KB)</td><td colspan="4">64</td><td colspan="4">128</td><td colspan="4">256</td><td colspan="4">64</td><td colspan="4">128</td><td colspan="4">256</td><td colspan="4">64</td><td colspan="5">128</td><td colspan="5">256</td><td colspan="4">128</td><td colspan="4">256</td><td colspan="4">128</td><td colspan="4">256</td></tr>
<tr><td>RAM (KB)</td><td colspan="8">8</td><td colspan="4">16</td><td colspan="8">8</td><td colspan="4">16</td><td colspan="9">8</td><td colspan="5">16</td><td colspan="4">8</td><td colspan="4">16</td><td colspan="4">8</td><td colspan="4">16</td></tr>
<tr><td>Data flash/E2 data flash (KB)</td><td colspan="8">8</td><td colspan="4">32</td><td colspan="8">8</td><td colspan="4">32</td><td colspan="9">8</td><td colspan="5">32</td><td colspan="4">8</td><td colspan="4">32</td><td colspan="4">8</td><td colspan="4">32</td></tr>
<tr><td>Clocks</td><td>On-chip oscillator</td><td colspan="54">YES (Low speed 125 kHz)</td></tr>
<tr><td>Data transfer</td><td>DTC</td><td colspan="54">YES</td></tr>
<tr><td>Analog</td><td>A/D (resolution × channels)</td><td colspan="24">12-bit × 8</td><td colspan="14">10-bit × 4, 12-bit × 8</td><td colspan="16">10-bit × 12, 12-bit × 8</td></tr>
<tr><td rowspan="3">Timers</td><td>8-/16-/32-bit timers (channels)</td><td colspan="54">—/16/—</td></tr>
<tr><td>PWM outputs</td><td colspan="24">25</td><td colspan="14">26</td><td colspan="16">32</td></tr>
<tr><td>3-phase PWM output</td><td colspan="54">YES</td></tr>
<tr><td rowspan="4">Communications</td><td>SCI (clock-synchronous/asynchronous) (channels)</td><td colspan="54">3</td></tr>
<tr><td>SPI/QSPI (clock-synchronous only) (channels)</td><td colspan="54">1/—</td></tr>
<tr><td>I^2C (channels)</td><td colspan="54">1</td></tr>
<tr><td>CAN (channels)</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="3">1</td><td colspan="2">0</td><td colspan="3">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">0</td></tr>
<tr><td>I/O</td><td>I/O ports</td><td colspan="24">46</td><td colspan="14">57</td><td colspan="8">76</td><td colspan="8">82</td></tr>
<tr><td rowspan="2">Other functions</td><td>Safety functions</td><td colspan="54">YES</td></tr>
<tr><td>External interrupts (pins)</td><td colspan="24">5</td><td colspan="30">9</td></tr>
<tr><td rowspan="3">Other</td><td>Power supply voltage (V)</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td><td>4 V to 5.5 V</td><td>2.7 V to 3.6 V</td></tr>
<tr><td>Operating ambient temperature (℃)</td><td colspan="54">–40 to 85 ℃</td></tr>
<tr><td>Package</td><td colspan="12">64-LFQFP (10 × 10 mm)</td><td colspan="12">64-LQFP (14 × 14 mm)</td><td colspan="14">80-LQFP (14 × 14 mm)</td><td colspan="8">100-LFQFP (14 × 14 mm)</td><td colspan="8">112-LQFP (20 × 20 mm)</td></tr>
</table>

Note: 1. Products supporting operation at 105°C are available.
Product number: R5F562TxxGxx
Temperature range: –40 to 105°C

RX62G (100 to 112 pins)

Group		RX62G							
Pin count		100				112			
Product name		R5F562G7ADFP*1	R5F562G7DDFP	R5F562GAADFP*1	R5F562GADDFP	R5F562G7ADFH*1	R5F562G7DDFH	R5F562GAADFH*1	R5F562GADDFH
CPU	CPU core	RX							
	Maximum operating frequency (MHz)	100							
	FPU	YES							
Memory	ROM (KB)	128		256		128		256	
	RAM (KB)	8		16		8		16	
	Data flash/E2 data flash (KB)	8		32		8		32	
Clocks	On-chip oscillator	YES (Low speed 125 kHz)							
Data transfer	DTC	YES							
Analog	A/D (resolution × channels)	10-bit × 12, 12-bit × 8							
Timers	8-/16-/32-bit timers (channels)	—/16/—							
	PWM outputs	32							
	3-phase PWM output	YES							
Communications	SCI (clock-synchronous/asynchronous) (channels)	3							
	SPI/QSPI (clock-synchronous only) (channels)	1/—							
	I²C (channels)	1							
	CAN (channels)	1	0	1	0	1	0	1	0
I/O	I/O ports	76				82			
Other functions	Safety functions	YES							
	External interrupts (pins)	9							
Other	Power supply voltage (V)	4 V to 5.5 V							
	Operating ambient temperature (℃)	–40 to 85 ℃							
	Package	100-LFQFP (14 × 14 mm)				112-LQFP (20 × 20 mm)			

Note: 1. Products supporting operation at 105°C are available.
Product number: R5F562GxxGxx
Temperature range: –40 to 105°C

RX24U (100 to 144 pins)

Group		RX24U					
Pin count		100			144		
Product name		R5F524UBADFP	R5F524UCADFP	R5F524UEADFP	R5F524UBADFB	R5F524UCADFB	R5F524UEADFB
CPU	CPU core	RXv2					
	Maximum operating frequency (MHz)	80					
	FPU	YES					
Memory	ROM (KB)	256	384	512	256	384	512
	RAM (KB)	32					
	Data flash (KB)	8					
Clocks	On-chip oscillator	YES (High speed oscillator 32MHz/64MHz, low speed oscillator 4MHz)					
Data transfer	DTC	YES					
Analog	A/D (Unit resolution × channels)	Unit0 12-bit × 5 Unit1 12-bit × 5 (simultaneous sample-and-hold of 3 channels) Unit2 12-bit × 10			Unit0 12-bit × 5 Unit1 12-bit × 5 (simultaneous sample-and-hold of 3 channels) Unit2 12-bit × 12		
	Programmable gain amplifier (channels)	Differential × 4					
	Comparator (channels)	4 (no reference voltage external input)					
	D/A (resolution × channels)	8-bit × 2 (comparator reference voltage + external output)					
Timers	8-/16-/32-bit timers (channels)	8/17/—					
	PWM outputs	44					
	3-phase PWM output	3					
Communications	SCI (clock-synchronous/asynchronous) (channels)	4			6		
	SPI/QSPI (clock-synchronous only) (channels)	5/—			7/—		
	I²C (channels)	5			7		
	CAN (channels)	1					
I/O	I/O ports	80			111		
Other functions	Safety functions	YES					
	External interrupts (pins)	9					
Other	Power supply voltage (V)	2.7 V to 5.5 V					
	Operating ambient temperature (℃)	–40 to 85 ℃					
	Package	100-LFQFP (14 × 14mm)			144-LFQFP (20 × 20mm)		

RX24T (64 to 100 pins)

