

Renesas Microcontrollers

RL78 Family

Industrial Automation



Healthcare



Consumer Electronics



Lighting Illumination



Automotive



Ecology

The RL78 family is the new generation of power-efficient microcontrollers from Renesas.

It enables customers to build compact and energy-efficient systems at lower cost.

The RL78 is a new generation of power-efficient microcontrollers that combine the excellent CPU performance of the 78K0R with the superior on-chip functions of the R8C and 78K. It delivers higher performance and lower power consumption than previous microcontrollers while enabling customers to utilize software resources developed for the R8C and 78K.

Comprehensive Development Tools

- Integrated development tools for more efficient development
- Support for powerful tools from Renesas partners

Low Power Consumption

- 45.5 $\mu\text{A}/\text{MHz}$ operation*1
 - 0.57 μA (RTC + LVD)
 - New SNOOZE mode
- Note: 1. Power supply current value during basic RL78/G10 operation

Broad Scalability

- 10 to 128 pins/1 to 512 KB
- Extensive product lineup to meet a broad range of requirements
- Pin compatibility
- Ability to reassign peripheral function pins

Reliable Safety Functions

- Memory with ECC
- Compliant with Safety Standard for Household Appliances (IEC 60730)
- Support for high operating temperatures (up to 150°C)
- Abnormal operation detection/avoidance function

Reduced System Cost

- 32 MHz $\pm 1\%$ high-precision on-chip oscillator
- On-chip power-on reset, low-voltage detection circuit, temperature sensor, data flash memory, etc.

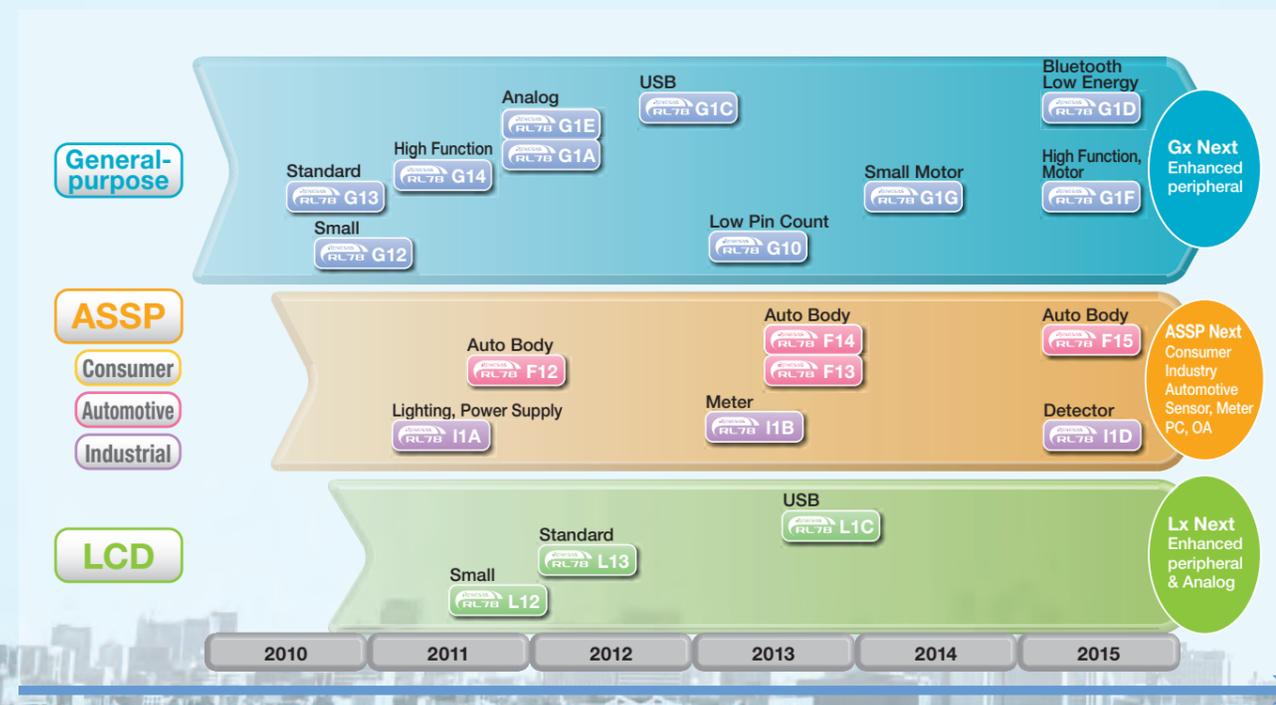
High Performance

- High processing performance of 1.39 DMIPS/MHz
- Support for power supply voltages from 1.6 to 5.5 V
- Max. 32 MHz operation

RL: Renesas Low power RL products deliver reduced power consumption.



RL78 roadmap



RL78 application fields

The RL78 family is utilized in a wide variety of applications.



Industrial Automation

- Lineup of microcontrollers for industrial applications requiring high reliability
- Broad array of compact packages
- Operating temperature range of -40°C to +105°C, and support available for higher temperatures



Home Automation

- Power efficiency among the best in the industry for extended battery life
- Support for low-voltage operation (1.6 V and above)
- Standby function with newly added SNOOZE mode for low power consumption during intermittent operation



Automotive

- Lineup of highly reliable microcontrollers for automotive applications
- Support for high operating temperatures (up to +150°C)
- CAN communication, safety functions, etc., for automotive applications



Power Tools

- Proven track record supplying consistently high-quality microcontrollers over the long term
- Ideal microcontroller platform for system development with lineup covering wide range of memory capacities, pin counts, and package options



Consumer Electronics

- Calendar function (RTC) as standard feature
- Serial communication, timers, and on-chip high-speed oscillator as standard features



Medical/Healthcare

- Lineup of compact packages
- Proven track record supplying major medical equipment manufacturers
- Active member of Continua Health Alliance



White Goods

- Hardware support for European safety standard for household appliances (IEC60730)
- Standard temperature range of -40°C to +85°C, and support available for higher temperatures
- On-chip high-speed on-chip oscillator, power-on reset, etc., ideal for cost-sensitive electric household appliances



Metering

- Standby function that is ideal for low-power applications such as meters and measuring devices
- On-chip analog functions for smartmeters
- Proven track record supplying the meter field for over 30 years



Lighting, Power Supplies

- High-resolution PWM output for lighting and power supply control applications
- Easy-to-use Applilet software (free of charge) supporting program development for lighting applications
- Support for DALI, DMX512, PMBus, and SMBus communication



Motor Control

- On-chip advanced-functionality timers for motor control
- High-speed on-chip oscillator with accuracy of $\pm 1\%$, ideal for low-cost, high-precision solutions



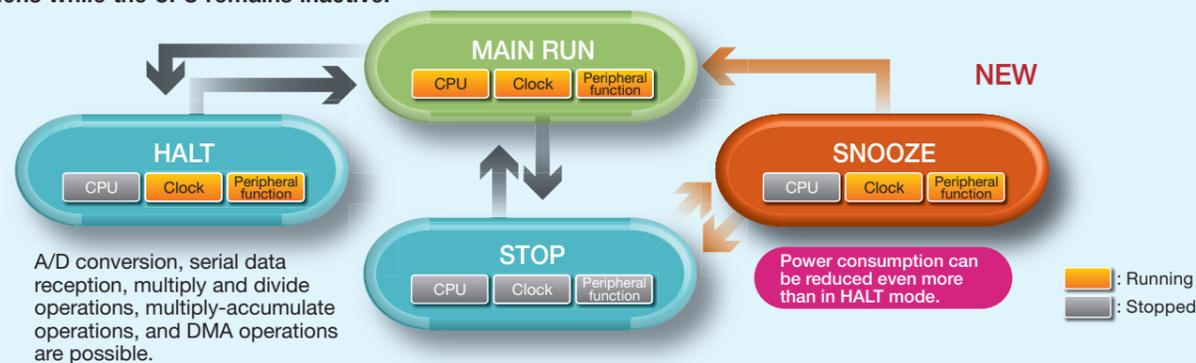
Detectors

- Improved analog functions necessary for detecting very small sensor signals
- Support for power-efficient detection when returning to high-speed operation from STOP mode

Low Power Consumption

New SNOOZE mode for more power savings

In SNOOZE mode the CPU is halted while A/D conversion and data reception are enabled. By transitioning from STOP mode (clock stopped) to SNOOZE mode, it is possible to start the on-chip oscillator and operate peripheral functions while the CPU remains inactive.



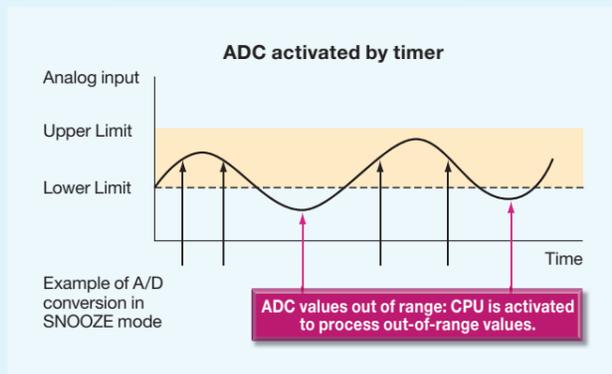
A/D conversion, serial data reception, multiply and divide operations, multiply-accumulate operations, and DMA operations are possible.

SNOOZE mode

- It is not necessary to activate the CPU for data reception.
- Using the exclusive SNOOZE mode, peripheral functions such as the ADC or UART can operate when in standby mode.
- Power consumption is one-tenth of normal operation. SNOOZE mode: 0.5 mA, RUN mode (ADC): 5 mA

HALT and STOP modes

- The standby function stops CPU operation, reducing overall microcontroller current consumption by 80%.
- The STOP mode disables the microcontroller's on-chip functions, reducing power consumption to the lowest level possible.



Low-power, high-performance products for lower system power consumption overall

In the most common operating modes, the RL78 family delivers an operating current of 65.5 $\mu\text{A}/\text{MHz}$ (while operating at 32 MHz) and a standby current of 0.57 μA (in SUB-HALT mode, with the RTC and LVD operating). Also, a newly developed SNOOZE mode has been added to the previously implemented HALT and STOP low-power operation modes. In SNOOZE mode the CPU is in the standby state while A/D conversion and serial communication are enabled, and the CPU is activated only when required. This mode is excellent for battery-powered systems as it greatly increases battery life.

Operating current comparison ($\mu\text{A}/\text{MHz}$)



Operating current comparison during clock operation (32.768 kHz, RTC + LVD)



STOP mode current comparison (WDT + LVD)

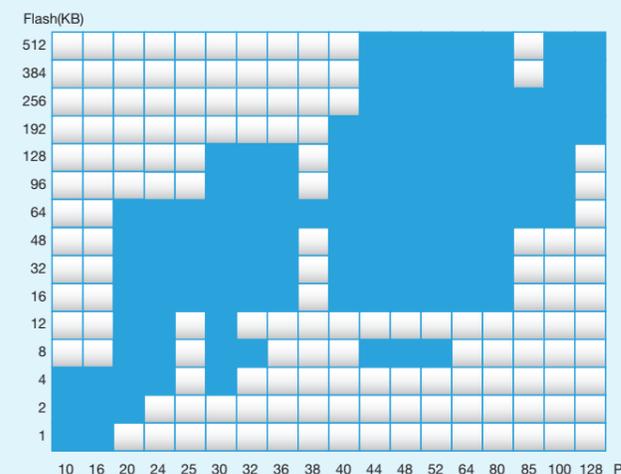


Source: Product data sheets and actual measurement

Broad Scalability

Extensive memory size and package options

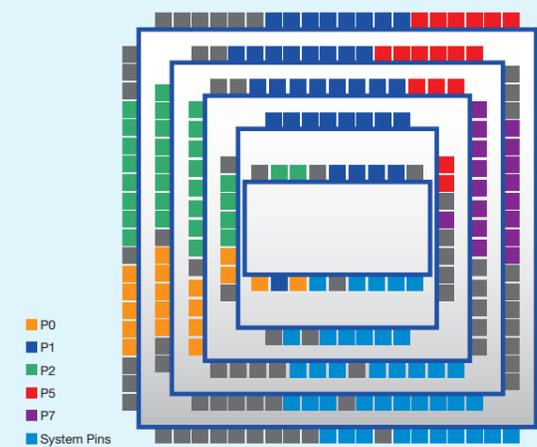
- The extensive lineup includes more than 300 product versions, with memory sizes from 1 KB to 512 KB and package pin counts from 10 pins to 128 pins. This extensive selection provides support for a broad range of application fields, including consumer, automotive, industrial, and communications.
- The wide range of options means that developers are covered if there are changes made to the specifications or more ROM capacity than originally estimated becomes necessary in the middle of the development process.
- Customers can rely on the same microcontroller series when developing product models ranging from the low-end to the high-end. Total development man-hours are reduced.



Excellent pin compatibility

- Scalability is maintained because the general location of peripheral function pins and input/output pins remains the same even when the pin count changes. Customers can continue to use the RL78 family of microcontrollers with confidence in the future.
- Customers can use standardized boards for product models ranging from the low-end to the high-end and boost the efficiency of the verification process.

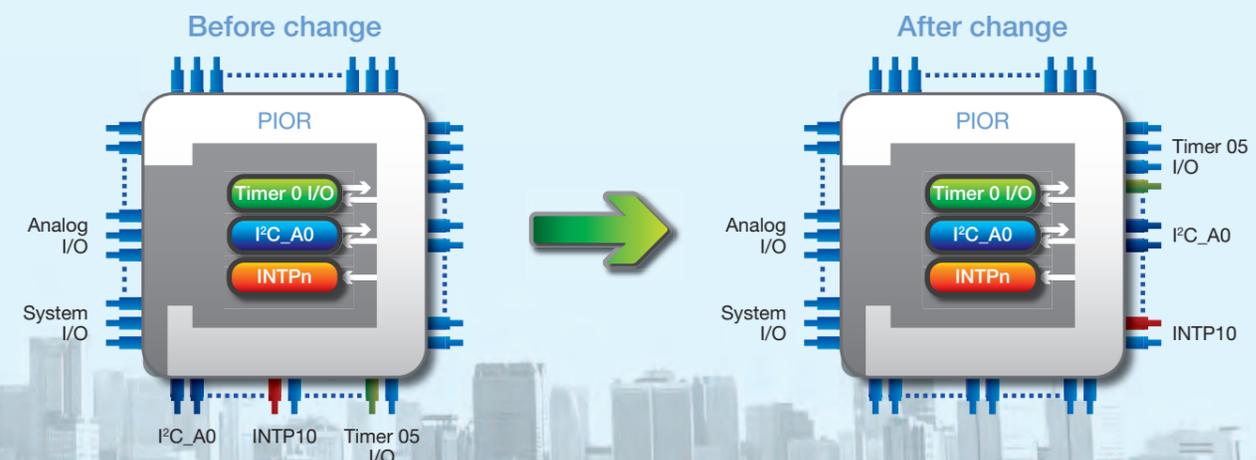
Example of I/O port assignments on RL78/G1x



Ability to reassign pin functions with PIOR register settings

Pin assignments can be changed for added board layout flexibility. The locations of peripheral function pins can be optimized.

Note: Not all pins can be reassigned.



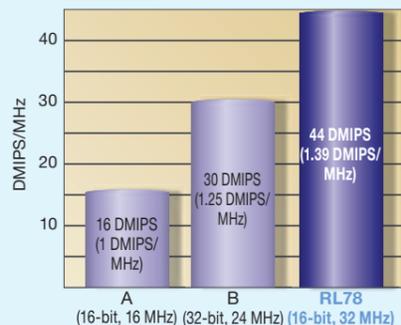
High Performance

RL78 microcontrollers with CPU core employing three-stage pipeline and Harvard architecture CPU processing performance is substantially improved compared with previous Renesas products.



- RL78 CPU core**
 - Three-stage pipeline CISC architecture
 - Max. operating frequency: 32 MHz
 - Support for multiply, divide, and multiply-accumulate instructions
- Memory**
 - Support for 1.8 V flash programming and boot swap
 - Program flash: 1 KB–512 KB
 - SRAM: 2.5 KB–48 KB
 - Data flash: 4 KB/8 KB
- System**
 - High-speed on-chip oscillator: 32 MHz ±1% (operation supported on timer RD only, 64/48 MHz)
- Power management**
 - Operating current: 66 μA/MHz^{*1}
 - HALT current: 0.57 μA (RTC + LVD)^{*1}
 - STOP current: 240 nA (SRAM data retained)^{*1}
 - SNOOZE current: 700 μA (UART), 1.2 mA (ADC)
- Safety**
 - Compliant with European safety standard for household appliances (IEC/UL 60730)
- Timers**
 - Advanced-functionality timer array unit (TAU)
 - Timer RD for three-phase motor control
 - Timer RG with two-phase encoder PWM function
 - Watchdog timer, real-time clock

- Analog**
 - On-chip ADC: 10-bit × 20 channels, conversion time: 2.1 μs
 - On-chip DAC: 8-bit × 2 channels, comparator × 2 channels
 - Communication**
 - CSI, UART, I²C, Simple I²C
 - Package**
 - 10-pin–128-pin
- Note: 1. Power supply current for RL78/G14 group, 64-pin, ROM = 64 KB product.



Reliable Safety Functions

Safety functions built into the microcontroller that enhance system reliability

Generally speaking a microcontroller is expected to operate normally even when exposed to noise. The RL78 family of microcontrollers have a number of safety functions that allow confirmation of normal operation. Customers can use these functions to easily perform self-diagnostics on microcontrollers. The self-diagnostic functions of the RL78 family contribute to enhanced system reliability.



Error detection

These functions check to make sure that the microcontroller's internal CPU and memory are operating properly. When an error is detected, measures such as an internal reset of the microcontroller can help to prevent the system from malfunctioning.

- Watchdog timer (WDT) as standard feature
- Flash memory CRC calculation
- RAM parity error detection
- CPU stack pointer monitoring function^{*1}
- Illegal memory access detection function^{*1}

Memory guard

This function disables writing to selected addresses in the RAM and SFRs.^{*2} It makes it possible to protect settings in RAM and the SFRs, contributing to improved reliability for the customer's system.

- RAM accidental write protection
- SFR accidental write protection

Fault detection

This function is for checking the operation of the microcontroller's clock generator circuit, A/D converter, and I/O pins. It simplifies the task of verifying microcontroller operation and makes it easier for customers to ensure safe and reliable operation of their systems.

- Frequency detection
- Simple A/D testing
- I/O power output level detection
- Clock monitoring function^{*1}

Notes:
 1. Available on the RL78/F13 and RL78/F14.
 2. SFR (special function register): Registers that store settings related to special functions such as clock control, the low-voltage detection circuit, port control, and interrupts.

