RX Family

Renesas 32-Bit Microcontrollers

BIG IDEAS
FOR EVERY SPACE

2016.1

Maintaining and Advancing the Renesas Tradition

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

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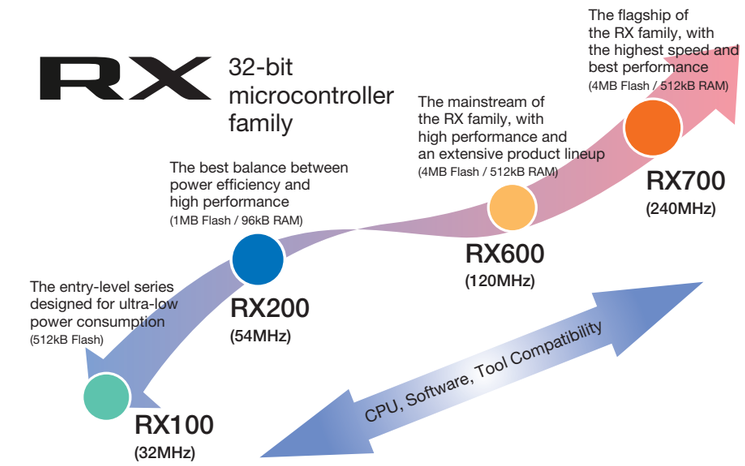
- New products added.
  RX700 Series: RX71M
  RX600 Series: RX634
  RX200 Series: RX231/RX230/RX23T
  RX100 Series: RX113/RX130
- Information on solutions added.
  Motor control solutions
  Capacitive touch solutions
  Functional safety solutions for the industrial field
- Information on package options and how to read product numbers added.

RX family microcontrollers are built around a cutting-edge CPU core that is exclusive to Renesas. Built on exclusive technologies accumulated over many years, it delivers improved responsiveness in all aspects and better power efficiency. It delivers superior 32-bit operation performance and software code size typical of 16-bit CPUs.
Bringing together a range of Renesas technologies, the RX family embodies the ultimate in 32-bit microcontrollers with on-chip flash for the industrial, electric home appliance, office equipment, and ICT fields.



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.

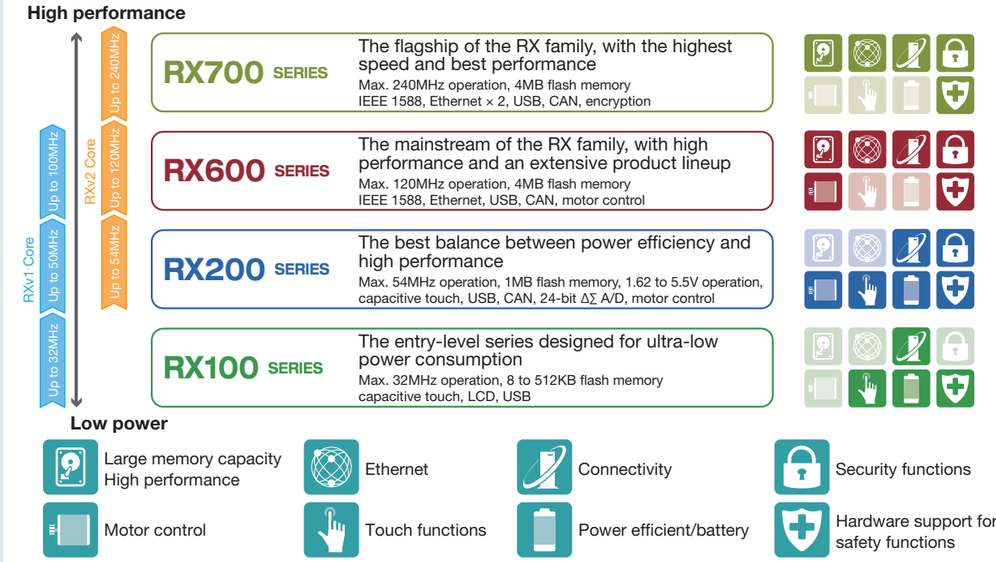
RX Family Product Evolution

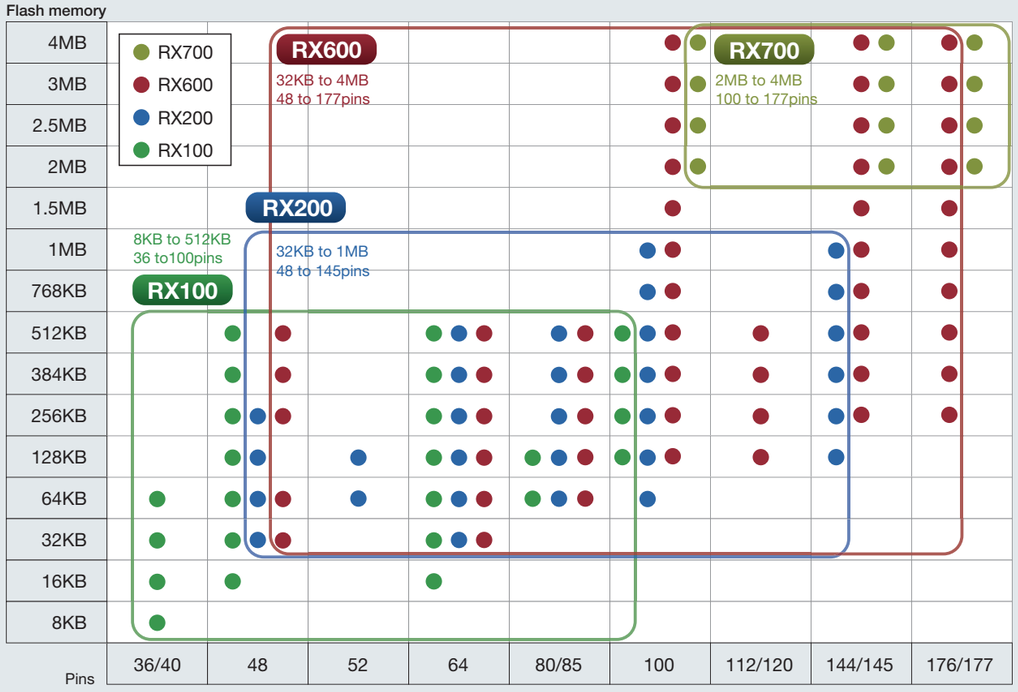
About the RX Family

The RX family is the new generation of microcontrollers built around the revolutionary RX core, which combines the strengths of RISC and CICS 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





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 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 to 32KB or ECCRAM there is 512KB of on-chip SRAM with a parity function that helps minimize malfunctions due to software errors in the SRAM. Hardware encryption functions such as AES, DES, SHA, and RNG enable authentication and data encryption to protect against data leaks. Other security functions include Trusted Memory, a special area of the on-chip flash memory containing program code that is protected from unauthorized read access.

- High speed, high performance
- Real-time performance
- High reliability
- Security

RX600 Series

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

The RX600 series is optimized for high speed and excellent performance. Up to 4MB of flash memory featuring zero-wait access makes it possible to extract the full performance potential of the maximum operating frequency of 120MHz. 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; and products optimized for applications such as sensing using image capture or security using AES encryption. The extensive product lineup provides support for a broad range of applications.

- High-performance 32-bit RX CPU Up to 4.55CoreMark/MHz
- High speed, large-capacity flash memory Zero-wait access Max. 4MB
- Extensive lineup Wide range of products for applications involving Ethernet motor control, etc.
- Safety functions IEC 60730 support IEC 61508 support

RX200 Series

RX Family Balance of Power Efficiency and Performance: RX200 Series

The RX200 series provides a balance between power efficiency and performance. Current consumption is 0.12mA/MHz during operation and only 0.8µA in standby mode (with RAM contents retained). The maximum operating speed of the CPU is 54MHz, delivering high performance of 4.16 CoreMark/MHz. The RX200 series supports a operating voltage range of 1.62V to 5.5V. Notable peripheral function modules include the MTU2 16-bit timer unit with advanced functionality, RTC, 12-bit A/D converter, and temperature sensor. In addition, numerous hardware options are available to assist the implementation of functional safety. These simplify the process of obtaining IEC 60730 safety certification for electric home appliances. The extensive RX200 series lineup spans memory capacities from 32KB to 1MB and pin counts from 48 to 145 pins. In addition to general-purpose products, there are products designed specifically for applications requiring 24-bit ΔΣ A/D converters, hardware-based AES encryption and decryption functions, and measuring capabilities used in power meters, etc. The RX200 series is suitable for use in digital cameras, electric home appliances, power meters, communication equipment, and industrial equipment.

- High-performance 32-bit RX CPU Up to 4.16CoreMark/MHz
- Low power consumption 0.12mA/MHz to 0.2mA/MHz
- Low voltage 1.62V to 5.5V
- Safety functions IEC 60730 support

RX100 Series

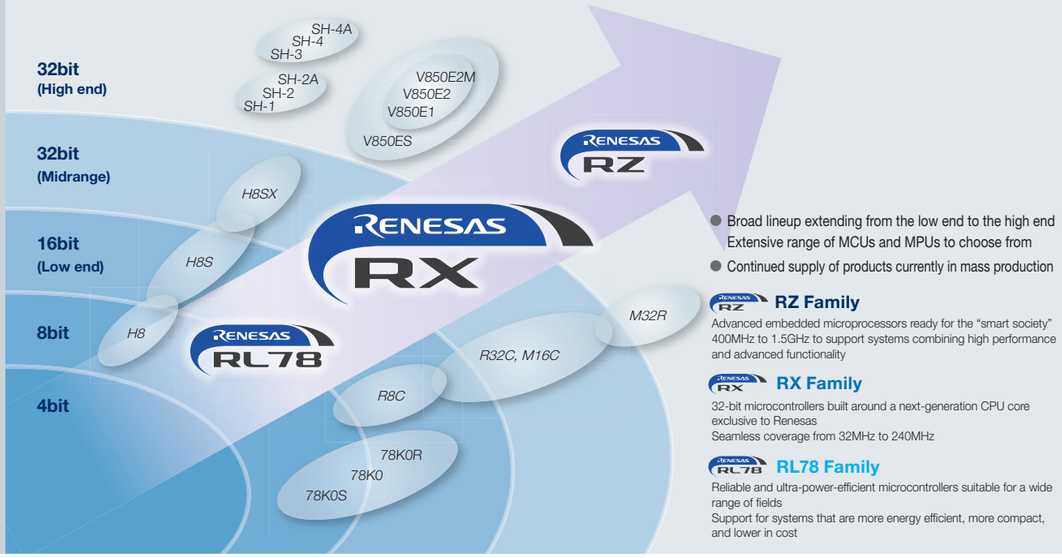
RX Family Ultra-Power-Efficient Series: RX100 Series

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 product lineup spans memory capacities from 8KB to 512KB and pin counts from 36 to 64 pins. Products with USB, LCD, and capacitive touch functionality are also available. The RX100 series is suitable for use in healthcare devices, communication equipment, electric home appliances, office equipment, measuring devices, and user interfaces.

- High-performance 32-bit RX CPU 3.08CoreMark/MHz
- Lowest power consumption 0.1mA/MHz
- Extensive user interface functions LCD, capacitive touch
- Safety functions IEC 60730 support IEC 61508 support

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

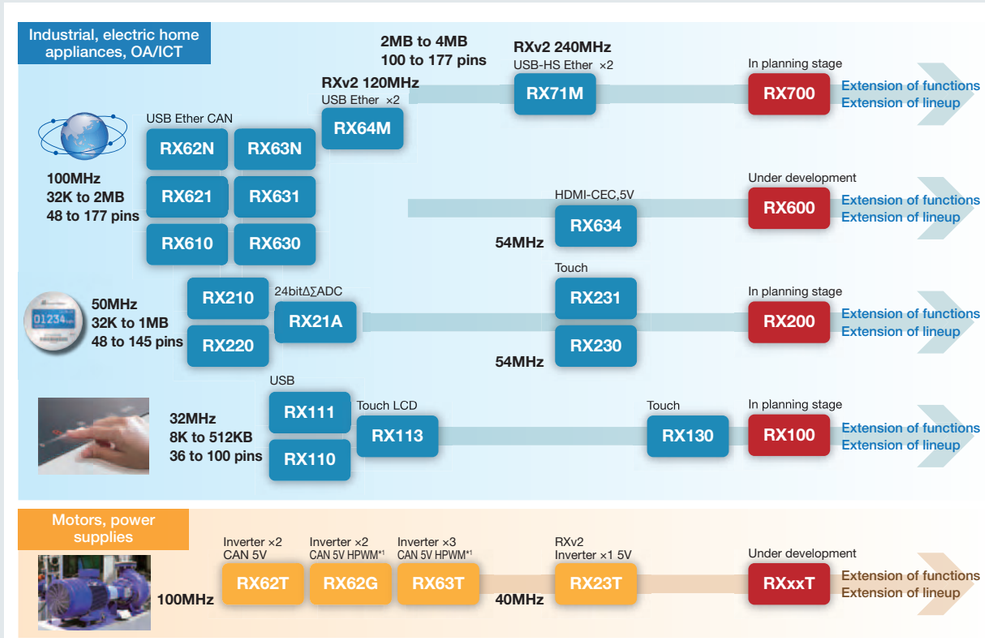
RZ Family
Advanced embedded microprocessors ready for the "smart society"
400MHz to 1.5GHz to support systems combining high performance and advanced functionality

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

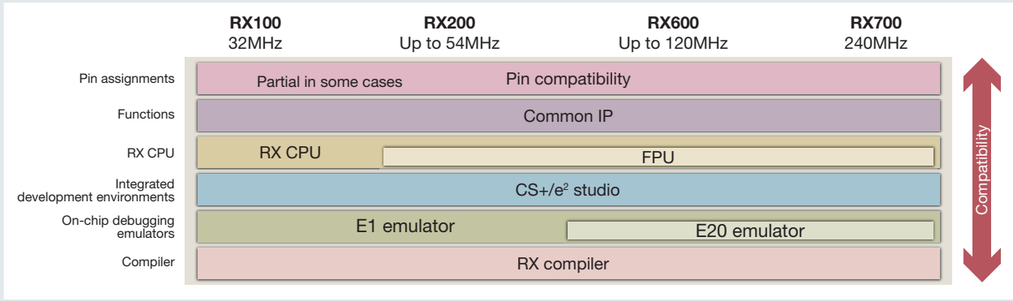
Plans to further extend the RX100, RX200, RX600, and RX700 series



Details of products in the development or design stage are subject to change without notice.
Note: 1. HPWM: High-resolution PWM

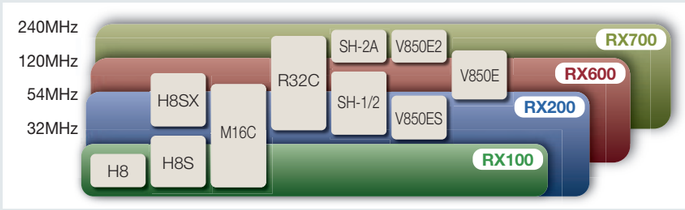
RX Family Compatibility

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.



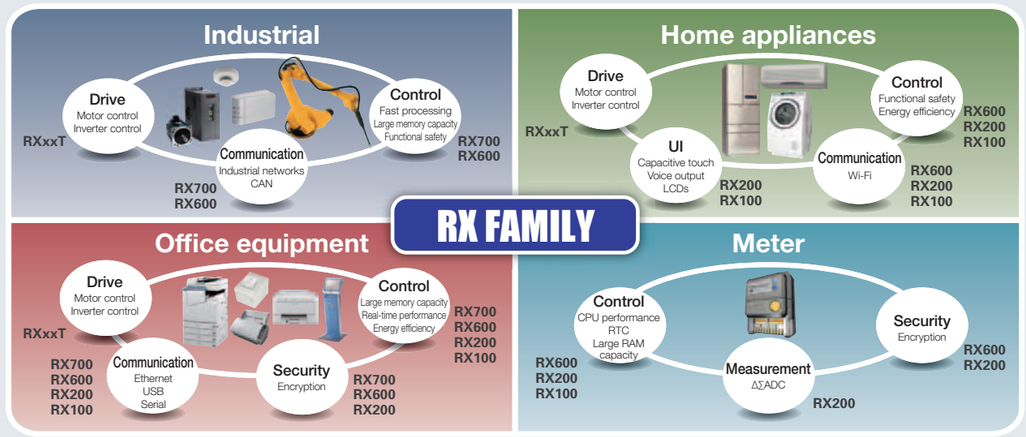
Existing Products and RX Extensibility

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

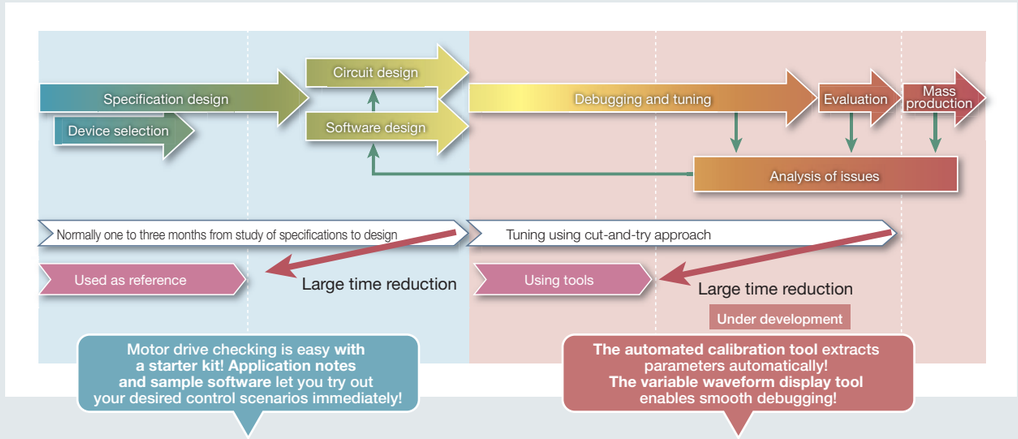


RX Family Solutions

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, verification, and confirmation.

Development Workflow



Motor Control Starter Kit (Renesas Solution Starter Kit)

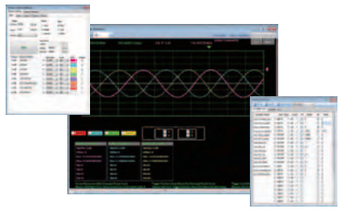
Package includes motor, inverter, and emulator.
The supplied sample software is ideal for practice and study.

- Motor control board (mounted with MCU, power element, etc.)
  Supplied MCU: RX62T or RX23T (under development)
- Brushless DC motor (permanent magnet synchronous motor): 24Monitoring of CPU internal information as on an oscilloscope
- E1 emulator
- Quick start guide
- DVD-ROM
  Documentation: User's manual, application notes, etc.
  Integrated development environment: CS+ free evaluation version
  Sample software: vector control, 120-degree continuity control

Just connect a power supply to start testing motor drive applications right away!

Variable Waveform Display Tool (In-Circuit Scope)

Real-time display of variable waveforms for up to eight channels.
Zoom function. Waveform display is updated immediately when parameters are changed.

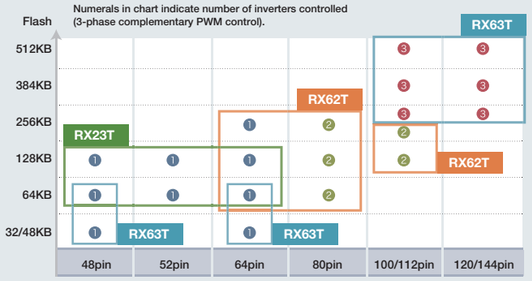


- Real-time debugging without halting the CPU
  The ability to read and write variable values makes it easy to make changes to the parameters at any time.
- DVD-ROM
  Ability to set resolution and triggers.
  Ability to assign display variable to channels.
- The control circuit and PC are electrically isolated from each other for safety
- Only required resources are UART and DTC

ASSP Lineup for Motor Applications

- Seamless range of products ranging from 48 to 144 pins, 32KB to 512KB of memory, and control of one to three inverters. You can choose the product that best matches your application.
- All advanced timer functions for motor control are upward compatible, so it is easy to switch devices to provide improved performance.