Group		RX24T										
Pin count		64		80				100				
Product name		R5F524T8ADFM	R5F524TAADFM	R5F524T8ADFN	R5F524TAADFN	R5F524T8ADFF	R5F524TAADFF	R5F524T8ADFP	R5F524TAADFP	R5F524TBADFP	R5F524TCADFP	R5F524TEADFP
CPU	CPU core	RXv2										
	Maximum operating frequency (MHz)	80										
	FPU	YES										
Memory	ROM (KB)	128	256	128	256	128	256	128	256	256	384	512
	RAM (KB)	16								32		
	Data flash (KB)	8										
Clocks	On-chip oscillator	YES (High speed oscillator 32 MHz/64 MHz, low speed oscillator 4 MHz)										
Data transfer	DTC	YES										
Analog	A/D (Unit resolution × channels)	Unit0 12-bit × 3 Unit1 12-bit × 4 (simultaneous sample-and-hold of 3 channels) Unit2 12-bit × 5		Unit0 12-bit × 5 Unit1 12-bit × 5 (simultaneous sample-and-hold of 3 channels) Unit2 12-bit × 7				Unit0 12-bit × 5 Unit1 12-bit × 5 (simultaneous sample-and-hold of 3 channels) Unit2 12-bit × 12				
	Programmable gain amplifier (channels)	4										
	Comparator (channels)	4 (reference voltage external input)								4 (no reference voltage external input)		
	D/A (resolution × channels)	8-bit × 1 (comparator reference voltage only)								8-bit × 2 (comparator reference voltage + external output)		
Timers	8-/16-/32-bit timers (channels)	8/13/—								8/17/—		
	PWM outputs	24		29				36		44		
	3-phase PWM output	2								3		
Communications	SCI (clock-synchronous/asynchronous) (channels)	3										
	SPI/QSPI (clock-synchronous only) (channels)	4/—										
	I²C (channels)	4										
	CAN (channels)	0								1		
I/O	I/O ports	49		61				81				
Other functions	Safety functions	YES										
	External interrupts (pins)	9										
Other	Power supply voltage (V)	2.7 V to 5.5 V										
	Operating ambient temperature (℃)	–40 to 85 ℃										
	Package	64-LFQFP (10 × 10 mm)		80-LFQFP (12 × 12 mm)		80-LQFP (14 × 14 mm)		100-LFQFP (14 × 14 mm)				

RX23T (48 to 64 pins)

Group		RX23T											
Pin count		48		52		64		48		52		64	
Product name		R5F523T3ADFL	R5F523T5ADFL	R5F523T3ADFD	R5F523T5ADFD	R5F523T3ADFM	R5F523T5ADFM	R5F523T3AGFL	R5F523T5AGFL	R5F523T3AGFD	R5F523T5AGFD	R5F523T3AGFM	R5F523T5AGFM
CPU	CPU core	RXv2											
	Maximum operating frequency (MHz)	40											
	FPU	YES											
Memory	ROM (KB)	64	128	64	128	64	128	64	128	64	128	64	128
	RAM (KB)	12											
	Data flash (KB)	—											
Clocks	On-chip oscillator	YES (High speed oscillator 32 MHz, low speed oscillator 4 MHz)											
Data transfer	DTC	YES											
Analog	A/D (resolution × channels)	12-bit × 10 (simultaneous sample-and-hold of 3 channels)											
	Programmable gain amplifier (channels)	—											
	Comparator (channels)	3											
	D/A (resolution × channels)	8-bit × 1 (comparator reference voltage only)											
Timers	8-/16-/32-bit timers (channels)	4/10/—											
	PWM outputs	16		18		20		16		18		20	
	3-phase PWM output	1											
Communications	SCI (clock-synchronous/asynchronous) (channels)	2											
	SPI/QSPI (clock-synchronous only) (channels)	3/—											
	I²C (channels)	3											
I/O	I/O ports	38		41		51		38		41		51	
Other functions	Safety functions	YES											
	External interrupts (pins)	7											
Other	Power supply voltage (V)	2.7 V to 5.5 V											
	Operating ambient temperature (℃)	–40 to 85 ℃						–40 to 105 ℃					
	Package	48-LFQFP (7 × 7 mm)		52-LQFP (10 × 10 mm)		64-LFQFP (10 × 10 mm)		48-LFQFP (7 × 7 mm)		52-LQFP (10 × 10 mm)		64-LFQFP (10 × 10 mm)	

RX231 (48 to 100 pins)

Group		RX231																																															
Pin count		48																64																		100															
Product name		R5F52315ADNE	R5F52315CDNE	R5F52316ADNE	R5F52316CDNE	R5F52317ADNE	R5F52317BDNE	R5F52318ADNE	R5F52318BDNE	R5F52315ADFL	R5F52315CDFL	R5F52316ADFL	R5F52316CDFL	R5F52317ADFL	R5F52317BDFL	R5F52318ADFL	R5F52318BDFL	R5F52315ADND	R5F52315CDND	R5F52316ADND	R5F52316CDND	R5F52317ADND	R5F52317BDND	R5F52318ADND	R5F52318BDND	R5F52315ADFM	R5F52315CDFM	R5F52316ADFM	R5F52316CDFM	R5F52317ADFM	R5F52317BDFM	R5F52318ADFM	R5F52318BDFM	R5F52315CDLF	R5F52316CDLF	R5F52315ADFP	R5F52315CDFP	R5F52316ADFP	R5F52316CDFP	R5F52317ADFP	R5F52317BDFP	R5F52318ADFP	R5F52318BDFP	R5F52315ADLA	R5F52315CDLA	R5F52316ADLA	R5F52316CDLA	R5F52317ADLA	R5F52317BDLA	R5F52318ADLA	R5F52318BDLA
CPU	CPU core	RXv2																																																	
	Maximum operating frequency (MHz)	54																																																	
	FPU	YES																																																	
Memory	ROM (KB)	128		256		384		512		128		256		384		512		128		256		384		512		128		256		384		512		128	256	128		256		384		512		128		256		384		512	
	RAM (KB)	32				64				32				64				32				64				32				64				32						64				32				64			
	Data flash/E2 data flash (KB)	8																																																	
Clocks	Subclock (external: 32.768 kHz)	—																YES																																	
	RTC	—																YES																																	
	On-chip oscillator	YES (54 MHz)																																																	
Data transfer	DMAC (channels)	4																																																	
	DTC	YES																																																	
Bus	BSC	—																																		YES															
Analog	A/D (resolution × channels)	12-bit × 8																12-bit × 12																		12-bit × 24															
	D/A (resolution × channels)	—																12-bit × 2																																	
Timers	8-/16-/32-bit timers (channels)	4/17/—																																																	
	PWM outputs	36																																																	
	3-phase PWM output	YES																																																	
Communications	SCI (clock-synchronous/asynchronous) (channels)	5																6																		7															
	SPI/QSPI (clock-synchronous only) (channels)	6/—																7/—																		8/—															
	I²C (channels)	6																7																		8															
	CAN (channels)	1	—	1	—	1					—	1	—	1					—	1	—	1					—	1	—	1				—		1	—	1	—	1					—	1	—	1			
	SSI (channels)	1																																																	
	SD Host/MMC (channels)	—																					1/—	—	1/—	—					1/—	—	1/—	—							1/—	—	1/—	—					1/—	—	1/—
	USB Host/Func	YES/YES																																																	
Security	Encryption	—					YES	—	YES	—					YES	—	YES	—					YES	—	YES	—					YES	—	YES	—							YES	—	YES	—					YES	—	YES
I/O	I/O ports	31																44																		80															
Other functions	Touch key (channels)	6																10																		24															
	ELC	YES																																																	
	Safety functions	YES																																																	
	External interrupts (pins)	7																8																		9															
Other	Power supply voltage (V)	1.8 V to 5.5 V																																																	
	Operating ambient temperature (℃)	–40 to 85 ℃																																																	
	Package	48-HWQFN (7 × 7 mm)								48-LFQFP (7 × 7 mm)								64-HWQFN (9 × 9 mm)								64-LFQFP (10 × 10 mm)								64-WFLGA (5 × 5 mm)		100-LFQFP (14 × 14 mm)								100-TFLGA (5.5 × 5.5 mm)							

RX231 (48 to 100 pins)

