RENESAS

BIG IDEAS FOR EVERY SPACE

RX100 SERIES MICROCONTROLLERS

Compact, affordable 32-bit architecture for ultra-low-power consumption and superior performance

2018.10

RENESAS RX

DRIVE YOUR IoT DESIGNS WITH

LOW POWER, LOW COST 32-BIT PERFORMANCE

Building Automation
- Thermostats
- Home Alarms
- Control Panels

Industrial/Commercial
- Keyless Entry Controls
- Irrigation Systems
- Asset-tracking Equipment
- POS Terminals

Portable Medical
- Glucose Meters
- Blood-pressure Monitors
- Fitness Monitors
- Wearable Sensors

Portable Electronics
- Remote Controls
- Meters/Measuring Instruments
- Games and Toys
- MP3 Players

The Renesas RX100 Series encompasses the RX Family's entry-level 32-bit MCUs, extending the advanced RX architecture to the lowest possible power and cost points. This series is a great fit for those who need a balance of the widest set of peripherals, highest performance, and optimal system cost. The RX100 Series delivers the market's first 32-bit MCUs to feature True Low Power and cutting-edge peripherals like capacitive touch and LCD drive capability, as well as fast wake-up, zero wait-state flash, DSP capabilities, and multiple safety functions. The RX100 Series is comprised of the only entry-level 32-bit MCUs that offer integrated USB 2.0 host, device, and OTG support.

Designed to support a broad range of applications, the RX100 Series provides a combination of ultra-low power consumption, on-chip connectivity, an extensive DSP library, and superior performance at an attractive price ideally suited for 32-bit embedded applications. It consumes only 350 nA in sleep mode and snaps into full operation in just 4.8 µs. Flash memory size ranges from 8 KB to 512 KB and compact, low pin-count packages are available ranging from 36 to 100 pins.

RX100 Block Diagram

Low Power, Fast Wake-up
- 100 µA/MHz*
- 350 nA standby, 4.8 µs Wake-up
- Safety Features

High Performance
- 3.08 CoreMark®/MHz
- 1.56 DMIPS/MHz
- 50 DMIPS @ 32 MHz

Advanced Peripherals
- USB 2.0
- Motor Control Timer
- LCD Controller
- Capacitive Touch

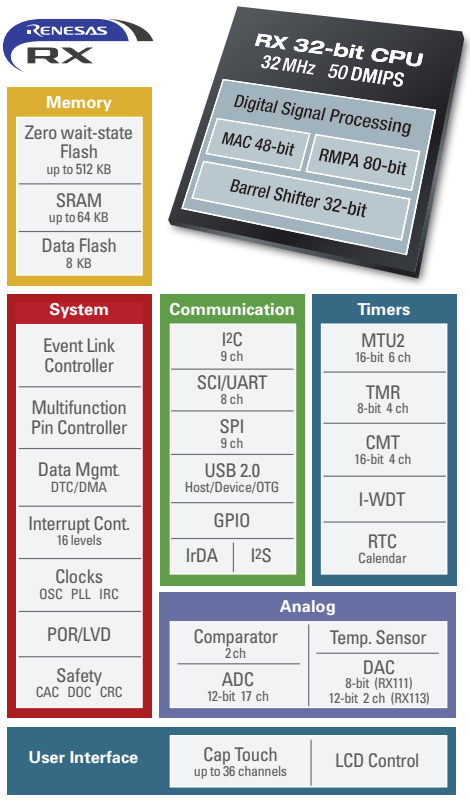
DSP Ready
- Hardware-based Divide
- Single-cycle Multiply
- 32-bit Barrel Shifter
- Extensive DSP Library

Safety
- Built-in Safety Features (CAC, DOC, I-WDT, GPIO)
- Temperature Sensor

Zero Wait-state Flash
- 1 KB Block Size
- Erase/Write Operation down to 1.8V
- BGO Data Flash (programmable while code is executed)

Environmental Sensors
- Smoke, Motion, Humidity, Light
- Wired and Wireless

Scalable
- Fully Compatible with RX600/RX700 and RX200
- Low Pin Count (36-100 pins), 8 KB to 512 KB
- Multifunction Pin Controller (MPC)



Home Appliances
- Air Conditioning
- Refrigerators
- Washing Machines

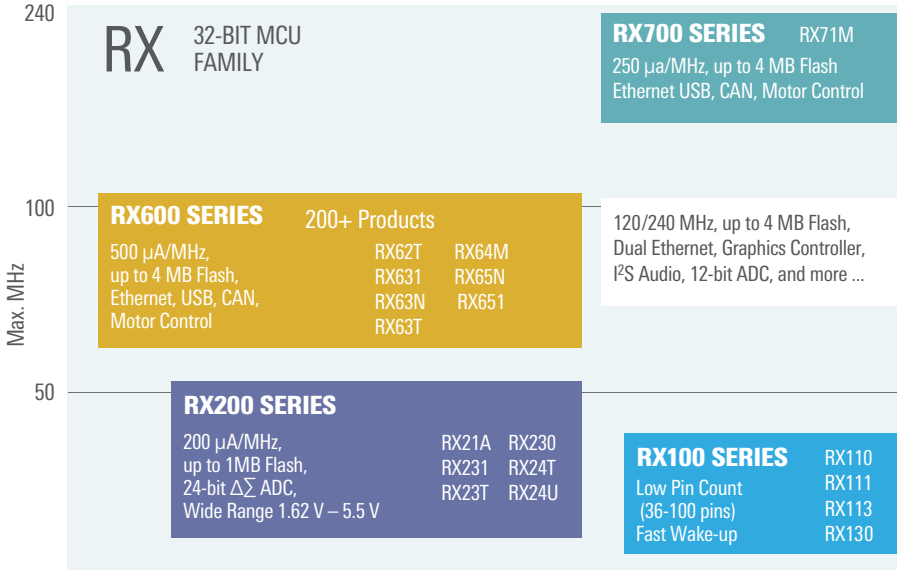
*All peripherals OFF, running NOP.

Please note: Refer to product selector guide in this brochure for specific device information.

RX FAMILY PERFORMANCE AND POWER ADVANTAGES

The RX Family contains three series of 32-bit MCUs that are optimized for a vast range of application requirements. The RX100, RX200, and RX600/RX700 Series are CPU and peripheral compatible and share the same software tools and ecosystem.

MCUs in the top-level RX600/RX700 Series are ideal for systems that require high-performance, excellent connectivity, LCD drive, and motor control capability. By contrast, devices in the RX200 and RX100 Series are optimized for ultra-low power, portable applications, safety functionality, and integrated analog interfaces.



RX100 – TRUE LOW POWER WITHOUT COMPROMISING PERFORMANCE

RX100 MCUs are great design choices for embedded systems that must minimize power consumption by running in sleep mode whenever possible, yet must wake-up quickly whenever there is a need to perform computing or control tasks. Renesas' True Low Power capability offers designers the lowest possible power consumption across the entire temperature and voltage range, including all peripherals and Flash memory, while also providing maximum flexibility with multiple operational and sleep modes. Four different power-saving modes are available: Run, Sleep, Deep Sleep, and Software Standby. Wake-up time in low-power mode ranges from less than 1 µs to 4.8 µs.