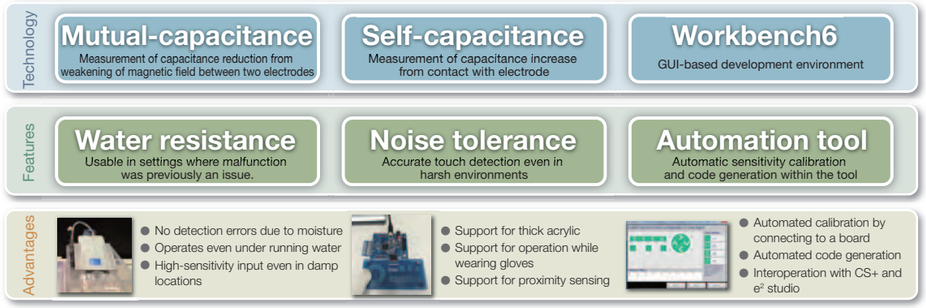
Lineup of Microcontroller Products for Motor Applications



Capacitive Touch Solutions

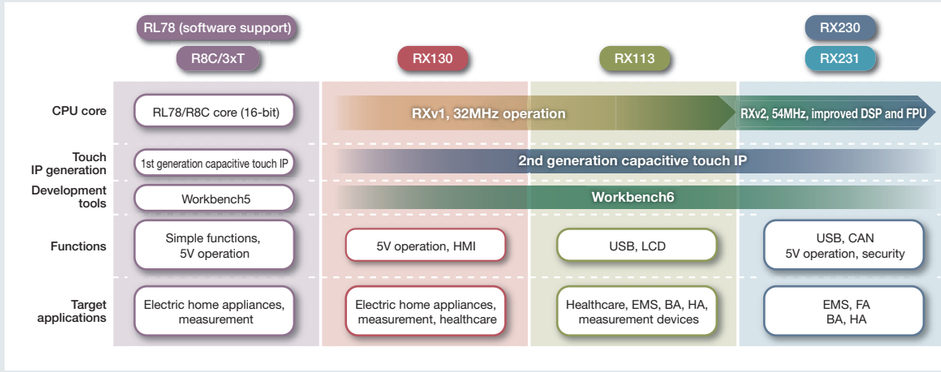
RX Capacitive Touch Functionality

- New touch IP supports both self-capacitance and, for the first time from Renesas, mutual-capacitance. Both types of touch detection are integrated into a single chip.
- Accurate touch input even in harsh environments and improved design flexibility.
- Workbench6 simplifies sensitivity calibration, which previously required multiple touch sensors, and development of control programs.



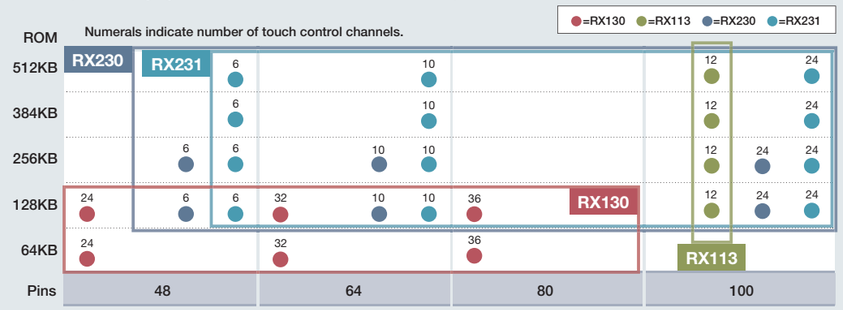
Roadmap

- 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 capacitive touch 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

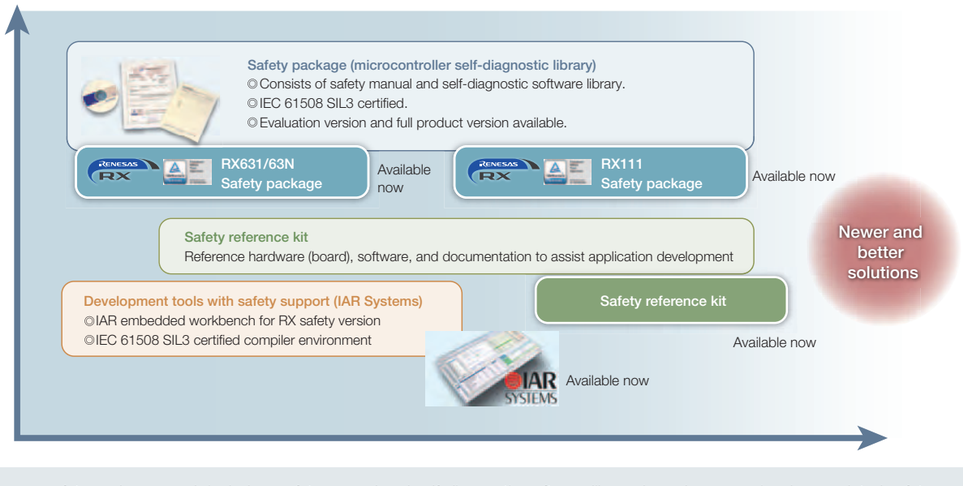


RX Family Solutions

Functional Safety Solutions for the Industrial Field

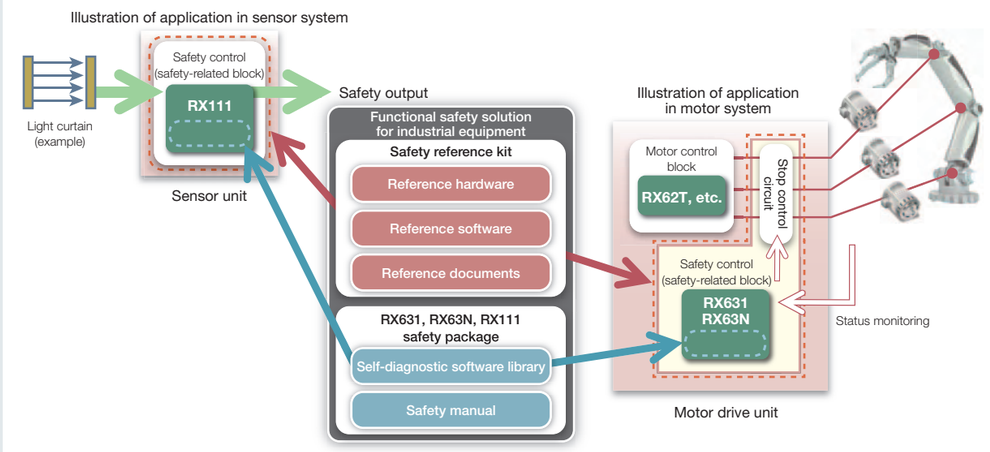
In the industrial equipment field the importance of “functional safety,” which aims to maintain safety even when malfunctions occur, is increasing as a way to prevent the adverse effect of breakdowns and accidents on plant operation, the adverse effect of injuries to personnel on society, and the associated 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 (IAR Systems).

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 offers safety reference kits consisting of software for industrial systems that is based on hardware and system specifications developed independently by existing customers. Documentation needed for authentication is also available. Renesas is working to extend the range of industrial solutions moving forward.

Solution Application Example



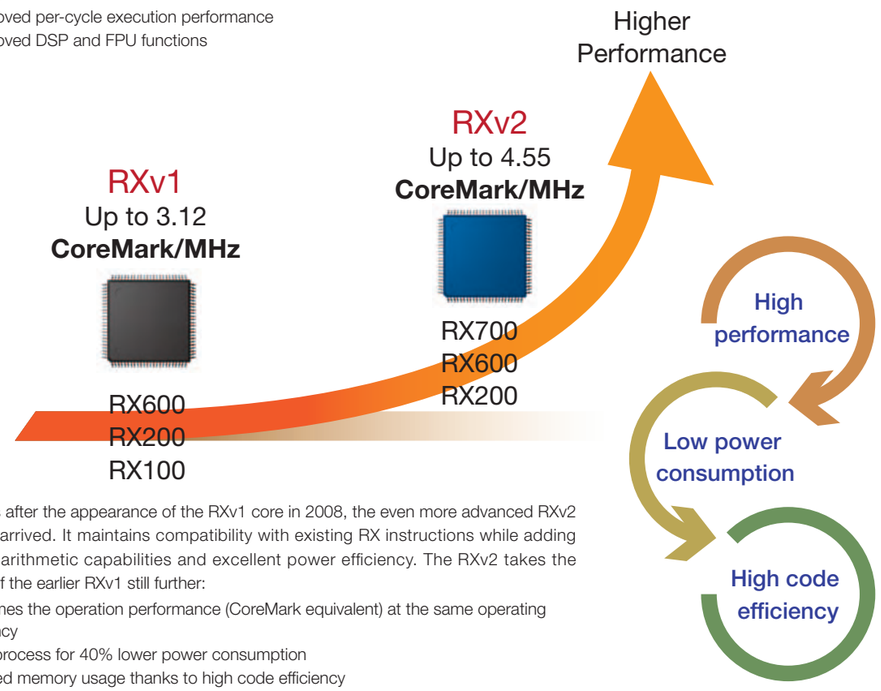
MEMO

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

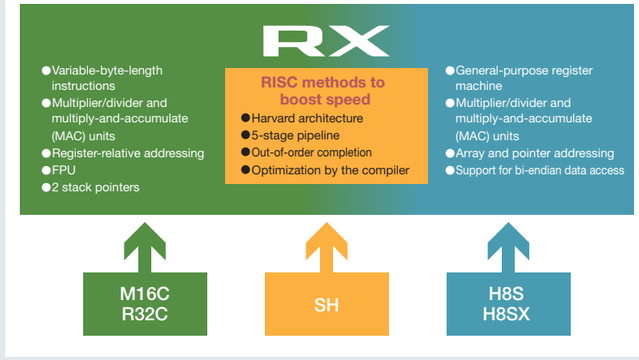
■ Comparison of RXv1 Core and RXv2 Core

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 3.12CoreMark/MHz	Up to 4.55CoreMark/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.

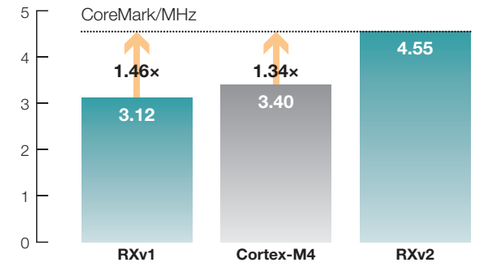


Feature 2 32-bit class operation performance with 16-bit class code size

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.

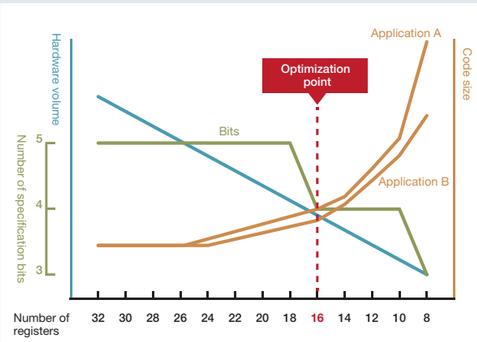
Improved pipeline and FPU/DSP instructions for better operation efficiency



Note: CoreMark scores are published by EEMBC (http://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.

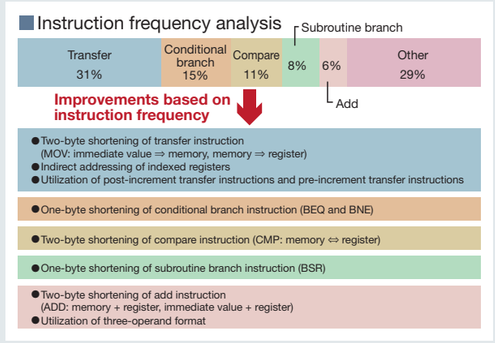


RX Core Features

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.

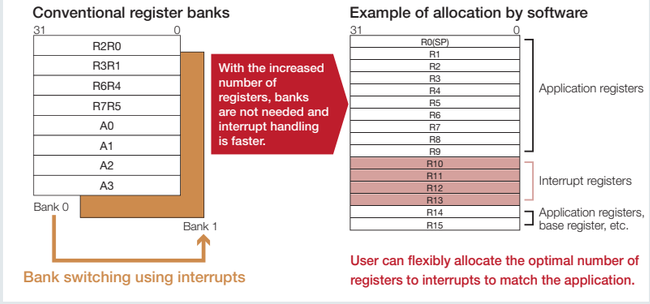
- Instructions have variable byte lengths, and the most frequently used instructions are assigned to the shortest instruction codes
- The most frequently used instructions were identified by analyzing actual application software.
- Some instructions were eliminated by adding addressing modes and adopting 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.

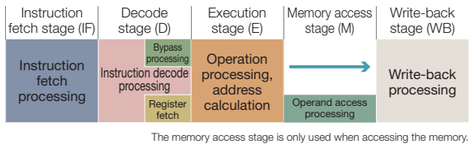


Feature 6 Pipeline Stage Configuration

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.

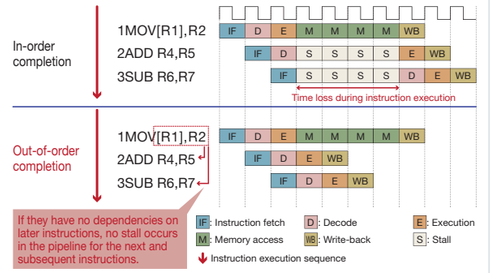
Pipeline Stage Configuration

- 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.



Out-of-Order Completion

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



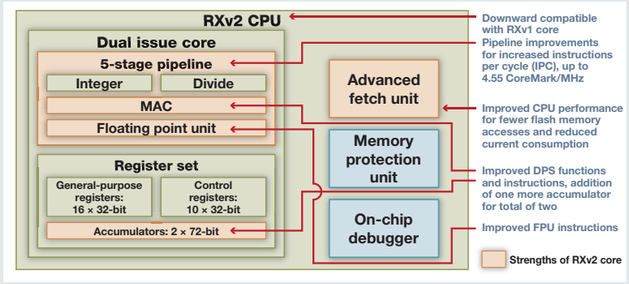
RXv2 Core Features

RXv2 Core: CPU Block Diagram

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

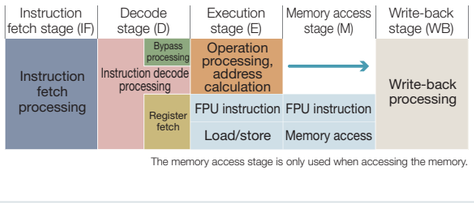
- Improved pipeline for substantial increase in the number of instructions per cycle (IPC)
- Advanced fetch unit with improved interface to on-chip flash memory. Reduces re-fetching of instructions due to penalty imposed by branch instructions and reduces the number of flash memory accesses. Achieves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



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	FSQRT(√),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

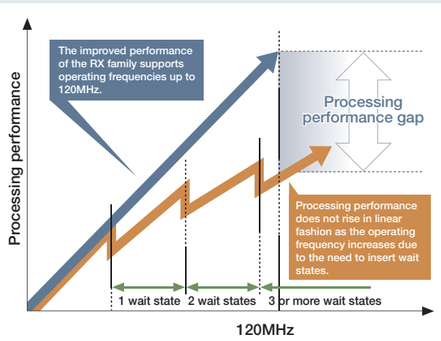
RX Family Features

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* 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.

■ Renesas High-Speed Flash Memory



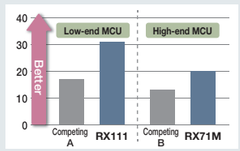
Feature 2 Variety of Package Types to Match Different Applications

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

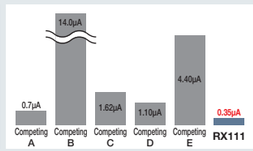
The unique RX CPU core combines a design optimized for power efficiency and an exclusive fabrication process to achieve excellent operation performance and low power consumption. Standby power consumption is also among the best anywhere in this class of microcontroller. This translates into reduced power 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)



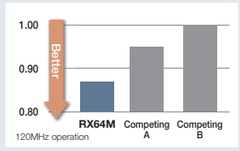
Renesas research based on datasheets of competing products.

Note: Renesas research based on information from competing companies.

Feature 4 Fast Interrupt Response Performance

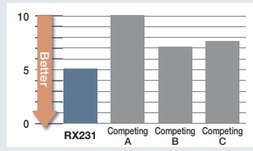
Interrupt response performance and standby time are substantially improved by the use of technologies developed for earlier products, such as high-speed flash memory that enables zero-wait access, and optimized register assignment. RX family microcontrollers are ideal for applications requiring a high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

■ Interrupt response time ratio: CPU comparison*1



Actual measurement data compiled by Renesas, standardized at 120MHz.

■ Standby recovery time (CPU and RAM contents retained)



Renesas research based on datasheets of competing products.

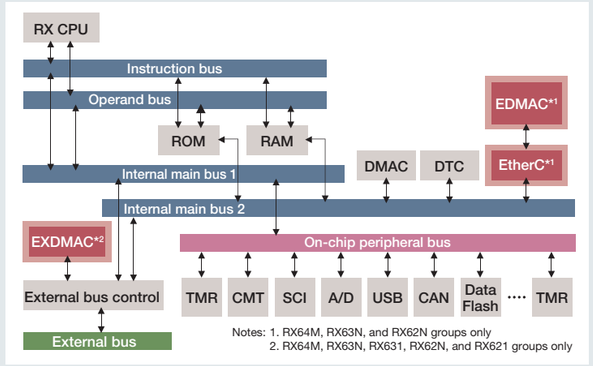
Note: 1. Renesas research based on information from competing companies.

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.

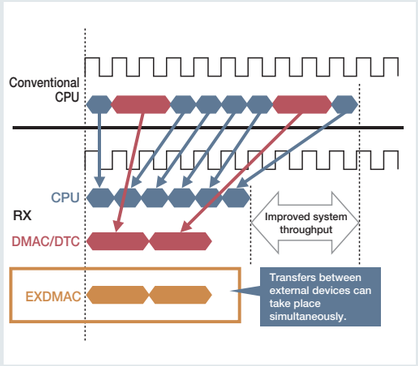
The hierarchical bus configuration of the RX family comprises main bus 1, which is used exclusively by the CPU; main bus 2, which is used exclusively by the DMAC and DTC; and peripheral and external buses. Parallel processing on different buses is supported. In addition, some products incorporate a dedicated 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



Notes: 1. RX64M, RX63N, and RX62N groups only
2. RX64M, RX63N, RX631, RX62N, and RX621 groups only

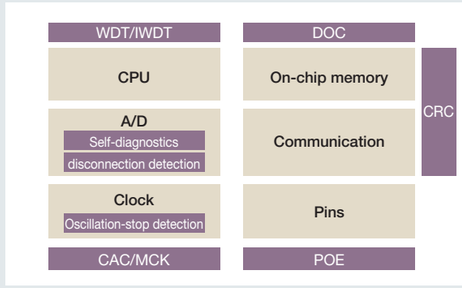
■ CPU, DMAC, DTC, and EXDMAC Operation Example



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

RX700 Series

RX700 Series Features

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

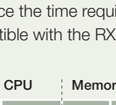
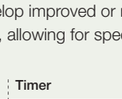
Real-time performance
Large-capacity 4MB flash memory supporting 120MHz access and AFU* for excellent real-time performance when operating at 240MHz
★AFU: Advanced Fetch Unit

High reliability
Dedicated ECCRAM and parity function 512KB large-capacity on-chip SRAM Safety functions to support electric home appliance and industrial safety standards

Security
On-chip high-speed encryption circuits for AES, DES, etc. Trusted Memory function that prevents unauthorized access to a portion of the on-chip flash memory to protect important programs

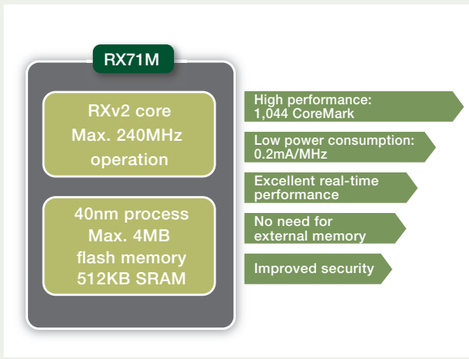
Main Applications of RX700 Series

Industrial	Office equipment	HMI
PLC General-purpose inverters Semiconductor fabrication equipment LCD panel manufacturing equipment	Compact printers and copiers POS terminals	LCD panel controllers

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.