<table>
<tr><td colspan="2">Group</td><td colspan="40">RX231</td></tr>
<tr><td colspan="2">Pin count</td><td colspan="16">48</td><td colspan="16">64</td><td colspan="8">100</td></tr>
<tr><td colspan="2">Product name</td><td>R5F52315AGNE</td><td>R5F52315CGNE</td><td>R5F52316AGNE</td><td>R5F52316CGNE</td><td>R5F52317AGNE</td><td>R5F52317BGNE</td><td>R5F52318AGNE</td><td>R5F52318BGNE</td><td>R5F52315AGFL</td><td>R5F52315CGFL</td><td>R5F52316AGFL</td><td>R5F52316CGFL</td><td>R5F52317AGFL</td><td>R5F52317BGFL</td><td>R5F52318AGFL</td><td>R5F52318BGFL</td><td>R5F52315AGND</td><td>R5F52315CGND</td><td>R5F52316AGND</td><td>R5F52316CGND</td><td>R5F52317AGND</td><td>R5F52317BGND</td><td>R5F52318AGND</td><td>R5F52318BGND</td><td>R5F52315AGFM</td><td>R5F52315CGFM</td><td>R5F52316AGFM</td><td>R5F52316CGFM</td><td>R5F52317AGFM</td><td>R5F52317BGFM</td><td>R5F52318AGFM</td><td>R5F52318BGFM</td><td>R5F52315AGFP</td><td>R5F52315CGFP</td><td>R5F52316AGFP</td><td>R5F52316CGFP</td><td>R5F52317AGFP</td><td>R5F52317BGFP</td><td>R5F52318AGFP</td><td>R5F52318BGFP</td></tr>
<tr><td rowspan="3">CPU</td><td>CPU core</td><td colspan="40">RXv2</td></tr>
<tr><td>Maximum operating frequency (MHz)</td><td colspan="40">54</td></tr>
<tr><td>FPU</td><td colspan="40">YES</td></tr>
<tr><td rowspan="3">Memory</td><td>ROM (KB)</td><td colspan="2">128</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">128</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">128</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">128</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td><td colspan="2">128</td><td colspan="2">256</td><td colspan="2">384</td><td colspan="2">512</td></tr>
<tr><td>RAM (KB)</td><td colspan="4">32</td><td colspan="4">64</td><td colspan="4">32</td><td colspan="4">64</td><td colspan="4">32</td><td colspan="4">64</td><td colspan="4">32</td><td colspan="4">64</td><td colspan="4">32</td><td colspan="4">64</td></tr>
<tr><td>Data flash/E2 data flash (KB)</td><td colspan="40">8</td></tr>
<tr><td rowspan="3">Clocks</td><td>Subclock (external: 32.768 kHz)</td><td colspan="16">—</td><td colspan="24">YES</td></tr>
<tr><td>RTC</td><td colspan="16">—</td><td colspan="24">YES</td></tr>
<tr><td>On-chip oscillator</td><td colspan="40">YES (54 MHz)</td></tr>
<tr><td rowspan="2">Data transfer</td><td>DMAC (channels)</td><td colspan="40">4</td></tr>
<tr><td>DTC</td><td colspan="40">YES</td></tr>
<tr><td>Bus</td><td>BSC</td><td colspan="32">—</td><td colspan="8">YES</td></tr>
<tr><td rowspan="2">Analog</td><td>A/D (resolution × channels)</td><td colspan="16">12-bit × 8</td><td colspan="16">12-bit × 12</td><td colspan="8">12-bit × 24</td></tr>
<tr><td>D/A (resolution × channels)</td><td colspan="16">—</td><td colspan="24">12-bit × 2</td></tr>
<tr><td rowspan="3">Timers</td><td>8-/16-/32-bit timers (channels)</td><td colspan="40">4/17/—</td></tr>
<tr><td>PWM outputs</td><td colspan="40">36</td></tr>
<tr><td>3-phase PWM output</td><td colspan="40">YES</td></tr>
<tr><td rowspan="7">Communications</td><td>SCI (clock-synchronous/asynchronous) (channels)</td><td colspan="16">5</td><td colspan="16">6</td><td colspan="8">7</td></tr>
<tr><td>SPI/QSPI (clock-synchronous only) (channels)</td><td colspan="16">6/—</td><td colspan="16">7/—</td><td colspan="8">8/—</td></tr>
<tr><td>I²C (channels)</td><td colspan="16">6</td><td colspan="16">7</td><td colspan="8">8</td></tr>
<tr><td>CAN (channels)</td><td>1</td><td>—</td><td>1</td><td>—</td><td colspan="5">1</td><td>—</td><td>1</td><td>—</td><td colspan="5">1</td><td>—</td><td>1</td><td>—</td><td colspan="5">1</td><td>—</td><td>1</td><td>—</td><td colspan="5">1</td><td>—</td><td>1</td><td>—</td><td colspan="4">1</td></tr>
<tr><td>SSI (channels)</td><td colspan="40">1</td></tr>
<tr><td>SD Host/MMC (channels)</td><td colspan="21">—</td><td>1/—</td><td>—</td><td>1/—</td><td colspan="5">—</td><td>1/—</td><td>—</td><td>1/—</td><td colspan="5">—</td><td>1/—</td><td>—</td><td>1/—</td></tr>
<tr><td>USB Host/Func</td><td colspan="40">YES/YES</td></tr>
<tr><td>Security</td><td>Encryption</td><td colspan="5">—</td><td>YES</td><td>—</td><td>YES</td><td colspan="5">—</td><td>YES</td><td>—</td><td>YES</td><td colspan="5">—</td><td>YES</td><td>—</td><td>YES</td><td colspan="5">—</td><td>YES</td><td>—</td><td>YES</td><td colspan="5">—</td><td>YES</td><td>—</td><td>YES</td></tr>
<tr><td>I/O</td><td>I/O ports</td><td colspan="16">31</td><td colspan="16">44</td><td colspan="8">80</td></tr>
<tr><td rowspan="4">Other functions</td><td>Touch key (channels)</td><td colspan="16">6</td><td colspan="16">10</td><td colspan="8">24</td></tr>
<tr><td>ELC</td><td colspan="40">YES</td></tr>
<tr><td>Safety functions</td><td colspan="40">YES</td></tr>
<tr><td>External interrupts (pins)</td><td colspan="16">7</td><td colspan="16">8</td><td colspan="8">9</td></tr>
<tr><td rowspan="3">Other</td><td>Power supply voltage (V)</td><td colspan="40">1.8 V to 5.5 V</td></tr>
<tr><td>Operating ambient temperature (℃)</td><td colspan="40">–40 to 105 ℃</td></tr>
<tr><td>Package</td><td colspan="8">48-HWQFN (7 × 7 mm)</td><td colspan="8">48-LFQFP (7 × 7 mm)</td><td colspan="8">64-HWQFN (9 × 9 mm)</td><td colspan="8">64-LFQFP (10 × 10 mm)</td><td colspan="8">100-LFQFP (14 × 14 mm)</td></tr>
</table>

RX230 (48 to 100 pins)

Group		RX230																					
Pin count		48				64						100				48				64				100	
Product name		R5F52305ADNE	R5F52306ADNE	R5F52305ADFL	R5F52306ADFL	R5F52305ADND	R5F52306ADND	R5F52305ADFM	R5F52306ADFM	R5F52305ADLF	R5F52306ADLF	R5F52305ADFP	R5F52306ADFP	R5F52305ADLA	R5F52306ADLA	R5F52305AGNE	R5F52306AGNE	R5F52305AGFL	R5F52306AGFL	R5F52305AGND	R5F52306AGND	R5F52305AGFM	R5F52306AGFM	R5F52305AGFP	R5F52306AGFP
CPU	CPU core	RXv2																							
	Maximum operating frequency (MHz)	54																							
	FPU	YES																							
Memory	ROM (KB)	128	256	128	256	128	256	128	256	128	256	128	256	128	256	128	256	128	256	128	256	128	256	128	256
	RAM (KB)	32																							
	Data flash/E2 data flash (KB)	8																							
Clocks	Subclock (external: 32.768 kHz)	—				YES										—				YES					
	RTC	—				YES										—				YES					
	On-chip oscillator	YES (54 MHz)																							
Data transfer	DMAC (channels)	4																							
	DTC	YES																							
Bus	BSC	—										YES				—								YES	
Analog	A/D (resolution × channels)	12-bit × 8				12-bit × 12						12-bit × 24				12-bit × 8				12-bit × 12				12-bit × 24	
	D/A (resolution × channels)	—				12-bit × 2										—				12-bit × 2					
Timers	8-/16-/32-bit timers (channels)	4/17/—																							
	PWM outputs	36		32		36																			
	3-phase PWM output	YES																							
Communications	SCI (clock-synchronous/asynchronous) (channels)	5				6						7				5				6				7	
	SPI/QSPI (clock-synchronous only) (channels)	6/—				7/—						8/—				6/—				7/—				8/—	
	I²C (channels)	6				7						8				6				7				8	
	SSI (channels)	1																							
I/O	I/O ports	35				48						84				35				48				84	
Other functions	Touch key (channels)	6				10						24				6				10				24	
	ELC	YES																							
	Safety functions	YES																							
	External interrupts (pins)	7				8						9				7				8				9	
Other	Power supply voltage (V)	1.8 V to 5.5 V																							
	Operating ambient temperature (℃)	–40 to 85 ℃														–40 to 105 ℃									
	Package	48-HWQFN (7 × 7 mm)		48-LFQFP (7 × 7 mm)		64-HWQFN (9 × 9 mm)		64-LFQFP (10 × 10 mm)		64-WFLGA (5 × 5 mm)		100-LFQFP (14 × 14 mm)		100-TFLGA (5.5 × 5.5 mm)		48-HWQFN (7 × 7 mm)		48-LFQFP (7 × 7 mm)		64-HWQFN (9 × 9 mm)		64-LFQFP (10 × 10 mm)		100-LFQFP (14 × 14 mm)	