Run Mode	ICLK Frequency	Internal Voltage Regulator Mode
High Speed	8 MHz - 32 MHz	High Power
Middle Speed	1 MHz - 8 MHz	Middle Power
Low Speed	32 kHz - 1 MHz	Low Power

Peripheral Functions

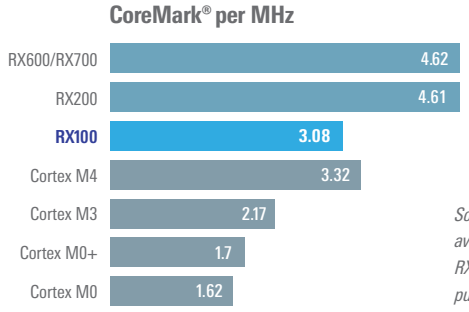
	USB	LCD	Cap Touch	I^2S
RX130	–	–	√	–
RX113	√	√	√	√
RX111	√	–	–	–
RX110	–	–	–	–

Peripherals that aren't required can be completely shut down in every mode. A flexible clock system allows peripherals to use a clock frequency from the one driving the CPU to achieve the lowest possible level of power consumption.

In run modes, the RX100 MCUs' three different operating modes can be applied according to the demands of the application at any point in time: high speed, middle speed, and low speed.

Computing Capabilities for Application Performance

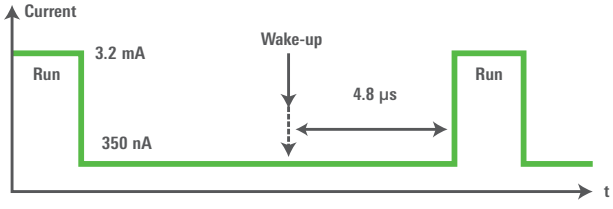
The RX100 core features 1.56 DMIPS/MHz and 3.08 CoreMark/MHz performance and achieves 50 DMIPS at 32 MHz.



Sources: Cortex®-M Series CoreMark available on www.arm.com. RX Family CoreMark per MHz are published on www.eembc.com.

Low Power Consumption, Fast Wake-up

Software standby achieves a power consumption of only 350 nA, with a 4.8 µs wake-up time. Applications requiring a shorter wake-up can utilize the Sleep and Deep-Sleep modes that reduce the delay to just 1 µs.



RX100 SERIES SAFETY FEATURES

RX100 MCUs provide six modular hardware subsystems that help products meet safety standards. Clock Accuracy Control checks that the clock frequency is within a predefined range. Oscillation Stop Detection switches the chip's main clock to an alternative source if the primary one fails. Data Operation Circuit continuously performs a SRAM failure test independent of the CPU. The Independent Watchdog Timer (I-WDT) uses a reliable internal clock source.

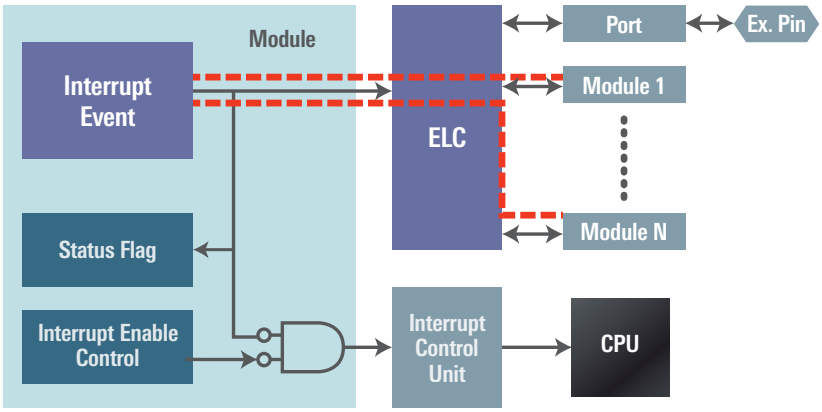
Clock	RAM	Serial Communication	OCO Dedicated for WDT
CAC Detects abnormal frequency	Data Operation Circuit Assists RAM failure check test	Cyclic Redundancy Check Detects serial communication data error	I-WDT Independent watchdog timer clock source from system clock
Oscillation Stop Detection Detects OSC stop Switch clock source to OCO			GPIO With read-back ability

CAC: Clock frequency accuracy measurement circuit OCO: On-chip oscillator

FEATURES ENABLING LOW POWER CONSUMPTION AND DESIGN FLEXIBILITY

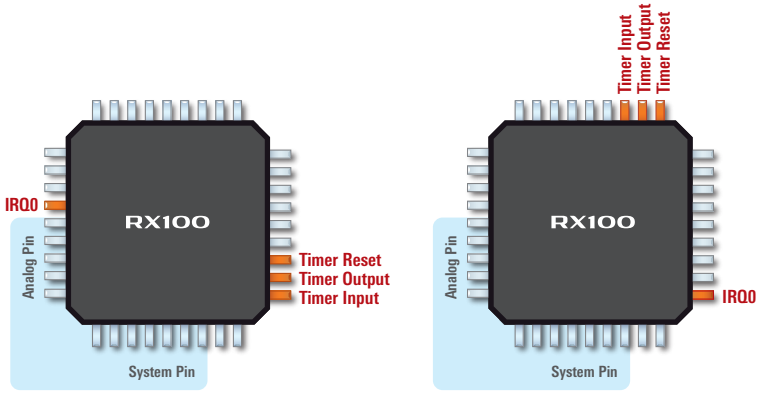
Event Link Controller

The Event Link Controller (ELC) is an innovative way to reduce CPU load by directly routing interrupt event signals from one peripheral or module to the other. As a result, power consumption, interrupt latency, and program size are minimized.



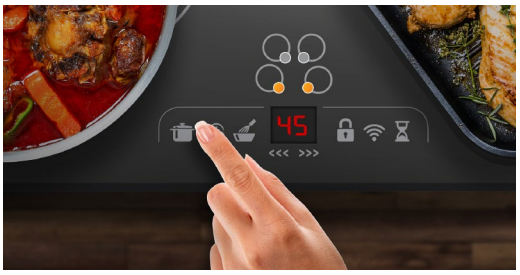
Multifunction Pin Controller

The Multifunction Pin Controller (MPC) allows peripheral input and output signals to be remapped to alternate ports, offering more design layout flexibility. In this example, the ports of the IRQ0 and timer have been moved to a different location of the MCU.



ADVANCED CAPACITIVE TOUCH TECHNOLOGY

The usability and quality of a human machine interface (HMI) – the medium through which a human interacts with a machine – is critical for the success of today's IoT platforms. Effective use of capacitive touch technology provides an intuitive interface and dramatically alters the end user experience. Renesas' latest generation of capacitive touch technology has been optimized for a wide range of HMI applications by providing extremely high resistance to environmental factors, allowing for operation in dusty or wet conditions, with gloved hands, and even through wood panels.