Reduced System Cost

Helping customers reduce system size and cost

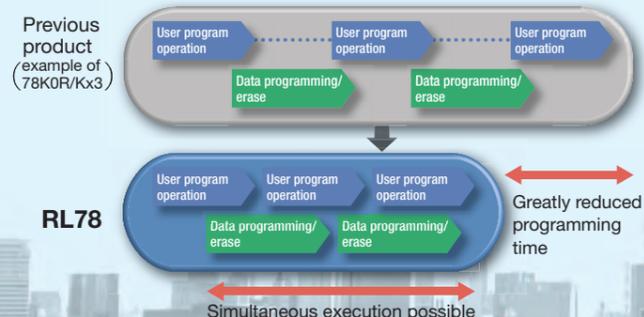
On-chip peripheral functions include a high precision (±1%) high-speed on-chip oscillator, background operation data flash supporting 1 million erase/program cycles, a temperature sensor, and multiple power supply interface ports. The RL78 family is fabricated using a newly developed 130 nm process that enables customers to achieve reduced system cost and smaller overall system size.

- Power supply detection circuit
- Temperature sensor
- Multiple power supply interface ports



Data flash with advanced functionality (background operation) for substantially reduced programming time

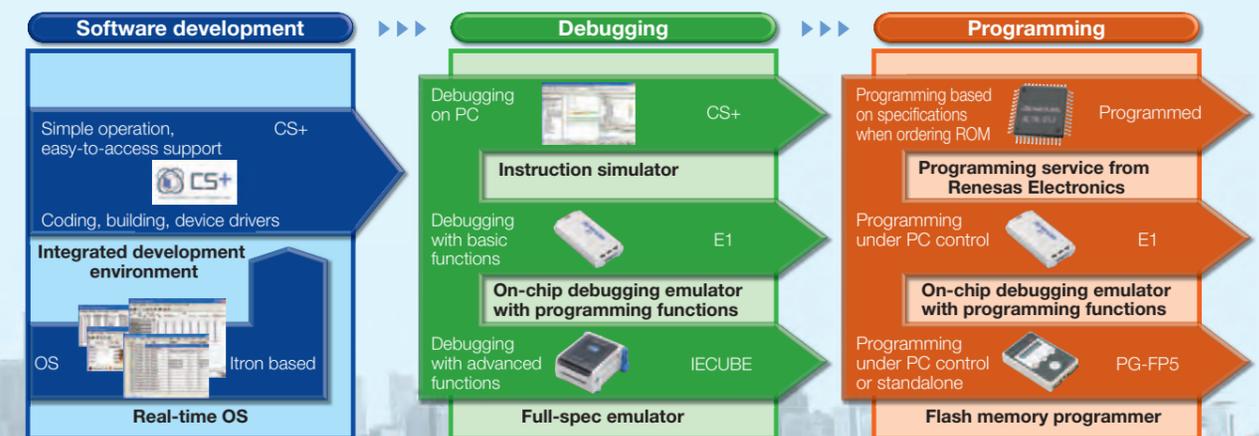
- Data access unit: 1 byte
- Data flash size: 4 KB (erasure unit: 1 KB)
- Number of overwrites: 1 million (typ.) (target)
- Dedicated library: Simplifies operations



Comprehensive Development Tools

A full lineup of tools that provides powerful support for efficient development

Renesas provides support for all stages of RL78 application development. The CS+ integrated development environment is easy to use and learn, helping shorten development cycles. A variety of debugging and programming environments are available to meet specific customer needs. Finally, Renesas partner vendors offer a rich array of tools and services covering a broad range of requirements.



RL78/G1D

RL78/G1D features

Power-efficient low-end microcontrollers with Bluetooth® Smart technology

- RF with ultra-low current consumption
 - 4.3 mA during RF transmission, 3.5 mA during RF reception (using on-chip DC-DC converter, 3 V operation)
 - Average current: 10 µA (1-second intervals, connection maintained)
- Reduced cost due to incorporation of functions of external components
 - On-chip balun cuts costs by reducing design burden.
 - Only twelve external components are needed in the lowest power configuration, reducing the mounting area and cost of parts.
- Adaptable RF technology
 - Automatic adjustment of transmission output (transmission operating current) to match the communication distance
 - Optimization that prioritizes low current consumption at short distances and prioritizes the communication distance at long distances

RL78/G1D lineup

ROM	pin	48	
256KB		20K	8K
192KB		16K	8K
128KB		12K	8K

RAM Size DATA Flash

Key RL78/G1D specifications

RL78 CPU core

- Three-stage pipeline CISC architecture
- Max. operating frequency: 32 MHz

Memory

- Support for 1.8 V flash programming and boot swap
- Program flash: 128 KB, 192 KB, 256 KB
- SRAM: 12 KB, 16 KB, 20 KB
- Data flash: 8 KB

System

- High-speed on-chip oscillator: 32 MHz
- Library support for multiply/divide and multiply-accumulate operation unit

RF

- Bluetooth 4.1 Single mode Master/Slave
- RF unit power management
- On-chip oscillator circuit for RF: 32.768 kHz

Power management

- Transmission current (MCU: STOP): 4.3 mA at 3 V

- Reception current (MCU: STOP): 3.5 mA at 3 V
- Sleep current (MCU: STOP, RF: DEEP_SLEEP): 1.4 µA
- Stop current (MCU: STOP, RF: POWER_DOWN): 0.3 µA

Safety

- Compliant with European safety standard for household appliances (IEC/UL 60730)
- Illegal memory access detection

Timers

- Advanced-functionality timer array unit (TAU)
- Watchdog timer, real-time clock

Analog

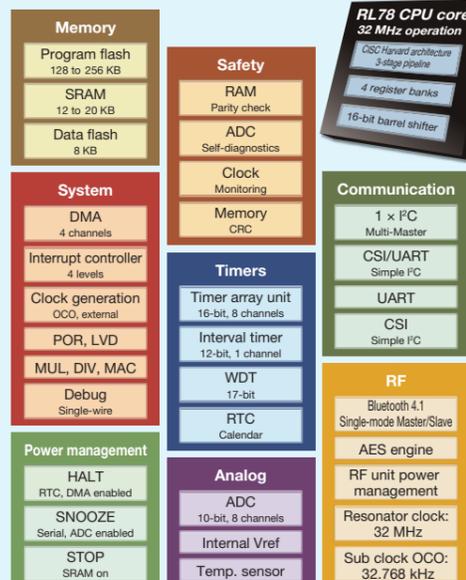
- On-chip ADC, 10-bit × 8 channels, conversion time: 2.1 µs
- Internal reference voltage (1.45 V)

Communication

- CSI × 2, UART × 2, I²C × 1, Simple I²C × 2

Package

- WQFN 6 × 6 mm 48-pin, 0.4 mm pitch



2.4 GHz RF transceiver

- Compliant with Bluetooth® v4.1 Low Energy (Single Mode, Master/Slave) specification
- Reception sensitivity: -90 dBm
- Max. transmission output power: 0 dBm
- Hardware encryption engine (AES/CCM) for Bluetooth® Smart
- Adaptable RF technology
- Support for wireless updates
- Ability to connect to up to 8 devices in Master mode
- Software protocol stack provided at no charge

RF transmit and receive currents among the world's smallest



RL78/G1F

RL78/G1F features

Peripheral functions and flexibility have been improved while retaining the same ROM sizes as the RL78/G14. In particular, analog functions have been strengthened, and the on-chip functions are ideal for motor control.

Main improvements to peripheral functions compared with RL78/G14

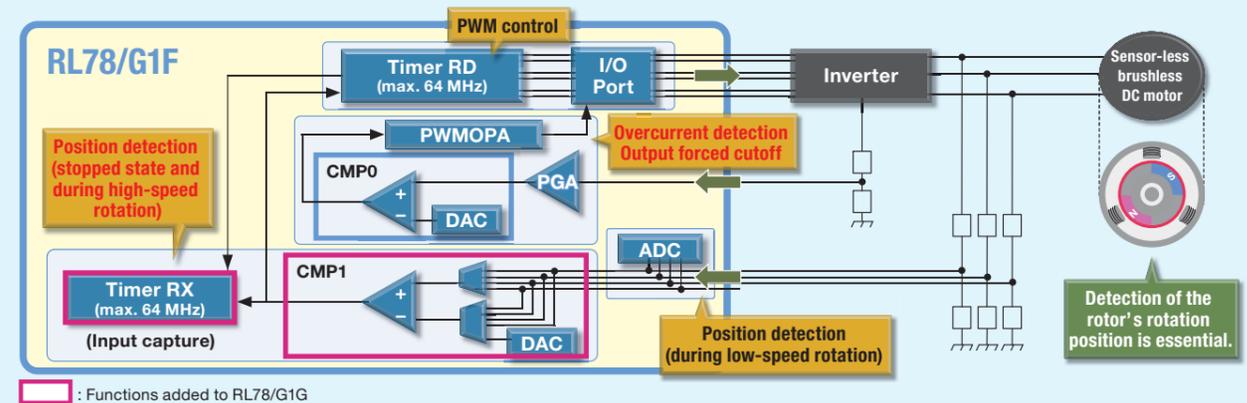
- Input capture timer (timer RX) for motor control
- Programmable-gain amplifier (PGA)
 - High slew rate of 3.0 V/µs (min.) (V_{DD} ≥ 4.0 V)
- 2-channel comparator (CMP0 and CMP1)
 - Fast response time of 70 ns (typ.) (1/8 that of RL78/G14)
- D/A converter (1 or 2 channels)
- IrDA communication function
- Debug functions including real-time trace

Motor control functions of the RL78/G1F

- 120-degree conducting control for sensor-less brushless DC motors
 - On-chip 4-input-selectable high-speed comparator (CMP1) and timer RX for rotor position detection without the use of sensors
 - Enables detection of the rotor position when stopped and during high-speed rotation.

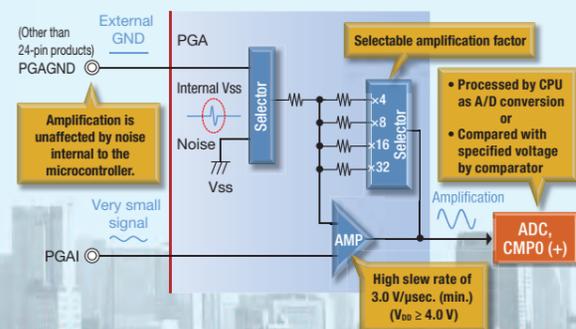


- Overcurrent detection and forced cutoff of PWM output
 - On-chip high-speed PGA for overcurrent detection + high-speed comparator (CMP0) and control output signal forced cutoff function (PWMOPA)
 - Supports quick detection of overcurrent conditions and immediate cutoff of PWM output.



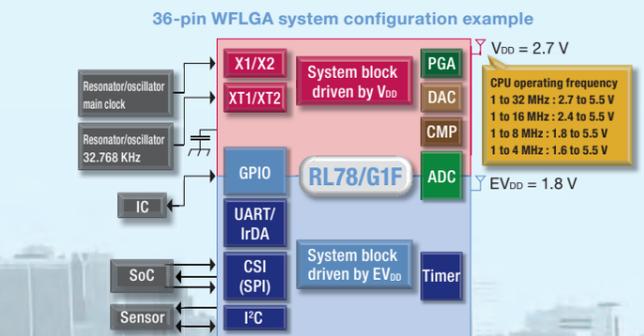
Programmable-gain amplifier (PGA) for boosting sensor signals

The amplification factor for boosting very small signals is selectable among ×4, ×8, ×16, and ×32. The slew rate ranges from a minimum of 3.0 V/µsec. (3.5 V/µsec. (min.) at other than ×32 V (V_{DD} ≥ 4.0 V)). The dedicated GND input (PGAGND pin) ensures that amplification is not affected by internal noise.



36-pin LGA package (4 × 4 mm) suitable for mobile devices

- Some functions support separate power supplies on 36-pin and 64-pin products. By providing separate power supplies (V_{DD} and EV_{DD}) it is possible to perform communication with an SoC, etc., at low voltage with running the CPU at high speed.
- The 36-pin products allow use of a 32.768 kHz subsystem clock oscillator (XT1) despite low pin count.



RL78/G13, G12

Block diagram

RL78 CPU core

- Three-stage pipeline CISC architecture
- Max. operating frequency: 32 MHz

Memory

- Support for 1.8 V flash programming and boot swap
- Program flash: 2 KB–512 KB
- SRAM: 256 B–32 KB
- Data flash: 2 KB/4 KB/8 KB/None

System

- High-speed on-chip oscillator: 32 MHz ±1%
- Library support for multiply/divide and multiply-accumulate operation unit

Power management

- Operating current: 66 µA/MHz^{*1}
- HALT current: 0.57 µA (RTC + LVD)^{*1}
- STOP current: 230 nA (SRAM data retained)^{*1}
- SNOOZE current: 700 µA (UART), 1.2 mA (ADC)

Safety

- Compliant with European safety standard for household appliances (IEC/UL 60730)
- Illegal memory access detection

Timers

- Advanced-functionality timer array unit (TAU)
- Watchdog timer, real-time clock

Analog

- 1.6 V (V_{DD}) operation
- On-chip ADC, 10-bit × 26 channels, conversion time: 2.1 µs
- Internal reference voltage (1.45 V)

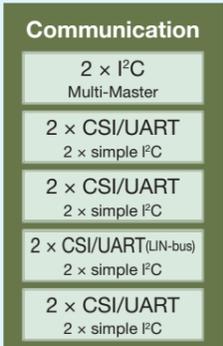
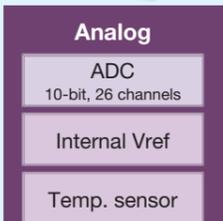
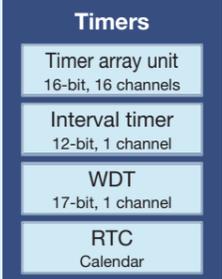
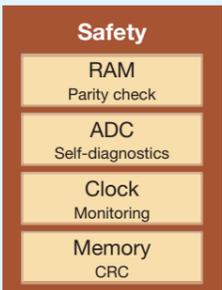
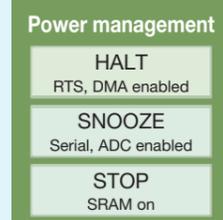
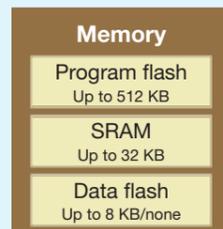
Communication

- CSI, UART, I²C, Simple I²C

Package

- 20-pin–128-pin

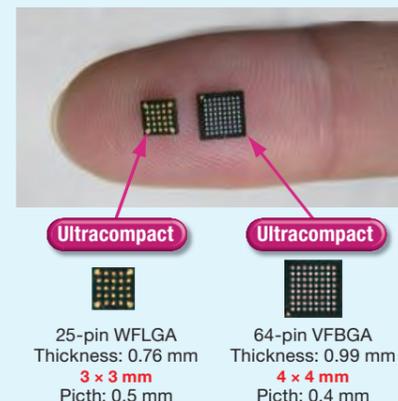
In mass production



(Reference) RL78: Block diagram of G13 group 128-pin product.

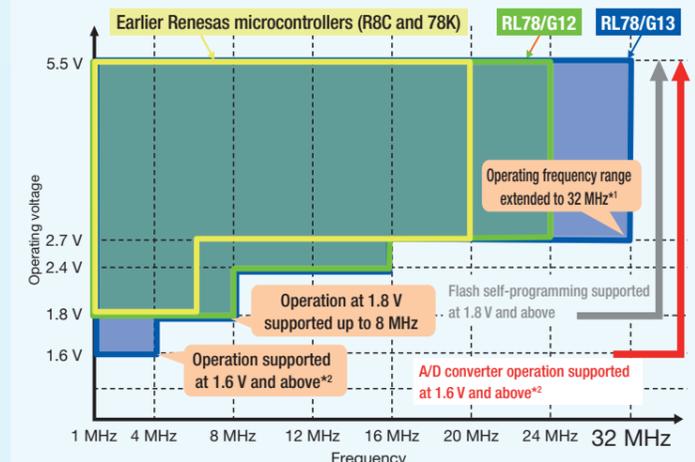
Extensive lineup: Compact packages

Available compact package options are ideal for miniaturized products.



High performance: Low-voltage operation

Expanded operating range compared with previous products and support for A/D conversion at voltages from 1.6 V



Notes: 1. 24 MHz (max.) on RL78/G12 2. Operation supported at 1.8 V and above on RL78/G12

High performance: Multiply and divide/multiply-accumulate operation unit

On-chip multiply-accumulate operation unit for reduced operation load on CPU

- Completion interrupt generated for divide operations only.
- Multiply-accumulate operation overflow/underflow interrupt generated when the cumulative result of multiply-accumulate operations causes an overflow or underflow.
- Combined-use divide completion interrupt and multiply-accumulate operation overflow/underflow interrupt.
- Whether an overflow or underflow occurred can be determined by referencing a status flag.
- Since the C lacks multiply-accumulate operation instructions, library functions are provided.

Multiply and divide circuit with support for multiply-accumulate operations

Operation	Execution time
Signed multiply	16 bits × 16 bits = 32 bits 1 clock cycle
Unsigned multiply	
Unsigned divide	32 bits / 32 bits = 32 bits ... 32 bits 16 clock cycles
Signed multiply-accumulate	16 bits × 16 bits + 32 bits = 32 bits 2 clock cycles
Unsigned multiply-accumulate	

Note: 1. Power supply current RL78/G13 group product with 64 pins and 64 KB of ROM.

Extensive lineup: RL78/G12, G13

Choose with confidence. Extensive lineup of 284 products.

pin	20	24	25	30	32	36	40	44	48	52	64	80	100	128
ROM														
512 KB								32 K						
384 KB								24 K						
256 KB								20 K						
192 KB								16 K						
128 KB				12 K										
96 KB				8 K	8 K	8 K	8 K	8 K	8 K	8 K	8 K	8 K	8 K	8 K
64 KB	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K	4 K
48 KB	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K	3 K
32 KB	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K
16 KB	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K	2 K
12 KB	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K	1 K
8 KB	768	768	768	768	768	768	768	768	768	768	768	768	768	768
4 KB	512	512	512	512	512	512	512	512	512	512	512	512	512	512
2 KB	256	256	256	256	256	256	256	256	256	256	256	256	256	256

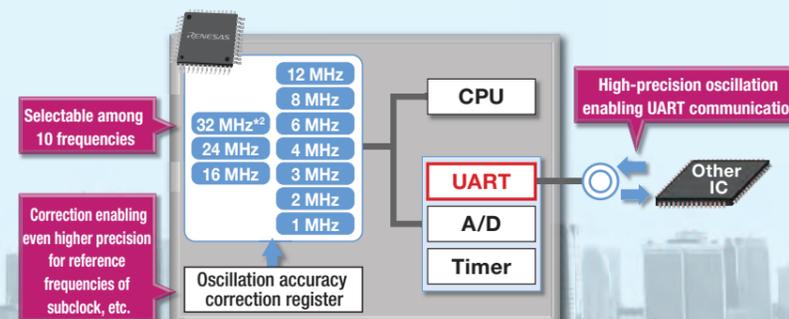
RAM No data flash RAM Equipped with data flash
 1. For 20-pin packages, the pin spacing of the RL78/G12 is 225 mil and that of the RL78/G13 is 300 mil.
 2. For the 64-pin BGA (4 × 4) package products, the ROM capacity ranges from 32 KB to 256 KB.