RX220 (48 to 100 pins)

Group		RX220														
Pin count		48				64								100		
Product name		R5F52201BDFL	R5F52203BDFL	R5F52205BDFL	R5F52206BDFL	R5F52201BDFM	R5F52203BDFM	R5F52205BDFM	R5F52206BDFM	R5F52201BDFK	R5F52203BDFK	R5F52205BDFK	R5F52206BDFK	R5F52203BDFP	R5F52205BDFP	R5F52206BDFP
CPU	CPU core	RXv1														
	Maximum operating frequency (MHz)	32														
Memory	ROM (KB)	32	64	128	256	32	64	128	256	32	64	128	256	64	128	256
	RAM (KB)	4	8		16	4	8		16	4	8		16	8		16
	Data flash/E2 data flash (KB)	8														
Clocks	Subclock (external: 32.768 kHz)	—				YES										
	RTC	—				YES										
	On-chip oscillator	YES (32 MHz)														
Data transfer	DMAC (channels)	4														
	DTC	YES														
Analog	A/D (resolution × channels)	12-bit × 8				12-bit × 12								12-bit × 16		
Timers	8-/16-/32-bit timers (channels)	4/10/—														
	PWM outputs	20														
	3-phase PWM output	YES														
Communications	SCI (clock-synchronous/asynchronous) (channels)	4				5										
	SPI/QSPI (clock-synchronous only) (channels)	5/—				6/—										
	I^{2}C (channels)	5				6										
I/O	I/O ports	35				49								85		
Other functions	ELC	YES														
	Safety functions	YES														
	External interrupts (pins)	7				8								9		
Other	Power supply voltage (V)	1.62 V to 5.5 V														
	Operating ambient temperature (°C)	–40 to 85 °C														
	Package	48-LFQFP (7 × 7 mm)				64-LFQFP (10 × 10 mm)				64-LFQFP (14 × 14 mm)				100-LFQFP (14 × 14 mm)		

Group		RX220														
Pin count		48				64								100		
Product name		R5F52201BGFL	R5F52203BGFL	R5F52205BGFL	R5F52206BGFL	R5F52201BGFM	R5F52203BGFM	R5F52205BGFM	R5F52206BGFM	R5F52201BGFK	R5F52203BGFK	R5F52205BGFK	R5F52206BGFK	R5F52203BGFP	R5F52205BGFP	R5F52206BGFP
CPU	CPU core	RXv1														
	Maximum operating frequency (MHz)	32														
Memory	ROM (KB)	32	64	128	256	32	64	128	256	32	64	128	256	64	128	256
	RAM (KB)	4	8		16	4	8		16	4	8		16	8		16
	Data flash/E2 data flash (KB)	8														
Clocks	Subclock (external: 32.768 kHz)	—				YES										
	RTC	—				YES										
	On-chip oscillator	YES (32 MHz)														
Data transfer	DMAC (channels)	4														
	DTC	YES														
Analog	A/D (resolution × channels)	12-bit × 8				12-bit × 12								12-bit × 16		
Timers	8-/16-/32-bit timers (channels)	4/10/—														
	PWM outputs	20														
	3-phase PWM output	YES														
Communications	SCI (clock-synchronous/asynchronous) (channels)	4				5										
	SPI/QSPI (clock-synchronous only) (channels)	5/—				6/—										
	I^{2}C (channels)	5				6										
I/O	I/O ports	35				49								85		
Other functions	ELC	YES														
	Safety functions	YES														
	External interrupts (pins)	7				8								9		
Other	Power supply voltage (V)	1.62 V to 5.5 V														
	Operating ambient temperature (°C)	–40 to 105 °C														
	Package	48-LFQFP (7 × 7 mm)				64-LFQFP (10 × 10 mm)				64-LFQFP (14 × 14 mm)				100-LFQFP (14 × 14 mm)		

RX210 (48 to 145 pins)

Group		RX210																																													
Pin count		48				64						69		80										100														144						145					
Product name		R5F52103BDFL	R5F52104BDFL	R5F52105BDFL	R5F52106BDFL	R5F52103BDFM	R5F52104BDFM	R5F52105BDFM	R5F52106BDFM	R5F52107CDFM	R5F52108CDFM	R5F52105BDBM	R5F52106BDBM	R5F52105BDFN	R5F52106BDFN	R5F52107CDFN	R5F52108CDFN	R5F52103BDFF	R5F52104BDFF	R5F52105BDFF	R5F52106BDFF	R5F52107CDFF	R5F52108CDFF	R5F52105BDFP	R5F52106BDFP	R5F52107CDFP	R5F52108CDFP	R5F5210ABDFP	R5F5210BBDFP	R5F52105BDLA	R5F52106BDLA	R5F52105BDLJ	R5F52106BDLJ	R5F52107CDLJ	R5F52108CDLJ	R5F5210ABDLJ	R5F5210BBDLJ	R5F52105BDFB	R5F52106BDFB	R5F52107BDFB	R5F52108BDFB	R5F5210ABDFB	R5F5210BBDFB	R5F52105BDLK	R5F52106BDLK	R5F52107BDLK	R5F52108BDLK	R5F5210ABDLK	R5F5210BBDLK
CPU	CPU core	RXv1																																													
	Maximum operating frequency (MHz)	50																																													
Memory	ROM (KB)	64	96	128	256	64	96	128	256	384	512	128	256	128	256	384	512	64	96	128	256	384	512	128	256	384	512	768	1024	128	256	128	256	384	512	768	1024	128	256	384	512	768	1024	128	256	384	512	768	1024
	RAM (KB)	12	16	20	32	12	16	20	32	64		20	32	20	32	64		12	16	20	32	64		20	32	64		96		20	32	20	32	64		96		20	32	64		96		20	32	64		96	
	Data flash/E2 data flash (KB)	8																																													
Clocks	Subclock (external: 32.768 kHz)	—				YES																																									
	RTC	—				YES																																									
	On-chip oscillator	YES (50 MHz)																																													
Data transfer	DMAC (channels)	4																																													
	DTC	YES																																													
Bus	BSC	—																						YES																									
Analog	A/D (resolution × channels)	12-bit × 8				12-bit × 12								12-bit × 14										12-bit × 16																									
	D/A (resolution × channels)	—				10-bit × 2																																									
Timers	8-/16-/32-bit timers (channels)	4/10/—																																		4/16/—											
	PWM outputs	20																																		36											
	3-phase PWM output	YES																																													
Communications	SCI (clock-synchronous/asynchronous) (channels)	5				6								7																						13											
	SPI/QSPI (clock-synchronous only) (channels)	6/—				7/—								8/—																						14/—											
	I^2C (channels)	6				7								8																						14											
I/O	I/O ports	35				49								65										85														123											
Other functions	ELC	YES																																													
	Safety functions	YES																																													
	External interrupts (pins)	7				8								9																																	
Other	Power supply voltage (V)	1.62 V to 5.5 V																																													
	Operating ambient temperature (℃)	–40 to 85 ℃																																													
	Package	48-LFQFP (7 × 7 mm)				64-LFQFP (10 × 10 mm)						69-WFBGA (3.91 × 4.26 mm)		80-LFQFP (12 × 12 mm)				80-LQFP (14 × 14 mm)						100-LFQFP (14 × 14 mm)						100-TFLGA (5.5×5.5 mm)		100-TFLGA (7 × 7 mm)						144-LFQFP (20 × 20 mm)						145-TFLGA (7 × 7 mm)					