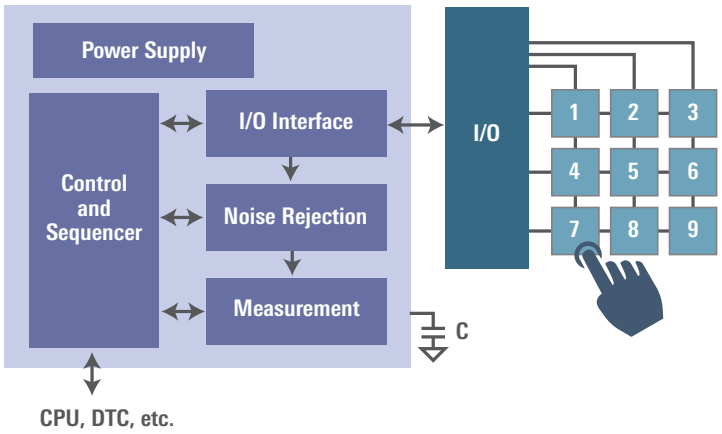


The Renesas RX130 and RX113 Series of microcontrollers incorporate a patented hardware peripheral block designed to measure small variations in electrical capacitance independent of the main CPU operation. This feature has been optimized to detect the presence of human touch typically used in touch interface applications. This proprietary intellectual property means that Renesas RX MCUs offer developers the latest in HMI technology for industrial, building automation, home appliance, and more.

Key Features and Benefits

- **High Sensitivity:** Touch detection through 10 mm in user interface panels – not only for glass and acrylic, but can also support non-traditional applications like wood or through the air
- **High Noise Tolerance:** World-class IEC 61000 4-3/4-6 level 3 compliance, hardware-assisted rejection of electrical noise, and adaptation to environmental changes
- **Water Resistance:** Operation with no errors when panels are wet
- **Hardware-Assisted Rejection:** Handles electrical noise and can adapt to environmental changes
- **Autonomous Operation:** Enables ultra-low power touch detection for portable devices
- **Channel Flexibility:** Up to 36 touch channels supporting buttons, wheels, or sliders
- **Sensing Methodologies:** Supports both self-capacitance and mutual-capacitance applications
- **Automatic Tuning Mechanism:** Supports cap touch sensitivity adjustment for applications using different materials, overlays, curved surfaces, or air gaps
- **Easy-to-Use Development Tools:** PC-based GUI tool for system configuration and development
- **Single-Chip Cap Touch Designs:** With 512 KB of Flash, many applications can implement the user interface and the cap touch sensing with a single MCU device
- **Package Options:** 48-, 64-, 80-, and 100-pin packages

Capacitive Touch Block Diagram



Capacitive Touch Evaluation System for RX130

- RX130 CPU board
- Touch application boards
- Evaluation software
- USB cable
- Quick-start guide

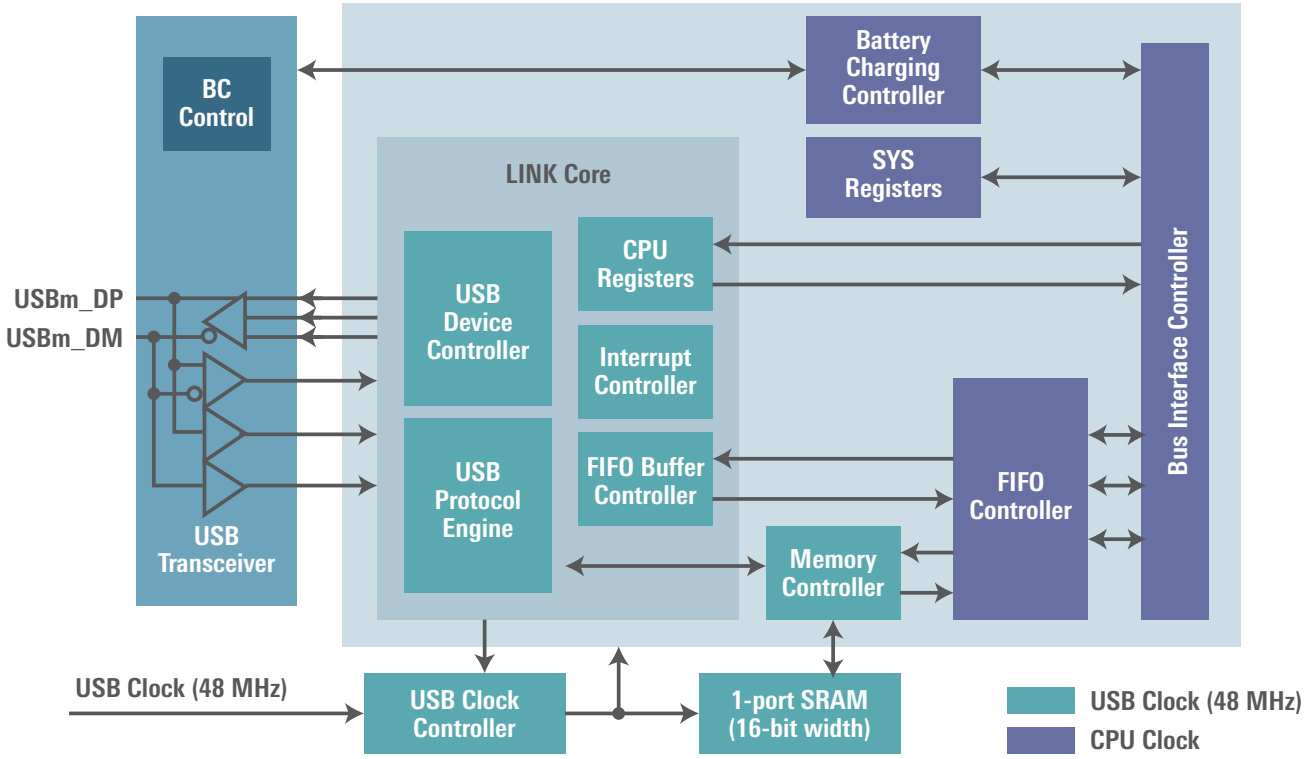
RX130 Capacitive Touch Renesas Solution Starter Kit

P/N: RTK0EG0003S02001BJ

www.renesas.com/RX130CAPT01

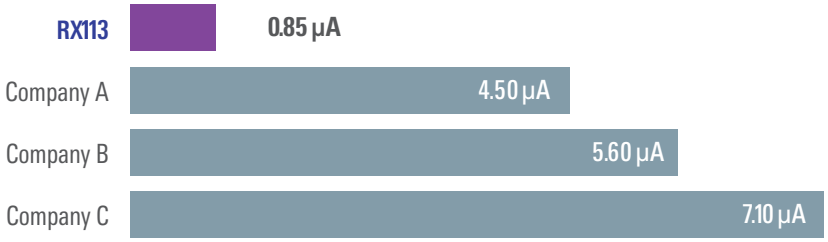
USB CONNECTIVITY OF RX100 MCUS

Devices in the RX100 Series incorporate a USB 2.0 Host/Function controller and an OTG communication peripheral. Operating as a host, the controller provides full-speed and low-speed data transfers. It also supports battery charging and complies with the battery charging application specification, rev 1.2. (Not available on RX110 Group.)