Extensibility from RX600 Series

The RX71M, the first offering in the RX700 series, provides a high level of compatibility by retaining the functions of the RX600 series while adding new functions such as USB High-Speed capability. It is easy to migrate from the RX600 series to the faster RX700 series, which helps reduce the time required to develop improved or next-generation products. In particular, the peripheral functions and pin assignments are compatible with the RX64M group, allowing for speedier rollouts of new product versions.

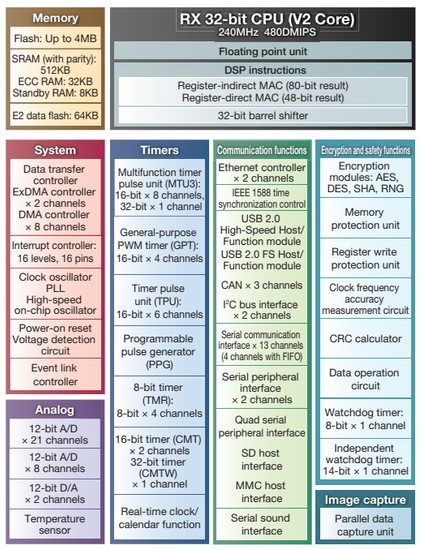
	CPU	Memory			Timer					Communication										Analog		Security		Other			
RX71M	240MHz RXv2 w FPU	Up to 4MB Flash	Up to 512KB RAM	64KB E2 Flash	RTC	3ph Motor MTU3 9ch	POE	4ch TMR 6ch TPU	4ch GPT	9ch SCI 4ch SCIF	2ch RSPI 2ch RIIC	3ch CAN	USB 2.0 OTG FS/HS w PHY	2ch Ether MAC	IEEE1588	SSI/SRC QSPI	SDHI MMCIF			12bit ADC 2unit	12bit DAC 2ch	AES SHA/DES	RNG	HOCO	VBAT	ELC	Trusted Memory
RX64M	120MHz RXv2 w FPU	Up to 4MB Flash	Up to 512KB RAM	64KB E2 Flash	RTC	3ph Motor MTU3 9ch	POE	4ch TMR 6ch TPU	4ch GPT	9ch SCI 4ch SCIF	1ch RSPI 2ch RIIC	3ch CAN	USB 2.0 OTG FS 2ch w PHY	2ch Ether MAC	IEEE1588	SSI/SRC QSPI	SDHI MMCIF			12bit ADC 2unit	12bit DAC 2ch	AES SHA/DES	RNG	HOCO	VBAT	ELC	Trusted Memory
RX63N	100MHz RXv1 w FPU	Up to 2MB Flash	Up to 256KB RAM	32KB E2 Flash	RTC	3ph Motor MTU2 6ch	POE	4ch TMR 12ch TPU	12ch SCI	3ch RSPI 4ch RIIC	3ch CAN	USB 2.0 OTG FS w PHY	1ch Ether MAC	12bit /10bit ADC 1unit	10bit DAC 2ch	AES				HOCO	VBAT						

RX71M Group

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

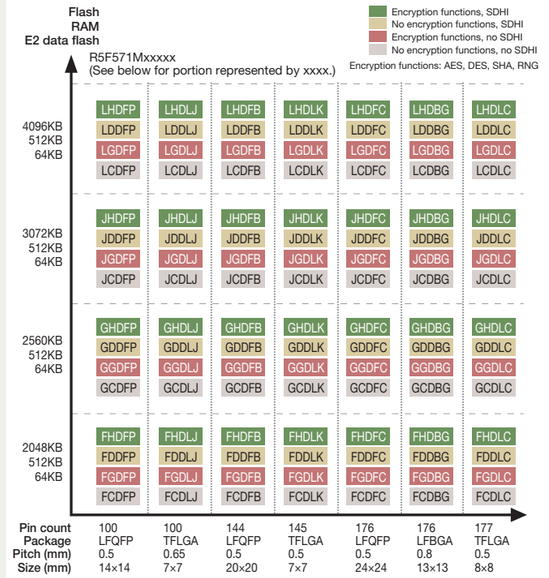
The RX71M group's maximum operating frequency of 240MHz is twice that of the RX600 series, making possible solid real-time performance suitable for industrial applications. A cache (AFU) optimized for flash memory enables access speeds equivalent to 240MHz, so the full potential of the CPU can be extracted. 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



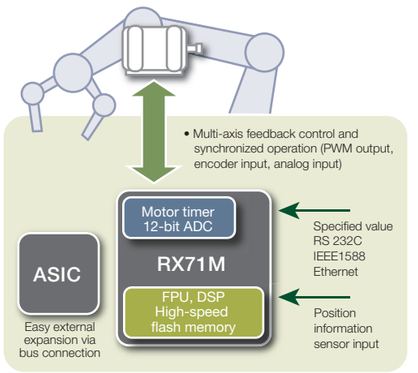
Note: Maximum specifications for the group are listed above.

RX71M Group Memory/Package Options



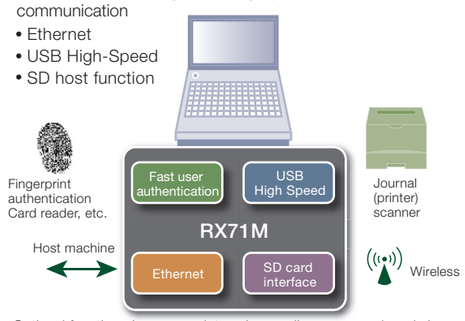
Industrial Robot: Application Example

- 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



POS Subsystem: Application Example

- High CPU performance to enable multitasking of main processing and communication processing
- Large memory capacity that contributes to more compact product design
- Enhanced connectivity and many optional functions for communication
  - Ethernet
  - USB High-Speed
  - SD host function



- Optional functions (scanner, printer, change dispenser, card reader) for communication
- Support for wireless connectivity using SD card host function

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 memory Zero-wait access Max. 4MB
Ability to extract 100% of CPU's performance potential
Fewer components for reduced power consumption

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

Safety functions IEC 60730 support IEC 61508 support
Support for for electric home appliance and industrial safety standards
Ability to enhance system safety

■ Main Applications of RX600 Series

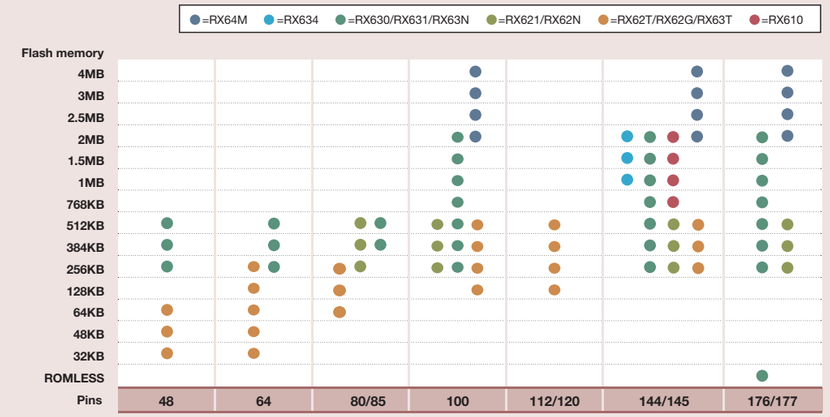
Office equipment	Audio	Industrial	Electric home appliances
Copiers Printers	Home theater systems AV receivers Audio amplifiers	Vending machines Machine tools General-purpose inverters	Air conditioners Refrigerators Washing machines

RX64M	Max. 120MHz 2MB to 4MB flash memory 2.7V to 3.6V	RXv2 core*1	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX631/ RX63N	Max. 100MHz 256KB to 2MB flash memory 2.7V to 3.6V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX621/ RX62N	Max. 100MHz 256KB to 512KB flash memory 2.7V to 3.6V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX63T	Max. 100MHz 32KB to 512KB flash memory 2.7V to 3.6V, 4.0V to 5.5V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX62T	Max. 100MHz 64KB to 256KB flash memory 2.7V to 3.6V, 4.0V to 5.5V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX62G	Max. 100MHz 128KB to 256KB flash memory 4.0V to 5.5V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX630	Max. 100MHz 384KB to 2MB flash memory 2.7V to 3.6V	RXv1 core	CAN	USB Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX634	Max. 54MHz 1MB to 2MB flash memory 2.7V to 3.6V, 4.0V to 5.5V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control
RX610	Max. 100MHz 768KB to 2MB flash memory 3.0V to 3.6V	RXv1 core	CAN	USB Host/Func	Ethernet	IEEE1588	HDMI (CEC)
		Remote control reception	Image capture	High-functionality motor control	Encryption	Safety functions	Power control

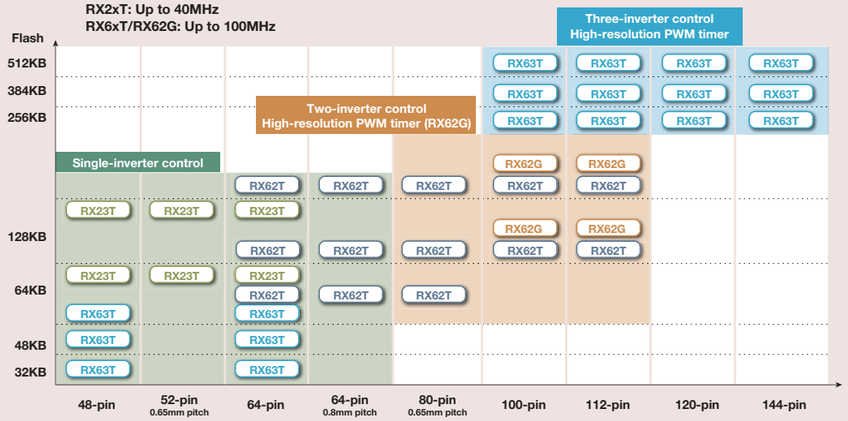
Large memory capacity High performance | Ethernet | Connectivity | Motor control | Hardware support for safety functions | Security functions

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

RX600 Series: Memory/Pin Count Options

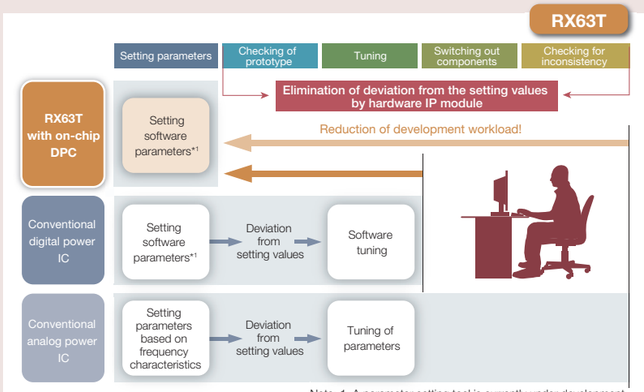


Microcontroller Lineup for Motors/Power Supplies



Benefits of Digital Power Supply Controller (DPC) Unit

In the past when developing a power supply system it was necessary to perform fine tuning to compensate for inconsistency (deviation from the setting values) in the elements in the power unit. The fine tuning process was labor-intensive and costly because it involved either the switching out of the actual components or processing in software to correct deviation from the setting values. In order to eliminate this problem the RX63T group integrates an on-chip digital power supply controller (DPC). The DPC is a dedicated hardware module that automatically corrects inconsistency in the elements in the power unit. Using a DPC can substantially reduce the burden imposed by fine tuning.

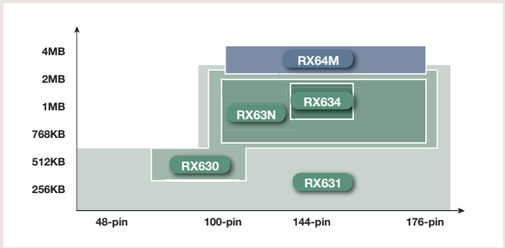


Note: 1. A parameter setting tool is currently under development.

RX600 Series

Range of Products for General-Purpose, Network, Security, and Sensing Applications

■ RX64M, RX63N, RX631, RX630, and RX634
Product Range

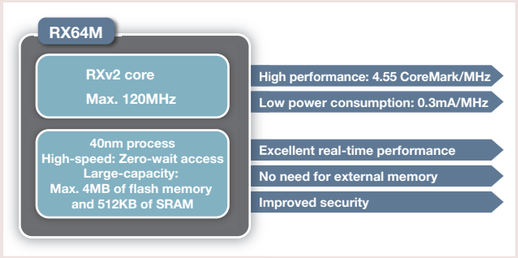


■ RX64M, RX63N, RX631, RX630, and RX634: Supported Applications

	General-purpose applications	Network and security applications		Sensor and monitoring applications
RX64M ●Ethernet/IEEE 1588 ●USB Host/Function/OTG ●Security (encryption) ●Safety functions	Copiers Printers Audio components Large-scale systems Vending machines Machine tools	Security systems Encrypted communication applications Data protection applications Entry entry/exit control systems POS terminals	Industrial network equipment (real-time Ethernet)	Industrial applications: 2-D barcode readers, shape and character recognition Human sensor applications: air conditioners, washing machines, refrigerators Simple camera applications: monitor cameras, building interior sensors
RX63N ●Ethernet ●USB Host/Function/OTG ●Security (encryption) ●Safety functions			Devices with networking support, HEMS, gateway devices	
RX631 ●USB Host/Function/OTG ●Security (encryption) ●Image capture ●Safety functions				Human sensor applications: air conditioners, washing machines, refrigerators Simple camera applications: monitor cameras, building interior sensors
RX630 ●USB Function ●Safety functions				
RX634 ●HDMI-CEC ●Remote control reception ●5V operation ●Safety functions				

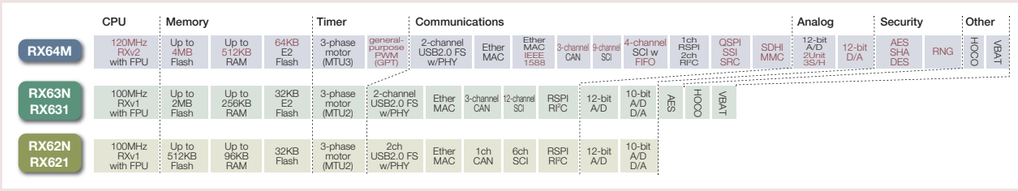
RXv2 Core, 40nm Process Flash Memory: High-Speed, Large-Capacity RX64M

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.



RX64M with Substantially Improved Peripheral Functions

The communication functions of the RX64M have been expanded and a general-purpose PWM timer newly added, all while maintaining a high level of compatibility with the on-chip functions of the earlier RX600 series. The integration of timers for Ethernet with IEEE 1588 support, which is in high demand for industrial applications, and for motor control allow improved synchronization among systems and flexible support for a variety of types of motor control. Alongside general-purpose serial communication capabilities, high-speed communication functions include USB and two Ethernet channels (pins 176 and 177), SD host interface, and QSPI interface. On-chip encryption functionality further heightens the reliability and robustness of these communication functions.



Two-Channel Industrial Network Functionality with IEEE 1588 Support for Industrial Applications

The RX64M has an on-chip Ethernet PTP controller (EPTPC) that uses the Precision Time Protocol (PTP) defined by IEEE 1588-2008 (version 2) to maintain time synchronization among devices. The EPTPC implements time control on the network and makes possible proper device control using time synchronization. It is ideal for applications that require industrial Ethernet network support.

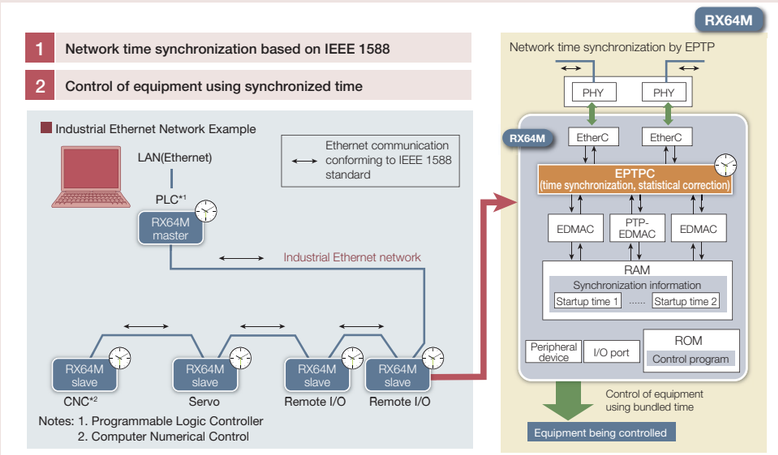
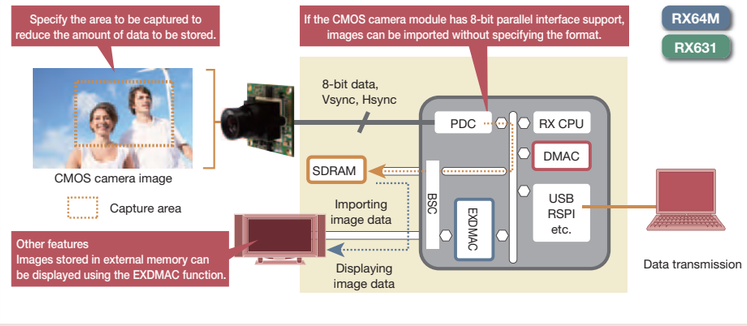


Image Capture Function Using Camera Connection Interface

Some product versions in the RX600 series have an on-chip parallel data capture unit (PDC) that can be used to connect a CMOS camera module. Images from the CMOS camera can be captured by the PDC and used to implement simple image sensor applications such as human sensors or barcode readers. Also, the EXDMAC can be used to display images captured by the PDC. All these capabilities are integrated into a single chip.

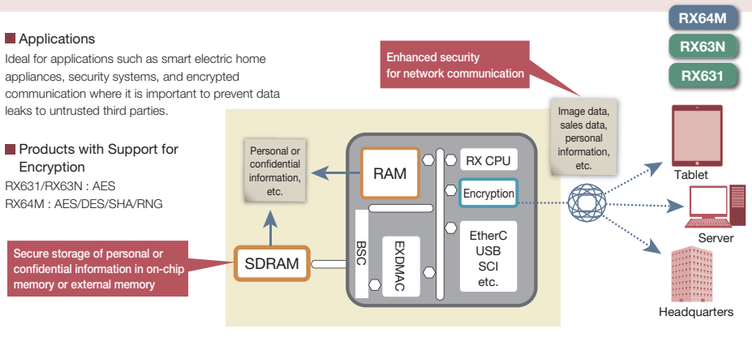


Security Using Hardware Encryption Functions

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/RNG



RX200 Series

RX200 Series Features

Low power consumption
0.12mA/MHz to 0.2mA/MHz
Long battery life

Low voltage
1.62V to 5.5V
Support for portable devices running on 1.8V through electric home appliances and industrial equipment running on 5V

High-performance 32-bit RX CPU
3.08 to 4.16 CoreMark/MHz
High performance CPU for low power consumption through intermittent operation

Safety functions
IEC 60730 support
Enhanced safety for electric home appliances

Main Applications of RX200 Series

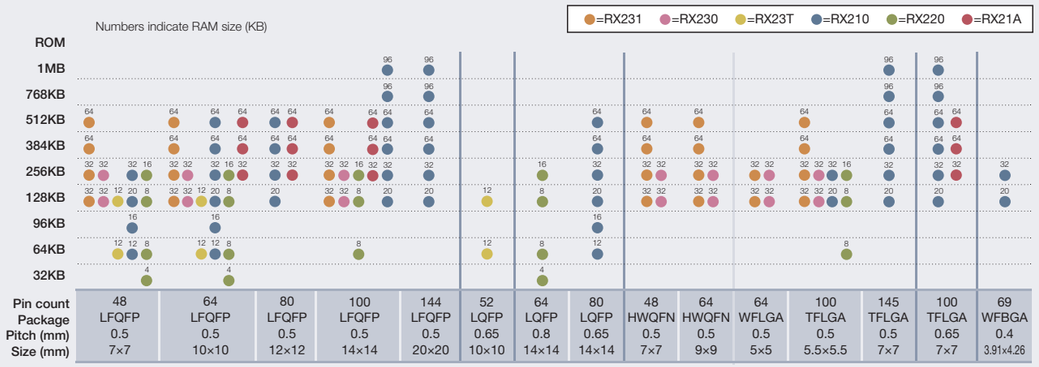
Consumer devices (battery drive)	Healthcare devices	Industrial	Electric home appliances
Smartphones Digital cameras and digital camcorders	Blood pressure gauges Blood sugar gauges	Power meters Pressure, temperature, and flow volume meters Inverters	Air conditioners Refrigerators Washing machines

RX23T	Max. 40MHz 64KB to 128KB 2.7V to 5.5V	RXv2 core*1	FPU	Safety functions	Touch	External bus	CAN
		USB H/F	SDHI	High-functionality 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 H/F	SDHI	High-functionality 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 H/F	SDHI	High-functionality 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 H/F	SDHI	High-functionality 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 H/F	SDHI	High-functionality 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 H/F	SDHI	High-functionality 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 · Motor control · Hardware support for safety functions · Security functions

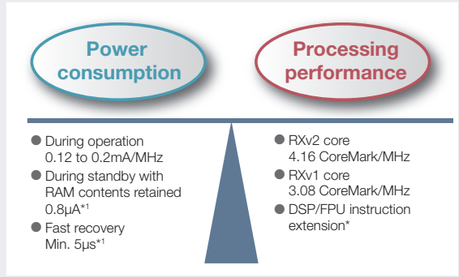
RX200 Series Lineup



Pin count	48	64	80	100	144	52	64	80	48	64	64	100	145	100	69
Package	LFQFP	LFQFP	LFQFP	LFQFP	LFQFP	LQFP	LQFP	LQFP	HWQFN	HWQFN	WFLGA	TFLGA	TFLGA	TFLGA	WFBGA
Pitch (mm)	0.5	0.5	0.5	0.5	0.5	0.65	0.8	0.65	0.5	0.5	0.5	0.5	0.5	0.65	0.4
Size (mm)	7×7	10×10	12×12	14×14	20×20	10×10	14×14	14×14	7×7	9×9	5×5	5.5×5.5	7×7	7×7	3.91×4.26

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 4.16 CoreMark/MHz)

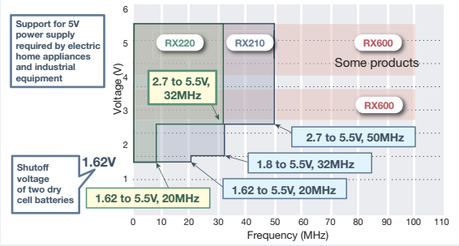


Note: 1. Example of RX231, details of other products differ.