Reduced system cost: On-chip high-precision, high-speed oscillator

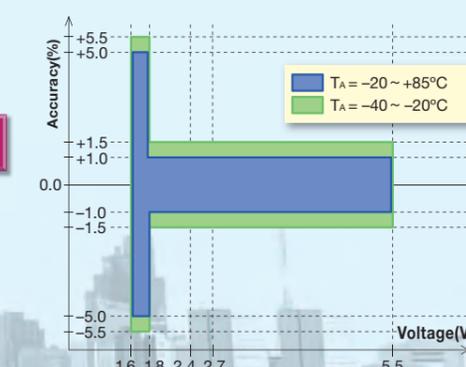
On-chip high-precision, high-speed oscillator to support UART communication

- On-chip high-speed clock generator circuit with precision of ±1%^{*1}
- Selectable frequencies: 32 MHz,^{*2} 24 MHz, 16 MHz, 12 MHz, 8 MHz, 6 MHz, 4 MHz, 3 MHz, 2 MHz, and 1 MHz
- Oscillation accuracy correction register for even higher precision

Notes: 1. ±5% on R5F103x 2. RL78/G13 only



HOCO oscillation frequency accuracy



RL78/G14 Ideal for consumer and industrial products such as motor control applications, household appliances, and mobile devices

CPU core supporting multiply and divide/multiply-accumulate instructions

Added multiply, divide, and multiply-accumulate instructions that enable high-speed operation by direct execution without needing to utilize library functions

Overview of multiply, divide, and multiply-accumulate instructions

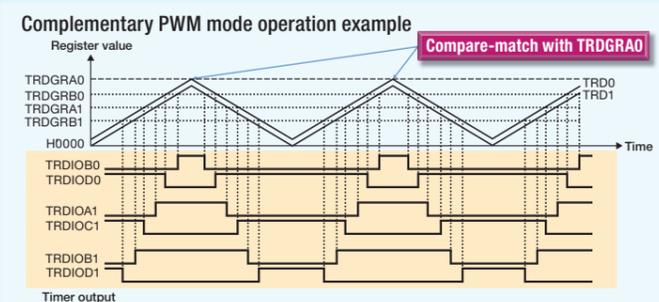
Operation		Execution time
Multiply	8 bits × 8 bits = 16 bits	1 clock cycle
	16 bits × 16 bits = 32 bits	2 clock cycles
Divide	16 bits / 16 bits = 16 bits ... 16 bits	9 clock cycles
	32 bits / 32 bits = 32 bits ... 32 bits	17 clock cycles
Multiply-accumulate	16 bits × 16 bits + 32 bits = 32 bits	3 clock cycles

- Points of difference from multiply and divide/multiply-accumulate operation unit on RL78/G12 and RL78/G13
- No interrupts are generated.
- A carry flag is set when the cumulative result of multiply-accumulate operations causes an overflow or underflow.

Featured function: Timer RD (complementary PWM mode)

High-resolution three-phase complementary PWM output ideal for driving DC brushless motors

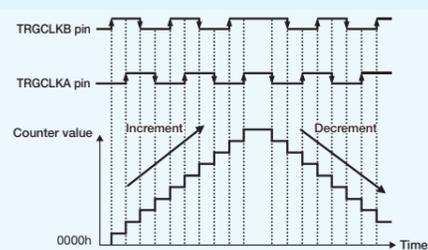
- Ability to output three sets of PWM waveforms with no overlap between the forward and reverse phases
- Use of on-chip high-speed oscillator (64 MHz or 48 MHz) as count source supported
 - ➔ Ability to operate using multiples of the CPU clock frequency for reduced power consumption



Featured function: Timer RG (phase counting mode)

This function counts (increments or decrements a counter) at both edges when two pulse signals with different phases are input to pins TRGCLKA and TRGCLKB. It is ideal for counting in a two-phase encoder.

TRGCLKB pin	↑	“H”	↓	“L”	“H”	↓	“L”	↑
TRGCLKA pin	“L”	↑	“H”	↓	“L”	↑	“H”	↓
Bits CNTEN7 to CNTEN0 in TRGCNTC register	CNTEN 7	CNTEN 6	CNTEN 5	CNTEN 4	CNTEN 3	CNTEN 2	CNTEN 1	CNTEN 0
Setting value of TRGCNTC register	1	1	1	1	1	1	1	1
Increment/decrement counter	+1	+1	+1	+1	-1	-1	-1	-1



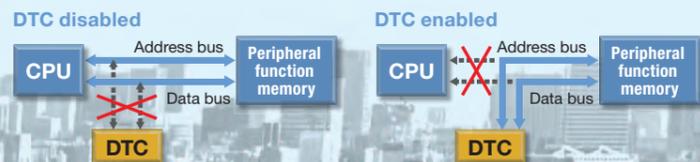
In combination with the TRGCNTC register value, this function performs phase counting by incrementing or decrementing a counter when a user-defined input state occurs.

Featured function: Data transfer controller (DTC)

The DTC provides functionality to transfer data from one memory location to another, bypassing the CPU.

- Increased number of transfer channels and activation sources for improved flexibility
- Support for data transfers among SFRs, on-chip RAM, and flash memory*

Note: 1. The DTC can only read data from flash memory.

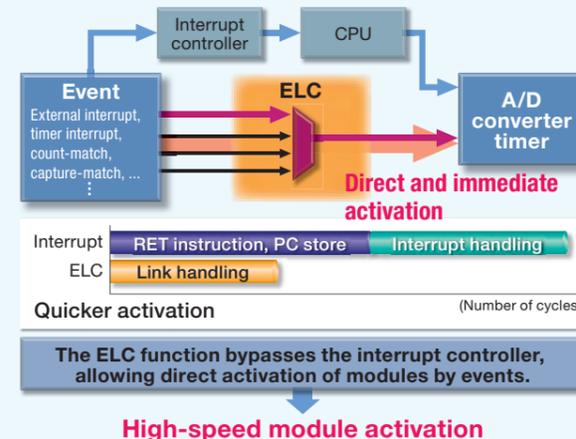


Comparison of DMA and DTC

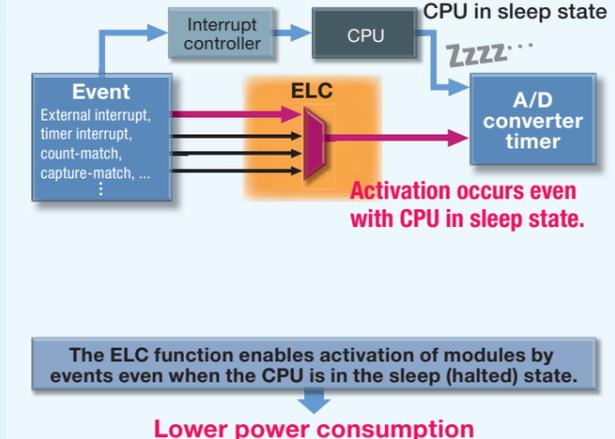
	DMA (G13 100-pin)	DTC (G14 100-pin)
Number of channels	4 channels	24 channels
Transfer address space	4 KB	64 KB
Max. transfer count/block size	1024/1024 bytes	256/512 bytes
Transfer target	SFR ↔ RAM	SFR ↔ RAM Flash memory → SFR, RAM
Number of activation sources	21	39
Other	—	Repeat and chain transfers supported

Featured function: Event link controller (ELC)

Direct links between hardware modules



No CPU operation needed

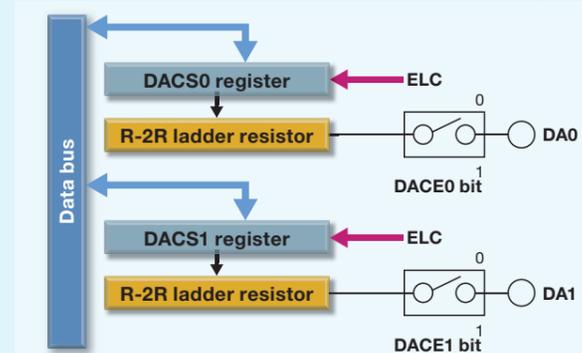


Featured function: D/A converter (products with ROM capacity of 96 KB or more only)

On-chip 8-bit D/A converter (2 channels) that simplifies control of analog output for applications such as audio playback or power supply control

D/A converter operation

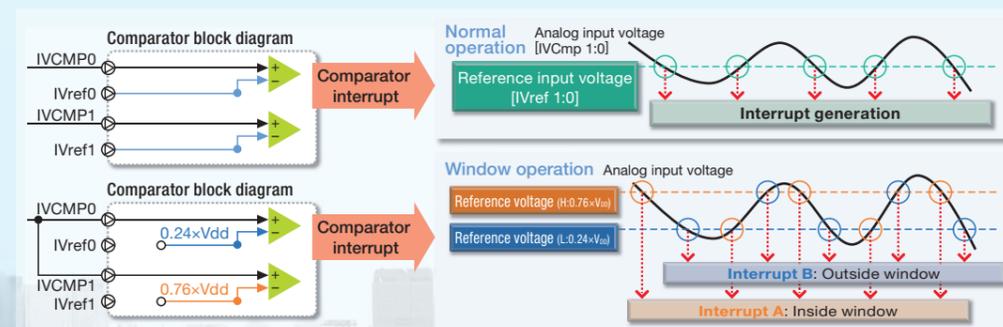
1. Normal mode
D/A conversion is started by a write operation to the DACSn (n = 0 or 1) register.
2. Real-time output mode
D/A conversion is started using the real-time output signal input by the ELC as the activation trigger.



Featured function: Comparator (products with ROM capacity of 96 KB or more only)

Comparator with two channels and support for switching between high-speed and low-speed modes (one channel on 30-pin SOP products)

- High-speed mode: Support for high-speed operation for motor control feedback, etc.
 - Low-speed mode: Support for low power consumption during battery monitoring, etc.
- Ability to use as a window function by combining channels



RL78/G10

RL78/G10 features

Ultra-low power consumption

- CPU operation: 46 μ A /MHz
- STOP mode: 560 nA

Lineup of low-pin-count products

- Lineup including 10-pin and 16-pin products
- General-purpose board pitch: 7.62 mm (300 mil)

High-precision high-speed on-chip oscillator

- Max. 20 MHz, oscillation accuracy \pm 2%

Other on-chip functions

- ADC
- Timer
- Selectable power-on reset
- Comparator
- Serial communication

	pin	
ROM	10	16
4 K	512	512
2 K	256	256
1 K	128	128

RAM Size

Key RL78/G10 specifications

RL78 CPU core

- Three-stage pipeline CISC architecture
- Max. operating frequency: 20 MHz

Memory

- Program flash: 1 KB–4 KB
- SRAM: 128 B–512 B

System

- High-speed on-chip oscillator: 20 MHz \pm 2%
- Selectable POR

Power management

- Operating current: 46 μ A/MHz
- HALT current: 290 μ A
- STOP current: 560 nA (SRAM data retained)

Safety

- Internal reset at illegal instruction execution

Timers

- Advanced-functionality timer array unit (TAU)
- Watchdog timer

Analog

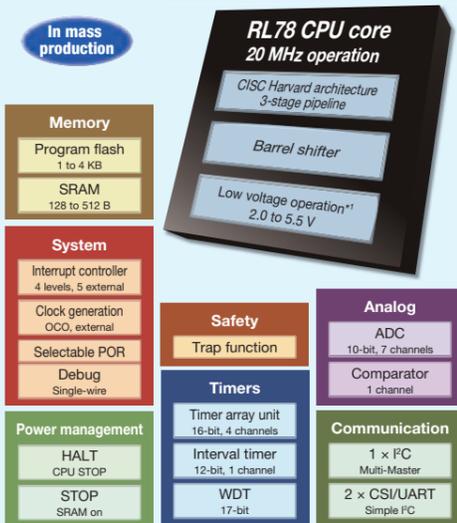
- On-chip ADC, 10-bit \times 7 channels, conversion time: 3.4 μ s
- On-chip comparator

Communication

- CSI, UART, I²C, Simple I²C

Package

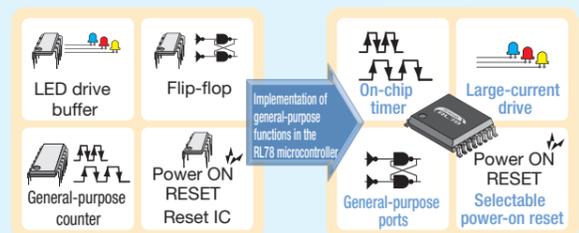
- 10-pin/16-pin



Note: 1. The SPOR detection voltage (VSPOR) must be between 2.25 V and 5.5 V.
(Reference) RL78: Block diagram of G10 group 16-pin product.

Lower system cost: Replacement for general-purpose logic ICs

Using general-purpose logic components complicates the design, manufacturing, and testing processes and can lead to malfunctions. Reducing the number of components is a key issue when developing new products.

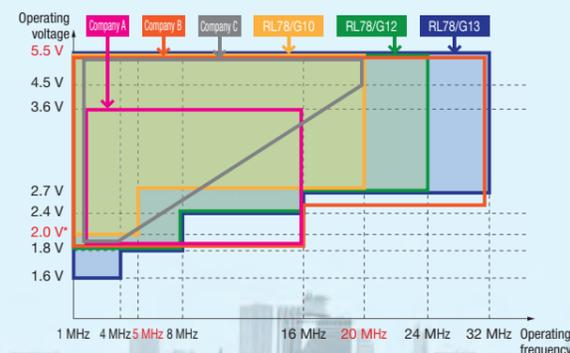


RL78 microcontrollers help simplify the design, manufacturing, and testing processes; reduce malfunctions; and provide numerous other advantages.

- More compact circuit board
- Reduced system cost

RL78/G10 vs. competing products: Operating voltage/frequency range

Covers the voltage range required by compact electric household appliance applications.



Note: The RL78/G10 includes a SPOR circuit detection voltage (VSPOR), so it should be used within a voltage range of 2.25 V to 5.5 V.

RL78/G1A

RL78/G1A features

High-precision A/D converter

- 12-bit A/D converter
 - Total error: \pm 1.7 LSB (typ.)
 - Conversion time: 3.375 μ s
- Multi-channel analog input
 - 28 analog input channels (max.) to support input from multiple sensors

Low power consumption/standby mode

- Low power consumption
 - Carries on the low power consumption of the RL78 family
 - Operating current: 66 μ A/MHz
 - STOP current: 0.23 μ A
- Standby mode
 - Three modes: HALT, SNOOZE, and STOP
 - Reduced average current during intermittent operation

Compact package/extensive peripheral functions

- Compact package
 - 3 \times 3 mm²: 25-pin LGA package
 - 4 \times 4 mm²: 64-pin BGA package
- Extensive peripheral functions
 - Timer (16-bit \times 8 channels)
 - Data flash (nonvolatile memory for data)
 - Serial communication (CSI, UART, I²C, etc.)
 - Fault detection (safety functions)

Key RL78/G1A specifications

RL78 CPU core

- Three-stage pipeline CISC architecture
- Max. operating frequency: 32 MHz

Memory

- Support for 1.8 V flash programming and boot swap
- Program flash: 16 KB–64 KB
- SRAM: 2 KB–4 KB
- Data flash: 4 KB

System

- High-speed on-chip oscillator: 32 MHz \pm 1%
- Library support for multiply/divide and multiply-accumulate operation unit

Power management

- Operating current: 66 μ A/MHz
- HALT current: 0.57 μ A (SUB + RTC + LVD)
- STOP current: 0.23 μ A (SRAM data retained)
- SNOOZE current: 700 μ A (UART), 1020 μ A (ADC)

Safety

- Compliant with European safety standard for household appliances (IEC/UL 60730)
- Illegal memory access detection

Timers

- Advanced-functionality timer array unit (TAU)
- Watchdog timer, real-time clock

Analog

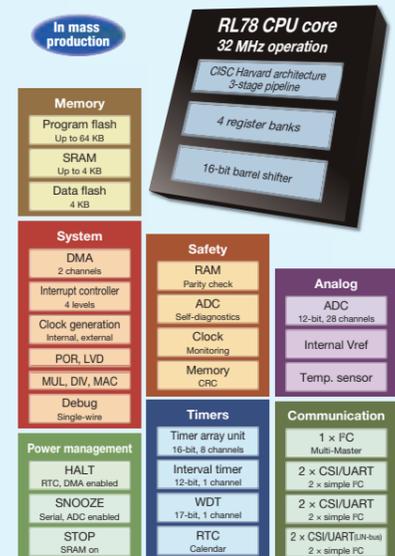
- 1.6 V (V_{DD}) operation
- On-chip ADC, 12-bit \times 28 channels, conversion time: 3.375 μ s
- Internal reference voltage (1.45 V)

Communication

- CSI, UART(LIN) I²C, Simple I²C

Package

- 25-pin LGA (3 \times 3 mm²)
- 32-pin QFN (5 \times 5 mm²)
- 48-pin QFN (7 \times 7 mm²)
- 64-pin QFN (7 \times 7 mm²)
- 64-pin QFP (10 \times 10 mm²)
- 64-pin BGA (4 \times 4 mm²)



(Reference) RL78: Block diagram of G1A group 64-pin product.

Overview of RL78/G1A

Lineup of RL78 family products with enhanced analog functions

Features

- New family RL78 CPU core
 - High-performance 16-bit CPU
 - High-speed 32 MHz operation
 - Low power consumption
 - 66 μ A/MHz when running
 - 0.57 μ A/MHz during standby (SUB + RTC + LVD)
- High performance peripheral functions
 - High-resolution 12-bit A/D converter
 - Improved sensing precision, max. 28 channels
 - On-chip high-precision high-speed clock generator circuit
 - Precision: \pm 1%
 - Data flash: 4 KB
 - Support for background operation
 - Multiply and divide/multiply-accumulate operation unit
 - Reduced CPU load

Memory lineup

Compact packages and extensive memory capacity options

	pin		25		32		48		64	
ROM	4 K	4 KB								
64 K	4 K	4 KB								
48 K	3 K	4 KB								
32 K	2 K	4 KB								
16 K	2 K	4 KB								

RAM Data flash

Support for multiple sensors of various types

Multi-channel analog input support among the best in the industry with 12-bit A/D converter

Infrared sensors, ultrasonic sensors, acceleration sensors, gyro sensors, pressure sensors, thermistors, etc.