LCD DRIVE SUPPORT

Need LCD support for your design? The RX113 Group's advanced peripheral set offers the latest in LCD drive and control capability. Designed for maximum flexibility, the RX113 provides user-selectable liquid crystal waveform, while the LCD driver voltage reference can easily switch between capacitor split method, external resistance method, or internal voltage boosting method. This allows users to maximize drive capability,
operating current, or drive voltage depending on application requirements.



- Supports capacitor split method, internal voltage boost method, and resistance division method
- Supports waveform types A and B
- Supports LCD contrast adjustment
- Supports LCD blinking
- Complies with USB Battery Charging Specification 1.2

ACCELERATE YOUR DESIGN WITH RX100 DSP CAPABILITIES

The Renesas RX100 MCU Series provides a clear advantage over competitive solutions by delivering critical DSP functionality not found in other entry-level 32-bit MCUs. Unlike competitive M0/M0+ families, the RX CPU core provides a hardware-based divide capability – offering a huge improvement in design efficiency and performance compared to software-based implementations.
The RX CPU core also contains important DSP-enabling features like a 5-stage pipeline and 32-bit barrel shifter – capabilities not available in M0/M0+ solutions. Renesas makes it easy to develop your DSP application code by providing an extensive, scalable DSP instruction set that has been designed to maximize the superior performance of the RX CPU core. The state-of-the art DSP capabilities offered in the RX100 Series make it the obvious choice for low-cost, low-power signal processing applications.

Capability	RX113	M0/M0+
Multiply 32x32	1 Cycle	Small – 32 Cycles Fast – 1 Cycle
Hardware Divide	18 Cycles	–
ROM-based or Software Divide	–	97-700 Cycles
DSP Library	RX Library	CMSIS[1]

1: Supplied by Arm

RX DSP LIBRARY – 36 KERNELS INCLUDE 308 FUNCTIONS

If your system needs digital-signal-processing (DSP) capabilities to handle applications such as intelligent sensing, imaging, communications, and audio, take advantage of the Renesas RX DSP Library. It contains 36 kernels and 308 functions that support filter, transform, complex, statistical, and matrix operations. Download all the DSP code you need.

Filter 128 Functions	
Kernel	Generic Real FIR
	IIR Biquad
	Leaky LMS Adaptive
	Generic Complex FIR
	Lattice FIR
	Lattice IIR
	Single-Pole IIR

Statistical 45 Functions	
Kernel	Mean
	Max/Min
	Mean Absolute Value
	Variance
	Histogram
	Max Absolute Value
	Mean Absolute Deviation
	Median

Complex 47 Functions	
Kernel	Magnitude
	Phase
	Complex Add
	Complex Subtract
	Complex Multiply
	Complex Conjugate
	Magnitude Squared
	Fast Magnitude Estimate

Matrix 40 Functions	
Kernel	Matrix Add
	Matrix Subtract
	Matrix Multiply
	Matrix Transpose
	Matrix Scale

Transform 48 Functions	
Kernel	Forward Complex FFT
	Forward Complex DFT
	Inverse Complex FFT
	Inverse Complex DFT
	Forward Real FFT
	Forward Real DFT
	Inverse Complex Conjugate Symmetric FFT
	Inverse Complex Conjugate Symmetric DFT

FIRMWARE INTEGRATION TECHNOLOGY (FIT)

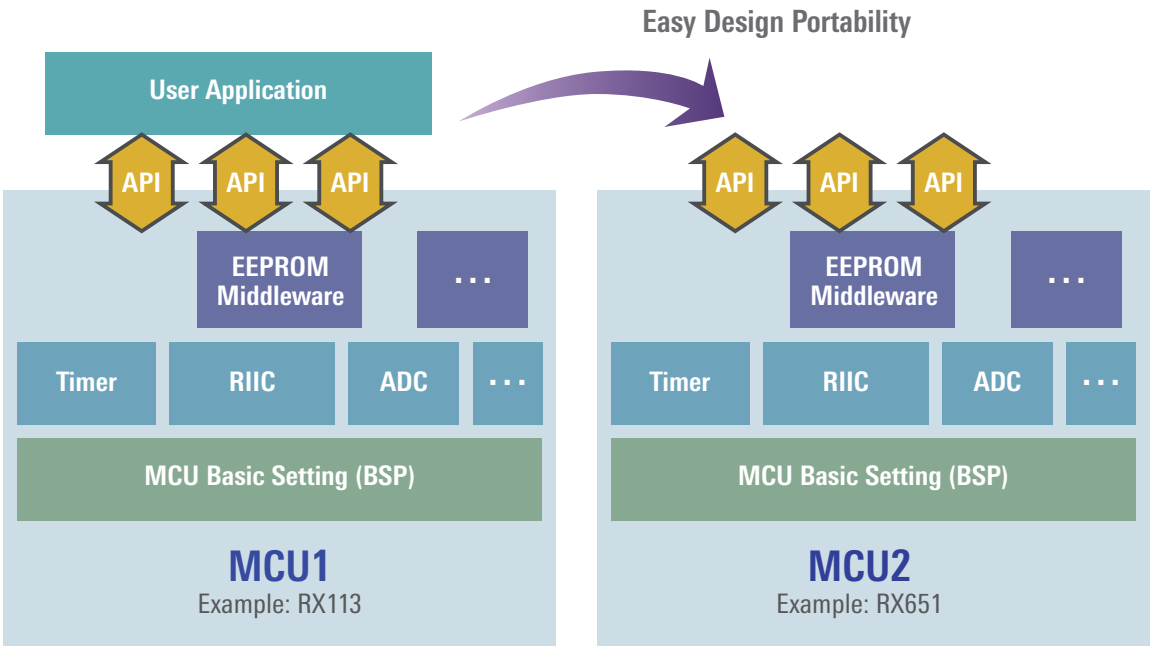
Firmware Integration Technology (FIT) is a global set of Renesas standards enabling creation of high-quality, easy-to-use, interoperable firmware that addresses customer needs.
FIT is a set of rules and guidelines to help produce better code and better projects – faster and easier.