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.

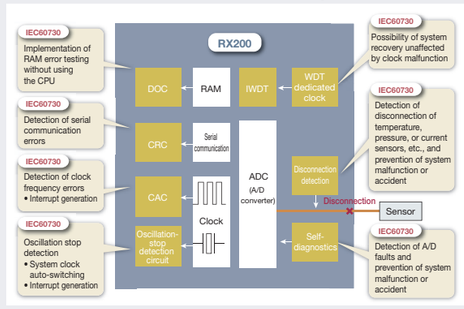
RX200 Operating Voltage and Frequency



Improved Functional Safety

The RX200 has many on-chip hardware modules that contribute to functional safety. This simplifies the task of meeting safety standards for electric home appliances and industrial equipment. VDE-certified application notes are also available.

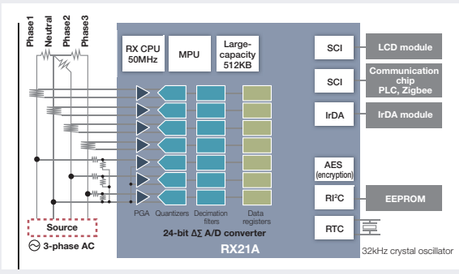
RX200 Functions to Assist Functional Safety



24-Bit ΔΣ A/D Converter

Some RX200 products have a highly accurate on-chip 24-bit ΔΣ A/D converter module. It incorporates seven independent units that provide support for three-phase power meters. The 24-bit ΔΣ A/D converter, combined with on-chip AES encryption and decryption functionality, memory protection unit (MPU), and RTC, provides capabilities that are ideal for applications such as power meters that require security or measurement devices employing clocks.

Application Example Employing ΔΣ A/D: Power Meter System



RX100 Series

RX100 Series Features

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

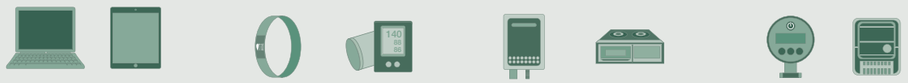
Many user interface functions
Strengthened communication functions with support for many communication standards

Minimum power consumption 0.1mA/MHz
Long battery life

Safety functions IEC 60730 support IEC 61508 support
Enhanced safety for electric home appliances

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 3.08CoreMark/MHz

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

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)

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

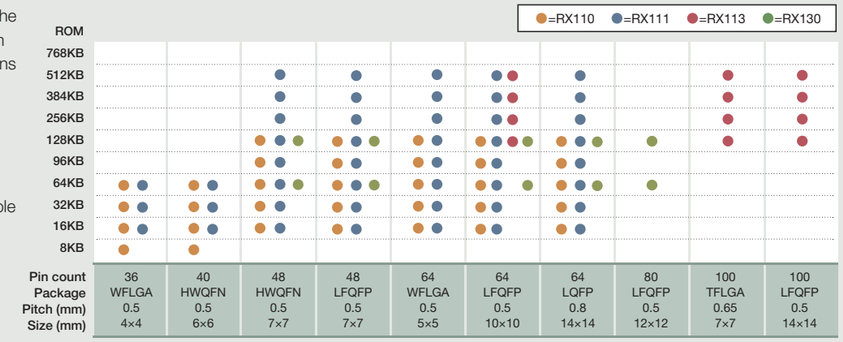
Note: 1. Not available on RX110

Specifications differ according to product number.

	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 128KB
		E2 data flash: 8KB	E2 data flash: 8KB	E2 data flash: 8KB
Pin count	36 to 64	36 to 64	64 to 100	48 to 80
Communication	SCI × 3 channels	SCI × 3 channels	SCI × 8 channels	SCI × 4 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)	
			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
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

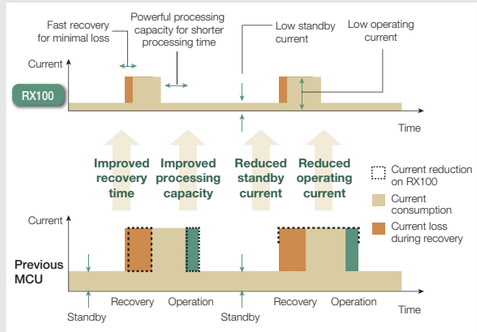
RX100 Series Lineup

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.



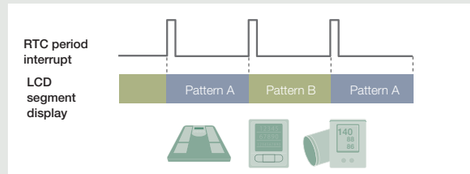
Fast Recovery from Standby for Improved Battery Life

The RX100 series has three features, listed below, that help reduce current consumption when using intermittent operation. This contributes to improved battery life.
(1) Low current consumption during operation (0.1mA/MHz) and when in standby mode (0.35μA)
(2) Fast recovery from standby (4.8μs) to minimize current loss during recovery
(3) High-performance RX CPU for shorter operation time and reduced power consumption



LCD Controller with Low Power Consumption

Switching between two patterns, A and B, by means of RTC period interrupts is supported, making it possible to implement flashing operation by preparing inverted patterns for A and B. During standby, it is possible to run only the RTC and LCD for flashing operation. The internal step-up circuit can be used to enable a 5V interface to the LCD display panel, and the display contrast is adjustable in 16 stages.



USB Low Speed and Full Speed Support

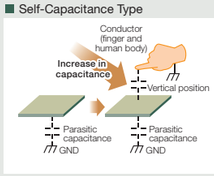
The USB module of the RX100 series supports both USB 2.0 Full Speed (12Mbps) and Low Speed (1.5Mbps) operation. Host, device, and OTG modes, and control, bulk, interrupt, and isochronous transfer types, are supported. HID, CDC, and MSC device class drivers are available.

High Sensitivity and Excellent Noise Tolerance for Capacitive Touch Panels

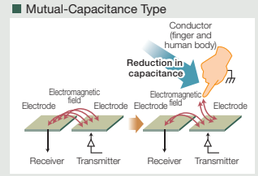
Newly developed support for capacitive touch panels benefits from prior experience to provide the three features listed below. These capabilities lay to rest the problems that have most bedeviled developers in the past.
(1) High sensitivity: Support for acrylic panels up to 10mm thick*1
(2) Excellent noise tolerance: Noise tolerance that meets the requirements of IEC 61000 4-3 and 4-6 helps minimize misoperation.
(3) Support for automated calibration tools: The Workbench 6 integrated development environment for touch automates many of the burdensome aspects of capacitive touch development. Once automatic calibration is complete, the easy-to-use software outputs custom source code.

Note: 1. Results of evaluation by Renesas Electronics. Actual performance may vary depending on the operating environment.

■ Self-Capacitance Type



■ Mutual-Capacitance Type



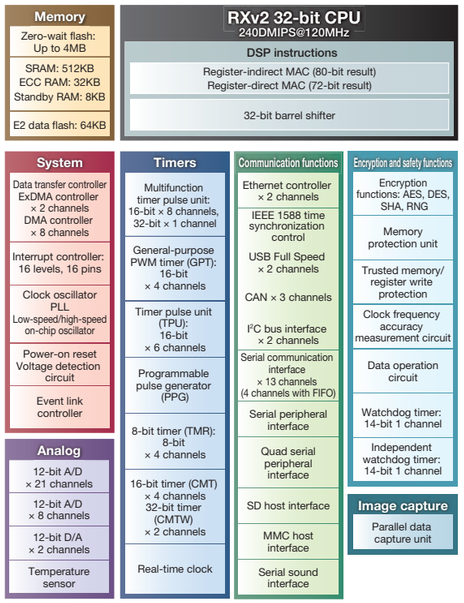
	Self-capacitance	Mutual-capacitance
Electrode pattern	○ Simple	△ More complex than self-capacitance
Substrate cost	○ Low	△ Higher than self-capacitance
Water resistance	△ Poor	○ Good
Matrix	△ Subject to limitations	○ Possible

RX64M Group

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

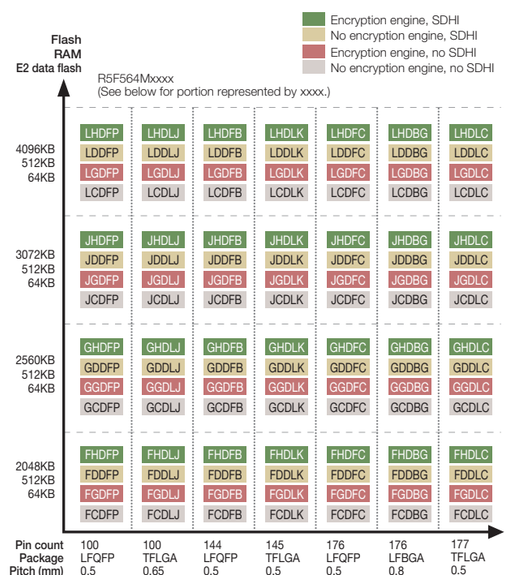
The RX64M group features the newly developed RXv2 core operating at 120MHz, up to 4MB of 120MHz zero-wait access ROM, and up to 552KB of RAM for even better real-time performance in industrial applications. Peripheral functions include Ethernet with IEEE 1588 support and intelligent multifunction timers such as MTU3 suitable for motor control and GPT. This is also the first group of microcontrollers in the RX family to provide an SD host interface that enables high-speed communication with SD cards. Peripheral functions retained from earlier microcontrollers, such as USB 2.0 Full Speed (Host/Function) capabilities, and 12-bit A/D and D/A converters, have been improved and made more flexible. Package pin counts range from 100 to 177 pins, providing support for numerous applications in the industrial and other fields.

RX64M Group Block Diagram



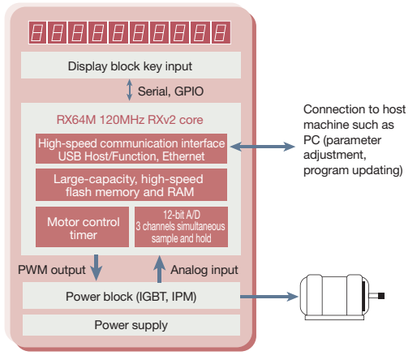
Note: Maximum specifications for the group are listed above.

RX64M Group Memory/Package Options



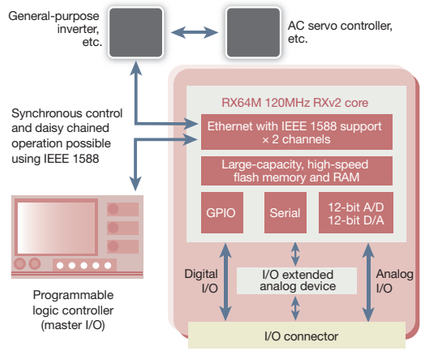
General-Purpose Inverter: Application Example

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



Remote I/O: Application Example

Synchronous control and daisy chained connection possible using Ethernet controller with IEEE 1588 support



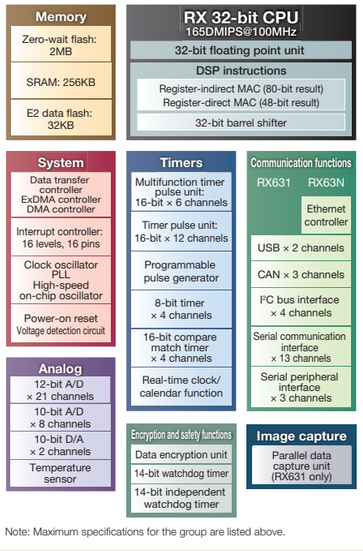
RX631/RX63N Group

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

The RX631 group and RX63N group 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.

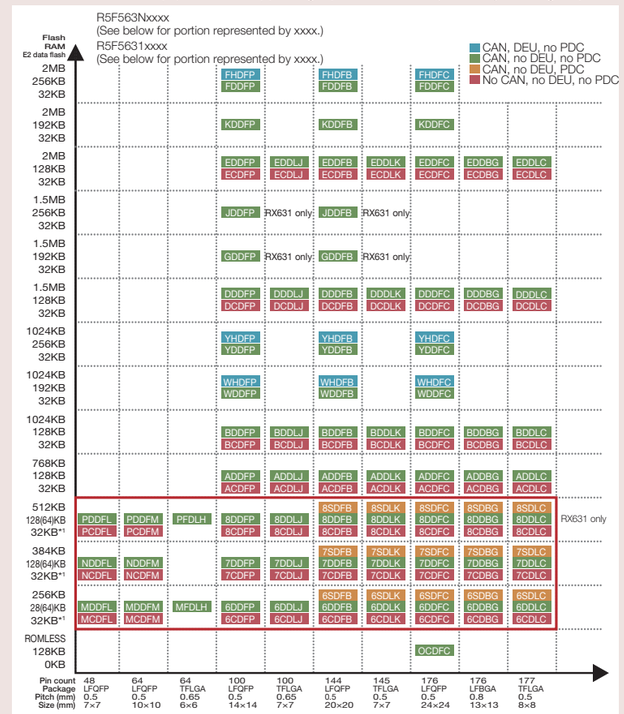
Applications: Copiers, audio components, large-scale systems, machine tools, security systems, POS terminals, HEMS, gateway devices, human sensors, monitor cameras, building interior sensors, etc.

RX631/RX63N Group Block Diagram



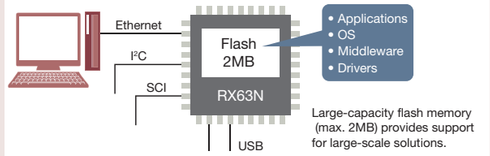
Note: Maximum specifications for the group are listed above.

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

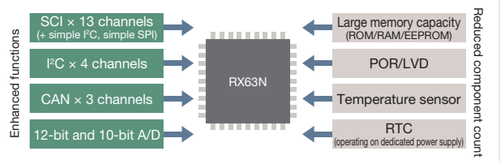


Notes: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.
1. The RAM size of the R5F5631Pxxxx, R5F5631Nxxxx, and R5F5631Mxxxx is 64KB.

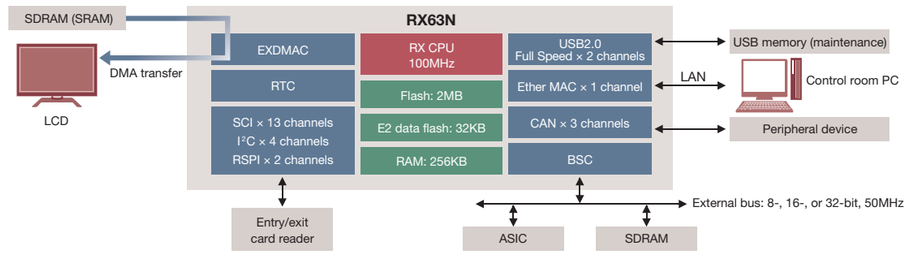
Support for Large-Scale Solutions



Enhanced Functions and Reduced Component Count



Application Example: Entry/Exit Control System



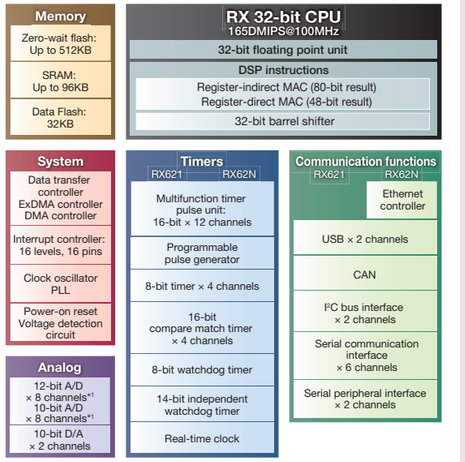
RX621/RX62N Group

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

The RX621 group and RX62N group combine 100MHz high-speed operation with enhanced communication functions. Ethernet and CAN are joined by two USB 2.0 Host 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.

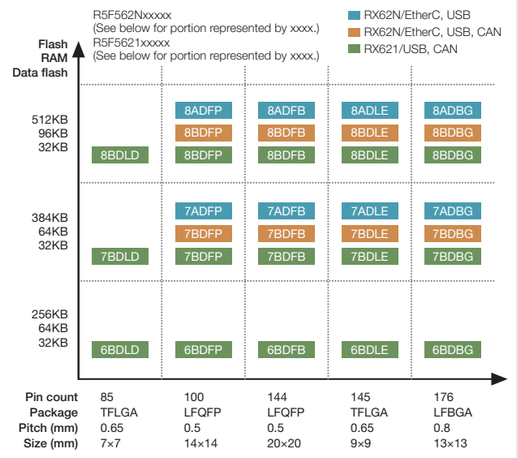
Applications: Inverters, AC servos, robots, NC machine tools, sequencers, measuring devices, POS peripheral devices, printers, etc.

RX621/RX62N Group Block Diagram

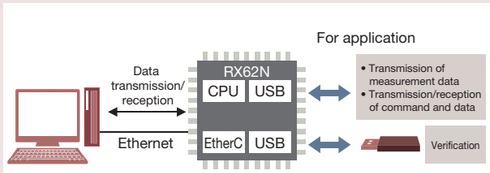


Note: 1. 10-bit A/D converter and 12-bit A/D converter cannot be used simultaneously.