RX210 (48 to 145 pins)

Group		RX210																																			
Pin count		48				64						80										100						144									
Product name		R5F52103BGFL	R5F52104BGFL	R5F52105BGFL	R5F52106BGFL	R5F52103BGFM	R5F52104BGFM	R5F52105BGFM	R5F52106BGFM	R5F52107CGFM	R5F52108CGFM	R5F52105BGFN	R5F52106BGFN	R5F52107CGFN	R5F52108CGFN	R5F52103BGFF	R5F52104BGFF	R5F52105BGFF	R5F52106BGFF	R5F52107CGFF	R5F52108CGFF	R5F52105BGFP	R5F52106BGFP	R5F52107CGFP	R5F52108CGFP	R5F52110ABGFP	R5F52110BBGFP	R5F52105BGFB	R5F52106BGFB	R5F52107BGFB	R5F52108BGFB	R5F52110ABGFB	R5F52110BBGFB				
CPU	CPU core	RXv1																																			
	Maximum operating frequency (MHz)	50																																			
Memory	ROM (KB)	64	96	128	256	64	96	128	256	384	512	128	256	384	512	64	96	128	256	384	512	128	256	384	512	768	1024	128	256	384	512	768	1024				
	RAM (KB)	12	16	20	32	12	16	20	32	64		20	32	64		12	16	20	32	64		20	32	64		96		20	32	64		96					
	Data flash/E2 data flash (KB)	8																																			
Clocks	Subclock (external: 32.768 kHz)	—				YES																															
	RTC	—				YES																															
	On-chip oscillator	YES (50 MHz)																																			
Data transfer	DMAC (channels)	4																																			
	DTC	YES																																			
Bus	BSC	—				—																YES															
Analog	A/D (resolution × channels)	12-bit × 8				12-bit × 12						12-bit × 14										12-bit × 16															
	D/A (resolution × channels)	—				10-bit × 2																															
Timers	8-/16-/32-bit timers (channels)	4/10/—																										4/16/—									
	PWM outputs	20																										36									
	3-phase PWM output	YES																																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	5				6						7																13									
	SPI/QSPI (clock-synchronous only) (channels)	6/—				7/—						8/—																14/—									
	I²C (channels)	6				7						8																14									
I/O	I/O ports	35				49						65										85						123									
Other functions	ELC	YES																																			
	Safety functions	YES																																			
	External interrupts (pins)	7				8						9																									
Other	Power supply voltage (V)	1.62 V to 5.5 V																																			
	Operating ambient temperature (℃)	–40 to 105 ℃																																			
	Package	48-LFQFP (7 × 7 mm)				64-LFQFP (10 × 10 mm)						80-LFQFP (12 × 12 mm)				80-LQFP (14 × 14 mm)						100-LFQFP (14 × 14 mm)						144-LFQFP (20 × 20 mm)									

RX21A (64 to 100 pins)

Group		RX21A																				
Pin count		64			80			100						64			80			100		
Product name		R5F521A6BDFM	R5F521A7BDFM	R5F521A8BDFM	R5F521A6BDFN	R5F521A7BDFN	R5F521A8BDFN	R5F521A6BDFP	R5F521A7BDFP	R5F521A8BDFP	R5F521A6BDLJ	R5F521A7BDLJ	R5F521A8BDLJ	R5F521A6BGFM	R5F521A7BGFM	R5F521A8BGFM	R5F521A6BGFN	R5F521A7BGFN	R5F521A8BGFN	R5F521A6BGFP	R5F521A7BGFP	R5F521A8BGFP
CPU	CPU core	RXv1																				
	Maximum operating frequency (MHz)	50																				
Memory	ROM (KB)	256	384	512	256	384	512	256	384	512	256	384	512	256	384	512	256	384	512	256	384	512
	RAM (KB)	32	64		32	64		32	64		32	64		32	64		32	64		32	64	
	Data flash/E2 data flash (KB)	8																				
Clocks	Subclock (external: 32.768 kHz)	YES																				
	RTC	YES																				
	On-chip oscillator	YES (50 MHz)																				
Data transfer	DMAC (channels)	4																				
	DTC	YES																				
Analog	A/D (resolution × channels)	10-bit × 4, 24-bit × 3			10-bit × 7, 24-bit × 4			10-bit × 7, 24-bit × 7						10-bit × 4, 24-bit × 3			10-bit × 7, 24-bit × 4			10-bit × 7, 24-bit × 7		
	D/A (resolution × channels)	—			10-bit × 2									—			10-bit × 2					
Timers	8-/16-/32-bit timers (channels)	4/10/—																				
	PWM outputs	20																				
	3-phase PWM output	YES																				
Communications	SCI (clock-synchronous/asynchronous) (channels)	5																				
	SPI/QSPI (clock-synchronous only) (channels)	7/—																				
	I²C (channels)	6			7									6			7					
I/O	I/O ports	39			52			67						39			52			67		
Other functions	ELC	YES																				
	Safety functions	YES																				
	External interrupts (pins)	8			9									8			9					
Other	Power supply voltage (V)	1.8 V to 3.6 V																				
	Operating ambient temperature (℃)	–40 to 85 ℃												–40 to 105 ℃								
	Package	64-LFQFP (10 × 10 mm)			80-LFQFP (12 × 12 mm)			100-LFQFP (14 × 14 mm)			100-TFLGA (7 × 7 mm)			64-LFQFP (10 × 10 mm)			80-LFQFP (12 × 12 mm)			100-LFQFP (14 × 14 mm)		

MEMO

RX130 (48 to 100 pins)

Group		RX130																																																								
Pin count		48										64										80					100				48										64										80					100			
Product name		R5F51303ADNE	R5F51305ADNE	R5F51306ADNE	R5F51307ADNE	R5F51308ADNE	R5F51303ADFL	R5F51305ADFL	R5F51306ADFL	R5F51307ADFL	R5F51308ADFL	R5F51303ADFM	R5F51305ADFM	R5F51306ADFM	R5F51307ADFM	R5F51308ADFM	R5F51303ADFK	R5F51305ADFK	R5F51306ADFK	R5F51307ADFK	R5F51308ADFK	R5F51303ADFN	R5F51305ADFN	R5F51306ADFN	R5F51307ADFN	R5F51308ADFN	R5F51305ADFP	R5F51306ADFP	R5F51307ADFP	R5F51308ADFP	R5F51303AGNE	R5F51305AGNE	R5F51306AGNE	R5F51307AGNE	R5F51308AGNE	R5F51303AGFL	R5F51305AGFL	R5F51306AGFL	R5F51307AGFL	R5F51308AGFL	R5F51303AGFM	R5F51305AGFM	R5F51306AGFM	R5F51307AGFM	R5F51308AGFM	R5F51303AGFK	R5F51305AGFK	R5F51306AGFK	R5F51307AGFK	R5F51308AGFK	R5F51303AGFN	R5F51305AGFN	R5F51306AGFN	R5F51307AGFN	R5F51308AGFN	R5F51305AGFP	R5F51306AGFP	R5F51307AGFP	R5F51308AGFP
CPU	CPU core	RXv1																																																								
	Maximum operating frequency (MHz)	32																																																								
Memory	ROM (KB)	64	128	256	384	512	64	128	256	384	512	64	128	256	384	512	64	128	256	384	512	64	128	256	384	512	128	256	384	512	64	128	256	384	512	64	128	256	384	512	64	128	256	384	512	64	128	256	384	512	64	128	256	384	512	128	256	384	512
	RAM (KB)	10	16	32	48		10	16	32	48		10	16	32	48		10	16	32	48		10	16	32	48		16	32	48		10	16	32	48		10	16	32	48		10	16	32	48		10	16	32	48		10	16	32	48		16	32	48	
	Data flash/E2 data flash (KB)	8																																																									
Clocks	Subclock (external: 32.768 kHz)	—										1																			—										1																		
	RTC	—										1																			—										1																		
	On-chip oscillator	YES (32 MHz)																																																									
Data transfer	DTC	YES																																																									
Analog	A/D (resolution × channels)	12-bit × 10										12-bit × 14										12-bit × 17					12-bit × 24				12-bit × 10										12-bit × 14										12-bit × 17					12-bit × 24			
	D/A (resolution × channels)	—										8-bit × 2																			—										8-bit × 2																		
Timers	8-/16-/32-bit timers (channels)	4/9/—																																																									
	PWM outputs	20																																																									
	3-phase PWM output	YES																																																									
Communications	SCI (clock-synchronous/asynchronous) (channels)	4																									7				4																									7			
	SPI/QSPI (clock-synchronous only) (channels)	5/—																									8/—				5/—																									8/—			
	I^2C (channels)	5																									8				5																									8			
I/O	I/O ports	39										53										69					89				39										53										69					89			
Other functions	Touch key (channels)	24										32										36									24										32										36								
	ELC	YES																																																									
	Safety functions	YES																																																									
	External interrupts (pins)	9																																																									
Other	Power supply voltage (V)	1.8 V to 5.5 V																																																									
	Operating ambient temperature (℃)	–40 to 85 ℃																													–40 to 105 ℃																												
	Package	48-HWQFN (7 × 7 mm)					48-LFQFP (7 × 7 mm)					64-LFQFP (10 × 10 mm)					64-LQFP (14 × 14 mm)					80-LFQFP (12 × 12 mm)					100-LFQFP (14 × 14 mm)				48-HWQFN (7 × 7 mm)					48-LFQFP (7 × 7 mm)					64-LFQFP (10 × 10 mm)					64-LQFP (14 × 14 mm)					80-LFQFP (12 × 12 mm)					100-LFQFP (14 × 14 mm)			