RL78/G1G

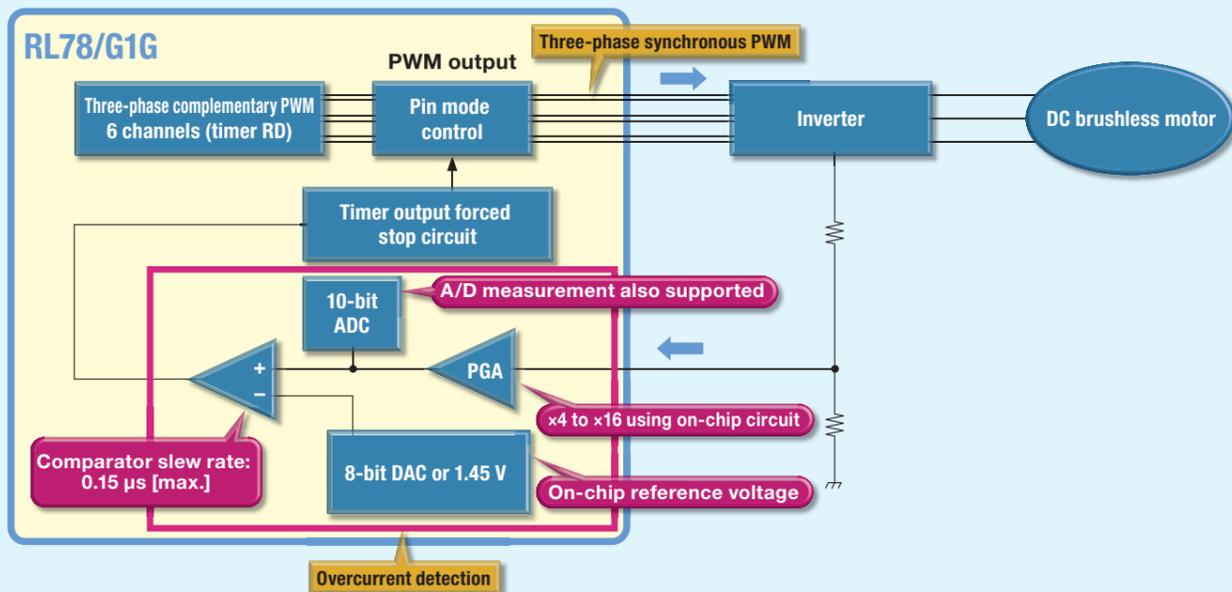
Ideal for DC brushless motor applications Consumer applications only

Support for power-efficient maintenance-free motor operation

RL78/G1G		
Motor control timer	Three-phase complementary PWM	6 channels (48 MHz operation supported)
	Forced shutoff	Supported (Hi-Z, H/L output settings supported)
Overcurrent detection	Programmable-gain amplifier	1 channel (on-chip amplifying resistor)
	Comparator	2 channels (response time: 0.15 μs [max.])
	Comparator reference voltage	8-bit DAC or internal reference voltage of 1.45 V



Application example: Three-phase synchronous PWM support and overcurrent detection circuit for reduced system cost



Lineup of products with low pin count and small ROM capacity In mass production

LQFP with 0.8 mm pin pitch for easy mounting using flow soldering

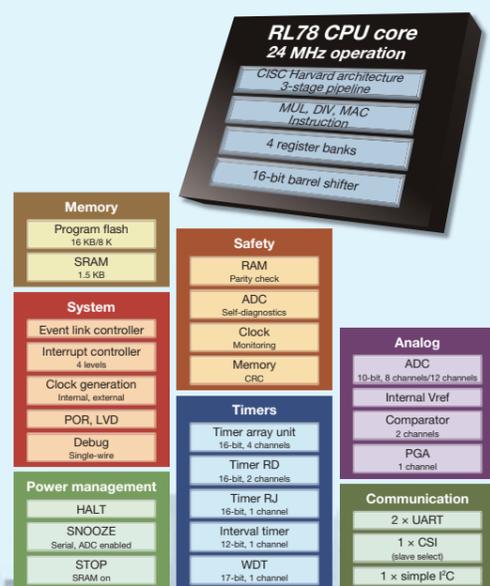
pin	30	32	44
ROM			
16 KB	1.5 KB	1.5 KB	1.5 KB
8 KB	1.5 KB	1.5 KB	1.5 KB

RAM Size Note: The RL/G1G is not equipped with data flash.

Other functions

- Operating current: 75 μA/MHz
- STOP current: 240 nA (SRAM contents retained)
- On-chip oscillator: 24 MHz ±2% (Ta = -40 to +85°C)
(48 MHz supply by timer RD for motor control supported)
- Compliant with European safety standard for household appliances (IEC/UL 60730)

RL78/G1G Block diagram



RL78/I1D

RL78/I1D features

- Low power consumption for extended battery life
 - High-speed recovery from STOP mode in just 3.4 μs, and supply of operating current in 124 μA when operating at 1 MHz.
 - Ability to operate peripheral circuits (sensor activation, signal amplification, obtaining A/D conversion results) without CPU intervention. Ability to determine whether it is necessary to activate the CPU based on A/D conversion results.
- On-chip analog functions needed for security and emergency applications
 - On-chip general-purpose op-amp, 12-bit A/D converter, and comparator

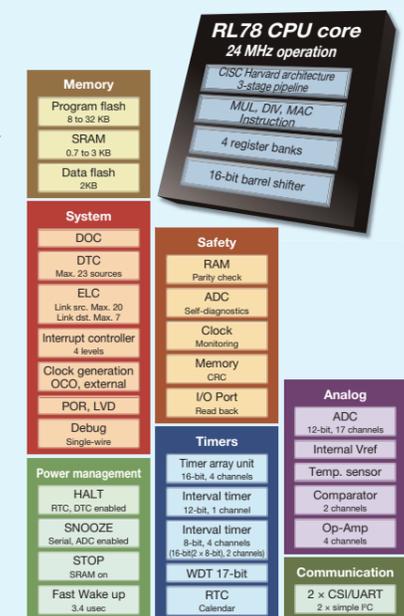
RL78/I1D lineup

pin	20	24	30	32	48
ROM					
32 KB			3 K	3 K	3 K
16 KB	2 K	2 K	2 K	2 K	2 K
8 KB	0.7 K	0.7 K	0.7 K		

RAM Size

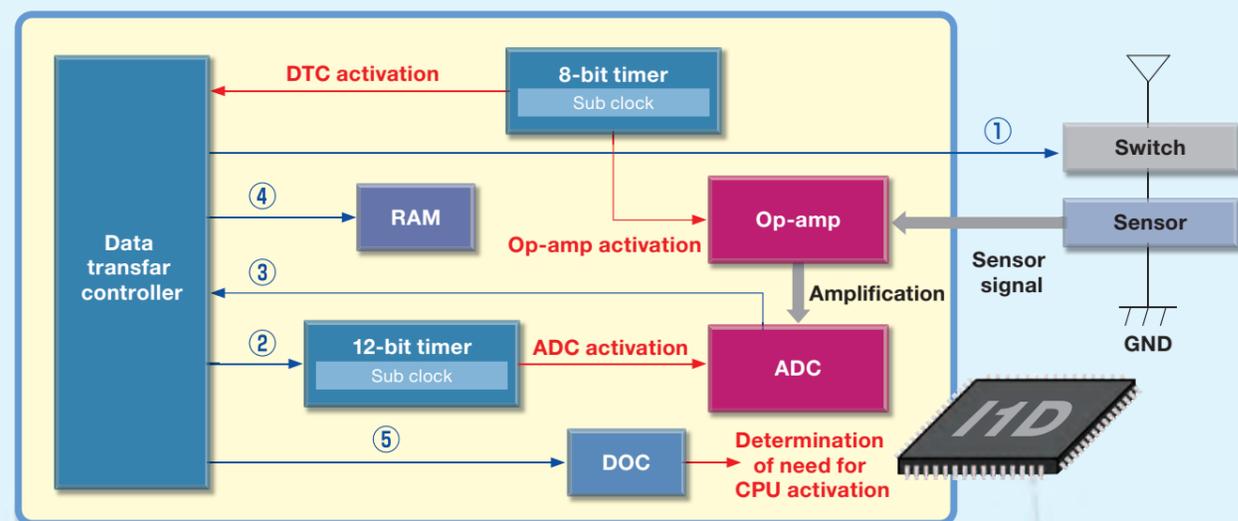
Key RL78/I1D specifications

- RL78 CPU core**
 - Three-stage pipeline CISC architecture
 - Max. operating frequency: 24 MHz
 - Support for multiply, divide, and multiply-accumulate instructions
- Memory**
 - Support for 1.8 V flash programming and boot swap
 - Program flash: 8 KB–32 KB
 - SRAM: 0.7KB–3 KB
 - Data flash: 2 KB
- System**
 - High-speed on-chip oscillator: 24 MHz ±1%
 - Middle-speed on-chip oscillator: 4 MHz ±12% (support for high-speed wakeup in 3.4 μs)
- Power management**
 - Operating current: 58.3 μA/MHz
 - HALT current: 0.64 μA (RTC + LVD)
 - STOP current: 220 nA (SRAM data retained)
 - SNOOZE current: 700 μA (UART), 500 μA (ADC)
- Safety**
 - Compliant with European safety standard for household appliances (IEC/UL 60730)
- Timers**
 - Advanced-functionality timer array unit (TAU)
 - 8-bit interval timer (can be used as 16-bit interval timer)
 - Watchdog timer, real-time clock
- Analog**
 - 1.6 V (V_{DD}) operation
 - On-chip ADC, 12-bit × 17 channels, conversion time: 3.375 μs
 - Internal reference voltage (1.8 V)
 - Op-amp × 4 channels (high-speed and low-power modes)
 - Comparator × 2 channels (window mode support)
- Communication**
 - CSI, UART, Simple I²C
- Package**
 - 20-pin/24-pin/30-pin/32-pin/48-pin



(Reference) RL78: Block diagram of 11D group 48-pin product.

SNOOZE mode operation example



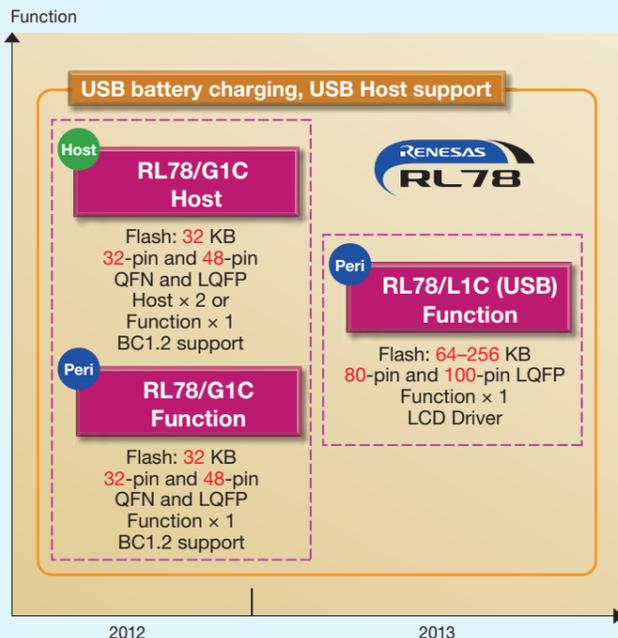
Operation procedure

- sensor activation,
- ADC activation,
- obtaining A/D conversion results,
- storing A/D conversion results in RAM,
- transmission of A/D conversion results to DOC (determination of need for CPU activation)

Common to RL78/G1C and RL78/L1C

Low-end USB microcontroller roadmap

RL78 series next-generation low-end USB microcontrollers



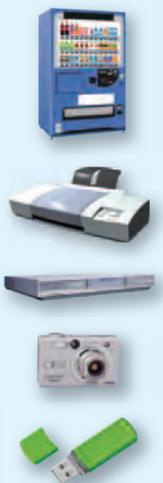
RL78/G1C

RL78/G1C(USB)

World's first low-end microcontroller with support for USB Battery Charging Specification, Revision 1.2 (BC1.2)

- Support for fast charging and power supply control in addition to USB communication
Ability to charge up to 1.5 A using BC1.2 (0.5 A for USB 2.0)
- Low power consumption during USB operation
Approx. 65% reduction compared with 78K0R, approx. 20% reduction compared with R8C
- Host × 2 channels, Function × 1 channel
Suitable for a broad range of applications

Necessary Functions	Target Applications	
BC function	Mobile batteries	
	USB chargers	
Host functionality	Vending machines	
	Printer	
	DVD player	
	Smartphone peripheral accessories	
Function functionality	Health devices	
	Measuring devices	
	USB memory	
	Mouse / keyboard	
	Handheld terminals	
	Barcode readers	
	UPS	



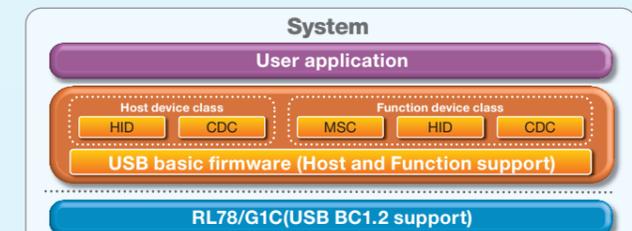
Overview of USB controller specifications

USB Host and USB BC1.2 support

		RL78/G1C	Reference
USB2.0	Function	1 channel	
	Host	2 channels	Host version only
Transfer speed	LS(1.5 Mbps)	○	Host/Function
	FS(12 Mbps)	○	Host/Function
	HS(480 Mbps)	—	Not supported
Transfer mode	Control	○	FIFO 64 bytes
	Bulk	○	FIFO 64 × 2 bytes, double buffering
	Interrupt	○	FIFO 64 bytes
	Isochronous	—	
On-chip resistors	○	D+ and D- lines, pull-up and pull-down resistors	
Supported battery charging classes	○	Support for Host and Function	
On-chip PLL	○	External resonator → 48 MHz generation	

USB sample firmware

USB sample firmware is available free of charge. This simplifies system development and reduces the amount of time required.



Free sample software (firmware) Note: BC1.2 detection control functionality is implemented for all device classes.

All application notes are available for download on the Renesas website. USB sample firmware

USB function	Title	Rev	Memory size[kByte]	
			ROM ¹⁾	RAM ²⁾
Host	Basic firmware	2.13	17.9 kB	2.7 kB
	HID (Human Interface Device Class)		17.2 kB	2.0 kB
	CDC (Communication Device Class)		19.5 kB	1.9 kB
Peripheral	Basic firmware	1.00	11.3 kB	1.5 kB
	HID (Human Interface Device Class)		12.0 kB	0.9 kB
	CDC (Communication Device Class)		11.2 kB	1.1 kB
	MS (Mass Storage Device Class) ²⁾		18.2 kB	2.5 kB
AOA	USB Host Android Open Accessory	1.00	15.9 kB	1.6 kB
Downloader	USB Peripheral Firmware Update	1.00	12.8 kB	3.1 kB

Notes: 1. ROM and RAM sizes for CS+ (V3.00.00) and CA78K0R (V1.71) environments
2. Includes EEPROM devices used as media.

Product lineup

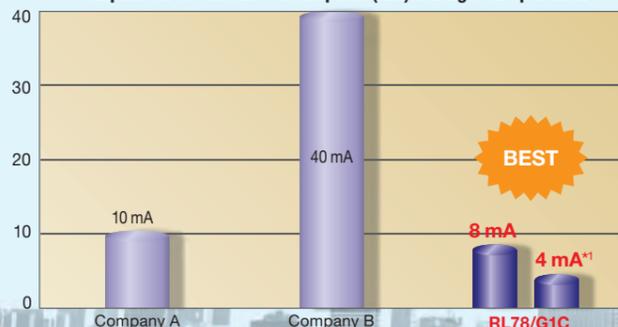
pin	32	48	80	100
ROM			16 K	16 K
256 KB			16 K	16 K
192 KB			12 K	12 K
128 KB			10 K	10 K
96 KB			8 K	8 K
64 KB				
32 KB	5.5 K	5.5 K		

RL78/G1C: 1 x only Function (green), 2 x Host or 1 x Function (orange)

RL78/L1C: 1 x only Function (blue)

USB features (low power consumption)

Operating current among world's lowest
Comparison of current consumption (mA) during USB operation



Note: 1. Non-communication state when only SOF packets are accepted

RL78/L1C

RL78/L1C features

- 100-pin LCD microcontroller with large-capacity ROM
 - ROM: 256 KB, RAM: 16 KB (max.)
 - Suitable for applications with advanced functionality
- Low-power LCD microcontroller retaining the features of the RL78 microcontroller family
 - High-performance 16-bit CPU
 - Low power consumption (particularly low LCD drive current due to divided allocation of LCD capacity)
 - Safety functions (compliant with European safety standard for household appliances)
- High-resolution ADC
 - 12-bit ADC to support high-precision sensing
 - Suitable for sensor measuring devices for consumer and industrial applications
- Full complement of communication functions
 - Compliant with Battery Charging Specification, Revision 1.2 (BC1.2) for USB peripherals
 - Ability to rapidly charge secondary batteries
 - Variety of serial interface functions
 - CSI/UART/Simple I²C×4
 - I²C(Multi-Master)×1
 - USB Peripheral×1

Overview of USB battery charging standards

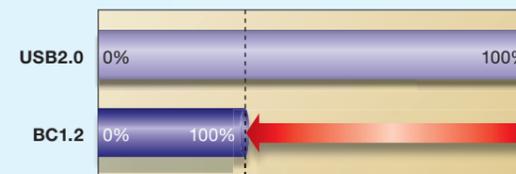
- Standards designed to enable rapid battery charging

Current max. value

USB 2.0 standard → 500 mA

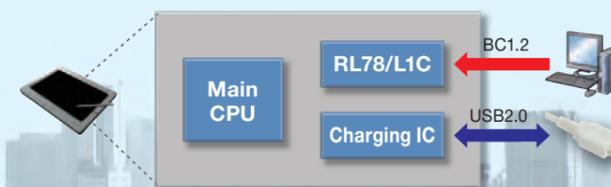
BC1.2 standard → 1500 mA

One-third the charging time



Note: Calculated value

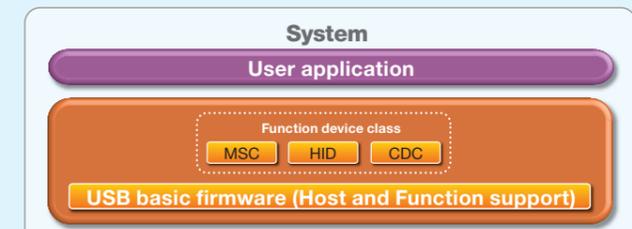
- USB battery charging application example



Data communication possible during USB battery charging

USB sample firmware

USB sample firmware is available free of charge. This simplifies system development and reduces the amount of time required.



Free sample software (firmware) Note: BC1.2 detection control functionality is implemented for all device classes.

All application notes are available for download on the Renesas website. USB sample firmware

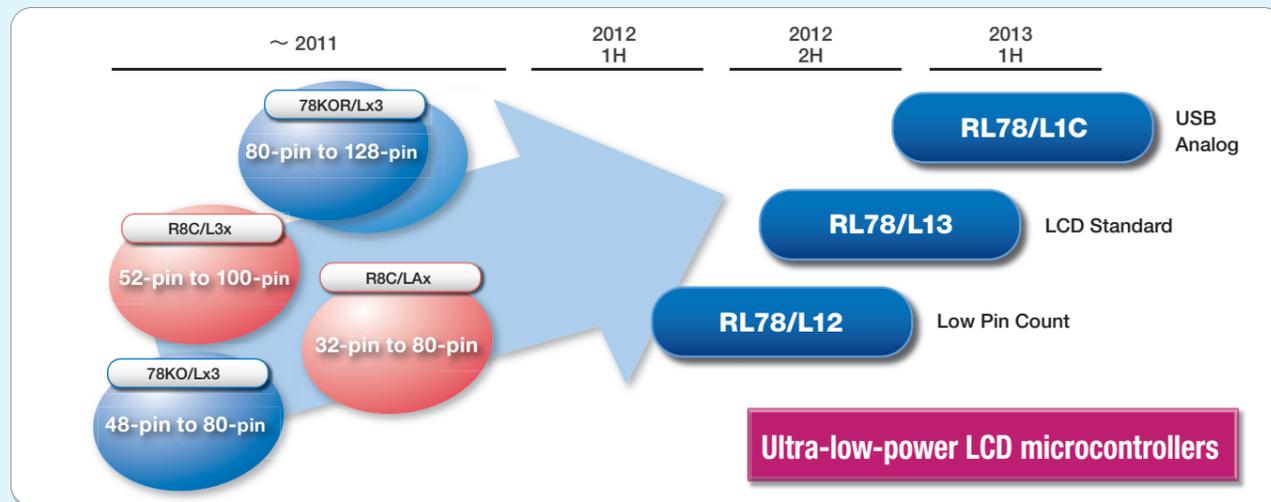
USB function	Title	Rev	Memory size[kByte]	
			ROM ¹⁾	RAM ²⁾
Peripheral	Basic firmware	2.13	11.3 kB	1.5 kB
	HID (Human Interface Device Class)		12.0 kB	0.9 kB
	CDC (Communication Device Class)		11.2 kB	1.1 kB
	MS (Mass Storage Device Class) ²⁾		18.2 kB	2.5 kB
Downloader	USB Peripheral Firmware Update	1.00	12.8 kB	3.1 kB

Notes: 1. ROM and RAM sizes for CS+ (V3.00.00) and CA78K0R (V1.71) environments
2. Includes EEPROM devices used as media.