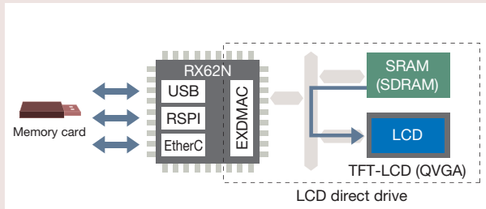
RX621/RX62N Group Memory/Package Options



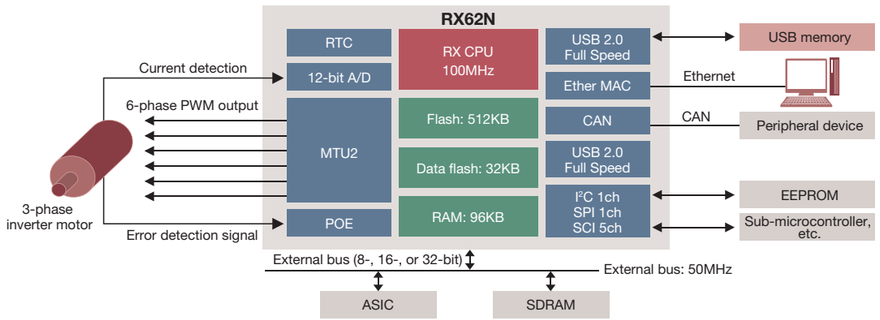
Integrated Communication Functions for Single-Chip Control



LCD Direct Drive Using EXDMAC



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

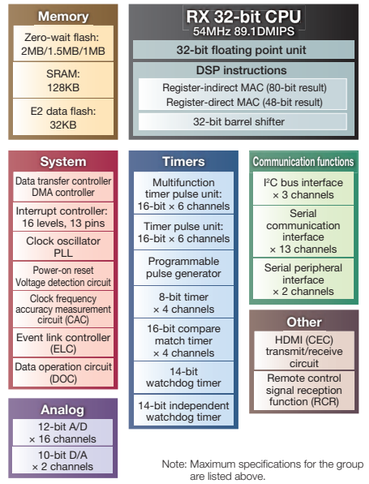


RX634 Group

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

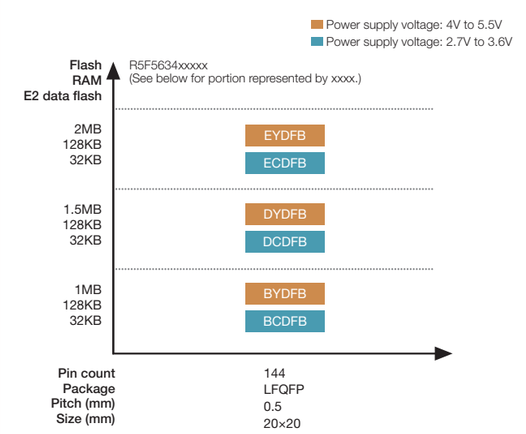
The RX634 group supports operation at both 3.3V and 5V, and the maximum operating frequency is 54MHz. The RX634 group dispenses with some functions of the RX630 group, such as CAN, USB, and RTC, and instead provides HDMI-CEC, which is essential for digital electric home appliances, and remote control 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



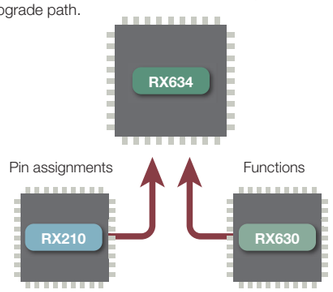
Note: Maximum specifications for the group are listed above.

RX634 Group Memory/Package Options



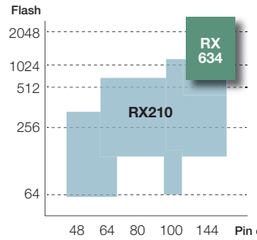
Excellent Extensibility from Other RX Family Products

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

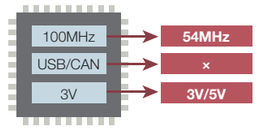


Product Lineup with Large-Capacity Flash Memory (2MB) for System Migration/Succession, 3V/5V Compatibility

Covers the top memory capacities of RX210 products

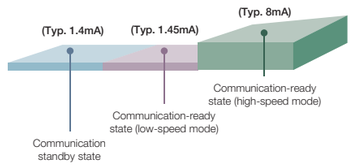


Slimmed-down upset of RX630 features 3V/5V support



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

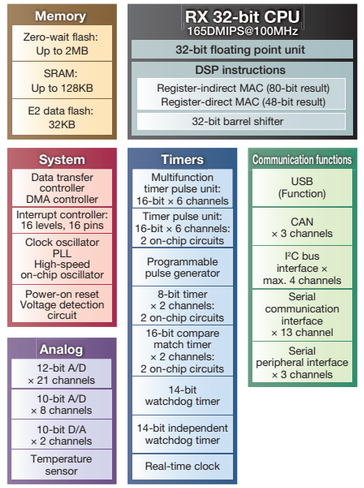
RX630 Group

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

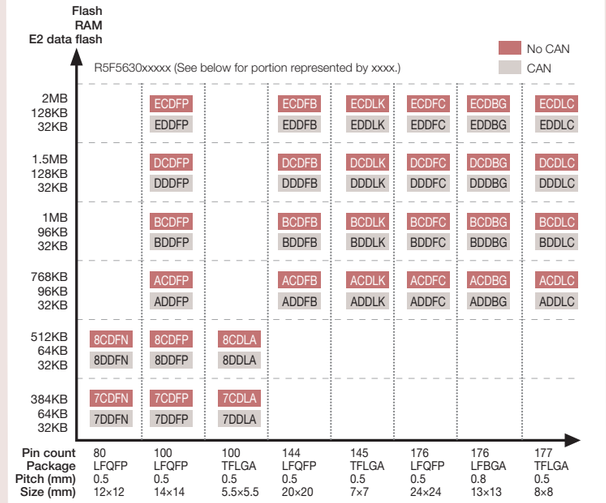
The RX630 group is available in small to large flash memory capacities and packages with low to high pin counts to meet the requirements of a broad range of embedded devices. All product versions have E2 data flash supporting 100,000 erase/programming cycles. The many peripheral functions include timers, 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

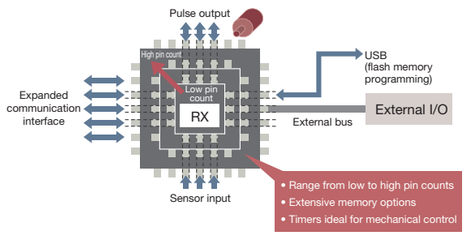


RX630 Group (Products Supporting Operation at 85°C) Memory/Package Options

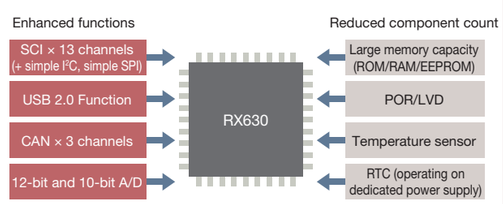


Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

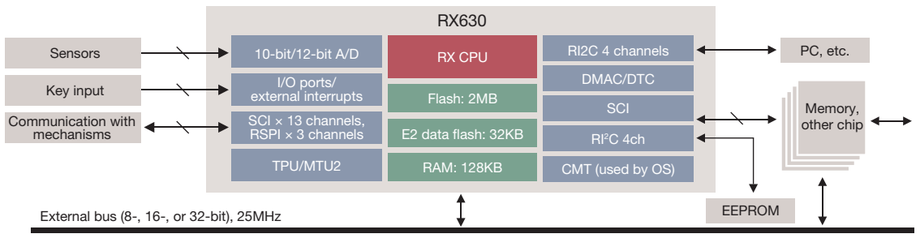
Extensive Lineup and Many Peripheral Functions



Enhanced Functions and Reduced Component Count



Block Diagram of Audio System Using RX630: Application Example



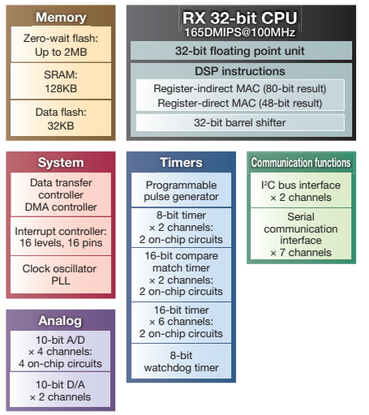
RX610 Group

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

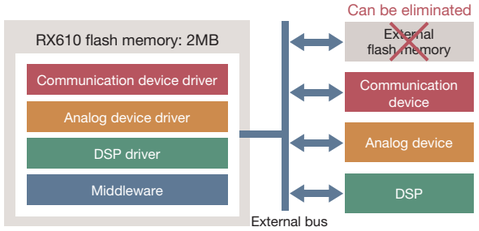
RX610 Group Block Diagram



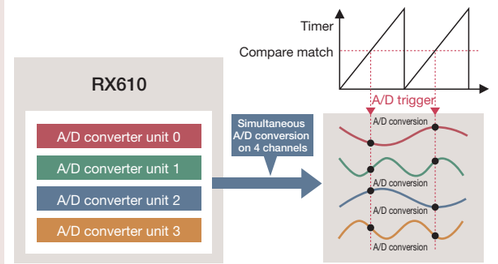
RX610 Group Memory/Package Options

Large-Capacity Flash Memory: 2MB

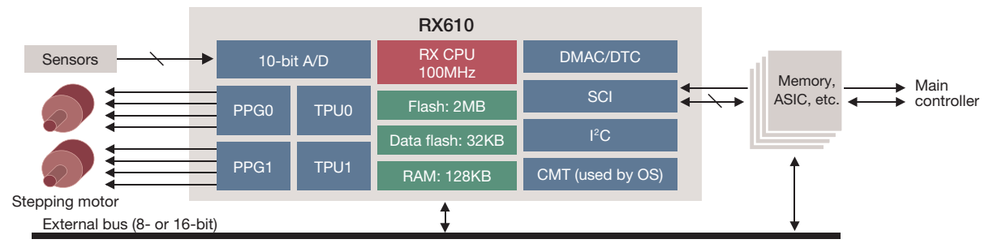
The on-chip flash memory can store drivers and middleware, eliminating the need for external flash memory.



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



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



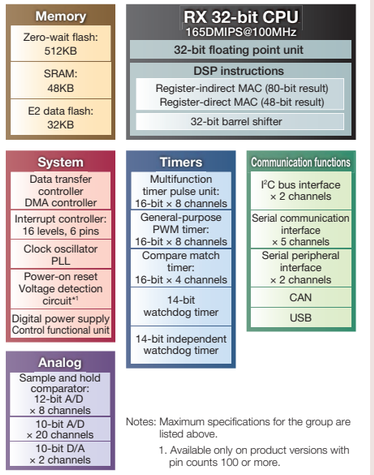
RX63T Group

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 psec.), 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.

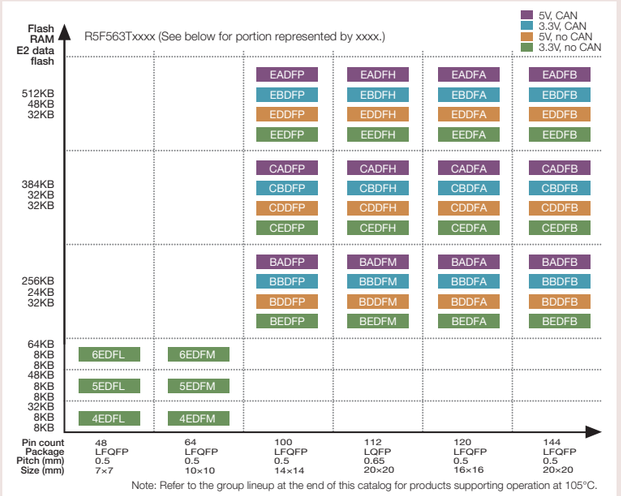
Applications: Office equipment/consumer devices: electric home appliances (white goods); industrial equipment: general-purpose inverters, AC servos, machine tools, sequencers, digital power supplies, solar power supplies

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.

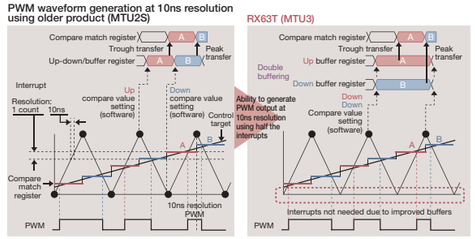
RX63T Group (Products Supporting Operation at 85°C) Memory/Package Options



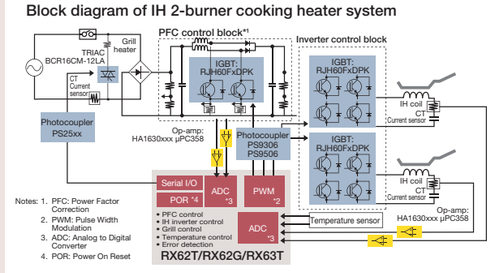
Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

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)



Notes: 1. PFC: Power Factor Correction
2. PWM: Pulse Width Modulation
3. ADC: Analog to Digital Converter
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.

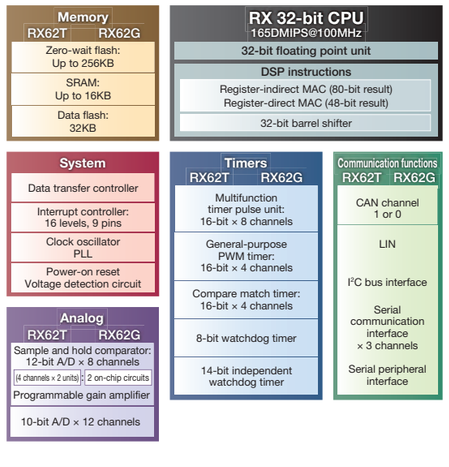
RX62T/RX62G Group

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

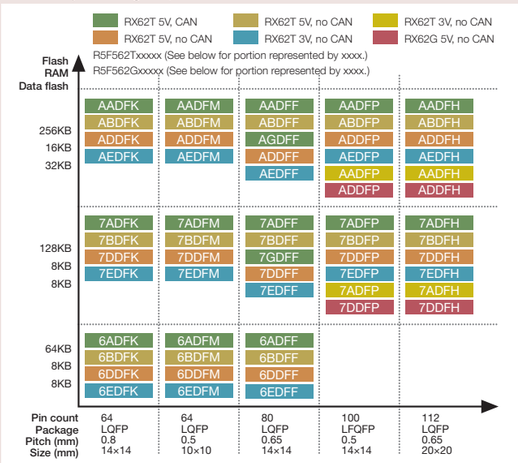
The RX62T group and RX62G group comprise general-purpose microcontrollers operating at up to 100MHz that are ideal for motor control or inverter control. On-chip functions such as multifunction timers (MTU3 and GPT), high-speed 10-bit A/D converter, and 12-bit A/D converter simplify motor control. In 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

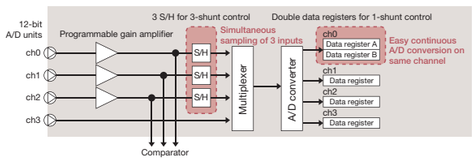


Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

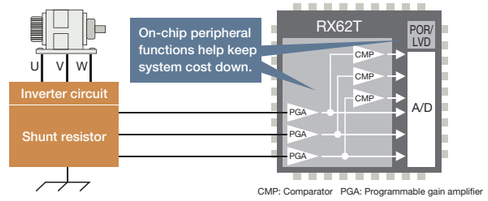
High-Functionality 12-Bit A/D Converter

Two systems for one-shunt control, two systems for three-shunt control, and ability to combine one- and three-shunt control

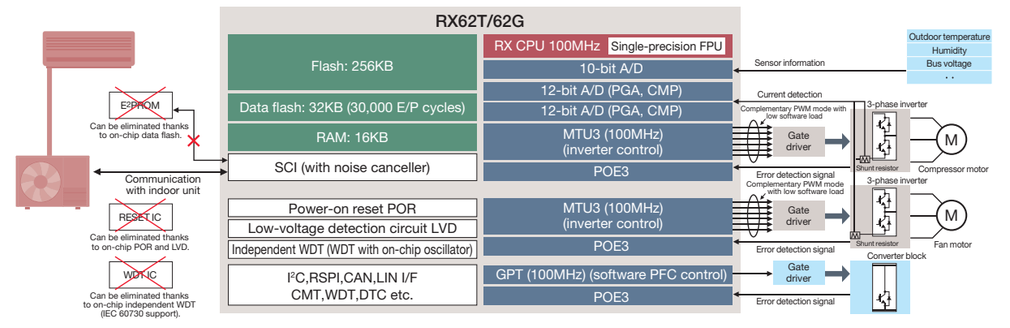
Simultaneous sample and hold on seven channels using two 12-bit A/D units plus one 10-bit A/D unit



Reduction of Peripheral Components



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

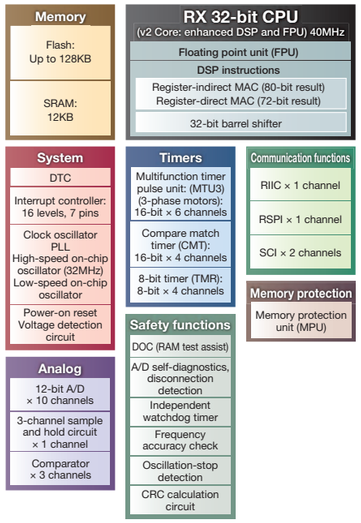


RX23T Group

Microcontrollers for Inverter Control with FPU, 5V Power Supply, Highly Accurate 12-Bit A/D, and Functions Inherited from RX602T

- The RX23T group is based on the RX62T series and is ideal for single-inverter control applications.
- The RX23T 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 delivers fast and precise operation processing of complex floating-point calculations required for inverter control.
- Support for 5V power supply and peripheral I/O, which are in strong demand in the inverter control field, provide improved noise tolerance while allowing easy reuse of existing design resources. High compatibility with the earlier 64-pin RX62T in both pin assignments and peripheral functions eases the migration process.

RX23T Group Block Diagram

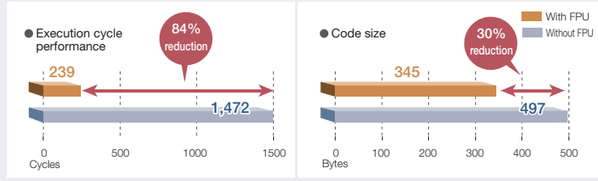


Note: Maximum specifications for the group are listed above.

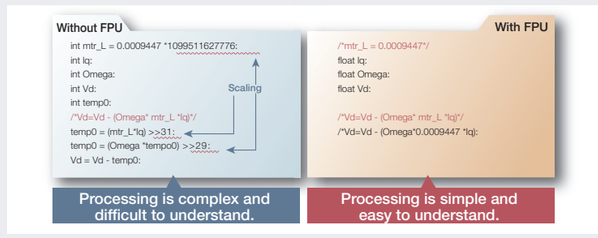
RX23T Group Memory/Package Options

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

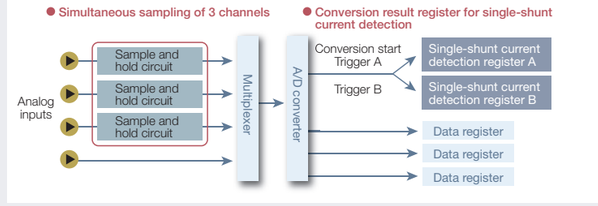
Note: Comparison with earlier Renesas product (comparison of performance with and without FPU using Renesas motor control software)



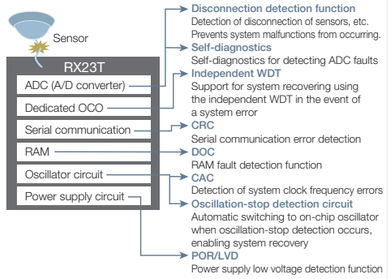
Scaling Unnecessary with FPU



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



Functions Supporting the Realization of Safe and Reliable Products



RX23T Group Application Examples

1. **Floating point arithmetic unit (FPU) for dramatically better floating-point operation performance**
   - Improved accuracy and substantially reduced processing time in motor control applications
   - Smaller code size, for operation using smaller ROM size!
   - No need for bothersome scaling when performing fixed-point calculations!
   - Improved program readability, easier maintenance, and substantially reduced development time
2. **RXv2 core (high-performance CPU core) for faster operation completion without raising the frequency**

   Higher efficiency for frequency used instruction codes and improved pipeline processing, resulting in better operation performance per unit of frequency (among the best in the industry among embedded devices)!