RX113 (64 to 100 pins)

Group		RX113																	
Pin count		64				100								64				100			
Product name		R5F51135ADFM	R5F51136ADFM	R5F51137ADFM	R5F51138ADFM	R5F51135ADFP	R5F51136ADFP	R5F51137ADFP	R5F51138ADFP	R5F51135ADLJ	R5F51136ADLJ	R5F51137ADLJ	R5F51138ADLJ	R5F51135AGFM	R5F51136AGFM	R5F51137AGFM	R5F51138AGFM	R5F51135AGFP	R5F51136AGFP	R5F51137AGFP	R5F51138AGFP
CPU	CPU core	RXv1																			
	Maximum operating frequency (MHz)	32																			
Memory	ROM (KB)	128	256	384	512	128	256	384	512	128	256	384	512	128	256	384	512	128	256	384	512
	RAM (KB)	32		64		32		64		32		64		32		64		32		64	
	Data flash/E2 data flash (KB)	8																			
Clocks	Subclock (external: 32.768 kHz)	YES																			
	RTC	YES																			
	On-chip oscillator	YES (32 MHz)																			
Data transfer	DTC	YES																			
Analog	A/D (resolution × channels)	12-bit × 11				12-bit × 17								12-bit × 11				12-bit × 17			
	D/A (resolution × channels)	12-bit × 2																			
Timers	8-/16-/32-bit timers (channels)	4/11/—																			
	PWM outputs	20																			
	3-phase PWM output	YES																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	6				8								6				8			
	SPI/QSPI (clock-synchronous only) (channels)	7/—				9/—								7/—				9/—			
	I²C (channels)	7				9								7				9			
	SSI (channels)	1																			
	USB Host/Func	YES/YES																			
I/O	I/O ports	48				84								48				84			
Other functions	Touch key (channels)	—				12								—				12			
	ELC	YES																			
	Safety functions	YES																			
	External interrupts (pins)	9																			
Other	Power supply voltage (V)	1.8 V to 3.6 V																			
	Operating ambient temperature (℃)	–40 to 85 ℃												–40 to 105 ℃							
	Package	64-LFQFP (10 × 10 mm)				100-LFQFP (14 × 14 mm)				100-TFLGA (7 × 7 mm)				64-LFQFP (10 × 10 mm)				100-LFQFP (14 × 14 mm)			

RX111 (36 to 64 pins)

Group		RX111																									
Pin count		36			40			48																			
Product name		R5F5111JADLM	R5F51111ADLM	R5F51113ADLM	R5F5111JADNF	R5F51111ADNF	R5F51113ADNF	R5F5111JADNE	R5F51111ADNE	R5F51113ADNE	R5F51114ADNE	R5F51115ADNE	R5F51116ADNE	R5F51117ADNE	R5F51118ADNE	R5F5111JADFL	R5F51111ADFL	R5F51113ADFL	R5F51114ADFL	R5F51115ADFL							
CPU	CPU core	RXv1																									
	Maximum operating frequency (MHz)	32																									
Memory	ROM (KB)	16	32	64	16	32	64	16	32	64	96	128	256	384	512	16	32	64	96	128							
	RAM (KB)	8	10		8	10		8	10		16		32	64		8	10		16							
	Data flash/E2 data flash (KB)	8																									
Clocks	Subclock (external: 32.768 kHz)	—						YES																			
	RTC	—						YES																			
	On-chip oscillator	YES (32 MHz)																									
Data transfer	DTC	YES																									
Analog	A/D (resolution × channels)	12-bit × 7			12-bit × 8			12-bit × 10																			
	D/A (resolution × channels)	—																									
Timers	8-/16-/32-bit timers (channels)	—/8/—																									
	PWM outputs	16																									
	3-phase PWM output	YES																									
Communications	SCI (clock-synchronous/asynchronous) (channels)	3																									
	SPI/QSPI (clock-synchronous only) (channels)	4/—																									
	I²C (channels)	4																									
	USB Host/Func	YES/YES																									
I/O	I/O ports	21			25			32																			
Other functions	ELC	YES																									
	Safety functions	YES																									
	External interrupts (pins)	9																									
Other	Power supply voltage (V)	1.8 V to 3.6 V																									
	Operating ambient temperature (℃)	–40 to 85 ℃																									
	Package	36-WFLGA (4 × 4 mm)			40-HWQFN (6 × 6 mm)			48-HWQFN (7 × 7 mm)																			

RX111 (36 to 64 pins)

Group		RX111																																																
Pin count		48			64																								40			48																64		
Product name		R5F51116ADFL	R5F51117ADFL	R5F51118ADFL	R5F5111JADFM	R5F51111ADFM	R5F51113ADFM	R5F51114ADFM	R5F51115ADFM	R5F51116ADFM	R5F51117ADFM	R5F51118ADFM	R5F5111JADFK	R5F51111ADFK	R5F51113ADFK	R5F51114ADFK	R5F51115ADFK	R5F51116ADFK	R5F51117ADFK	R5F51118ADFK	R5F5111JADLF	R5F51111ADLF	R5F51113ADLF	R5F51114ADLF	R5F51115ADLF	R5F51116ADLF	R5F51117ADLF	R5F51118ADLF	R5F5111JAGNF	R5F51111AGNF	R5F51113AGNF	R5F5111JAGNE	R5F51111AGNE	R5F51113AGNE	R5F51114AGNE	R5F51115AGNE	R5F51116AGNE	R5F51117AGNE	R5F51118AGNE	R5F5111JAGFL	R5F51111AGFL	R5F51113AGFL	R5F51114AGFL	R5F51115AGFL	R5F51116AGFL	R5F51117AGFL	R5F51118AGFL	R5F5111JAGFM	R5F51111AGFM	R5F51113AGFM
CPU	CPU core	RXv1																																																
	Maximum operating frequency (MHz)	32																																																
Memory	ROM (KB)	256	384	512	16	32	64	96	128	256	384	512	16	32	64	96	128	256	384	512	16	32	64	96	128	256	384	512	16	32	64	16	32	64	96	128	256	384	512	16	32	64	96	128	256	384	512	16	32	64
	RAM (KB)	32	64		8	10		16		32	64		8	10		16		32	64		8	10		16		32	64		8	10		8	10		16		32	64		8	10		16		32	64		8	10	
	Data flash/E2 data flash (KB)	8																																																
Clocks	Subclock (external: 32.768 kHz)	YES																											—			YES																		
	RTC	YES																											—			YES																		
	On-chip oscillator	YES (32 MHz)																																																
Data transfer	DTC	YES																																																
Analog	A/D (resolution × channels)	12-bit × 10			12-bit × 14																								12-bit × 8			12-bit × 10																12-bit × 14		
	D/A (resolution × channels)	—			8-bit × 2																								—																			8-bit × 2		
Timers	8-/16-/32-bit timers (channels)	—/8/—																																																
	PWM outputs	16																																																
	3-phase PWM output	YES																																																
Communications	SCI (clock-synchronous/asynchronous) (channels)	3																																																
	SPI/QSPI (clock-synchronous only) (channels)	4/—																																																
	I²C (channels)	4																																																
	USB Host/Func	YES/YES																																																
I/O	I/O ports	32			48																								25			32																48		
Other functions	ELC	YES																																																
	Safety functions	YES																																																
	External interrupts (pins)	9																																																
Other	Power supply voltage (V)	1.8 V to 3.6 V																																																
	Operating ambient temperature (℃)	–40 to 85 ℃																											–40 to 105 ℃																					
	Package	48-LFQFP (7 × 7 mm)			64-LFQFP (10 × 10 mm)								64-LQFP (14 × 14 mm)								64-WFLGA (5 × 5 mm)								40-HWQFN (6 × 6 mm)			48-HWQFN (7 × 7 mm)								48-LFQFP (7 × 7 mm)								64-LFQFP (10 × 10 mm)		