FIT provides:

- Common file and directory structure
- Common documentation practices
- Easy insertion into customer's project
- Ability to integrate multiple modules
- Simple configuration
- Strong foundation to build code
- Common platform for installation of modules

FIT Enables Portability:

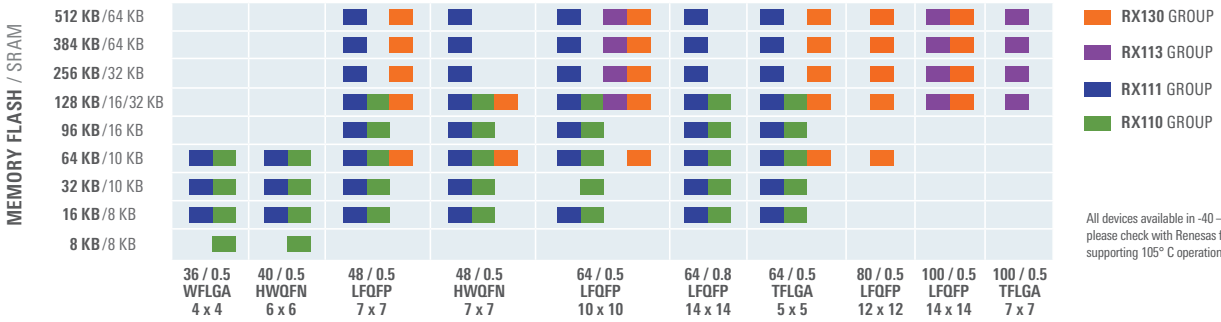
- API-based implementation
- User application can move to another MCU easily



FIT Module Name	RX130	RX113	RX111	RX110
BSP	√	√	√	√
CGC	√	√	√	√
MPC	√	√	√	√
LPC	√	√	√	√
12-bit ADC	√	√	√	√
SCI Multi-Mode	√	√	√	√
Byte Queue	√	√	√	√
Long Queue	√	√	√	√
IRQ	√	√	√	√
LVD	√	√	√	√
GPIO	√	√	√	√
RSPI	√	√	√	√
CAC	√	√	√	√

FIT Module Name	RX130	RX113	RX111	RX110
CMT	√	√	√	√
RTC	√	√	√	√
DAC	√	√	√	NA
IWDT	√	√	√	√
MTU/TPU	√	√	√	√
ELC	√	√	√	NA
RIIC	√	√	√	√
SCI Simple I²C	√	√	√	√
RIIC Module for EEPROM Access	√	√	√	√
Simple I²C Module for EEPROM Access	√	√	√	√
SSI	NA	√	NA	NA
LCD	NA	√	NA	NA

RX100 MCU SERIES PORTFOLIO



All devices available in -40 – 85°C version; please check with Renesas for versions supporting 105° C operation.

RX100 SERIES DEVICES

	Part Number	MHz	Flash Size (KB)	Data Flash (KB)	VCC (V)	RAM (KB)	16-bit Timers	Watchdog Timers	Motor Control Timer	RTC	A/D 12-bit	DAC	Op-Amps	SCI	SPI	I²C	GPIO	Pin Count/ Package Type	Pin pitch (mm)	Package
RX130 Group	R5F51308ADFP#30	32	512	8	1.8-5.5	48	8	1	–	Y	24	2	Y	4	5	5	88	100-LQFP	0.5	PLQP0100KB-B 14x14mm
	R5F51308ADFN#30									Y	17	2					68	80-LQFP	0.5	PLQP0080KB-B 12x12mm
	R5F51308ADFM#30									Y	14	2					52	64-LQFP	0.5	PLQP0064KB-C 10x10mm
	R5F51308ADFK#30									Y	14	2					52	64-LQFP	0.8	PLQP0064GA-A 14x14mm
	R5F51308ADFL#30									–	10	–					38	48-LQFP	0.5	PLQP0048KB-B 7x7mm
	R5F51307ADFP#30	32	384	8	1.8-5.5	48	8	1	–	Y	24	2	Y	4	5	5	88	100-LQFP	0.5	PLQP0100KB-B 14x14mm
	R5F51307ADFN#30									Y	17	2					68	80-LQFP	0.5	PLQP0080KB-B 12x12mm
	R5F51307ADFM#30									Y	14	2					52	64-LQFP	0.5	PLQP0064KB-C 10x10mm
	R5F51307ADFK#30									Y	14	2					52	64-LQFP	0.8	PLQP0064GA-A 14x14mm
	R5F51307ADFL#30									–	10	–					38	48-LQFP	0.5	PLQP0048KB-B 7x7mm
	R5F51306BDFP#30	32	256	8	1.8-5.5	32	8	1	–	Y	24	2	Y	4	5	5	88	100-LQFP	0.5	PLQP0100KB-B 14x14mm
	R5F51306BDFN#30									Y	17	2					68	80-LQFP	0.5	PLQP0080KB-B 12x12mm
	R5F51306BDFM#30									Y	14	2					52	64-LQFP	0.5	PLQP0064KB-C 10x10mm
	R5F51306BDFK#30									Y	14	2					52	64-LQFP	0.8	PLQP0064GA-A 14x14mm
	R5F51306BDFL#30									–	10	–					38	48-LQFP	0.5	PLQP0048KB-B 7x7mm
	R5F51305BDFP#30	32	128	8	1.8-5.5	16	8	1	–	Y	24	2	Y	4	5	5	88	100-LQFP	0.5	PLQP0100KB-B 14x14mm
	R5F51305ADFN#30									Y	17	2					68	80-LQFP	0.5	PLQP0080KB-B 12x12mm
	R5F51305ADFM#30									Y	14	2					52	64-LQFP	0.5	PLQP0064KB-C 10x10mm
	R5F51305ADFK#30									Y	14	2					52	64-LQFP	0.8	PLQP0064GA-A 14x14mm
	R5F51305ADFL#30									–	10	–					38	48-LQFP	0.5	PLQP0048KB-B 7x7mm
	R5F51305ADNE#U0									–	10	–					38	48-HWQFN	0.5	PWQN0048KB-A 7x7mm
	R5F51303ADFN#30	32	64	8	1.8-5.5	10	8	1	–	Y	17	2	Y	4	5	5	88	80-LQFP	0.5	PLQP0080KB-B 12x12mm
	R5F51303ADFM#30									Y	14	2					52	64-LQFP	0.5	PLQP0064KB-C 10x10mm
	R5F51303ADFK#30									Y	14	2					52	64-LQFP	0.8	PLQP0064GA-A 14x14mm
	R5F51303ADFL#30									–	10	–					38	48-LQFP	0.5	PLQP0048KB-B 7x7mm
	R5F51303ADNE#U0									–	10	–					38	48-HWQFN	0.5	PWQN0048KB-A 7x7mm
RX113 Group	R5F51138ADFP#3A	32	512	8	1.8-3.6	64	8	1	1	1	17	2	Y	8	9	9	82	100-LQFP	0.5	PLQP0100KB-A: 14x14mm
	R5F51138ADLJ#2A										17						82	100-TFLGA	0.65	PTLG0100JA-A: 7x7mm
	R5F51138ADFM#3A										11						46	64-LQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51137ADFP#3A	32	384	8	1.8-3.6	64	8	1	1	1	17	2	Y	8	9	9	82	100-LQFP	0.5	PLQP0100KB-A: 14x14mm
	R5F51137ADLJ#2A										17						82	100-TFLGA	0.65	PTLG0100JA-A: 7x7mm
	R5F51137ADFM#3A										11						46	64-LQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51136ADFP#3A	32	256	8	1.8-3.6	64	8	1	1	1	17	2	Y	8	9	9	82	100-LQFP	0.5	PLQP0100KB-A: 14x14mm
	R5F51136ADLJ#2A										17						82	100-TFLGA	0.65	PTLG0100JA-A: 7x7mm
	R5F51136ADFM#3A										11						46	64-LQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51135ADFP#3A	32	128	8	1.8-3.6	64	8	1	1	1	17	2	Y	8	9	9	82	100-LQFP	0.5	PLQP0100KB-A: 14x14mm
	R5F51135ADLJ#2A										17						82	100-TFLGA	0.65	PTLG0100JA-A: 7x7mm
	R5F51135ADFM#3A										11						46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
RX111 Group	R5F51118ADFM#3A	32	512	8	1.8-3.6	64	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51118ADFK#3A										14						46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51118ADLF#UA										14						46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51118ADFL#3A										10						30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51118ADNE#UA										10						30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51117ADFM#3A	32	384	8	1.8-3.6	64	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51117ADFK#3A										14						46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51117ADLF#UA										14						46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51117ADFL#3A										10						30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51117ADNE#UA										10						30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51116ADFM#3A	32	256	8	1.8-3.6	64	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51116ADFK#3A										14						46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51116ADLF#UA										14						46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51116ADFL#3A										10						30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51116ADNE#UA										10						30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm