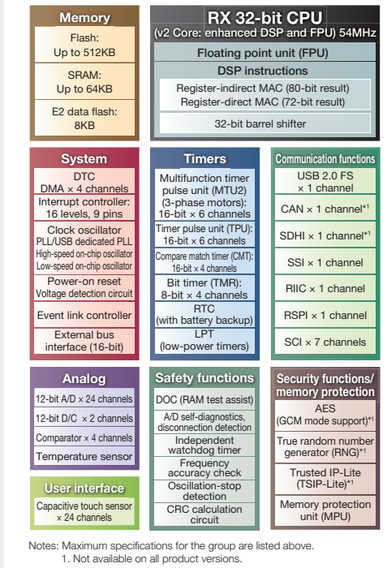
   - RX23T (RXv2 core):
     166 CoreMark (when operating at 40MHz)

RX231 Group

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

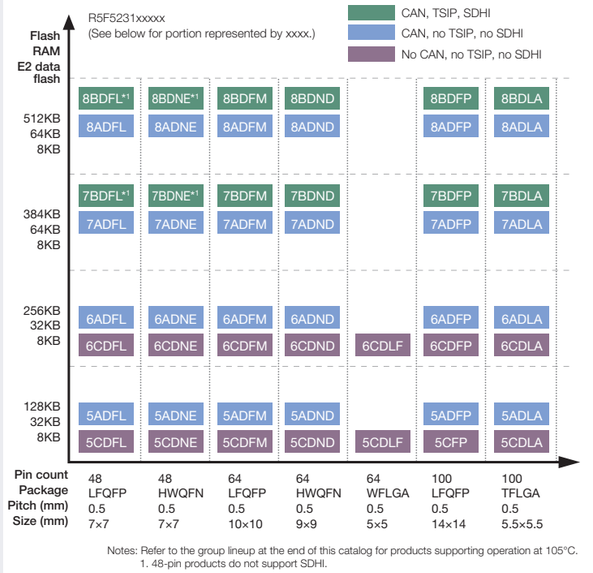
The RX231 group combines the RXv2 core with enhanced DSP/FPU and technology for low power consumption to provide an optimal balance for high power efficiency. It can handle high-load processing such as digital filtering even in environments with low current supply capacity, making it suitable for applications 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.

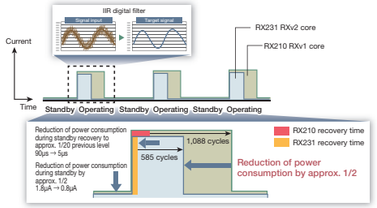
RX231 Group Memory/Package Options



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

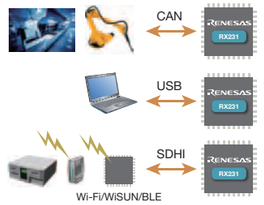
- RXv2 core with enhanced DSP and FPU delivers twice the power efficiency in processing such as digital filtering.
- Standby current with RAM and register contents retained is 0.8µA, among the best in the industry.
- Fast recovery from the standby state in as little as 5µs (when using LOCO at 4MHz).



RX231 Group Application Examples

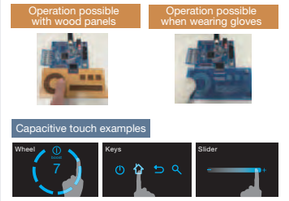
Communication

A variety of communication functions for the age of IoT.



Capacitive Touch

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



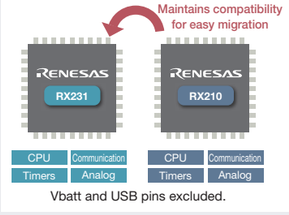
Security

Robust, world-class security with TSIP-Lite

- TSIP-Lite (Trusted-Secure-IP)
- AES
- True random number generator (RNG) circuit
- Unique chip ID
- Memory protection unit (MPU)
- Flash ID code protection

Migration from Earlier Products

Same pin assignments as RX210
Same IP modules as RX210



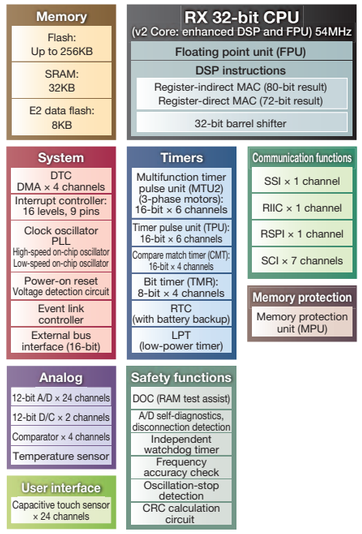
Vbatt and USB pins excluded.

RX230 Group

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

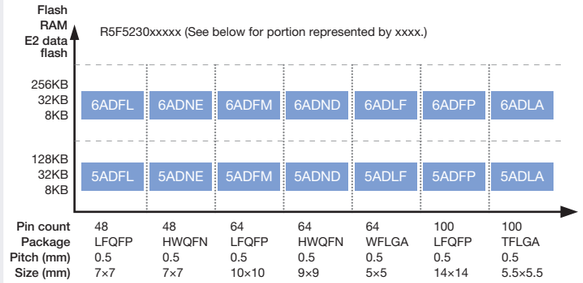
- The RX230 group is suitable for electric home appliances and industrial equipment requiring 5V power supply support, external bus, and capacitive touch functionality.
- The RX230 group combines the RXv2 core with enhanced DSP/FPU and technology for low power consumption to provide an optimal balance 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 and measuring devices.
- In addition to the functional safety features of earlier products, the RX230 group's memory protection unit (MPU) provides enhanced protection of RAM contents.
- High compatibility with the earlier RX210 in both pin assignments and peripheral functions eases the migration process.

RX230 Group Block Diagram



Note: Maximum specifications for the group are listed above.

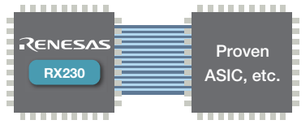
RX230 Group Memory/Package Options



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

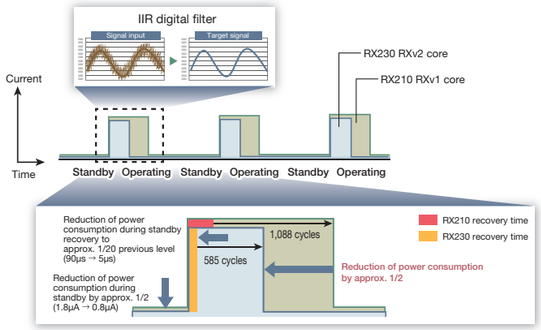
5V + External Bus

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



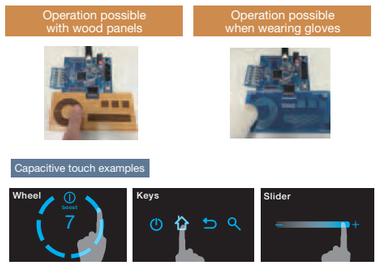
High Power Efficiency

- 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).



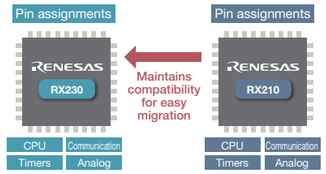
Capacitive Touch

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.

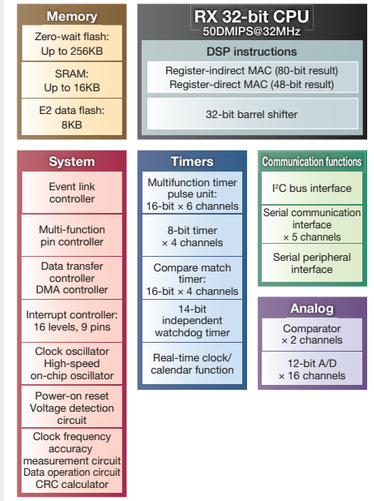
RX230 Group Application Examples

RX220 Group

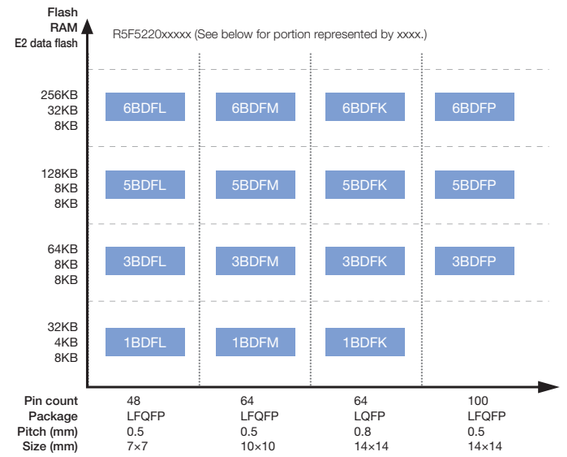
Slimmed Down Model with 32MHz Operation, Maintains Compatibility with More Powerful RX210 Group

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



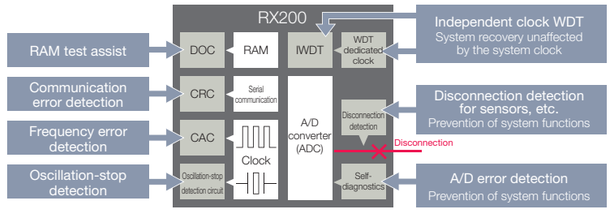
RX220 Group Memory/Package Options



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

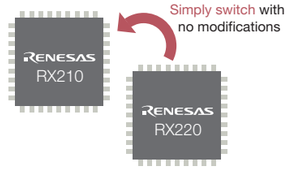
Enhanced Safety Functions

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

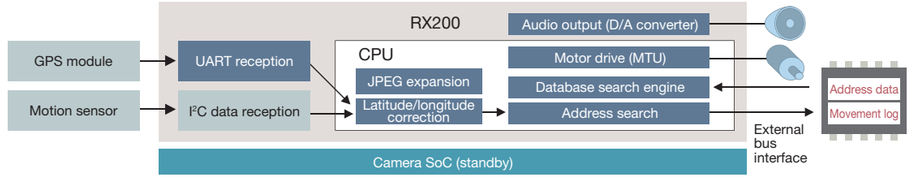


Compatibility with RX210

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

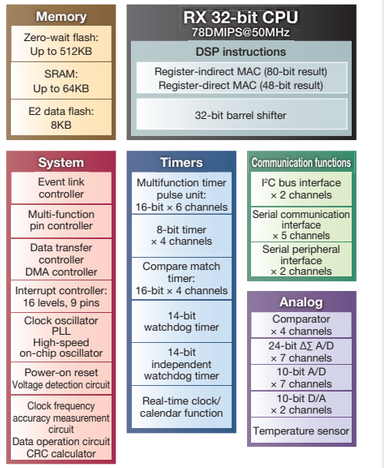


RX21A Group

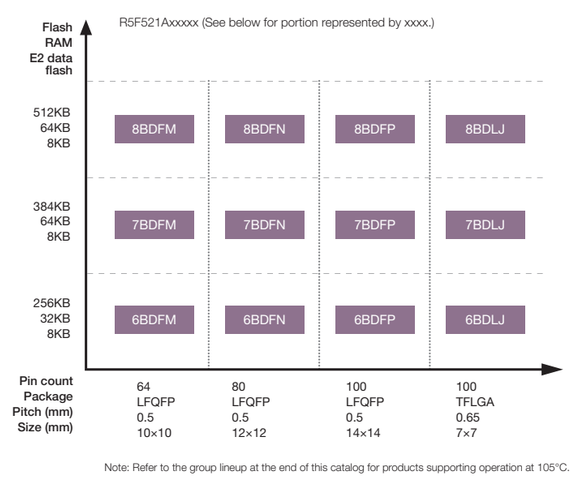
50MHz Operation and Key Smart Meter Functions Such as ΔΣ A/D Converter and Encryption

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

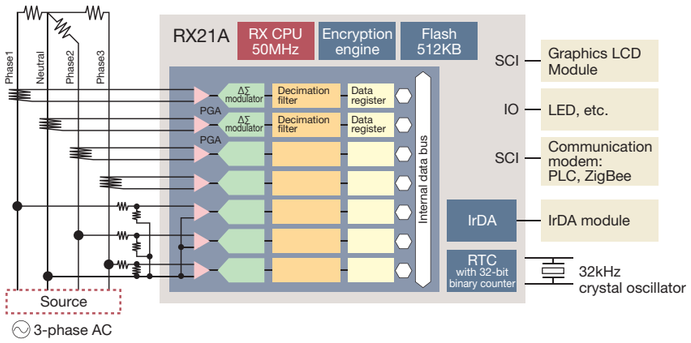


RX21A Group Memory/Package Options



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

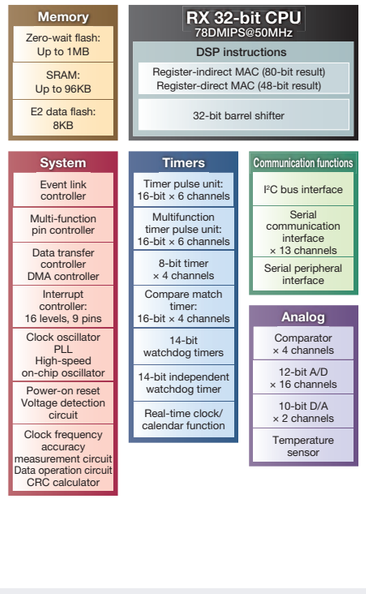
RX21A Application Examples

RX210 Group

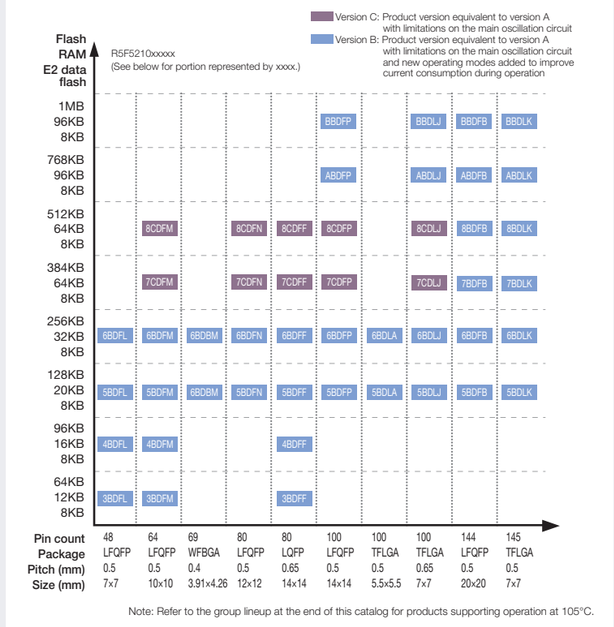
High Performance (50MHz Operation) and Low Power Consumption, Wide Voltage Range, External Bus Support

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 compact package types such as LGA are also available. And now WLBGA, an even smaller package option measuring 3.91 × 4.26mm, has been added. Product versions with support for high-temperature operation (105°C) are also available.

RX210 Group Block Diagram

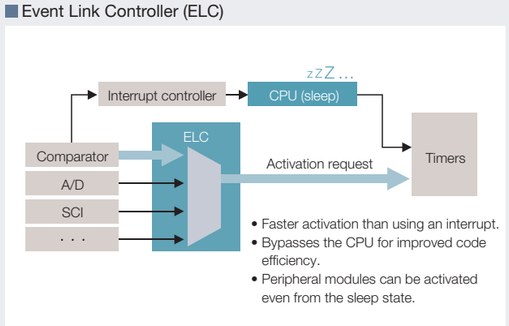


RX210 Group Memory/Package Options

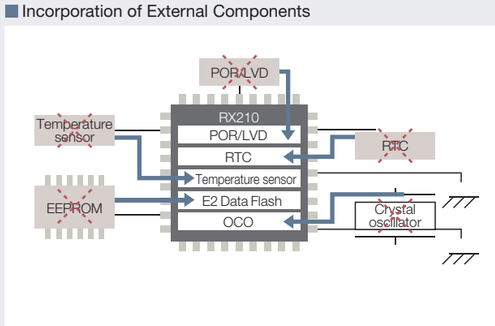


Note: Refer to the group lineup at the end of this catalog for products supporting operation at 105°C.

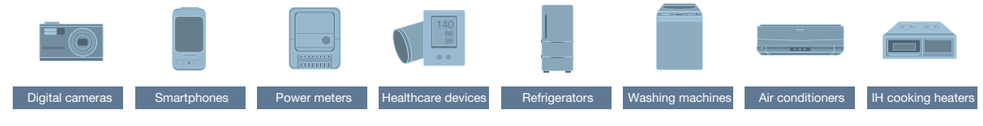
Event Link Controller (ELC)



Incorporation of External Components



RX210 Application Examples

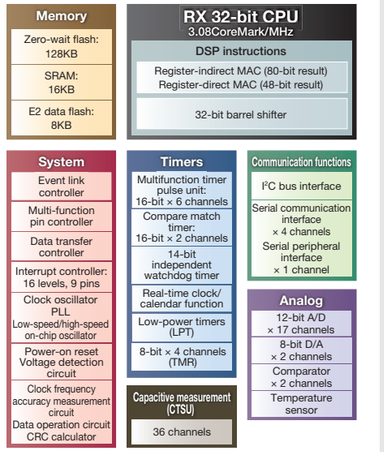


RX130 Group

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

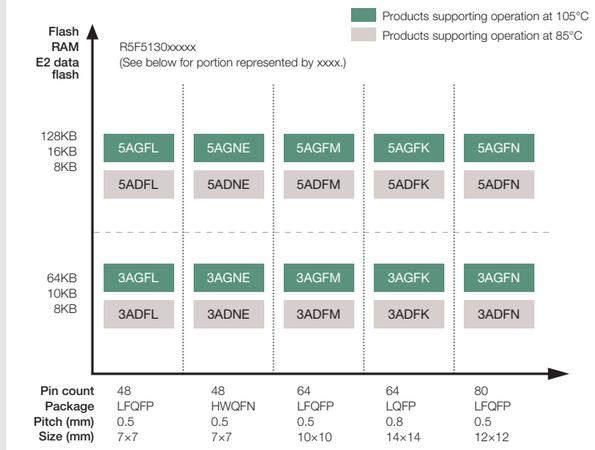
The RX130 group has on-chip support for up to 36 capacitive touch sensor (CTSU) channels, the most in the RX family. The lineup includes products with low ROM capacity and low pin count. The high-performance 32-bit RX core makes it easy to control a human-machine interface (HMI) for an electric home 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

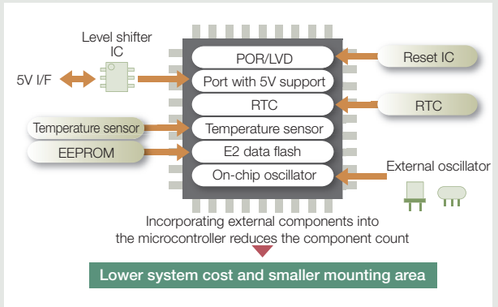


Note: Maximum specifications for the group are listed above.

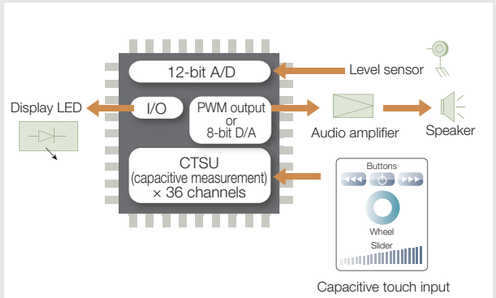
RX130 Group Memory/Package Options



Many Peripheral Functions



Application Example: Block Diagram of Washing Machine UI Using RX130



RX Microcontrollers with Capacitive Touch Functionality: Roadmap

RX113

- Pin count: 100
- ROM: 128KB to 512KB
- Power supply voltage: 1.8V to 3.6V
- Functions
  - Capacitive touch: 12 channels
  - Segment LCD
  - USB

Etc.

RX231

- Pin count: 48, 64, or 100
- ROM: 128KB to 512KB
- Power supply voltage: 1.8V to 5.5V
- Functions
  - Capacitive touch: 24 channels (max.)
  - DSP/FPU*1
  - USB, CAN

Etc.

RX130

- Pin count: 48, 64, or 80
- ROM: 64KB to 128KB
- Power supply voltage: 1.8V to 5.5V
- Functions
  - Capacitive touch: 36 channels (max.)

Etc.