RX111 (36 to 64 pins)

Group		RX111												
Pin count		64												
Product name		R5F51114AGFM	R5F51115AGFM	R5F51116AGFM	R5F51117AGFM	R5F51118AGFM	R5F5111JAGFK	R5F5111AGFK	R5F5113AGFK	R5F51114AGFK	R5F51115AGFK	R5F51116AGFK	R5F51117AGFK	R5F51118AGFK
CPU	CPU core	RXv1												
	Maximum operating frequency (MHz)	32												
Memory	ROM (KB)	96	128	256	384	512	16	32	64	96	128	256	384	512
	RAM (KB)	16		32	64		8	10		16		32	64	
	Data flash/E2 data flash (KB)	8												
Clocks	Subclock (external: 32.768 kHz)	YES												
	RTC	YES												
	On-chip oscillator	YES (32 MHz)												
Data transfer	DTC	YES												
Analog	A/D (resolution × channels)	12-bit × 14												
	D/A (resolution × channels)	8-bit × 2												
Timers	8-/16-/32-bit timers (channels)	—/8/—												
	PWM outputs	16												
	3-phase PWM output	YES												
Communications	SCI (clock-synchronous/asynchronous) (channels)	3												
	SPI/QSPI (clock-synchronous only) (channels)	4/—												
	I²C (channels)	4												
	USB Host/Func	YES/YES												
I/O	I/O ports	48												
Other functions	ELC	YES												
	Safety functions	YES												
	External interrupts (pins)	9												
Other	Power supply voltage (V)	1.8 V to 3.6 V												
	Operating ambient temperature (℃)	–40 to 105 ℃												
	Package	64-LFQFP (10 × 10 mm)					64-LQFP (14 × 14 mm)							

RX110 (36 to 64 pins)

Group		RX110																			
Pin count		36				40				48											
Product name		R5F5110HADLM	R5F5110JADLM	R5F51101ADLM	R5F51103ADLM	R5F5110HADNF	R5F5110JADNF	R5F51101ADNF	R5F51103ADNF	R5F5110JADNE	R5F51101ADNE	R5F51103ADNE	R5F51104ADNE	R5F51105ADNE	R5F5110JADFL	R5F51101ADFL	R5F51103ADFL	R5F51104ADFL	R5F51105ADFL
CPU	CPU core	RXv1																			
	Maximum operating frequency (MHz)	32																			
Memory	ROM (KB)	8	16	32	64	8	16	32	64	16	32	64	96	128	16	32	64	96	128		
	RAM (KB)	8		10		8		10		8	10		16		8	10		16			
Clocks	Subclock (external: 32.768 kHz)	—								YES											
	RTC	—								YES											
	On-chip oscillator	YES (32 MHz)																			
Data transfer	DTC	YES																			
Analog	A/D (resolution × channels)	12-bit × 7				12-bit × 8				12-bit × 10											
Timers	8-/16-/32-bit timers (channels)	—/6/—																			
	PWM outputs	8																			
Communications	SCI (clock-synchronous/asynchronous) (channels)	3																			
	SPI/QSPI (clock-synchronous only) (channels)	4/—																			
	I²C (channels)	4																			
I/O	I/O ports	25				29				36											
Other functions	Safety functions	YES																			
	External interrupts (pins)	9																			
Other	Power supply voltage (V)	1.8 V to 3.6 V																			
	Operating ambient temperature (℃)	–40 to 85 ℃																			
	Package	36-WFLGA (4 × 4 mm)				40-HWQFN (6 × 6 mm)				48-HWQFN (7 × 7 mm)					48-LFQFP (7 × 7 mm)						

RX110 (36 to 64 pins)

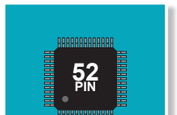
Group		RX110																																						
Pin count		64															40				48										64									
Product name		R5F5110JADFM	R5F51101ADFM	R5F51103ADFM	R5F51104ADFM	R5F51105ADFM	R5F5110JADFK	R5F51101ADFK	R5F51103ADFK	R5F51104ADFK	R5F51105ADFK	R5F5110JADLF	R5F51101ADLF	R5F51103ADLF	R5F51104ADLF	R5F51105ADLF	R5F5110HAGNF	R5F5110JAGNF	R5F51101AGNF	R5F51103AGNF	R5F5110JAGNE	R5F51101AGNE	R5F51103AGNE	R5F51104AGNE	R5F51105AGNE	R5F5110JAGFL	R5F51101AGFL	R5F51103AGFL	R5F51104AGFL	R5F51105AGFL	R5F5110JAGFM	R5F51101AGFM	R5F51103AGFM	R5F51104AGFM	R5F51105AGFM	R5F5110JAGFK	R5F51101AGFK	R5F51103AGFK	R5F51104AGFK	R5F51105AGFK
CPU	CPU core	RXv1																																						
	Maximum operating frequency (MHz)	32																																						
Memory	ROM (KB)	16	32	64	96	128	16	32	64	96	128	16	32	64	96	128	8	16	32	64	16	32	64	96	128	16	32	64	96	128	16	32	64	96	128	16	32	64	96	128
	RAM (KB)	8	10		16		8	10		16		8	10		16		8		10		8	10		16		8	10		16		8	10		16		8	10		16	
Clocks	Subclock (external: 32.768 kHz)	YES															—				YES																			
	RTC	YES															—				YES																			
	On-chip oscillator	YES (32 MHz)																																						
Data transfer	DTC	YES																																						
Analog	A/D (resolution × channels)	12-bit × 14															12-bit × 8				12-bit × 10										12-bit × 14									
Timers	8-/16-/32-bit timers (channels)	—/6/—																																						
	PWM outputs	8																																						
Communications	SCI (clock-synchronous/asynchronous) (channels)	3																																						
	SPI/QSPI (clock-synchronous only) (channels)	4/—																																						
	I²C (channels)	4																																						
I/O	I/O ports	52															29				36										52									
Other functions	Safety functions	YES																																						
	External interrupts (pins)	9																																						
Other	Power supply voltage (V)	1.8 V to 3.6 V																																						
	Operating ambient temperature (℃)	–40 to 85 ℃															–40 to 105 ℃																							
	Package	64-LFQFP (10 × 10 mm)					64-LQFP (14 × 14 mm)					64-WFLGA (5 × 5 mm)					40-HWQFN (6 × 6 mm)				48-HWQFN (7 × 7 mm)					48-LFQFP (7 × 7 mm)					64-LFQFP (10 × 10 mm)					64-LQFP (14 × 14 mm)				