RL78/L12, L13, L1C

LCD microcontroller product roadmap

New successor products combining the features of earlier LCD microcontrollers



RL78/L12, RL78/L13, and RL78/L1C product concept

- Low-power LCD driver**
 - Capacitor split type for generating LCD drive voltage
 - 89% reduction in current consumption compared with previous product. Particularly large reduction in LCD drive current
- Support for many segment LCD panel types**
 - Resistance division type suitable for large panels
 - Voltage boost type suitable for battery powered systems
 - Capacitor split type suitable for very small currents
- Return of panels with very large segment counts**
 - Max. display segment count: 416

		L12	L13	L1C
Healthcare	Blood pressure meters	✓	✓	✓
	Composition meters		✓	✓
	Blood sugar level meters			✓
	Pedometers	✓	✓	✓
	Thermometers	✓		
Electric household appliances	Rice cookers		✓	
	Microwave ovens	✓	✓	✓
	Hot water pots		✓	
Compact electric household appliances	LCD remote controls	✓	✓	
	Hot water heaters		✓	
	Telephones	✓	✓	
	Kitchen tools		✓	
Measuring devices	Temperature controllers		✓	✓
	Sensor modules			✓



RL78/L12, L13, L1C Product lineup

ROM	pin	32	44	48	52	64	80	100
256 KB								
192 KB							16 K	16 K
128 KB							16 K	16 K
96 KB						8 K	8 K	12 K
64 KB						6 K	6 K	10 K
48 KB						4 K	4 K	8 K
32 KB						2 K	2 K	
16 KB		1.5 K						
8 KB		1 K	1 K	1 K	1 K	1 K	1 K	

RAM RL78/L12: 32pin-64pin RAM RL78/L13: 64pin-80pin RAM RL78/L1C: 80pin-100pin

LCD display seg × com lineup

At each pin count the new products support higher segment counts than earlier products.

pin	32	48	52	64	80	100	128
50 or more					51	56	54
45 - 49					48		
40 - 44					40	40	
35 - 39						40	
30 - 34			30	32	32	31	32
25 - 29	26	24	24				
20 - 24	22	24	24				
15 - 19							
9 - 14	13	9					

RL78/L1x 78KOR/Lx3 78K0/Lx3
R8C/L3xx R8C/LAxx

Ultra-low standby current consumption (clock counter + LCD display)

Capacitor split provides extremely low current consumption when driving LCD panels.

	Renesas RL78/L1x	Company A	Company B	Company C	Company D
Resistance division method*1	11.6 μA(TYP.)	11.7 μA (@2.2 V)	Not implemented	12.0 μA (@1.8 V)	Not implemented
Capacitor split method	7.35 μA(TYP.)	Not implemented	Not implemented	Not implemented	Not implemented
Voltage boost method	21.19 μA(TYP.)	24.5 μA	22.9 μA	Not implemented	23.7 μA

Notes: 1. Current value including sub-oscillator, RTC operation, LCD operation and current flow to LCD panel. The calculation assumes an LCD panel drive current of 10 μA when using the resistance division method. (The value differs depending on the drive method.)
2. Calculated using an external resistance value of 1,000 kΩ for the external resistance division method.

Supports the three typically used LCD drive methods. Enables LCD circuits with ultra-low power consumption.

	Features/anticipated applications			
Resistance division method	For heavy-duty LCD/AC power supply applications Using resistance division to generate the drive voltage achieves high LCD drive capacity at low cost. External resistors are used for voltage division to generate the LCD drive voltage. The ability to input an external voltage means that external resistors and capacitors can be used to adjust the operating current and drive capacity.			
	High	Standard	Dependent on VDD	Rice cookers
Internal voltage boost method	For battery-powered applications The operating current is small and the drive voltage remains constant even when the battery voltage drops, so there is no dimming of the LCD display. The reference voltage is generated internally, and external capacitors are used to boost the voltage. The reference voltage can be adjusted by software in order to modify the LCD contrast. (On the RL78/L12, 18 setting steps are supported.)			
	Standard	Small current	Constant	Composition meters
Capacitor split method	For battery-powered applications This method uses the smallest operating current. The LCD display dims when the battery voltage drops. It can be used without modification in cases where the aim is to dim the display according to the remaining battery capacity. To prevent the display from dimming as the battery voltage drops, the system can switch to the internal voltage boost method when the battery voltage is low. It is also possible to use the internal voltage boost method with the capacitor split method implemented in an external circuit.			
	High	Very small current	Dependent on VDD	

Note: 1. Drive voltage: 3 V, 1/3 bias, external resistance value: 1,000 kΩ, no LCD panel connected

RL78/I1A

RL78/I1A features

- Basic peripheral functions for lighting and power supply applications
 - Timers for LED control and PFC control
 - 64 MHz source clock, zero current detection, forced output stop function
 - Analog functions for feedback
 - 10-bit A/D converter (2.125 μsec. conversion), PGA, comparator
 - Support for high temperatures up to 105°C or 125°C
- Current consumption
 - LED power supply control: 3.3 mA (main operation), CPU clock: 16 MHz, timer KB clock: 64 MHz, PLL: on
 - UART (DALI) receive standby: 0.23 μA (STOP current)
- Full complement of connectivity functions
 - Communication functions (DALI, UART, I²C, CSI, PMBus, SMBus)
- Special peripheral functions for "intelligent" operation and improved efficiency
 - Dithering function (0.98 ns pseudo-resolution), software start function, max. frequency limit function, interleaved PFC, standby communication wait

RL78/I1A lineup

pin	20	30	38
ROM			
64 KB		4 K	4 K
32 KB	2 K	2 K	

RAM Size
Operating temperature ranges up to 105°C or 125°C supported

Advantages of RL78/I1A

Dithering function

Delivers min. average resolution of 0.98 ns.

Fine-grained lighting and voltage control

Linked operation of 16-bit timer KB and INTP comparator

Timer restart function
Forced output stop function (Hi-Z/Hi/Lo)

TKBOxx
INTPx
INTCPx

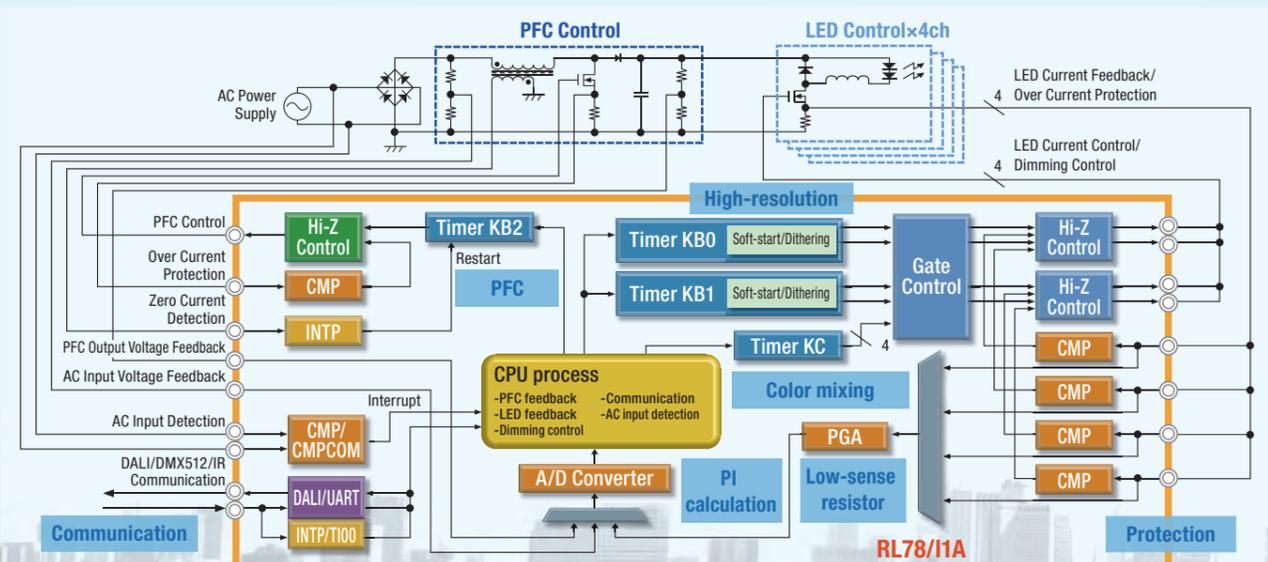
PFC control
Protection function

DALI master/slave communication functions

- Manchester coding
- Transmit/receive data: 8-, 16-, 17-, or 24-bit

Implementation in hardware of communication functions for lighting

System configuration example: PFC control + LED constant current control

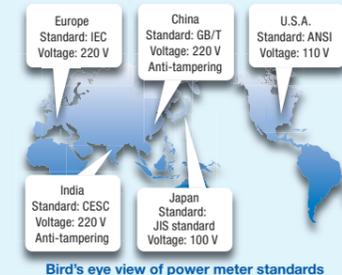
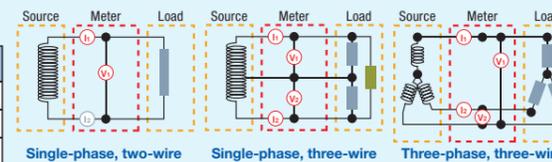


RL78/I1B

Target power meter markets of RL78/I1B

Power meter types
There are various types of meters to match the information required in different countries.

Wiring Type	Main Applications	Main Regions
Single-phase, two-wire	Home	Europe, China, India
Single-phase, three-wire	Home	Japan, N. America
Three-phase, three-wire	Commercial/Industrial	Worldwide



Product lineup and concept

Product lineup to accommodate various meter types
Four products

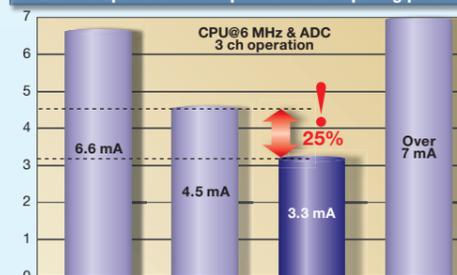
pin	80	100
ROM		
128 KB	8 K	8 K
64 KB	6 K	6 K

RAM Size

Aiming for low power consumption

- Low Power Consumption
 - Operating current: 96 μA/MHz
 - Standby current: 0.69 μA (during RTC or LVD operation)
- Newly developed 24-bit ΔΣ ADC
 - Current during ADC operation: 0.53 mA/channel

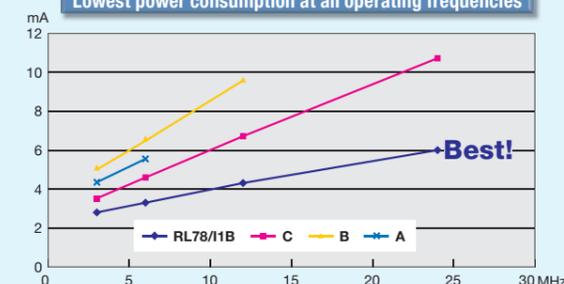
25% lower power consumption than competing products*



Note: 1. Based on research by Renesas

Low power consumption among the best in its class:
Power efficient during both calculations and backup operation

Lowest power consumption at all operating frequencies

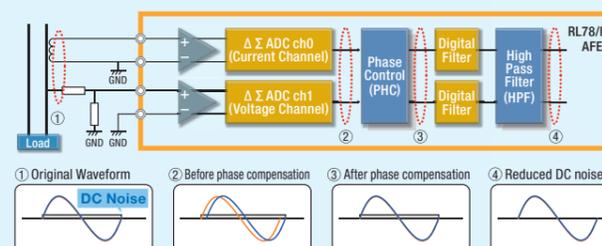


MCU	RL78/I1B				A	B	C
	64/128 KB	- 32 KB	- 120 KB	Up to 128 KB			
CPU Frequency (MHz)	4 K	4 K	4 K	4 K			
ADC 3-channel operation at each CPU operating frequency (MHz)	3	2.8	4.35	5.1	3.525		
	6	3.3	5.55	6.6	4.595		
	12	4.2	—	9.6	6.695		
	24	6	—	—	10.725		

ΔΣ ADC with improved functionality for power meters

Implementation in hardware of functions essential for power measurement

Phase correction circuit, high-pass filter

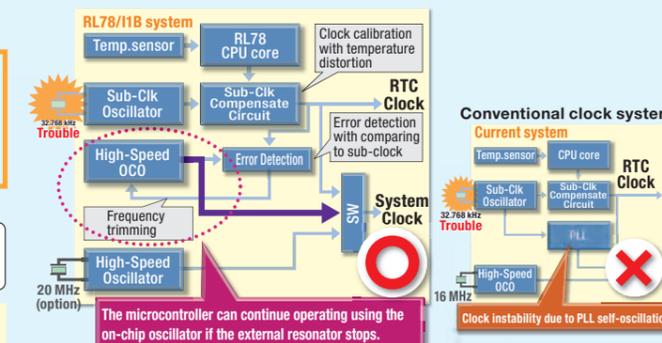


- Newly developed 24-bit ADC
 - Designed for low power consumption
 - Reduced CPU operating frequency that contributes to lower power consumption (on-chip PHC and HPF)
- To further cut power consumption ...
 - Support for multiple sampling frequencies (3.906 kHz and 1.953 kHz)

High-speed on-chip oscillator with accuracy of ±0.05%

Subclock resonator single-crystal system

Exclusive Renesas system is more robust than conventional PLL designs.



- High-precision clock: ±0.05% (high-speed on-chip oscillator with correction circuit)
 - Correction of on-chip oscillator by subclock (exclusive Renesas circuit)
- Safety functions: Clock system
 - High-speed on-chip oscillator maintains oscillation at ±1% accuracy even if external resonator stops operating.

RL78/F13, F14 Suitable for automotive applications and for industrial applications as well

The RL78/F1x microcontrollers are the successors to the 78K0R and R8C families. They combine high performance with low power consumption, and features such as CAN/LIN communication functions, advanced-functionality timers, and safety functions make them ideal for both automotive and industrial applications.

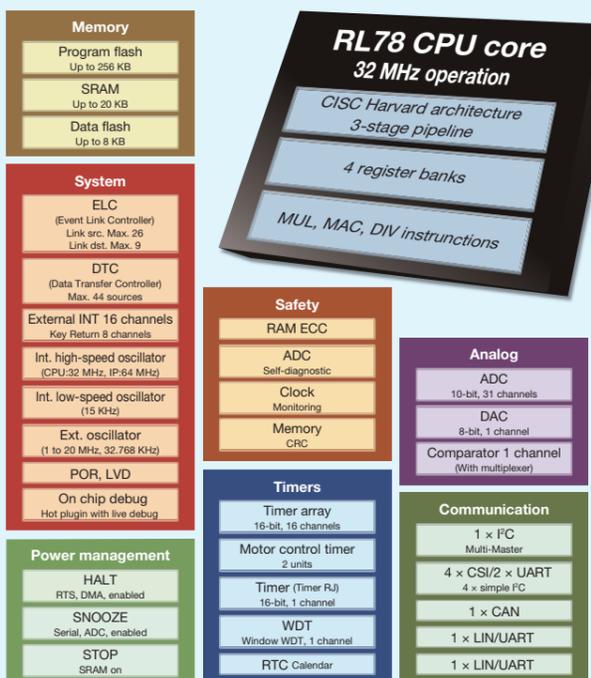
RL78/F13, F14 lineup

RL78/F13							
pin	20	30	32	48	64	80	
ROM							
128 KB		8 K	8 K	8 K	8 K	8 K	8 K
96 KB		6 K	6 K	6 K	6 K	6 K	6 K
64 KB	4 K	4 K	4 K	4 K	4 K	4 K	4 K
48 KB	3 K	3 K	3 K	3 K	3 K	3 K	3 K
32 KB	2 K	2 K	2 K	2 K	2 K	2 K	2 K
16 KB	1 K	1 K	1 K	1 K			

RL78/F14						
pin	30	32	48	64	80	100
ROM						
256 KB			20 K	20 K	20 K	20 K
192 KB			16 K	16 K	16 K	16 K
128 KB			10 K	10 K	10 K	10 K
96 KB			8 K	8 K	8 K	8 K
64 KB	6 K	6 K	6 K	6 K	6 K	6 K
48 KB	4 K	4 K	4 K			

CAN White numbers in LIN indicate RAM Size (KB)

RL78/F14 block diagram



100-pin product

RL78/F13 features

- Lineup of pin counts from 20 to 80 pins and memory from 16 KB to 128 KB
CAN products and non-CAN products are pin compatible.
- Switching to other product versions is easy because the CPU core, peripheral functions, and pin layout are the same.
Software compatibility

RL78/F14 features

- AUTOSAR support (R3.2 and R4.0 planned) MCAL and CAN/LIN software driver support planned
→ Contributes to improved software quality.
- Expanded motor functionality
Comparator and D/A converter can be combined with timer RD for applications such as brushless DC motor control.
- Downward compatibility with RL78/F13 simplifies switching to other product versions.

- More advanced functionality
 - 32 MHz operation
 - Three-phase waveform output function (timer RD)
 - 4 KB BGO data flash
 - 8 KB BGO data flash
 - High-speed on-chip oscillator
CPU: 32 MHz, peripheral:
 - Advanced on-chip debugging functionality
RAM monitoring, live debugging
 - Functional safety support
- Compact package
 - QFN Package lineup
 - 32-pin SSOP
- High temperature support
 - Operation at Ta = 150°C



CAN module

- Architecture enabling continued utilization of legacy communication software specifications
 - Retains functionality of previous CAN module
- Reduced load for interrupt handling
 - Implementation in hardware of typical interrupt-related functions
 - Reduction of overhead from interrupts at CAN transmit/receive completion
 - Suppression of interrupts at completion of CAN reception of unneeded messages
- Improved self-diagnostic functions
 - Support for read/write testing of RAM used by CAN
- Implementation in hardware of communication control software processing for reduced CPU load
 - Partial implementation in hardware of AUTOSAR-compliant CAN MCAL block and Pdu_Router
 - Implementation in hardware of ECU self-diagnostic functions (OBD II support functions)



LIN module

- Retains LIN protocol engine with proven track record on R32C and M16C.
- Full implementation in hardware of master and slave functionality
- Responses from header transmit/receive
Handling of responses at transmit/receive completion and error detection are completely automated.
- Compliant with LIN revisions 1.3, 2.0, and 2.1 and SAEJ2602
- Functions designed for AUTOSAR (ability to issue frame headers and responses with separate commands, etc.)