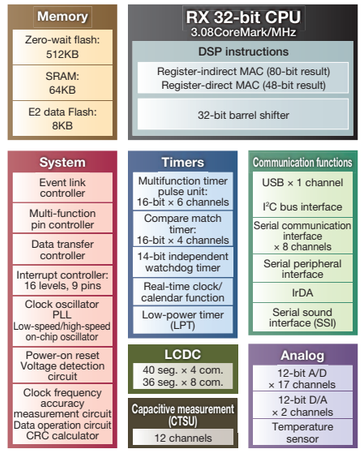
Note: 1. FPU: Floating point unit

RX113 Group

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

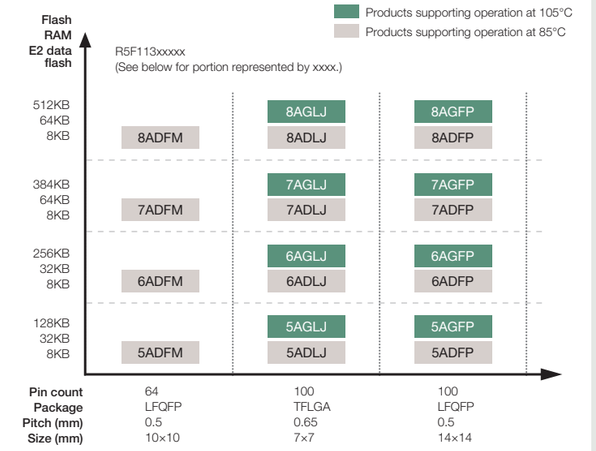
The RX113 group provides UI functions such as LCD and capacitive touch, and communication functions such as USB and IrDA. It is suitable for systems requiring single-chip implementation of a bidirectional human-machine interface (HMI) or interfaces with a variety of peripheral devices in application 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



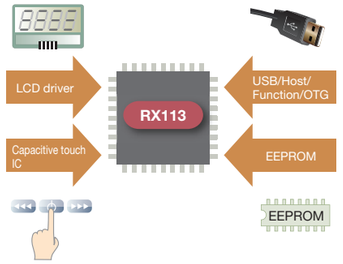
Note: Maximum specifications for the group are listed above.

RX113 Group Memory/Package Options



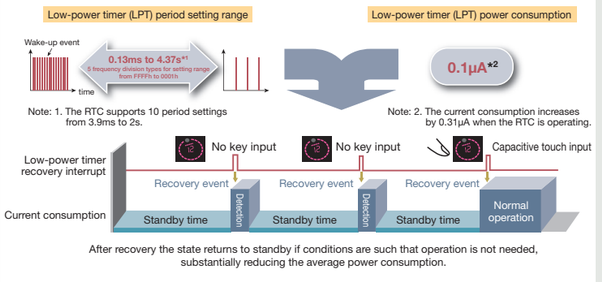
Many Peripheral Functions for Fewer External Components

- A variety of functions that can reduce the mounting area to 1/3 the previous size.
  Contributes to lower BOM cost.

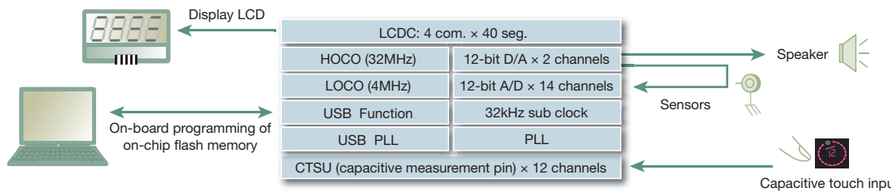


Low-Power Timer (LPT) for Lower Average Current Consumption

- Generation of standby recovery event signals can be accomplished with ultra-low power consumption.
- Flexible CPU standby time control contributes to low power consumption during operation.



Application Example: Block Diagram of Measuring Device Using RX113

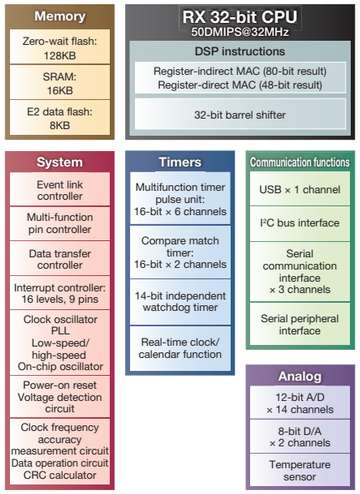


RX111 Group

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

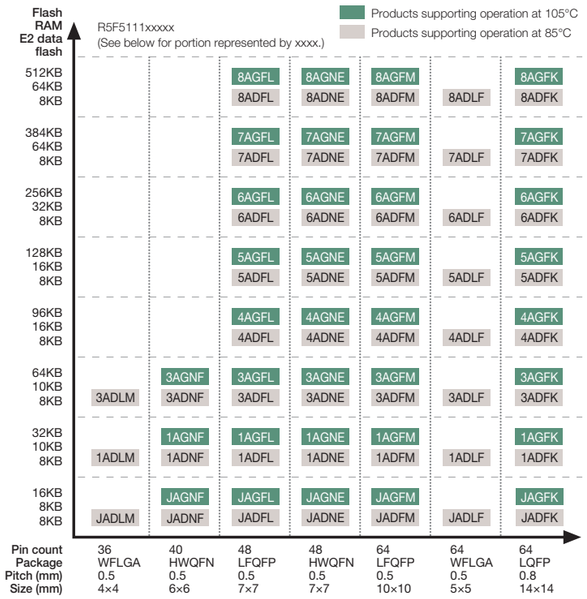
The RX111 group has an extensive product lineup at the low end of the ROM capacity and pin count range of the RX family. It implements USB 2.0 functionality with battery charger (BC1.2) support. With the low current consumption typical of the RX100 series, and fast standby recovery in as little as 4.8µs, 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



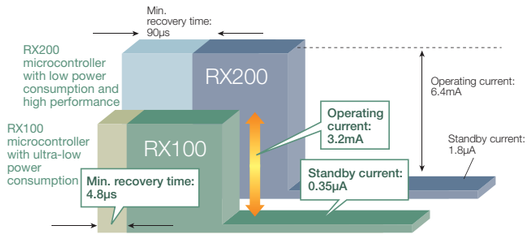
Note: Maximum specifications for the group are listed above.

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.



Less current loss during recovery

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

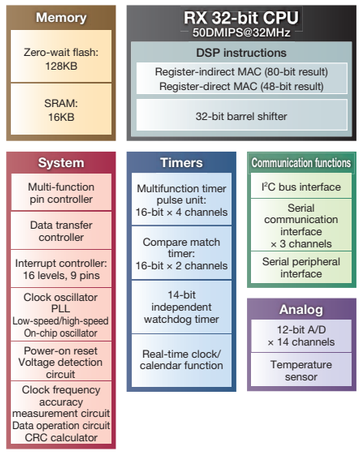
RX111 Group Applications Examples

RX110 Group

Simple Functionality and Extensive ROM/RAM Capacity and Package Options

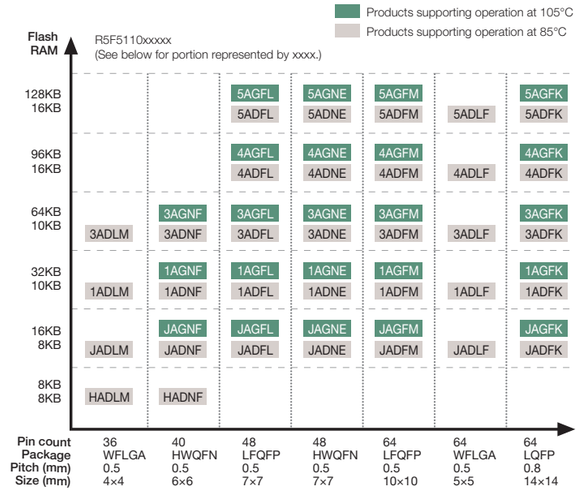
RX110 group microcontrollers have the simplest configurations in the RX100 series. The product lineup includes small ROM/RAM memory capacities from 8KB/8KB to 128KB/16KB and low pin counts from 36 to 64 pins. Built around a 32-bit RX core operating at 32MHz and with on-chip functions such as 12-bit A/D 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



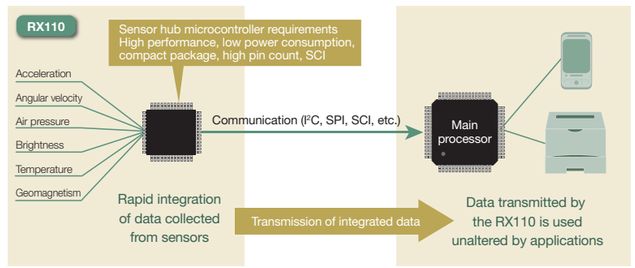
Note: Maximum specifications for the group are listed above.

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, RIIC × 1

RX110 Group Application Examples

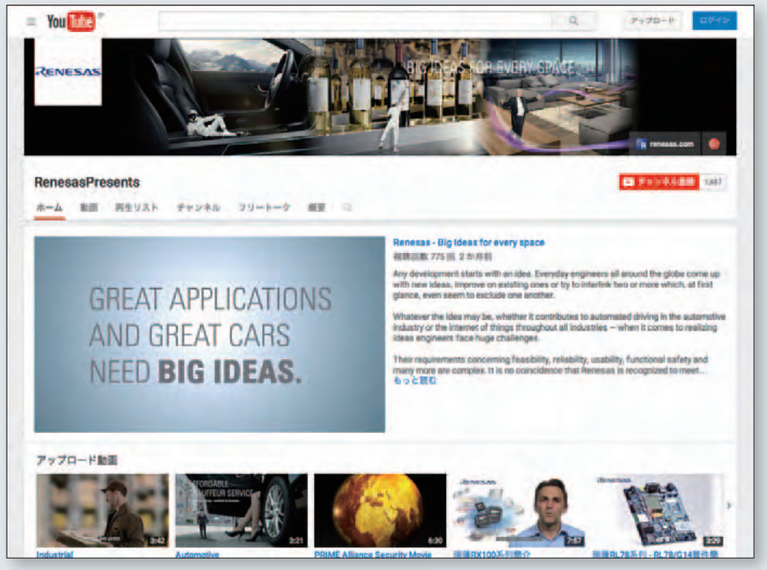
Renesas on the Web

Introducing the Renesas RX Family page

It's the perfect place to find out what is going on at RX family right now.

http://www.renesas.com/rx

Official Renesas YouTube Channel: "Renesas Presents"



https://www.youtube.com/user/RenesasPresents

Purchasing Renesas microcontrollers online

Renesas microcontrollers can be purchased online at our website. It can be accessed 24 hours a day from your work or home PC and supports direct orders and purchases in quantities as small as one unit. Renesas provides strong support through its sales presence to each and every customer engaged in product development.

You can also purchase Renesas Electronics microcontrollers from the websites.

Click to Buy/Samples
from the Renesas Electronics website.

http://www.renesas.com/

Simply enter the products you wish to purchase, the quantity, and the shipping address, and we'll ship your order directly to the specified address. We can also accommodate requests for expedited shipping.

e-Learning (free of charge)

These seminar courses make use of the web and allow each learner to proceed at his or her own pace. They are available for anyone to make use of free of charge.

http://www.renesas.com/support/training_and_workshops/index.jsp

RX Family Development Tools

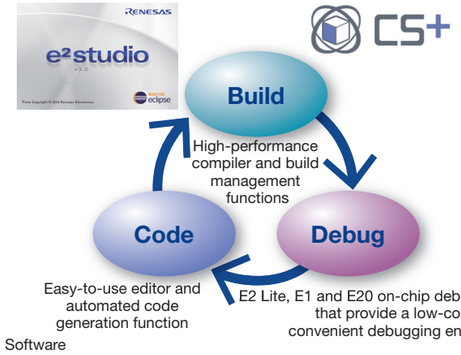
Development Tools Designed to Maximize the Features of the RX Family

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.

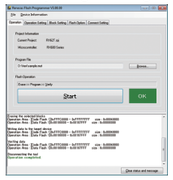
Introduction | Development | Evaluation | Mass production

Free evaluation versions of tools

Renesas integrated development environments



Renesas Flash Programmer flash memory programming software



Starter kit you can use right away

PG-FP5 standalone flash programmer

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

Introduction | Development | Evaluation | Mass production

Starter kits you can start using right away

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.

<Package contents>

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

URL http://www.renesas.com/rsk

Free evaluation versions you can start using right away

Free evaluation versions of tools are available for download on the Renesas website. These free evaluation versions are a great way to get started.

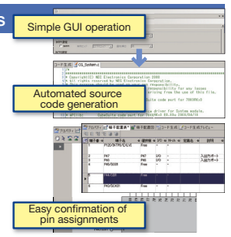
Free Tool DOWNLOAD

URL http://www.renesas.com/tool_evaluation

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.

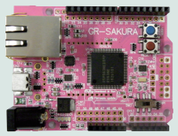
Note: Some microcontrollers in the RX200 and RX600 series are supported by a Peripheral Driver Generator (free tool) that is separate from the integrated development environment.



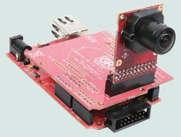
Gadget Renesas Project: Simple Introduction to Building Things with the RX63N and RX64M

Gadget Renesas is a new project launched as a collaboration between Renesas and its partner companies to provide as many customers as possible, from novices to old hands, the tools they need to build things using microcontrollers.
For the RX family a compact pink gadget board mounted with an RX63N or RX64M microcontroller is provided, backed by a cloud-based web compiler environment and libraries that let you easily create microcontroller programs without specialized knowledge.
Visit the webpage below for more information on the Gadget Renesas project.

http://gadget.renesas.com/en/index.html



GR-SAKURA-FULL Gadget Renesas board mounted with the RX63N
Now available from Wakamatsu Tsusho K.K. and RS Components K.K.



GR-KAEDE Gadget Renesas board mounted with the RX64M
Can also be used as a network camera or human sensor solution by combining the onboard image processing middleware of the RX64M with an optional camera board.
Now available from NGX Technologies.

Note: GR-KAEDE with the optional camera board is pictured above.

Introduction | Development | Evaluation | 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
QSPI single master driver
SCIF single master driver

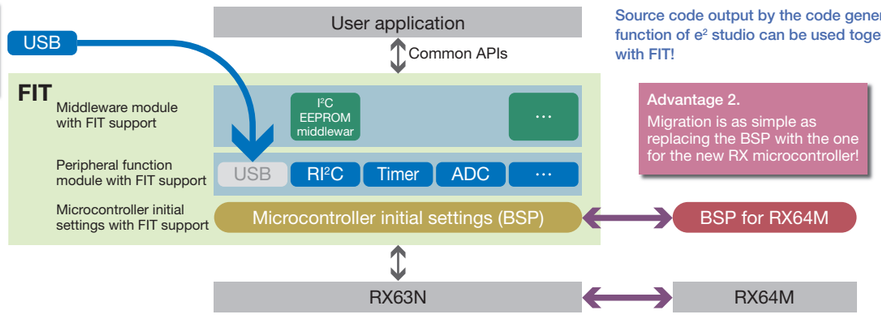
URL http://www.renesas.com/support/software/index.jsp

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.
- 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!

When used in combination with the e2 studio integrated development environment, it becomes even easier to incorporate modules with FIT support into your project. Source code output by the code generation function of e2 studio can be used in combination with modules with FIT support. (Support for the code generation function is currently available for the RX64M and RX71M groups, and support for additional products is planned.)

URL http://www.renesas.com/fit

RX Family Development Tools

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Two integrated development environments designed to meet the needs of customers

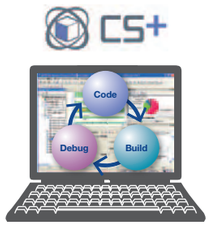
e² studio: An integrated development environment based on Eclipse!

Based on Eclipse, an open source integrated development environment that has achieved worldwide adoption, e² studio supports the Renesas RX family of microcontroller products. In addition to the powerful editor and project management tools that come standard with Eclipse, a variety of extension functions are available as Renesas tools. 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 http://www.renesas.com/e2studio

CS+: Simple, convenient, reliable!

This integrated development environment includes support for Renesas microcontrollers ranging from 8 to 32 bits in a single package. Functions such as source code static analysis and graphical display of changes in variable values provide powerful backup for all aspects of application development, from coding and building through debugging. Extensive tutorials are available, so 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 http://www.renesas.com/cs+

Both CS+ and e² studio can read project files created with the other integrated development environment, so it is easy to migrate from one to the other.

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.

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 http://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 http://www.iar.com/ewrx

GNURX GNU tool from KPIT Technologies Ltd.

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

URL http://www.kpitgnutools.com/

Realizing high-quality real-time multitasking systems

RI600V4 and RI600PX real-time OSes for the RX family

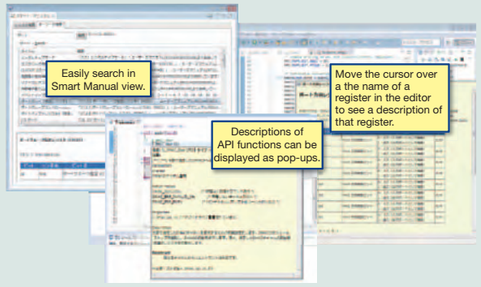
Compliant with the industry standard µITRON4.0 standard. RI600PX with memory protection support is available for use with RX microcontrollers equipped with the memory protection function. The affinity with integrated development environments and easily configurable kernel architecture make it possible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

URL http://www.renesas.com/ri600v4,
http://www.renesas.com/ri600px

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.

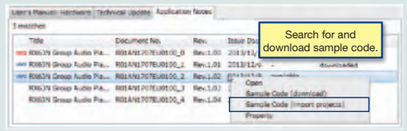
A function that provides easy reference to hardware manuals and information on APIs is included in e² studio. In Smart Manual view you can reference the hardware manual or search its contents by specifying a peripheral I/O register*1 or keyword.*2 In the editor simply hover the mouse cursor over the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

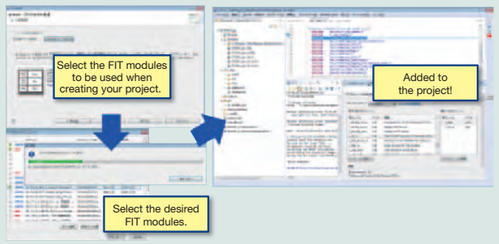
Notes: 1. You can search for information on peripheral I/O registers and their individual bits.
2. You can search the manual using topic keywords.
3. Popup information is available for functions output by automated code generation, FIT modules, and service calls of the Renesas real-time OS (RI600V4).



Convenient functions of e² studio 2: It is easy to import FIT modules and sample code.

To add FIT modules to a project in e² studio, simply select the necessary modules when creating the project. You can also use the Smart Browser to search for sample code and import it into your project without needing to access the Web.





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Emulators

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. No external power supply needed.
- Coverage function supported on the RX64M group when used in combination with the E20 emulator.
- With the separately available microcontroller debugging board, debugging can be performed without taking over user pins.*2

URL http://www.renesas.com/e2lite
http://www.renesas.com/e1
http://www.renesas.com/e20

Notes: 1. On the RX200 and RX100, the usable functions are equivalent to those of the E1.
2. Support differs depending on the device.

E1 emulator
Suitable for evaluating basic debugging functions. Supports on-chip trace.

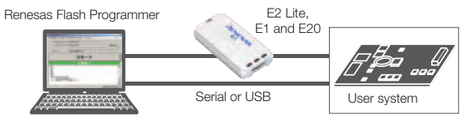
E20 emulator*1
The more advanced sibling of the E1. Supports sophisticated debugging functions such as enhanced trace and real-time RAM monitoring.

Two varieties of flash programming tools from Renesas to match your usage scenario

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

- Programming using the E2 Lite, E1 or E20 is controlled by a PC via a serial or USB connection.
- Support for interoperation with other software by using batch processing
- Support for unique code embedding

URL http://www.renesas.com/rfp



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

PG-FP5: Support for programming without a PC

- Standalone programming
- Programming under PC control using a dedicated GUI
- Support for up to 8 programming environments
- Specialized for use on production lines (command control, remote control)
- Support for unique code embedding

URL http://www.renesas.com/pg_fp5

Note: 1. Portion represented by xx indicates the target market.

Reading project files into another integrated development environment

CS+ and e² studio can both read projects created in the other integrated development environment. Both CS+ and e² studio can also read projects created in High-performance Embedded Workshop. Make sure to try out the features of the newest integrated development environments.