RX Family Safety Functions and Product Support

Safety Function	Description	Supported By																							
		RX71M	RX64M	RX651	RX65N	RX631	RX63N	RX621	RX62N	RX634	RX630	RX610	RX63T	RX62T	RX62G	RX24U	RX24T	RX23T	RX231	RX230	RX220	RX210	RX21A	RX130	RX113	RX111	RX110
CRC calculator (CRC)	Detection of errors in communication data, etc.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Independent watchdog timer (IWDT)	CPU runaway monitoring using WDT employing clock separate from the CPU clock	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Oscillation-stop detection	Oscillation-stop detection	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Clock frequency accuracy measurement function (CAC)/ frequency measurement function (MCK)	Clock frequency error detection	○	○	○	○	○	○			○	○		○			○	○	○	○	○	○	○	○	○	○	○	○
Data operation circuit (DOC)	System memory test assist	○	○	○	○					○			○			○	○	○	○	○	○	○	○	○	○	○	○
Port output enable (POE)	Pin protection	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	
A/D self-diagnostics	Fault detection function for A/D converter unit	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○			
A/D disconnection detection	Analog input disconnection detection assist	○	○	○	○					○						○	○	○	○	○	○	○	○	○			

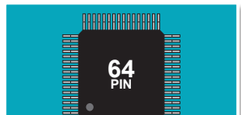
RX Family Package Lineup

●LQFP



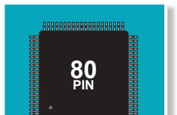
52-LQFP (10 × 10 mm)

Pitch	0.65 mm
Thickness (max.)	1.70 mm
Used by	RX23T



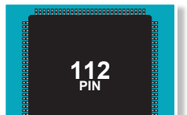
64-LQFP (14 × 14 mm)

Pitch	0.80 mm
Thickness (max.)	1.70 mm
Used by	RX62T, 220, 130, 111, 110



80-LQFP (14 × 14 mm)

Pitch	0.65 mm
Thickness (max.)	1.70 mm
Used by	RX62T, 24T, 210



112-LQFP (20 × 20 mm)

Pitch	0.65 mm
Thickness (max.)	1.70 mm
Used by	RX63T, 62T, 62G

●LFQFP

48-LFQFP (7 × 7 mm)

Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX631, 63T, 23T, 231, 230, 220, 210, 130, 111, 110

64-LFQFP (10 × 10 mm)

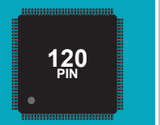
Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX631, 63T, 62T, 24T, 23T, 231, 230, 220, 210, 21A, 130, 113, 111, 110

80-LFQFP (12 × 12 mm)

Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX630, 24T, 220, 210, 21A, 130

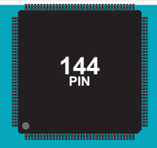
100-LFQFP (14 × 14 mm)

Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX71M, 64M, 65N, 651, 631, 63N, 621, 62N, 630, 63T, 62T, 62G, 24U, 24T, 231, 230, 220, 210, 21A, 130, 113



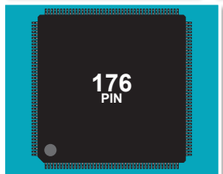
120-LFQFP (16 × 16 mm)

Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX63T



144-LFQFP (20 × 20 mm)

Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX71M, 64M, 65N, 651, 631, 63N, 621, 62N, 634, 630, 610, 63T, 24U, 210



176-LFQFP (24 × 24 mm)

Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX71M, 64M, 631, 63N, 630

●HWQFN

40-HWQFN (6 × 6 mm)

Pitch	0.50 mm
Thickness (max.)	0.80 mm
Used by	RX111, 110

48-HWQFN (7 × 7 mm)

Pitch	0.50 mm
Thickness (max.)	0.80 mm
Used by	RX230, 231, 130, 111, 110

64-HWQFN (9 × 9 mm)

Pitch	0.50 mm
Thickness (max.)	0.80 mm
Used by	RX230, 231

●LFBGA

176-LFBGA (13 × 13 mm)

Pitch	0.80 mm
Thickness (max.)	1.40 mm
Used by	RX71M, 64M, 631, 63N, 621, 62N, 630, 610

●WFBGA

69-WFBGA (3.91 × 4.26 mm)

Pitch	0.40 mm
Thickness (max.)	0.70 mm
Used by	RX210

●TFLGA

64-TFLGA (6 × 6 mm)

Pitch	0.65 mm
Thickness (max.)	1.05 mm
Used by	RX631

85-TFLGA (7 × 7 mm)

Pitch	0.65 mm
Thickness (max.)	1.20 mm
Used by	RX621

100-TFLGA (5.5 × 5.5 mm)

Pitch	0.50 mm
Thickness (max.)	1.05 mm
Used by	RX630, 230, 231, 210

100-TFLGA (7 × 7 mm)

Pitch	0.65 mm
Thickness (max.)	1.05 mm
Used by	RX71M, 64M, 65N, 651, 631, 63N, 210, 21A, 113

145-TFLGA (7 × 7 mm)

Pitch	0.50 mm
Thickness (max.)	1.05 mm
Used by	RX71M, 64M, 65N, 651, 631, 63N, 630, 210

145-TFLGA (9 × 9 mm)

Pitch	0.65 mm
Thickness (max.)	1.20 mm
Used by	RX621, 62N

177-TFLGA (8 × 8 mm)

Pitch	0.50 mm
Thickness (max.)	1.05 mm
Used by	RX71M, 64M, 631, 63N, 630

●WFLGA

36-WFLGA (4 × 4 mm)

Pitch	0.50 mm
Thickness (max.)	0.76 mm
Used by	RX111, 110

64-WFLGA (5 × 5 mm)

Pitch	0.50 mm
Thickness (max.)	0.76 mm
Used by	RX230, 231, 111, 110

How to Read RX Family Product Numbers

R5 Renesas MCU | **F** ROM Type F: Flash S: ROM LESS | **5** RX Family | **63N** Product Group | **F** ROM/RAM/data flash capacity (KB)*1 | **D** Chip Original info*1 | **D** Operating ambient temperature | **FC** Package type/pin count/pin pitch | **#V** Packing specification + Tray | **0** Product identification code

Product Group

71M	RX71M	**62G**	RX62G
64M	RX64M	**24U**	RX24U
651	RX651	**24T**	RX24T
65N	RX65N	**23T**	RX23T
631	RX631	**231**	RX231
63N	RX63N	**230**	RX230
621	RX621	**220**	RX220
62N	RX62N	**210**	RX210
634	RX634	**21A**	RX21A
630	RX630	**130**	RX130
610	RX610	**113**	RX113
63T	RX63T	**111**	RX111
62T	RX62T	**110**	RX110

ROM/RAM/data flash capacity (KB)*1

Chip Original info*1

Operating ambient temperature

N	−20 °C to 85 °C
D	−40 °C to 85 °C
G	−40 °C to 105 °C

Package type/pin count/pin pitch

BG	LFBGA	176	0.8
BM	WLBGA	69	0.4
FA	LQFP	120	0.5
FB	LQFP	144	0.5
FC	LQFP	176	0.5
FD	LQFP	52	0.65
FF	LQFP	80	0.65
FH	LQFP	112	0.65
FK	LQFP	64	0.8
FL	LQFP	48	0.5
FM	LQFP	64	0.5
FN	LQFP	80	0.5
FP	LQFP	100	0.5
LA	TFLGA	100	0.5
LC	TFLGA	177	0.5
LD	TFLGA	85	0.65
LE	TFLGA	145	0.65
LF	WFLGA	64	0.5
LH	TFLGA	64	0.65
LJ	TFLGA	100	0.65
LK	TFLGA	145	0.5
LM	WFLGA	36	0.5
ND	HWQFN	64	0.5
NE	HWQFN	48	0.5
NF	HWQFN	40	0.5

Packing specification + Tray

U, 2	HWQFN, WFLGA, TFLGA, LFBGA, WLBGA
V, 3	LFQFP, LQFP

Example of product information for RX63N (176-pin), product No. R5F563NFDDFC#V0

This guide lists the values for individual product numbers. For information on the actual product lineup, refer to the relevant user's manual.

Note: 1. This information is different for each RX group. Refer to the relevant user's manual for details.

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(Rev.4.0-1 November 2017)

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