RL78/F1x applications

The RL78/F1x group supports high operating temperatures and offers LIN/CAN communication functionality, making it suitable for a wide range of automotive applications. Some typical applications are listed below.

- Various types of motor control



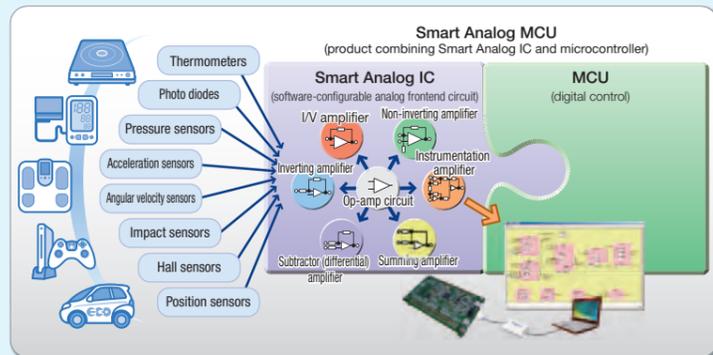
The high reliability required by automotive applications makes these microcontrollers suitable for industrial applications as well.

Smart Analog (RL78/G1E) Suitable for products incorporating sensors, such as electric household appliances, industrial equipment, and healthcare devices

Microcontroller with on-chip analog frontend for sensor applications (and ability to control analog frontend circuit configuration and characteristics from microcontroller)

The RL78/G1E Smart Analog microcontroller is based on the RL78/G1A and incorporates an on-chip analog frontend. It is suitable for a variety of sensor applications and will contribute to the realization of sensor systems that are more compact and lower in cost while also reducing the time required for development.

- **Smart Analog**
Smart Analog products allow you to use *software* to change the circuit configuration or characteristics in order to provide support for multiple types of sensors and drivers. Smart Analog functionality is available on Smart Analog ICs, which contain analog circuits only, and on the RL78/G1E Smart Analog microcontroller, which integrates a Smart Analog IC.



RL78/G1E features

- Analog frontend functions essential for sensor control**
 - Improved analog functions such as configurable amplifier, adjustable-gain amplifier, filters, D/A converter, and temperature sensor
- High-precision, high-speed on-chip oscillator**
 - On-chip oscillator accuracy of $\pm 1\%$, support for UART communication ($T_A = -20$ to $+85^\circ\text{C}$, $V_{DD} = 1.8$ to 5.5 V)
 - Frequency selectable among 32, 24, 16, 12, 8, 6, 4, 3, 2, and 1 MHz
- 12-bit A/D conversion**
 - Multiple ADC channels (max. 17 channels) to support input from a variety of sensors
 - Support for high-speed, high-precision A/D conversion
- Low Power Consumption**
 - 88.4 $\mu\text{A}/\text{MHz}$ during CPU operation, 0.67 μA during standby
 - Even lower power consumption in SNOOZE mode

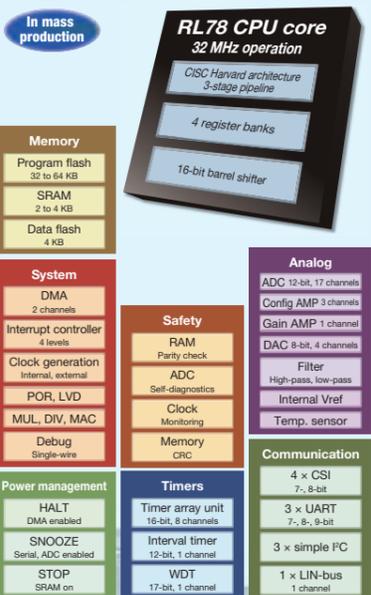
RL78/G1A specifications

- **RL78-S2 CPU Core**
 - Three-stage pipeline CISC architecture
 - Max. operating frequency: 32 MHz
- **Memory**
 - Support for 1.8 V flash programming and boot swap
 - Program flash: 32 KB–64 KB
 - SRAM: 2 KB–4 KB
 - Data flash: 4 KB
- **System**
 - High-speed on-chip oscillator: 32 MHz $\pm 1\%$ (target)
 - Library support for multiply/divide and multiply-accumulate operation
- **Power management**
 - Operating current: 88.4 $\mu\text{A}/\text{MHz}$ (when operating at 32 MHz, configurable amplifier channels 1 to 3 and D/A converter channel 3 operating)
 - HALT current: 145 μA (high-speed on-chip oscillator stopped, AFE stopped)
 - STOP current: 370 nA (SRAM data retained, AFE stopped)
- SNOOZE current: 700 μA (UART operating, AFE stopped), 420 μA (ADC operating, AFE stopped)
- **Safety**
 - Compliant with European safety standard for household appliances (IEC/UL 60730)
 - Illegal memory access detection
- **Timers**
 - Advanced-functionality timer array unit (TAU)
 - Watchdog timer
- **Analog**
 - Power supply voltage range: 3.0 V to 5.5 V (excluding ADC)
 - On-chip ADC, 12-bit \times 17 channels, conversion time: 3.375 μs
 - On-chip DAC: 8-bit \times 4 channels
 - Configurable amplifier \times 3 channels, gain amplifier \times 1 channel
 - Low-pass filter, high-pass filter
- **Communication**
 - CSI, UART (LIN), Simple I²C
- **Package**
 - 64-pin/80-pin

Product lineup

pin	64		80	
ROM				
64 K	4 K	4 K	4 K	4 K
48 K	3 K	4 K	3 K	4 K
32 K	2 K	4 K	2 K	4 K

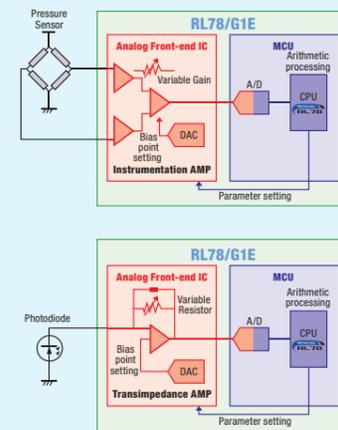
RAM (light blue), Data flash (dark blue)



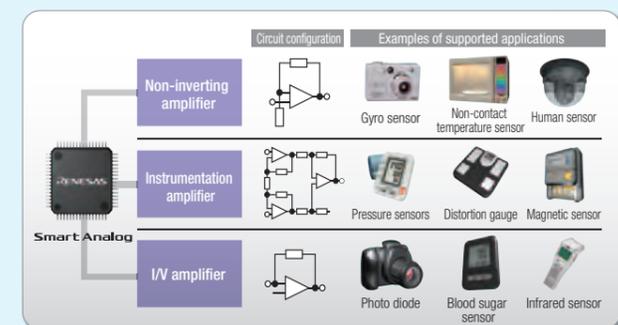
(Reference) RL78: Block diagram of G1E group 80-pin product.

Application fields: Suitable for a variety of sensor applications

The RL78/G1E (with variable amplifier circuit configuration) incorporates a configurable amplifier*1 in its analog frontend circuit block. Using software control it is possible to change the analog circuit configuration and characteristics (adjusting the variable gain, offset and bias voltage, etc.) while the microcontroller is operating. Applications employing multiple sensors are supported by the ability to switch the analog circuit configuration in time-sharing fashion using software. This makes it possible to support a variety of different sensors. The RL78/G1E can be used as a common platform analog frontend IC.



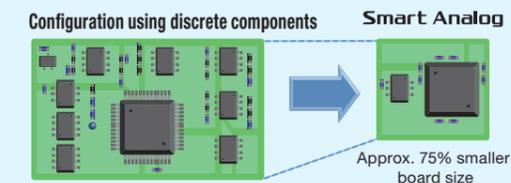
- ◀ Setting the analog circuit (configurable amplifier) as an instrumentation amplifier*2 for use with pressure sensors
- ◀ Setting the analog circuit (configurable amplifier) as an I/V amplifier for use with photodiodes



A variety of sensor types can be accommodated by switching the analog circuit configuration
Notes: 1. Selectable among non-inverting amplifier, inverting amplifier, differential amplifier, and I/V conversion amplifier.
2. The three-channel configurable amplifier is configured as a single-channel instrumentation amplifier operating on multiple channels.

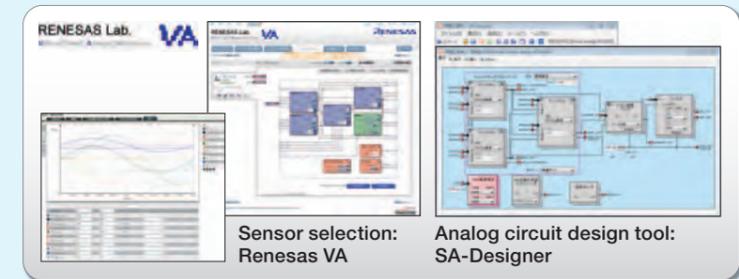
Making possible more compact and lower cost sensor systems

Integrating the peripheral components on a single chip reduces the component count by 90% and the board size by 75% compared with the use of discrete components for the analog frontend circuit (according to a comparison by Renesas).

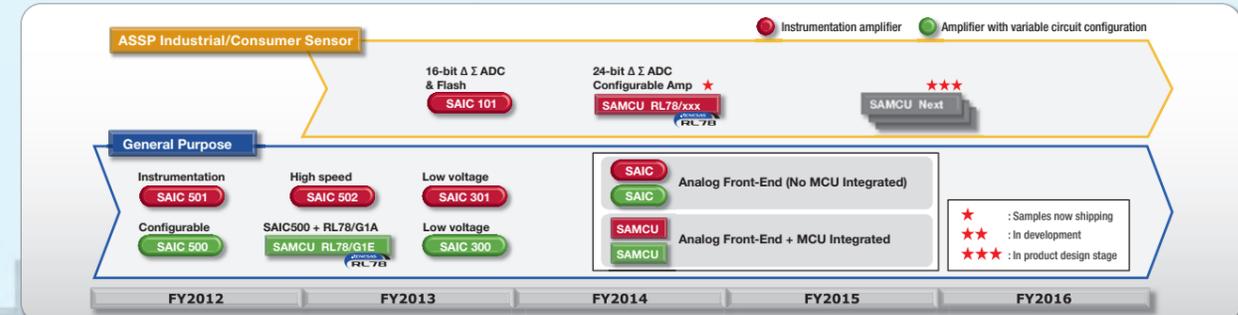


Substantial reduction in development time by replacing the conventional analog circuit design process with software

You can accomplish analog circuit design tasks with your PC and mouse by using Renesas VA, a convenient web-based simulator for selecting sensors, and SA-Designer, which lets you configure analog circuits as well as changing and optimizing their characteristics.



Smart Analog roadmap

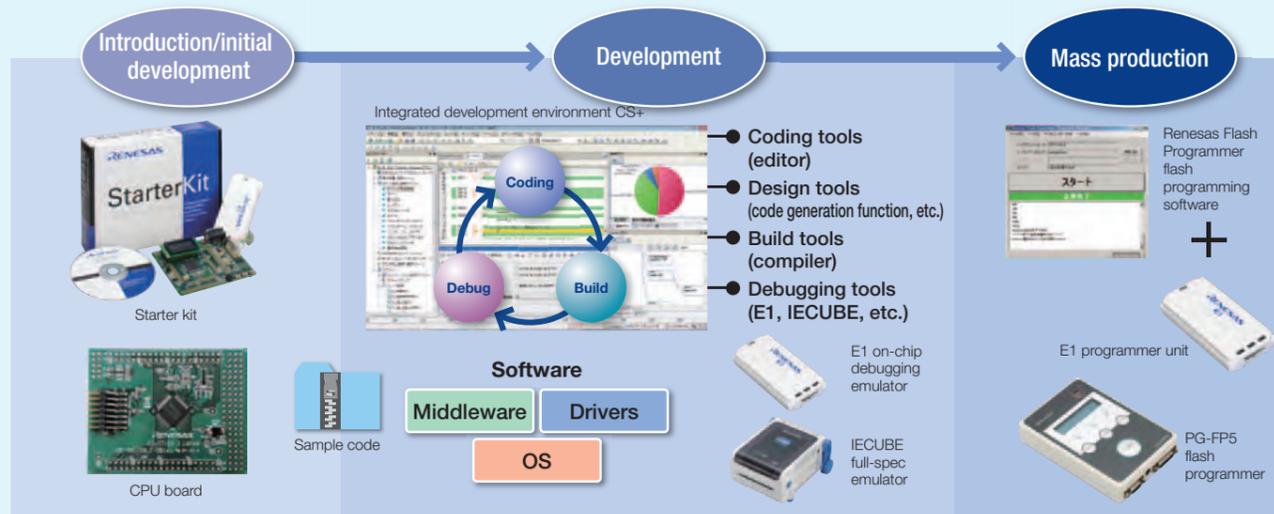


Smart Analog website

http://www.renesas.com/smart_analog/

RL78 family development environment http://www.renesas.com/rl78_tools

Renesas Electronics supports all aspects of application development for the RL78 family with products such as the integrated development environment CS+, real-time OSes, and programming tools.

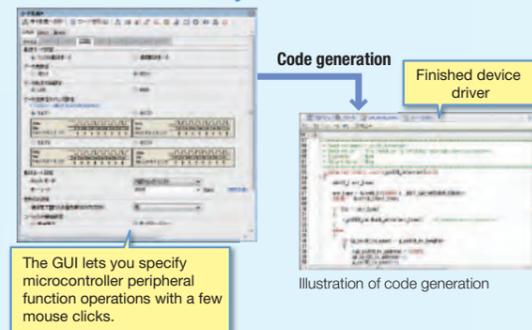


CS+ integrated development environment Code generation function that makes it easy to create device drivers

CS+ is an integrated development environment designed to bring *simplicity*, *convenience*, and *peace of mind* to the software development process, which consists of repeated cycles of coding, building, and debugging. Of particular note is the code generation function, which automatically generates device driver code to control microcontroller peripheral functions (timers, UART, A/D, etc.) based on settings entered via a GUI. This reduces the number of man-hours the customer must spend on the development of device drivers.

An evaluation version of CS+ is available free of charge. Make sure to try it out before embarking on your next full-scale development project.

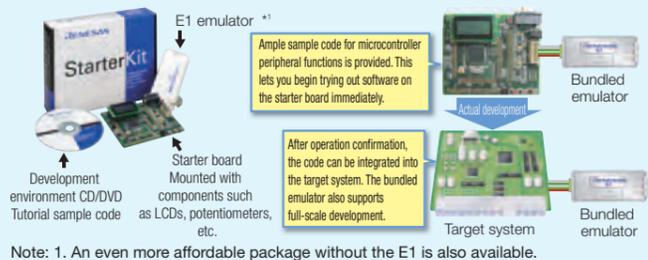
[Evaluation software download](http://www.renesas.com/tool_evaluation) [URL](http://www.renesas.com/tool_evaluation) http://www.renesas.com/tool_evaluation



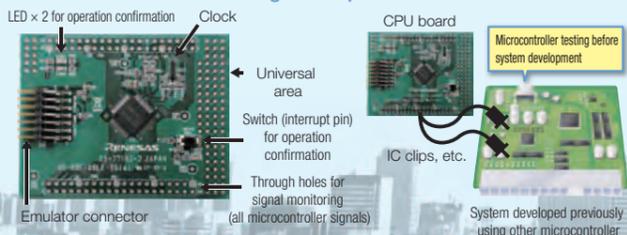
Evaluation boards: Enabling smooth introduction of new microcontrollers

Renesas supplies evaluation boards for a variety of purposes, including microcontroller performance evaluation, initial operation confirmation, evaluation circuit creation, and prototyping of application products.

Renesas starter kit features and usage example



CPU board features and usage example



E1 and IECUBE: Emulator options

To meet differing customer requirements, two emulator products are available for debugging RL78 microcontroller software: E1 and IECUBE.

- E1: Provides basic debugging and evaluation functions. Also supports on-chip trace functionality.*1
- IECUBE: Supports high-level debugging functionality such as trace of all instructions, measurement of time between events, and coverage. Provides powerful debugging capabilities.

Product	Trace Function	Time Measurement Function	Coverage Function	Device Equivalence	Flash Programming Function
E1	Yes*1	Ability to measure single run-break duration	No	◎*2	Yes
IECUBE	Yes	Ability to measure duration between two events	Yes	○*3	No

Notes: 1. Microcontrollers with on-chip trace support only
2. Actual device operating
3. Emulation of device operation for FPGA, etc.

An integrated development environment providing powerful support for all aspects of the development of embedded systems

CS+ Using the intuitive graphical user interface (GUI), operations involving different tools are consistent and easy to master. An extensive tutorial is provided to help beginning users get up to speed.

Installation

Integration of a variety of tools under a consistent GUI for enhanced ease of use



Effective utilization of development resources

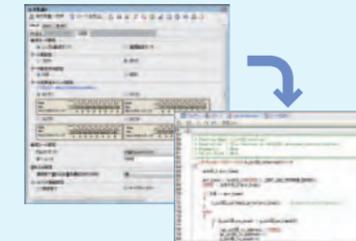
Customers can reuse existing development resources by migrating them to CS+.

Coding

Rich support for editing program code

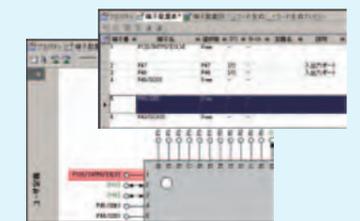
Easy code generation*1

Simply make settings in the GUI to automatically generate program code (device drivers) for microcontroller peripheral functions (timers, UART, A/D converter, etc.). The specifications of the code generation API functions, etc., are common across all products. So once you have developed a program using the code generation function, adapting it for a different microcontroller is a simple matter of replacing the device drivers. This substantially reduces development man-hours, allowing developers to focus on the use of new peripheral functions. The automatically generated source files consist of code in the C language. This allows someone using a particular microcontroller for the first time to see at a glance why a certain setting or processing routine is employed. However, it is only necessary to examine the source code if you wish to see in detail the way in which microcontroller settings are applied.



Easy pin assignment table generation*1

You can specify the processing of multiplexed pins by looking at the pin assignment table and referring to a diagram showing the pin layout. The pin layout diagram can be pasted into design documentation and the pin assignment table can be output in Microsoft Excel format.



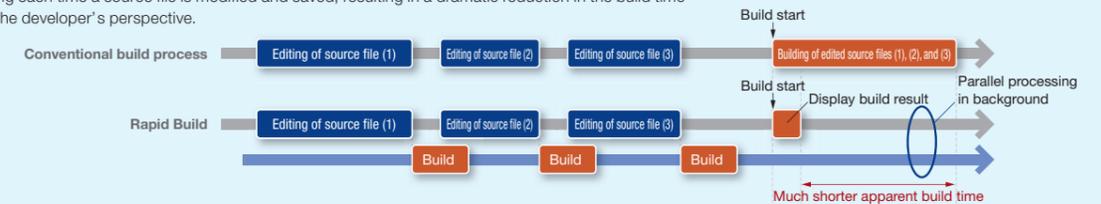
Note: 1. Some microcontrollers are not supported.