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 (RTE0T0002LKCE00000R) or E1 (R0E000010KCE00)	E20 (R0E000200KCT00) *2	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	Renesas Flash Programmer (R0C00000FDW13R) *5 *7	PG-FP5 *8 or E2 Lite or E1 or E20
RX600	RX610	Renesas Starter Kit for RX610 (Part No.: R0K556100S000BE)					—		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX621 RX62N	Renesas Starter Kit+ for RX62N (Part No.: R0K5562N0S000BE)					For 144-pin 0.5 mm pin pitch products: R0E5562N8PFK00 For 100-pin 0.5 mm pin pitch products: R0E5562N8PFK10 *1		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)	CS+ support e² studio support High-performance Embedded Workshop support	CS+ support e² studio support High-performance Embedded Workshop support			For 100-pin 0.5 mm pin pitch products: R0E5562GAPFK00 For 80-pin 0.65 mm pin pitch products: R0E5562GAPFJ00 For 64-pin 0.5 mm pin pitch products: R0E5562GAPFK10			
	RX630	Renesas Starter Kit for RX630 (Part No.: R0K505630S000BE)					For 144-pin 0.5 mm pin pitch products: R0E55630EDMB00 For 100-pin 0.5 mm pin pitch products: R0E55630EDMB01		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX631 RX63N	Renesas Starter Kit+ for RX63N (Part No.: R0K50563NS010BE (with CS+) or YR0K50563NS010BE (with e² studio))					For 144-pin 0.5 mm pin pitch products: R0E5563NEDMB00 For 100-pin 0.5 mm pin pitch products: R0E5563NEDMB01			
	RX63T (64 or fewer pins)	Renesas Starter Kit for RX63T (64-pin) (Part No.: R0K50563TS000BE)					—		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX63T (100 or more pins)	Renesas Starter Kit for RX63T (144-pin) (Part No.: R0K5563THS000BE (with CS+) or YR0K5563THS000BE (with e² studio))					For 120-pin 0.5 mm pin pitch products: R0E5563TEDMB00 *4 For 112-pin 0.65 mm pin pitch products: R0E5563TEDMB01 For 100-pin 0.5 mm pin pitch products: R0E5563TEDMB02		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX634	—	CS+ support e² studio support	CS+ support e² studio support			—		Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX64M	Renesas Starter Kit+ for RX64M (Part No.: R0K50564MS000BE (with CS+) or YR0K50564MS000BE (with e² studio))					—		Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
RX200	RX210	Renesas Starter Kit for RX210 (Part No.: R0K505210S003BE)	CS+ support e² studio support High-performance Embedded Workshop support	CS+ support e² studio support High-performance Embedded Workshop support		E20 (R0E000200KCT00) *2 Note: Debugging functions equivalent E1 emulator only	—	For E2 Lite or E1: R0E000010ACB10	Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX220	Renesas Starter Kit for RX220 (Part No.: R0K505220S000BE)								
	RX21A	—								
	RX230	—	CS+ support e² studio support	CS+ support e² studio support					Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX231	Renesas Starter Kit for RX231 R0K505231S000BE (with CS+) or YR0K505231S000BE (with e² studio) ★								
	RX23T	Renesas Starter Kit for RX23T RTK500523TS00000BE(with CS+) or YRTK500523TS00000BE (with e² studio) ★							Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
RX100	RX110	—	CS+ support e² studio support	CS+ support e² studio support					Renesas Flash Programmer (R0C00000FDW13R) *5 *7	
	RX111	Renesas Starter Kit for RX111 (Part No.: R0K505111S000BE (with CS+) or YR0K505111S000BE (with e² studio))								
	RX113	Renesas Starter Kit for RX113 (Part No.: R0K505113S000BE (with CS+) or YR0K505113S000BE (with e² studio))							Renesas Flash Programmer (R0C00000FDW13R) *5 *6	
	RX130	★★								

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 http://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 http://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.
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.
http://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.

★: New product ★★: Under development

Solutions from Partner Vendors for RX Family

Compilers
KPIT Technologies Ltd.
IAR Systems AB
OS
CMX Systems, Inc.
Express Logic, Inc.
FreeRTOS.org
Micrium
MiSPO Co., Ltd.
SEGGER Microcontroller
Emulators
SEGGER Microcontroller
Sohwa & Sophia Technologies Inc.
Programmers
Data I/O Corporation
E-Globaledge Corporation
Falcon Denshi K.K.
Flash Support Group Company
HOKUTO DENSHI CO,.LTD
Kyoei Co., Ltd.
MINATO ELECTRONICS INC.
NAITO DENSEI MACHIDA MFG. CO., LTD
SMH Technologies*1
SUISEI ELECTRONICS SYSTEM CO., LTD.
Sunny Giken Inc.
TESSERA TECHNOLOGY INC.
Wave Technology Co., Ltd.
Yokogawa Digital Computer Corporation
Programming Services
Falcon Denshi K.K. (Exclusive distributor of HI-LO SYSTEMS for Japanese customers)
Flash Support Group Company

Note: 1. Under development
Get the latest information here. http://www.renesas.com/rx_partners

The portal website of the Alliance Partner Program has been updated and redesigned. 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.

https://www.renesaspartners.com/

Visit the following web page to to view information on products and services from partner companies with RX family support.

http://www.renesas.com/rx_partners

RX Family Group Lineup

RX700/RX600 Series

Group			RX71M	RX64M	RX63N	RX62N	RX631	RX621
CPU core			RXv2	RXv2	RXv1	RXv1	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
Maximum operating frequency (MHz)		CPU	240	120	100	100	100	100
		BCLK/BCLK pin	120/60	120/60	100/50	100/50	100/50	100/50
Code flash memory			4 MB	4 MB	2 MB	512 KB	2 MB	512 KB
Data flash memory			64 KB	64 KB	32 KB	32 KB	32 KB	32 KB
SRAM			512 KB + 8 KB + 32 KB	512 KB + 8 KB + 32 KB	256 KB	96 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
Data transfer	DMAC/DTC/EXDMAC		8 channels/Yes/2 channels	8 channels/Yes/2 channels	4 channels/Yes/2 channels	4 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	—	—
		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 (Function)	FS: 2 channels (Host/Function/OTG)	FS: 1 channel (Host/Function/OTG) FS: 1 channel (Function)	FS: 2 channels (Host/Function/OTG)
		USB-LS Host	Yes	Yes	—	—	—	—
		CAN	3 channels	3 channels	3 channels	1 channel	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/4 channels	6 channels/2 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	—/—	—/—	—/—	—/—
	Timers	32-bit timer	3 channels	3 channels	—	—	—	—
		16-bit timer	22 channels	22 channels	22 channels	16 channels	22 channels	16 channels
		8-bit timer	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 (8-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
	Analog	A/D	12-bit × 8 channels (3 sample and hold channels) 12-bit × 21 channels	12-bit × 8 channels (3 sample and hold 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 × 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	10-bit × 2 channels	10-bit × 2 channels	10-bit × 2 channels	10-bit × 2 channels
	Other	SDHI/MMC	1 channel/1 channel	1 channel/1 channel	—	—	—	—
		Image capture (PDC)	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, 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 85 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C	–40 to 85 °C, –40 to 105 °C	–40 to 85 °C
Pakages	TFLGA-177 (8 × 8)		Yes	Yes	Yes	—	Yes	—
	LFQFP-176 (24 × 24)		Yes	Yes	Yes	—	Yes	—
	LFBGA-176 (13 × 13)		Yes	Yes	Yes	Yes	Yes	Yes
	TFLGA-145 (9 × 9)		—	—	—	Yes	—	Yes
	TFLGA-145 (7 × 7)		Yes	Yes	Yes	—	Yes	—
	LQFP-144 (20 × 20)		Yes	Yes	Yes	Yes	Yes	Yes
	LQFP-100 (14 × 14)		Yes	Yes	Yes	Yes	Yes	Yes
	TFLGA-100 (7 × 7)		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, temperature sensor
Operating ambient temperature			–40 to 85 °C, –40 to 105 °C	–40 to 85 °C	–20 to 85 °C, –40 to 85 °C
Pakages	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	—	—

RX6xT, RX2xT

Group			RX63T	RX62T	RX62G	RX23T
CPU core			RXv1	RXv1	RXv1	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
Maximum operating frequency (MHz)		CPU	100	100	100	40
		BCLK/BCLK pin	50/50	—	—	—
Code flash memory			512 KB	256 KB	256 KB	128 KB
Data flash memory			32 KB	32 KB	32 KB	—
SRAM			48 KB	16 KB	16 KB	12 KB
External bus	External bus width/SDRAM interface		8, 16/—	—/—	—/—	—/—
Data transfer	DMAC/DTC/EXDMAC		4 channels/Yes/—	— /Yes/—	— /Yes/—	— /Yes/—
Peripheral functions	Serial interfaces	USB-FS	1 channel (Host/Function/OTG)	—	—	—
		CAN	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	2 channels/1 channel/1 channel
	Timers	16-bit timer	20 channels	16 channels	16 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)
		3-phase PWM outputs	3	2	2	1
		PWM delay generation function	Yes	—	Yes	—
		Digital power supply control unit	Yes	—	—	—
	Analog	A/D	2 units: 12-bit × 4 channels (3 sample and hold channels), 10-bit × 20 channels	2 units: 12-bit × 4 channels (3 sample and hold channels), 10-bit × 12 channels	2 units: 12-bit × 4 channels (3 sample and hold channels), 10-bit × 12 channels	12-bit × 10 channels (3 sample and hold channels)
		D/A	10-bit × 2 channels	—	—	—
	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
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
Pakages	LFQFP-144 (20 × 20)		Yes	—	—	—
	LFQFP-120 (16 × 16)		Yes	—	—	—
	LQFP-112 (20 × 20)		Yes	Yes	Yes	—
	LFQFP-100 (14 × 14)		Yes	Yes	Yes	—
	LFQFP-80 (14 × 14)		—	Yes	—	—
	LQFP-64 (14 × 14)		—	Yes	—	—
	LFQFP-64 (10 × 10)		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 (3 sample and hold channels)	12-bit × 16 channels	24-bitΔΣ × 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
Pakages	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	—	—
	LFQFP-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	—	—	—
	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	128 KB
Data flash memory			8 KB	8 KB	8 KB	8 KB
SRAM			64 KB	64 KB	16 KB	16 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
Pakages	LFQFP-100 (14 × 14)		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	—

RX71M (100 to 177 pins)

Series		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)	9																				
	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 ℃																				
	Pakage	100-LQFP (14 × 14 mm)																100-TFLGA (7 × 7 mm)				

Note: 1. AES/DES/SHA/RNG

RX71M (100 to 177 pins)

| Series | | RX71M | | |

RX71M (100 to 177 pins)

| Series | | RX71M | | |

RX64M (100 to 177 pins)

| Series | | RX64M | | |

RX64M (100 to 177 pins)

| Series | | RX64M | | |

RX631 (48 to 176 pins)

| Series | | RX631 | | |

RX631 (48 to 176 pins)

| Series | | RX631 | | |

RX631 (48 to 176 pins)

| Series | | RX631 | | |

RX631 (48 to 176 pins)

| Series | | RX631 | | |

RX63N (100 to 176 pins)

| Series | | RX63N | | |

RX63N (100 to 176 pins)

| Series | | RX63N | | |

RX621 (85 to 176 pins)

Series		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)	17															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Pakage	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)

Series		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)	17															
Other	Power supply voltage (V)	2.7 V to 3.6 V															
	Operating ambient temperature (℃)	–40 to 85 ℃															
	Pakage	100-LFQFP (14 × 14 mm)				144-LFQFP (20 × 20 mm)				145-TFLGA (9 × 9 mm)				176-LFBGA (13 × 13 mm)			

RX634 (144 pins)

Series		RX634					
Pin count		144					
Product name		R5F5634BDDFB	R5F5634BYDFB	R5F5634DDDFB	R5F5634DYDFB	R5F5634EDDFB	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 ℃					
	Pakage	144-LFQFP (20 × 20 mm)					

RX630 (100 to 144 pins)

Series		RX630																			
Pin count		80				100															
Product name		R5F56307CDFN	R5F56307DDFN	R5F56308CDFN	R5F56308DDFN	R5F56307CDFP	R5F56307DDFP	R5F56308CDFP	R5F56308DDFP	R5F5630ACDFP	R5F5630ADDFP	R5F5630BCDFP	R5F5630BDDFP	R5F5630CDDFP	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 ℃															
	Pakage	80-LFQFP (12 × 12 mm)				100-LFQFP (14 × 14 mm)												100-TFLGA (5.5 × 5.5 mm)			

RX630 (100 to 144 pins)

| Series | | RX630 | | |

RX610 (144 to 176 pins)

Series		RX610															
Pin count		144								176							
Product name		R5F56104 VDFP	R5F56104 VNFP	R5F56106 VDFP	R5F56106 VNFP	R5F56107 VDFP	R5F56107 VNFP	R5F56108 VDFP	R5F56108 VNFP	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	YES															
	External interrupts (pins)	17															
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 ℃
	Pakage	144-LFQFP (20 × 20 mm)								176-LFBGA (13 × 13 mm)							

RX63T (48 to 144 pins)

Series		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		—					
	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				
	Operating ambient temperature (℃)	–40 to 85 ℃																					
	Pakage	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)

| Series | | RX63T | | |

RX62T (64 to 112 pins)

| Series | | RX62T | | |

RX62G (100 to 112 pins)

Series		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 ℃							
	Pakage	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

RX23T (48 to 64 pins)

Series		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)	10											
Clocks	On-chip oscillator	YES (LOCO:4 MHz)											
Data transfer	DTC	YES											
Analog	A/D (resolution × channels)	12-bit × 10											
Timers	8-/16-/32-bit timers (channels)	4/10/—											
	PWM outputs	16		18		20		16		18		20	
	3-phase PWM output	YES											
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 ℃					
	Pakage	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)

| Series | | RX231 | | |

RX231 (48 to 100 pins)

| Series | | RX231 | | |

RX230 (48 to 100 pins)

Series		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 ℃									
	Pakage	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)

Series		RX220																														
Pin count		48				64								100			48				64								100		
Product name		R5F52201BDFL	R5F52203BDFL	R5F52205BDFL	R5F52206BDFL	R5F52201BDFM	R5F52203BDFM	R5F52205BDFM	R5F52206BDFM	R5F52201BDFK	R5F52203BDFK	R5F52205BDFK	R5F52206BDFK	R5F52203BDFP	R5F52205BDFP	R5F52206BDFP	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	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	4	8		16	4	8			4	8			8		16
	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	DMAC (channels)	4																														
	DTC	YES																														
Analog	A/D (resolution × channels)	12-bit × 8				12-bit × 12								12-bit × 16			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											4				5											
	SPI/QSPI (clock-synchronous only) (channels)	5/—				6/—											5/—				6/—											
	I²C (channels)	5				6											5				6											
I/O	I/O ports	35				49								85			35				49								85		
Other functions	ELC	YES																														
	Safety functions	YES																														
	External interrupts (pins)	7				8								9			7				8								9		
Other	Power supply voltage (V)	1.62 V to 5.5 V																														
	Operating ambient temperature (℃)	–40 to 85 ℃															–40 to 105 ℃															
	Pakage	48-LFQFP (7 × 7 mm)				64-LFQFP (10 × 10 mm)				64-LFQFP (14 × 14 mm)				100-LFQFP (14 × 14 mm)			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)

| Series | | RX210 | | |

RX210 (48 to 145 pins)

Series		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	R5F5210ABGFP	R5F5210BBGFP	R5F52105BGFB	R5F52106BGFB	R5F52107BGFB	R5F52108BGFB	R5F5210ABGFB	R5F5210BBGFB
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 ℃																																	
	Pakage	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)

Series		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 ℃									
	Pakage	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)			

RX130 (48 to 80 pins)

Series		RX130																					
Pin count		48				64				80		48				64				80			
Product name		R5F51303ADNE	R5F51305ADNE	R5F51303ADFL	R5F51305ADFL	R5F51303ADFM	R5F51305ADFM	R5F51303ADFK	R5F51305ADFK	R5F51303ADFN	R5F51305ADFN	R5F51303AGNE	R5F51305AGNE	R5F51303AGFL	R5F51305AGFL	R5F51303AGFM	R5F51305AGFM	R5F51303AGFK	R5F51305AGFK	R5F51303AGFN	R5F51305AGFN		
CPU	CPU core	RXv1																					
	Maximum operating frequency (MHz)	32																					
Memory	ROM (KB)	64	128	64	128	64	128	64	128	64	128	64	128	64	128	64	128	64	128	64	128		
	RAM (KB)	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16		
	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 × 10				12-bit × 14				12-bit × 17			
	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	1																					
Communications	SCI (clock-synchronous/asynchronous) (channels)	4																					
	SPI/QSPI (clock-synchronous only) (channels)	5/—																					
	I²C (channels)	5																					
I/O	I/O ports	39				53				69		39				53				69			
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 ℃											
	Pakage	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)	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)												

RX113 (64 to 100 pins)

Series		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 ℃							
	Pakage	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)

Series		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 ℃																													
	Pakage	36-WFLGA (4 × 4 mm)			40-HWQFN (6 × 6 mm)			48-HWQFN (7 × 7 mm)								48-LFQFP (7 × 7 mm)															

RX111 (36 to 64 pins)

| Series | | RX111 | | |

RX111 (36 to 64 pins)

Series		RX111												
Pin count		64												
Product name		R5F51114AGFM	R5F51115AGFM	R5F51116AGFM	R5F51117AGFM	R5F51118AGFM	R5F5111JAGFK	R5F51111AGFK	R5F51113AGFK	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 ℃												
	Pakage	64-LFQFP (10 × 10 mm)					64-LQFP (14 × 14 mm)							

RX110 (36 to 64 pins)

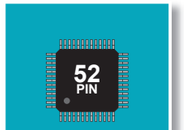
Series		RX110																						
Pin count		36				40				48														
Product name		R5F5110HADLM	R5F5110JADLM	R5F51101ADLM	R5F51103ADLM	R5F5110HADNF	R5F5110JADNF	R5F51101ADNF	R5F51103ADNF	R5F5110JADNE	R5F51101ADNE	R5F51103ADNE	R5F51104ADNE	R5F51105ADNE	R5F5110JADFL	R5F51101ADFL	R5F51103ADFL	R5F51104ADFL	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 ℃																						
	Pakage	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)

| Series | | RX110 | | |

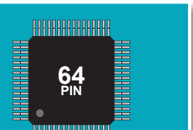
RX Family Package Lineup

●LQFP



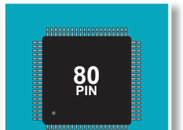
52-LQFP (10 × 10 mm)

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



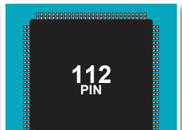
64-LQFP (14 × 14 mm)

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, 210



112-LQFP (20 × 20 mm)

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

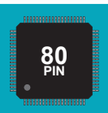
●LFQFP

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, 23T, 231, 230, 220, 210, 21A, 130, 113, 111, 110



80-LFQFP (12 × 12 mm)

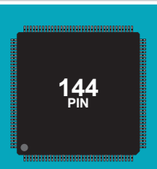
Pitch	0.50 mm
Thickness (max.)	1.70 mm
Used by	RX630, 220, 210, 21A, 130

100-LFQFP (14 × 14 mm)

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

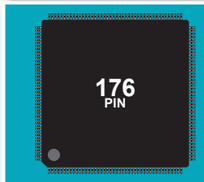
120-LFQFP (16 × 16 mm)

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, 631, 63N, 621, 62N, 634, 630, 610, 63T, 210



176-LFQFP (24 × 24 mm)

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

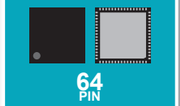
●HWQFN

40-HWQFN (6 × 6 mm)

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

48-HWQFN (7 × 7 mm)

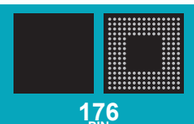
Pitch	0.50 mm
Thickness (max.)	0.80 mm
Used by	RX230, 231, 130, 111, 110



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, 631, 63N, 210, 21A, 113

145-TFLGA (7 × 7 mm)

Pitch	0.50 mm
Thickness (max.)	1.05 mm
Used by	RX71M, 64M, 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 | **5** RX Family | **63N** Product group | **F** ROM/RAM/data flash capacity (KB)*1 | **D** Chip Original info*1 | **D** Operating ambient temperature | **FP** Package type/pin count/pin pitch | **#V** Packing specification | **0** Product identification code

Product group

71M	RX71M	62G	RX62G
64M	RX64M	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

Operating ambient temperature

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

Packing specification

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

Package type/pin count/pin pitch

BG	LFBGA	176	0.8
BM	WLBGA	69	0.4
FA	LFQFP	120	0.5
FB	LFQFP	144	0.5
FC	LFQFP	176	0.5
FD	LQFP	52	0.65
FF	LQFP	80	0.65
FH	LQFP	112	0.65
FK	LQFP	64	0.8
FL	LFQFP	48	0.5
FM	LFQFP	64	0.5
FN	LFQFP	80	0.5
FP	LFQFP	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

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.

Notes:
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