RX100 SERIES DEVICES

	Part Number	MHz	Flash Size (KB)	Data Flash (KB)	VCC (V)	RAM (KB)	16-bit Timers	Watchdog Timers	Motor Control Timer	RTC	A/D 12-bit	DAC	Op-Amps	SCI	SPI	I²C	GPIO	Pin Count/ Package Type	Pin pitch (mm)	Package
RX111 Group	R5F51115ADFM#3A	32	128	8	1.8-3.6	16	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51115ADFK#3A										14						46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51115ADLF#UA										14						46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51115ADFL#3A										10						30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51115ADNE#UA										10						30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51114ADFM#3A	32	96	8	1.8-3.6	16	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51114ADFK#3A										14	2					46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51114ADLF#UA										14	2					46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51114ADFL#3A										10	–					30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51114ADNE#UA										10	–					30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51113ADFM#3A	32	64	8	1.8-3.6	10	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51113ADFK#3A									1	14	2					46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51113ADLF#UA									1	14	2					46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51113ADNE#UA									1	10	–					30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51113ADFL#3A									1	10	–					30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51113ADNF#UA									–	8	–					24	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm
	R5F51113ADLM#UA									–	7	–					20	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
	R5F51111ADFM#3A	32	32	8	1.8-3.6	10	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51111ADFK#3A									1	14	2					46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51111ADLF#UA									1	14	2					46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51111ADNE#UA									1	10	–					30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51111ADFL#3A									1	10	–					30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F51111ADNF#UA									–	8	–					24	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm
	R5F51111ADLM#UA									–	7	–					20	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
	R5F5111JADFM#3A	32	16	8	1.8-3.6	8	8	1	1	1	14	2	Y	3	4	4	46	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F5111JADFK#3A									1	14	2					46	64-LQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F5111JADLF#UA									1	14	2					46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F5111JADNE#UA									1	10	–					30	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F5111JADFL#3A									1	10	–					30	48-LQFP	0.5	PLQP0048KB-A: 7x7mm
	R5F5111JADNF#UA									–	8	–					24	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm
	R5F5111JADLM#UA									–	7	–					20	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
RX110 Group	R5F51105ADFM#30	32	128	–	1.8-3.6	16	2	1	–	1	14	–	Y	3	4	4	46	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51105ADFK#30										14						46	48-LFQP	0.5	PLQP0048KB-A: 7x7mm
	R5F51105ADLF#U0										14						46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51105ADFL#30										10						30	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51105ADNE#U0										10						30	64-LFQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51104ADFM#30	32	96	–	1.8-3.6	16	2	1	–	1	14	–	Y	3	4	4	46	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51104ADFK#30										14						46	48-LFQP	0.5	PLQP0048KB-A: 7x7mm
	R5F51104ADLF#U0										14						46	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51104ADFL#30										10						30	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51104ADNE#U0										10						30	64-LFQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51103ADFM#30	32	64	–	1.8-3.6	10	2	1	–	1	14	–	Y	3	4	4	46	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
	R5F51103ADFK#30									1	14						46	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm
	R5F51103ADLF#U0									1	14						46	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51103ADFL#30									1	10						30	48-LFQP	0.5	PLQP0048KB-A: 7x7mm
	R5F51103ADNE#U0									1	10						30	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51103ADNF#U0									–	8						28	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51103ADLM#U0									–	7						24	64-LFQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F51101ADFM#30	32	32	–	1.8-3.6	10	2	1	–	1	14	–	Y	3	4	4	46	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
	R5F51101ADFK#30									1	14						46	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm
	R5F51101ADLF#U0									1	14						46	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F51101ADFL#30									1	10						30	48-LFQP	0.5	PLQP0048KB-A: 7x7mm
	R5F51101ADNE#U0									1	10						30	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F51101ADNF#U0									–	8						28	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F51101ADLM#U0									–	7						24	64-LFQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F5110JADFM#30	32	16	–	1.8-3.6	8	2	1	–	1	14	–	Y	3	4	4	46	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
	R5F5110JADFK#30									1	14						46	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm
	R5F5110JADLF#U0									1	14						46	48-HWQFN	0.5	PWQN0048KB-A: 7x7mm
	R5F5110JADFL#30									1	10						30	48-LFQP	0.5	PLQP0048KB-A: 7x7mm
	R5F5110JADNE#U0									1	10						30	64-WFLGA	0.5	PWLG0064KA-A: 5x5mm
	R5F5110JADNF#U0									–	8						28	64-LFQFP	0.5	PLQP0064KB-A: 10x10mm
	R5F5110JADLM#U0									–	7						24	64-LFQFP	0.8	PLQP0064GA-A: 14x14mm
	R5F5110HADNF#U0	32	8	–	1.8-3.6	8	2	1	–	–	8	–	Y	2	3	3	24	36-WFLGA	0.5	PWLG0036KA-A: 4x4mm
	R5F5110HADLM#U0										7						28	40-HWQFN	0.5	PWQN0040KC-A: 6x6mm

Selected examples shown here. Please check http://am.renesas.com/rx100 for complete list of available devices. Note: Support for 105° C available.

GET UP AND RUNNING WITH THE RX ECOSYSTEM

Renesas makes it easy to launch new system designs. Our comprehensive hardware and software tools – including very low cost and free products – help swiftly advance the product development process from concept stage to final RX-based design.

Renesas Customizable Software Library

Applilet is a support tool that makes it easy to generate code optimized for an RX100 MCU. It functions through a simple GUI windows application or via an e² studio plug-in. This tool generates customizable device drivers that compile and work right out of the box.

www.renesas.com/applilet

e² studio – the Eclipse-based Integrated Development Environment (IDE)

The Renesas e² studio IDE is a complete development and debug environment based on the popular Eclipse platform and the associated C/C++ Development Tooling (CDT) project.

Basic Features		Advanced Debug Features	
– Connect / Disconnect – Run / Stop (Resume / Suspend) – Software breakpoints – Source step / disassembly step	– Variable and Expression views – Register view – Basic Memory view – Endian selection	– Renesas Debug view with Call Stack – I/O Registers view – Trace view – Eventpoints view	– Real-time Expression view – Real-time Memory view – Real-time Chart view

www.renesas.com/e2studio

RX100 Renesas Starter Kits (RSK)

These complete RX100-based hardware/software platforms for in-depth application design include the E1 Debugger, e² studio, demonstration firmware, and a trial version of the Renesas RX compiler.