Building

A building environment designed to extract optimal performance from each microcontroller

Easy building

A conventional development environment requires you to edit all of the source files first and then build the entire project. This can be very time consuming. CS+ has a Rapid Build function that automatically starts building each time a source file is modified and saved, resulting in a dramatic reduction in the build time from the developer's perspective.



Debugging

Rich debugging functions that interoperate with a simulator or emulator

Easy debugging

There is also an Action Event function that displays the value of a variable or variables when program execution reaches a specified address. This function allows convenient debugging, making it possible to access the variable name display function simply by right-clicking and without the need to spend time on additional builds.

Useful visual feedback and ability to search

The ability to display variable values during program execution or graphs like an oscilloscope makes it possible to develop programs while monitoring analog variations, as is necessary for sensor applications and the like. You can display the ratios of execution times among functions or a call graph to track down the processing associated with high loads. This makes it possible to improve overall system performance in a very efficient manner. Other analysis functions include a source code display for functions and variables, CSV output of information, and the ability to search for all occurrences of specific definitions or declarations. These capabilities simplify administration and management even when the program structure is comparatively large-scale and complex.



Implementation

Effective support functions even after implementation

Easy backup

The powerful backup function allows saving and restoring of complete projects and associated tool settings.

Easy updates

The update manager function of CS+ automatically checks on the Internet for newer versions of the installed tools. This makes keeping up to date easy.

RI78V4 real-time OS compliant with μ ITRON standard

A high-quality real-time multitasking environment for embedded systems

- Complies with worldwide standard μ ITRON 4.0 specification.
- Compact design suitable for ROM storage
- Full complement of service calls
- Excellent real-time performance (interrupt response time, task switching time)
- Support for convenient functions when used in conjunction with the CS+ integrated development environment (automatic setting of options required to build the OS, display of the state of objects managed by the OS such as tasks and semaphores, graphical display of task operation history and service call issue history)

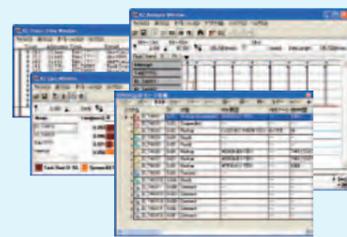


Illustration of function screens in conjunction with CS+

Middleware

- Extensive lineup for RL78 applications, including audio, file system, and memory drivers
- Common interface design with flexible support for the entire RL78 family
- Sample programs included. Highly efficient design process for less time to product completion

RL78 family middleware lineup

- | | |
|---|--|
| <ul style="list-style-type: none"> ■ Audio • ADPCM encoder/decoder ■ Signal processing • Digital filters (FIR, IIR) • FFT library ■ Security • AES library • SHA hash function library • RSA library*1 | <ul style="list-style-type: none"> ■ File system • Open source FAT file system (TFAT) ■ Memory drivers • SPI mode MultiMediaCard driver • SPI mode MMC/SD memory card driver • SPI serial flash driver • SPI single master driver • Renesas SPI serial EEPROM driver • Renesas I²C serial EEPROM driver • I²C single master driver |
|---|--|
- Note: 1. Under development

Application notes and sample code

Renesas provides sample programs with documentation describing how to use microcontroller peripheral functions as well as system examples.

- Sample code for RL78, constantly expanding lineup
- Extensive sample code including register definition files
- Substantial reduction in time to completion for products incorporating RL78 family microcontrollers



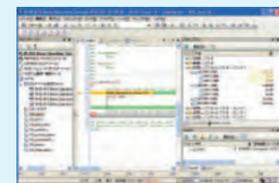
Visit the following URL to download sample code based on the philosophy of "simpler and faster."
<http://www.renesas.com/software>

Three types of debugging environment to match your development style

Debugging on a PC [CS+ simulator for RL78 family, 78K0R, and 78K0]

Simulator enabling source-level debugging of applications in the CS+ integrated development environment before the target system exists

- Rich break functions and coverage measurement functions
- Ability to evaluate software modules in a manner very similar to evaluation on the actual device



Simulator for CS+

Debugging with basic functions [E1 on-chip debugging emulator]

Basic debugging capabilities at an inexpensive price. This emulator also supports on-chip trace functionality.*1

- Simple to connect. Allows debugging via a connection to an RL78 microcontroller mounted in the system under development.
- Also functions as a flash programmer.
- Environmentally friendly. All materials from the components to the packaging are RoHS compliant.



Notes: The E20 emulator may be used as well, but the supported debugging functions are equivalent to those of the E1.

1. On microcontrollers with on-chip trace support only

Debugging with high-level functions [IECUBE full-spec emulator]

A high-performance full-spec emulator with more advanced functions

- Trace with time-tag function
- Provides access via a GUI to more powerful debugging capabilities, including a duration measurement function and coverage function.



Three types of programming environment to match your development goals and circumstances

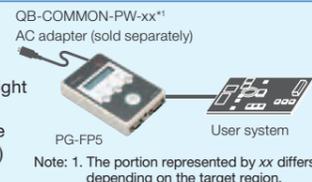
Programming controlled by a PC [Renesas Flash Programmer flash programming software]

- Ability to control flash programming from a PC using the E1 or a serial connection
- Two programming operation modes (Basic mode and Full mode)
- Ability to automate programming by running scripts
- Ability to embed unique code



Programming controlled by a PC or stand-alone programming [PG-FP5 flash programmer]

- Stand-alone programming
- Programming controlled by a PC using a dedicated GUI
- Ability to store settings for up to eight environments
- Ideal for use on the production line (command control, remote control)
- Ability to embed unique code



Ordering pre-programmed ROM (growing number of products supported)*1

Pre-programmed flash memory products from Renesas Electronics

1. The support status differs depending on the product. Please contact a Renesas sales company or agent for details.

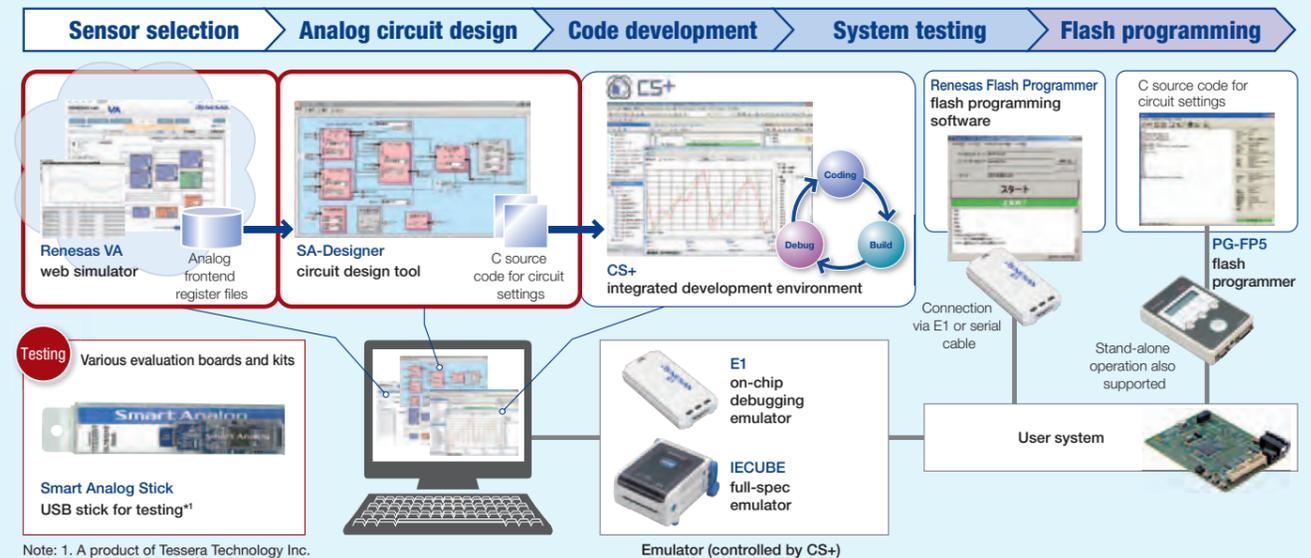


Smart Analog development tools

http://www.renesas.com/smart_analog_tools

Lineup of development tools utilizing Smart Analog functions

Smart Analog devices allow you to change the circuit configuration and characteristics by making settings in software, thereby enabling support for multiple types of sensors and drivers. Smart Analog development tools include the standard development tools for RL78 family microcontrollers as well as Renesas VA, SA-Designer, and evaluation boards and kits.

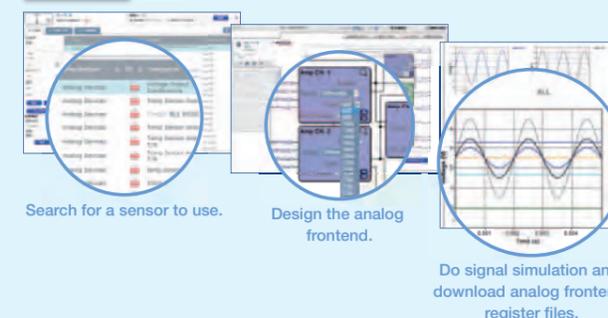


Sensor selection Free of charge

Sensor selection without the actual device: Renesas VA web simulator

This cloud-based tool lets you perform analog circuit design and simulations combining Smart Analog devices and approximately 1,000 varieties of sensors.

Try it now. [Web http://www.renesas.com/renesas_va](http://www.renesas.com/renesas_va)



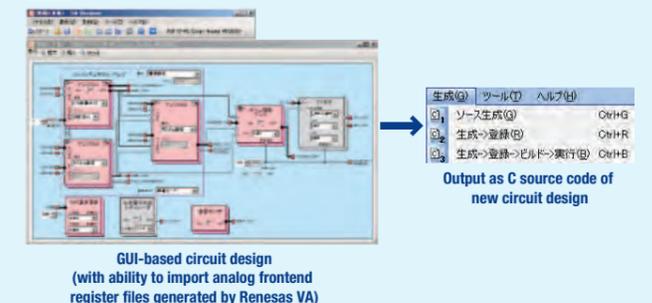
Supported devices Smart Analog IC 300 series
 Smart Analog IC 500 series
 Smart Analog MCU (RL78/G1E)

Analog circuit design Free of charge

Simple circuit design with a few mouse clicks: SA-Designer

This tool lets you actually design the analog frontend circuit of your Smart Analog product and then outputs the circuit data as C source code.

[Web http://www.renesas.com/sa_designer](http://www.renesas.com/sa_designer)



Supported devices Smart Analog IC 101 series
 Smart Analog IC 300 series
 Smart Analog IC 500 series
 Smart Analog MCU (RL78/G1E)

Smart Analog evaluation boards to simplify testing of Smart Analog systems

A selection of starter kits and evaluation boards provide the ideal way to get started with Smart Analog.

[Web http://www.renesas.com/products/smart_analog/peer/manual_softtools_index.jsp#partner](http://www.renesas.com/products/smart_analog/peer/manual_softtools_index.jsp#partner)

Smart Analog Easy Starter, an GUI-based evaluation tool, lets you do circuit design on analog frontends for sensors and monitor waveforms.

It is possible to connect an option board to a Renesas Starter Kit. The first such product is mounted with the Smart Analog IC101 and sensor elements.



Alliance partners

A wide variety of products for the RL78 family, such as compilers, and programmers, are available from Renesas' alliance partners.

[Get the latest information here.](http://www.renesas.com/rl78_partners)

http://www.renesas.com/rl78_partners

■ Compiler

IAR Systems AB

■ RTOS

CMX Systems, Inc.

FreeRTOS.org

Micrium

SEGGER Microcontroller

■ Programming Services*1

Falcon Denshi K.K. (Exclusive distributor of HI-LO SYSTEMS for Japanese customers)

Flash Support Group Company

SYNCHRO-WORK CORPORATION

■ Programmers*2

Data I/O Corporation

Flash Support Group Company*3

HI-LO System Research Co., Ltd.*3

MINATO ELECTRONICS INC.

NAITO DENSEI MACHIDA MFG. CO., LTD

SMH Technologies*3

SUISEI ELECTRONICS SYSTEM CO., LTD.

TESSERA TECHNOLOGY INC.

Wave Technology Co., Ltd.

Yokogawa Digital Computer Corporation

Notes: 1. Currently supported or support planned.
2. Contact the manufacturer to determine if use on a mass production line is supported.
3. Under development or to be developed.

Development tools for RL78 family

[Get the latest information here.](http://www.renesas.com/rl78_tools)

http://www.renesas.com/rl78_tools

Microcontroller		Starter kit	CPU board	Real-time OS	Integrated development environment (including compiler and simulator)	Software tool	On-chip debugging emulator	Full-spec emulator	Flash memory programming tools		
Series	Group								Flash programming software	Flash memory programmer	
RL78/G1x	RL78/G10	—	QB-R5F10Y16-TB*13 or RTE510Y470TGB00000R*13	RI78V4*6 (R0R07800TCW01w)*7	CS+	C compiler package (with integrated development environment) for RL78 and 78K families*8 (ROC07800QSW01D) (ROC07800QSW01N)	E1*9, 10 (R0E000010KCE00)	IECUBE*11 (QB-RL78xxx)	Renesas Flash Programmer for E1 (ROC00000FDW12R)*12 or PGFP5 software	E1 or PG-FP5	
	RL78/G12	—	QB-R5F1026A-TB								
	RL78/G13	Renesas Starter Kit for RL78/G13*11 (Part No.: ROK50100LS000BE)									QB-R5F100LE-TB*12 or QB-R5F100SL-TB*12
		Renesas Starter Kit for RL78/G13 (without E1)*12 (Part No.: ROK50100LS900BE)									—
	RL78/G14	Renesas Starter Kit for RL78/G14*11 (Part No.: ROK50104PS000BE)									QB-R5F104LE-TB*13 or QB-R5F104PJ-TB*13
		Renesas Starter Kit for RL78/G14 (without E1)*12 (Part No.: ROK50104PS900BE)									—
	RL78/G1A	—	QB-R5F10ELE-TB								
	RL78/G1C	Renesas Starter Kit for RL78/G1C*11 (Part No.: ROK5010JGS000BE)									QB-R5F10JGC-TB
		Renesas Starter Kit for RL78/G1C (without E1)*12 (Part No.: ROK5010JGS900BE)									
	RL78/G1D	Evaluation kit available									—
RL78/G1F	—	YQB-R5F118LE-TB									
RL78/G1G	Renesas Starter Kit for RL78/G1G** (Part No.: ROK5011EFS000BE)		Alternative products available*14								
	Renesas Starter Kit for RL78/G1G (without E1)*12** (Part No.: ROK5011EFS900BE)										
RL78/G1E**	Smart Analog Stick*9		QB-R5F10FME-TB								
RL78/11x	RL78/11A	—	QB-R5F107DE-TB								
	RL78/11B	—	RTE510MPG0TGB00000R								
	RL78/11D	—	RTE5117GC0TGB00000R								
RL78/L1x	RL78/L12	Renesas Starter Kit for RL78/L12** (Part No.: ROK5010RLS000BE)									
	RL78/L13	Renesas Starter Kit for RL78/L13*11 (Part No.: ROK5010WMS000BE)									
		Renesas Starter Kit for RL78/L13 (without E1)*12 (Part No.: ROK5010WMS900BE)									
RL78/L1C	Renesas Starter Kit for RL78/L1C*11 (Part No.: ROK50110PS000BE)		QB-R5F110PJ-TB								
	Renesas Starter Kit for RL78/L1C (without E1)*12 (Part No.: ROK50110PS900BE)										
RL78/F1x	RL78/F12	—	QB-R5F109GE-TB								
	RL78/F13	—	QB-R5F10BMG-TB								
	RL78/F14	—	QB-R5F10PPJ-TB								

Notes: 1. Includes CPU board, E1 on-chip debugging emulator, software (CS+ integrated development environment), and the evaluation version of Renesas Flash Programmer.
2. The QB-R5F100LE-TB supports the RL78/G13 with 64 KB of flash memory. The QB-R5F100SL-TB supports the RL78/G13 with 512 KB of flash memory.
3. The QB-R5F104LE-TB supports the RL78/G14 with 64 KB of flash memory. The QB-R5F104PJ-TB supports the RL78/G14 with 256 KB of flash memory.
4. The Renesas VA web simulator and SA-Designer circuit design software are available as analog design tools.
5. A separate USB cable is required. The custom GUI design software is available for download on the web. (The URL is printed in the product's user's manual.)
6. Evaluation licenses and mass-production licenses are available.
7. The lowercase letter w denotes the type of license. It can stand for one of the following numeral and letters:
1: Evaluation license: The real-time OS can be installed on one host computer.
A: Evaluation license: The real-time OS can be installed on an unlimited number of host computers.
K: Mass-production license: The real-time OS can be embedded in up to 3,000 products with the source code closed.
U: Mass-production license: The real-time OS can be embedded in an unlimited number of products with the source code closed.
Z: Mass-production license: The real-time OS can be embedded in an unlimited number of products with the source code disclosed.
8. Product No. ROC07800QSW01D is supplied with install media (DVD), and product No. ROC07800QSW01N does not include install media.
9. The E1 emulator product includes an E1 emulator unit, USB interface cable, target system interface cable, and software CD-ROM.
10. The E20 emulator may be used as well, but the supported debugging functions are equivalent to those of the E1.
11. The IECUBE product includes an IECUBE emulator unit, USB interface cable, and software CD-ROM. For details of the system configuration, see "List of constituent products of IECUBE (QB-RL78xxx) full-spec emulator system" below.
12. In response to requests from many customers who already own the E1 emulator, Renesas now offers a more affordably priced Renesas Starter Kit (without E1) package. The only difference from the standard Renesas Starter Kit package is that the E1 is not included. As with the standard Renesas Starter Kit package, a CPU board, cables, evaluation versions of development tools (compiler, etc.), and manuals are included. These can be used with the customer's own E1 emulator for application prototyping and microcontroller evaluation.
13. The QB-R5F10Y16-TB supports the 10-pin version of the RL78/G10 with 2 KB of flash memory. The RTE510Y470TGB00000R supports the 16-pin version of the RL78/G10 with 4 KB of flash memory.
14. Available from RS Components (Product No.: YQB-R5F11EFA-TB)
* The products (RI78V4, CS+, Renesas Flash Programmer, and PG-FP5) require a personal computer running Microsoft Windows® 7, Microsoft Windows Vista®, or Microsoft Windows® XP. Refer to <http://www.renesas.com/windows> for details regarding the operating environment.
* See the next and following pages for details on microcontroller production status.
** Under development

RL78/L1C HMI solution kit

Overview

The RL78/L1C HMI solution kit (R0K578L1CD000BR) is a human-machine interface (HMI) solution kit that includes a segment LCD display circuit, audio playback circuit, and capacitive touch key sensor circuit. It simplifies the development and evaluation of products with HMI and USB support, such as electric household appliances and healthcare devices, that are also equipped with communication functions.