RX130 RSK
P/N: YROK5051135000BE
www.renesas.com/RSKRX130-512KB

RX113 RSK
P/N: YROK5051135000BE
www.renesas.com/RSKRX113

RX111 RSK
P/N: YR0K505111S000BE
www.renesas.com/RSKRX111

RX130 Target Board

Target Board for RX family provides an entry point to evaluation, prototyping, and developing for the RX MCU family. It incorporates an emulator circuit so you can use it for your own application design without the need for further tool investments.

RTK5RX1300C00000BR

Complete Debugging, Emulation, and Programming

On-chip debugging of an RX-based application is performed via a debug connection to the target and USB connection to the Windows-based IDE. The Renesas E1 and E2 debuggers offer thorough CPU control and visibility. The E2 is more economical than the E1 and is suitable for work across the whole range from hobbyist projects and education to professional development.

Renesas E1
P/N: R0E000010KCE00

Renesas E2
P/N: RTE0T00020KCE00000R

www.renesas.com/tools

Third-party Solutions

Compilers

IAR SYSTEMS
www.iar.com/ewrx

The IAR Embedded Workbench for RX is now available in two editions – The EWRX Standard edition and the new EWRX-BL Baseline edition, which is targeted at developers working with Renesas RX MCUs with smaller memory like the RX100 Series. The Baseline edition is limited to a code size of 256 KB, but otherwise provides a fully functional IDE, including project manager, editor, compiler, assembler, linker librarian, and debugger tools.

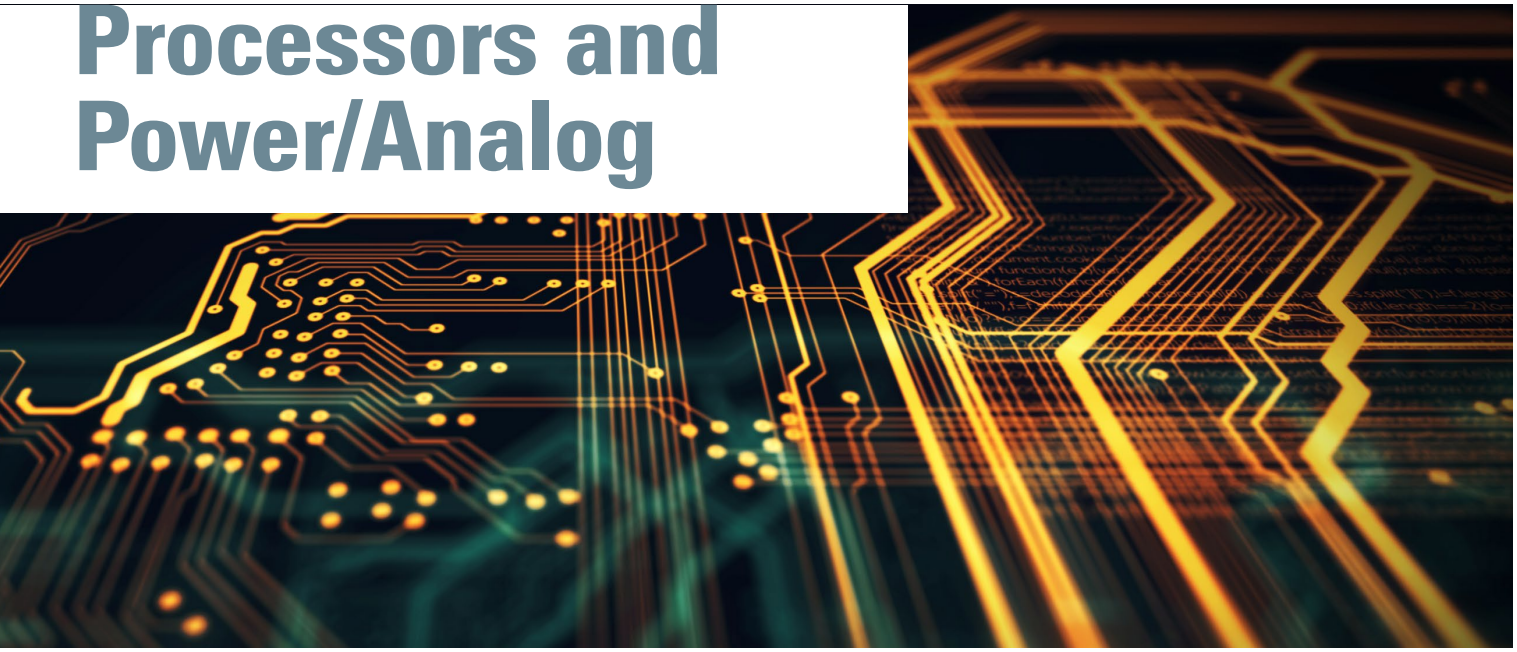
NEW: Free 64 KB size-limited Kickstart version is now also available!

KPIT Cummins Infosystems Limited
www.kpitgnutools.com
KPIT GNURX compiler

	Micrium	CMX SYSTEMS	RoweBots	expresslogic	freeRTOS	SEGGER
	www.micrium.com	www.cmx.com	www.rowebots.com	www.expresslogic.com	www.freertos.org	www.segger.com
RTOS	µC/OS-III	CMX-RTX	Unison	ThreadX	FreeRTOS	embOS
USB	✓	✓	✓	✓		✓

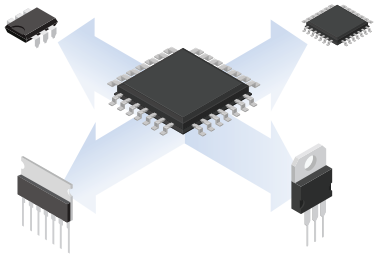
MEMO

Processors and Power/Analog



Complete System Solutions at Your Fingertips

In today's fast paced technology environment, designers need to be innovative without compromising time to market. Thinking at the system level is crucial to being able to address design challenges upfront. By offering quality solutions for the two most critical parts of your design, processors and power, Renesas accelerates your development and enables differentiation, while bringing predictability to your application. Whatever your product field – automotive, industrial, home electronics, office automation or information communication technology – Renesas is the partner you can rely on from design to production.



A top-to-bottom, front-to-back product offering will help speed design and bring quality, compatibility, and predictability to your applications.

Power Management and Precision Analog Products

Power Management	Amplifiers & Buffers	Audio & Video	Data Converters	Switches & Multiplexers	Optoelectronics	Timing & Digital
• Discrete DC/DC Converters • Battery Management Systems (BMS) • Computing Power VRM/IMVP • Digital Power • Display Power and Backlighting • Hot Swap & ORing • Isolated Power Supply • LED Drivers • LNB Regulators • Low Dropout Regulator ICs • MOSFET Drivers • PMIC • Power Modules	• Buffers • Comparators • Current Sense • Differential Amplifiers • Display Amplifiers and Buffers • Gain Blocks • High-Speed Op Amps • Instrumentation Amplifiers • Line Drivers • Precision Op Amps • Sample and Hold Amplifiers • Transistor Arrays	• Switches • Automotive Infotainment & Security Surveillance • Buffered Video MUXs • Audio Processor • DVI/HDMI • Display ICs • HD Video Analog Front End (AFEs) • Surveillance ICs • Video Decoders/ Encoders • Video ICs	• D/A Converters • Digital Potentiometers (DCPs) • High-Speed A/D Converters • Precision A/D Converters • Voltage References	• High Voltage • Low Voltage • Medium Voltage • USB – High-Speed – High-Speed plus 2ch Stereo Audio – High-Speed UART Dual 3-1 MUX	• Ambient Light Sensors • Ambient Light and Proximity Sensors • Laser Diode Drivers (LDD) • Proximity Sensors **Interface** • RS-485 & RS-422 • RS-232 • 2-Wire Bus Buffers • Signal Integrity	• Clock Generators • Counters/Time Base ICs • DSP • Memory • Microprocessors and Peripherals • Real Time Clocks **Space & Harsh Environment** • Radiation Hardened • Defense & Hi-Reliability

POWERING AN MCU

Buck-Boost Converter

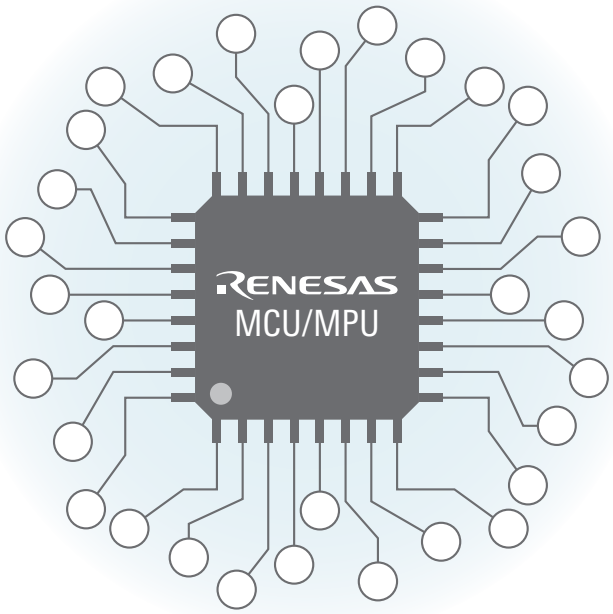
ISL9120, ISL91107, ISL91128
- Current Range: 400mA – 2.4A
- Low Iq ~ 20µA
- Input Voltage: 0.6V – 5.5V
- Output Voltage: 2.5V – 5.25V

Buck Converters

ISL9103/A, ISL9107/A, ISL9307
- Current Range: 500mA – 1.5A
- Low Iq ~ 17µA
- Input Voltage: 2.7V – 6V
- Output Voltage: 0.8V - V_{IN}

Boost Converters

ISL9111, ISL9113, ISL91133
- Current Range: 400mA – 2.3A
- Low Iq ~ 20µA
- Input Voltage: 0.6V – 5.4V
- Output Voltage: 2.5V – 5.25V



Linear Regulators

ISL9007, ISL9021A, ISL9016
- Current Range: 150mA – 400mA
- Low Iq ~ 25µA
- Input Voltage: 1.5V – 6.5V
- Output Voltage: 0.9V – 3.3V

Bi-Directional Buck-Boost Conv

ISL95338
- Current Range: <10A
- V_{IN}: 3.2V – 23.5V; V_{OUT}: 2.4V – 20V

Battery Chargers

ISL6294, ISL9230, ISL9220
- Dual power source (USB & Wireless Charging + Power Path)
- Current Range: 300mA – 1.5A
- 30V Input Compliant

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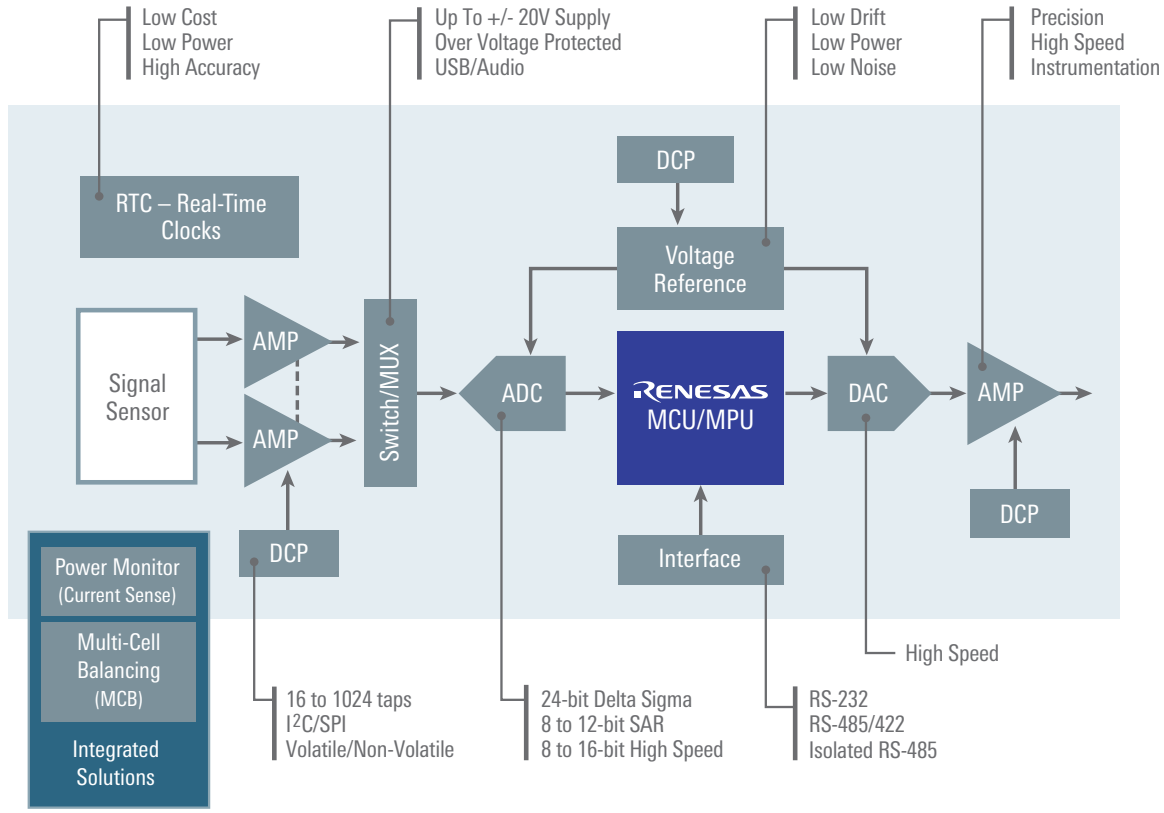
Renesas' broad precision analog portfolio provides a wide range of next-gen precision instrumentation, medical, communication and industrial process control applications where innovation, reliability and dependability is central to the analog designs.



BIG IDEAS FOR EVERY SPACE

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