Features

- Segment LCD display, capacitive touch key input, and audio playback circuit
Simplifies the development and evaluation the products with human-machine interfaces such as electric household appliances and healthcare devices
 - The inclusion of the touch key interface makes it easy to achieve a more attractive design.
 - Includes audio middleware (Sodiack from AREX Corporation) for audio playback and voice speed conversion.
 - The LCD display uses the internal voltage boost method to deliver even lower power consumption.
- Sensor control system for M2M



Applications

- The USB Function capability and serial flash memory of the RL78/L1C can be used in healthcare devices to store measurement data and transfer or manage data on a smartphone or PC via a USB connection.
- ECHONET Lite can be used to implement communication support. Operation has been confirmed using external modules for 920 MHz (sub-GHz) band communication, ZigBee RF4CE communication, and PLC communication (DSCK).

Product specifications

Item	Description	Remarks
Product No.	R0K5 78L1CD000BR	—
Power supply	[1] Size AA batteries (3) [2] USB VBUS	[1] or [2] selectable using jumper
Input voltage	2.6 to 5.5 V	—
Current consumption	Normal operation: Approx. 10 mA, low-power mode: Approx. 0.1 mA	—
Dimensions	Main unit: 120 × 70 × 22 mm, battery box: 70 × 48 × 20 mm	—
Environmental conditions	Operation: 10 to 35°C, storage: -10 to 50°C	No condensation
Microcontroller	RL78/L1C (ROM: 256 KB, RAM: 16 KB, 100-pin)	R5F110PJAFB
External flash memory	M25PX16 (2 MB)	SPI communication
Standard interface	USB micro-B	—
Debugging interface	E1 connector	—
Functions	Brightness measurement (1 digital brightness sensor)	—
	Temperature measurement (1 analog temperature sensor)	Offset setting function
	Display (1 LCD and 2 LEDs)	—
	Key input (4 touch keys, 1 push button, 1 reset button)	—
	Audio output (on-board speaker or external output via earphone jack)	Audio middleware for volume adjustment
	USB-UART conversion	—

RL78/G1C USB charger solution kit

Overview

The RL78/G1C USB charger solution kit (R0K578G1CD010BR) is an evaluation kit equipped with the RL78/G1C, which integrates USB Host and Peripheral capabilities, a charge control IC, serial EEPROM, character LCDs, and brightness and temperature sensors. It simplifies the development and evaluation of products implementing rapid battery charging using USB Battery Charging Specification, Revision 1.2 (USB BC 1.2) and products with USB support. Users choosing this solution will be able to move quickly from the planning to the design stage of system development and to reduce the number of prototype iterations, thus achieving more efficient development.



Features

- Enables development of systems utilizing interoperation with smartphones via USB connections (auxiliary batteries, data transfer).
 - The USB Host capability of the RL78/G1C can be used to implement data transfer to a smartphones compatible with Android™ Open Accessory.
 - The USB BC 1.2 detection function can be used to identify whether devices are compatible with USB BC 1.2 or not.
 - The nickel-metal hydride batteries of the solution kit can be used to supply the optimal current to a smartphone.
- Enables development of systems utilizing interoperation with PCs via USB connections (rapid chargers, USB mice, USB storage).
 - The USB Peripheral capability of the RL78/G1C can be used to implement data transfer from serial EEPROM to a PC.
 - USB mouse (HID class) functionality and USB storage (mass storage class) functionality can both be supported at once.
 - The USB BC 1.2 detection function can be used to identify whether PCs are compatible with USB BC 1.2 or not or to identify dedicated chargers.
 - The nickel-metal hydride batteries of the solution kit can be charged rapidly and safely.
- Standalone operation (brightness or temperature sensor, recording of measurement results, clock)
 - Brightness and temperature sensor measurement data can be displayed on the LCD, stored in the serial EEPROM, and time stamped.
 - Support for battery remaining indication and sleep mode.

Product specifications

Item	Description	Remarks	
Product No.	R0K578G1CD010BR	—	
Power supply	Nickel-metal hydride batteries: 6 size AAA batteries	—	
Current consumption	Operation: 10 mA, sleep: 0.5 mA	—	
Dimensions	90 × 55 × 28 [mm]	—	
Environmental conditions	Operation: 10 to 35°C, storage: -10 to 50°C	No condensation	
MCU	RL78/G1C (ROM: 32 KB, RAM: 5.5 KB, 48-pin QFP) Main clock: 12.000 MHz, subclock: 32.768 kHz	R5F10JGCAFB	
EEPROM	R1EX25512ATA00A (64 KB)	SPI communication	
USB interface	Standard-A connector	Host	
	micro-B connector	Peripheral	
Charging	USB (input from micro-B connector)	5 V	
Supply power	USB (input from standard-A connector)	5 V	
Operation functions	When connected to a smartphone	Power to smartphone	—
		Communication with smartphone	Android™ Open Accessory "DemoKit" required.
	When connected to a PC	USB mouse	—
		Reading and writing log records (brightness, temperature, battery voltage, power voltage, charging current)	—
Standalone operation		Charging of main unit	—
		Display and logging of brightness and temperature	—
		Display of clock or remaining battery, sleep function	—
Display functions	Brightness	0 to 65,535 lux, 1 lux units	—
	Temperature	0 to 99°C, 1°C units	—
	Battery voltage	0 to 5,000 mV, 1 mV units	—
	Clock	24-hour display, 1 minute units	—
	Charging current	1 to 500 mA, 1 mA units	—
	Supply power current	1 to 1,500 mA, 1 mA units	—
	Other	USB BC 1.2 detection, VID, PID	—

RL78 lineup RL78/G10 (10 to 16 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series		RL78/G10	
ROM (bytes)	Pin count	10-pin	16-pin
	512 K		
384 K			
256 K			
192 K			
128 K			
96 K			
64 K			
48 K			
32 K			
24 K			
16 K			
8 K			
4 K		R5F10Y17ASP*1 (512/—)	R5F10Y47ASP*1 (512/—)
2 K		R5F10Y16ASP*1 (256/—)	R5F10Y46ASP*1 (256/—)
1 K		R5F10Y14ASP*1 (128/—)	R5F10Y44ASP*1 (128/—)
Package		10-pin LSSOP SP thickness: 1.45 mm 4.4 × 3.6 mm Pitch: 0.65 mm 	16-pin SSOP SP thickness: 1.725 mm 4.4 × 5.0 mm Pitch: 0.65 mm

Note: 1. D version for industrial applications with operating temperature range of -40 to +85°C also available.

RL78 lineup RL78/G12 (20 to 30 pins)

Series		RL78/G12					
ROM (bytes)	Pin count	20-pin	24-pin	30-pin			
	512 K						
384 K							
256 K							
192 K							
128 K							
96 K							
64 K							
48 K							
32 K							
16 K		R5F1036AASP*1 (1.5 K/—)	R5F1026AASP*1 (1.5 K/2 K)	R5F1037AANA*1 (1.5 K/—)	R5F1027AANA*1 (1.5 K/2 K)	R5F103AAASP*1 (2 K/—)	R5F102AAASP*1 (2 K/2 K)
12 K		R5F10369ASP*1 (1 K/—)	R5F10269ASP*1 (1 K/2 K)	R5F10379ANA*1 (1 K/—)	R5F10279ANA*1 (1 K/2 K)	R5F103A9ASP*1 (1 K/—)	R5F102A9ASP*1 (1 K/2 K)
8 K		R5F10368ASP*1 (768/—)	R5F10268ASP*1 (768/2 K)	R5F10378ANA*1 (768/—)	R5F10278ANA*1 (768/2 K)	R5F103A8ASP*1 (768/—)	R5F102A8ASP*1 (768/2 K)
4 K		R5F10367ASP*1 (512/—)	R5F10267ASP*1 (512/2 K)	R5F10377ANA*1 (512/—)	R5F10277ANA*1 (512/2 K)	R5F103A7ASP*1 (512/—)	R5F102A7ASP*1 (512/2 K)
2 K		R5F10366ASP*1 (256/—)	R5F10266ASP*1 (256/2 K)				
1 K							
Package		20-pin LSSOP SP thickness: 1.45 mm 4.4 × 6.5 mm Pitch: 0.65 mm 	24-pin HWQFN NA thickness: 0.80 mm 4 × 4 mm Pitch: 0.50 mm 	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 			

Note: 1. D version for industrial applications with operating temperature range of -40 to +85°C and G version (products with data flash only) for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup
RL78/G13 (20 to 48 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G13										
	Pin count	20-pin	24-pin	25-pin	30-pin	32-pin	36-pin	40-pin	44-pin	48-pin	
512 K									R5F100FLAFP (32 K/8 K)*2 R5F101FLAFP (32 K/—)*2	R5F100GLAFB (32 K/8 K)*2 R5F101GLAFB (32 K/—)*2	R5F100GLANA (32 K/8 K)*2 R5F101GLANA (32 K/—)*2
384 K									R5F100FKAFP (24 K/8 K)*2 R5F101FKAFP (24 K/—)*2	R5F100GKAFB (24 K/8 K)*2 R5F101GKAFB (24 K/—)*2	R5F100GKANA (24 K/8 K)*2 R5F101GKANA (24 K/—)*2
256 K									R5F100FJAFP (20 K/8 K)*1 R5F101FJAFP (20 K/—)*1	R5F100GJAFB (20 K/8 K)*1 R5F101GJAFB (20 K/—)*1	R5F100GJANA (20 K/8 K)*1 R5F101GJANA (20 K/—)*1
192 K								R5F100EHANA (16 K/8 K)*1 R5F101EHANA (16 K/—)*1	R5F100FHAFP (16 K/8 K)*1 R5F101FHAFP (16 K/—)*1	R5F100GHAFB (16 K/8 K)*1 R5F101GHAFB (16 K/—)*1	R5F100GHANA (16 K/8 K)*1 R5F101GHANA (16 K/—)*1
128 K				R5F100AGASP (12 K/8 K)*1 R5F101AGASP (12 K/—)*1	R5F100BGANA (12 K/8 K)*1 R5F101BGANA (12 K/—)*1	R5F100CGALA (12 K/8 K)*3 R5F101CGALA (12 K/—)*3	R5F100EGANA (12 K/8 K)*1 R5F101EGANA (12 K/—)*1	R5F100FGAFP (12 K/8 K)*1 R5F101FGAFP (12 K/—)*1	R5F100GGAFB (12 K/8 K)*1 R5F101GGAFB (12 K/—)*1	R5F100GGANA (12 K/8 K)*1 R5F101GGANA (12 K/—)*1	
96 K				R5F100AFASP (8 K/8 K)*1 R5F101AFASP (8 K/—)*1	R5F100BFANA (8 K/8 K)*1 R5F101BFANA (8 K/—)*1	R5F100CFALA (8 K/8 K)*3 R5F101CFALA (8 K/—)*3	R5F100EFANA (8 K/8 K)*1 R5F101EFANA (8 K/—)*1	R5F100FFAFP (8 K/8 K)*1 R5F101FFAFP (8 K/—)*1	R5F100GFAFB (8 K/8 K)*1 R5F101GFAFB (8 K/—)*1	R5F100GFANA (8 K/8 K)*1 R5F101GFANA (8 K/—)*1	
64 K	R5F1006EASP (4 K/4 K)*1 R5F1016EASP (4 K/—)*1	R5F1007EANA (4 K/4 K)*1 R5F1017EANA (4 K/—)*1	R5F1008EALA (4 K/4 K)*3 R5F1018EALA (4 K/—)*3	R5F100AEASP (4 K/4 K)*1 R5F101AEASP (4 K/—)*1	R5F100BEANA (4 K/4 K)*1 R5F101BEANA (4 K/—)*1	R5F100CEALA (4 K/4 K)*3 R5F101CEALA (4 K/—)*3	R5F100EEANA (4 K/4 K)*1 R5F101EEANA (4 K/—)*1	R5F100FEAFP (4 K/4 K)*1 R5F101FEAFP (4 K/—)*1	R5F100GEAFB (4 K/4 K)*1 R5F101GEAFB (4 K/—)*1	R5F100GEANA (4 K/4 K)*1 R5F101GEANA (4 K/—)*1	
48 K	R5F1006DASP (3 K/4 K)*1 R5F1016DASP (3 K/—)*1	R5F1007DANA (3 K/4 K)*1 R5F1017DANA (3 K/—)*1	R5F1008DALA (3 K/4 K)*3 R5F1018DALA (3 K/—)*3	R5F100ADASP (3 K/4 K)*1 R5F101ADASP (3 K/—)*1	R5F100BDANA (3 K/4 K)*1 R5F101BDANA (3 K/—)*1	R5F100CDALA (3 K/4 K)*3 R5F101CDALA (3 K/—)*3	R5F100EDANA (3 K/4 K)*1 R5F101EDANA (3 K/—)*1	R5F100FDAFP (3 K/4 K)*1 R5F101FDAFP (3 K/—)*1	R5F100GDAFB (3 K/4 K)*1 R5F101GDAFB (3 K/—)*1	R5F100GDANA (3 K/4 K)*1 R5F101GDANA (3 K/—)*1	
32 K	R5F1006CASP (2 K/4 K)*1 R5F1016CASP (2 K/—)*1	R5F1007CANA (2 K/4 K)*1 R5F1017CANA (2 K/—)*1	R5F1008CALA (2 K/4 K)*3 R5F1018CALA (2 K/—)*3	R5F100ACASP (2 K/4 K)*1 R5F101ACASP (2 K/—)*1	R5F100BCANA (2 K/4 K)*1 R5F101BCANA (2 K/—)*1	R5F100CCALA (2 K/4 K)*3 R5F101CCALA (2 K/—)*3	R5F100ECANA (2 K/4 K)*1 R5F101ECANA (2 K/—)*1	R5F100FCAFP (2 K/4 K)*1 R5F101FCAFP (2 K/—)*1	R5F100GCAFB (2 K/4 K)*1 R5F101GCAFB (2 K/—)*1	R5F100GCANA (2 K/4 K)*1 R5F101GCANA (2 K/—)*1	
16 K	R5F1006AASP (2 K/4 K)*1 R5F1016AASP (2 K/—)*1	R5F1007AANA (2 K/4 K)*1 R5F1017AANA (2 K/—)*1	R5F1008AALA (2 K/4 K)*3 R5F1018AALA (2 K/—)*3	R5F100AAASP (2 K/4 K)*1 R5F101AAASP (2 K/—)*1	R5F100BAANA (2 K/4 K)*1 R5F101BAANA (2 K/—)*1	R5F100CAALA (2 K/4 K)*3 R5F101CAALA (2 K/—)*3	R5F100EAANA (2 K/4 K)*1 R5F101EAANA (2 K/—)*1	R5F100FAAFP (2 K/4 K)*1 R5F101FAAFP (2 K/—)*1	R5F100GAAFB (2 K/4 K)*1 R5F101GAAFB (2 K/—)*1	R5F100GAANA (2 K/4 K)*1 R5F101GAANA (2 K/—)*1	
12 K											
8 K											
4 K											
2 K											
1 K											
Package	20-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	24-pin HWQFN NA thickness: 0.80 mm 4 × 4 mm Pitch: 0.50 mm 	25-pin WFLGA LA thickness: 0.76 mm 3 × 3 mm Pitch: 0.50 mm 	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	32-pin HWQFN NA thickness: 0.80 mm 5 × 5 mm Pitch: 0.50 mm 	36-pin WFLGA LA thickness: 0.76 mm 4 × 4 mm Pitch: 0.50 mm 	40-pin HWQFN NA thickness: 0.80 mm 6 × 6 mm Pitch: 0.50 mm 	44-pin LQFP FP thickness: 1.60 mm 10 × 10 mm Pitch: 0.80 mm 	48-pin LFQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm 	48-pin HWQFN NA thickness: 0.80 mm 7 × 7 mm Pitch: 0.50 mm 	

Notes: 1. D version for industrial applications with operating temperature range of -40 to +85°C and G version for industrial applications with operating temperature range of -40 to +105°C also available.
2. D version for industrial applications with operating temperature range of -40 to +85°C also available.
3. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup
RL78/G13 (52 to 128 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series		RL78/G13									
ROM (bytes)	Pin count	52-pin			64-pin		80-pin		100-pin		128-pin
	512 K	R5F100JLAFA (32 K/8 K)*2 R5F101JLAFA (32 K/—)*2	R5F100LLAFB (32 K/8 K)*2 R5F101LLAFB (32 K/—)*2	R5F100LLAFA (32 K/8 K)*2 R5F101LLAFA (32 K/—)*2		R5F100MLAFB (32 K/8 K)*2 R5F101MLAFB (32 K/—)*2	R5F100MLAFA (32 K/8 K)*2 R5F101MLAFA (32 K/—)*2	R5F100PLAFB (32 K/8 K)*2 R5F101PLAFB (32 K/—)*2	R5F100PLAFA (32 K/8 K)*2 R5F101PLAFA (32 K/—)*2	R5F100SLAFB (32 K/8 K)*2 R5F101SLAFB (32 K/—)*2	
384 K	R5F100JKAFB (24 K/8 K)*2 R5F101JKAFB (24 K/—)*2	R5F100LKAFA (24 K/8 K)*2 R5F101LKAFA (24 K/—)*2	R5F100LKAFB (24 K/8 K)*2 R5F101LKAFB (24 K/—)*2		R5F100MKAFB (24 K/8 K)*2 R5F101MKAFB (24 K/—)*2	R5F100MKAFB (24 K/8 K)*2 R5F101MKAFB (24 K/—)*2	R5F100PKAFB (24 K/8 K)*2 R5F101PKAFB (24 K/—)*2	R5F100PKAFA (24 K/8 K)*2 R5F101PKAFA (24 K/—)*2	R5F100SKAFB (24 K/8 K)*2 R5F101SKAFB (24 K/—)*2		
256 K	R5F100JJAFB (20 K/8 K)*1 R5F101JJAFB (20 K/—)*1	R5F100LJAFB (20 K/8 K)*1 R5F101LJAFB (20 K/—)*1	R5F100LJAFB (20 K/8 K)*1 R5F101LJAFB (20 K/—)*1	R5F100LJABG (20 K/8 K)*3 R5F101LJABG (20 K/—)*3	R5F100MJAFB (20 K/8 K)*1 R5F101MJAFB (20 K/—)*1	R5F100MJAFB (20 K/8 K)*1 R5F101MJAFB (20 K/—)*1	R5F100PJAFB (20 K/8 K)*1 R5F101PJAFB (20 K/—)*1	R5F100PJAFB (20 K/8 K)*1 R5F101PJAFB (20 K/—)*1	R5F100SJAFB (20 K/8 K)*2 R5F101SJAFB (20 K/—)*2		
192 K	R5F100JHAFB (16 K/8 K)*1 R5F101JHAFB (16 K/—)*1	R5F100LHAFB (16 K/8 K)*1 R5F101LHAFB (16 K/—)*1	R5F100LHAFB (16 K/8 K)*1 R5F101LHAFB (16 K/—)*1	R5F100LHABG (16 K/8 K)*3 R5F101LHABG (16 K/—)*3	R5F100MHAFB (16 K/8 K)*1 R5F101MHAFB (16 K/—)*1	R5F100MHAFB (16 K/8 K)*1 R5F101MHAFB (16 K/—)*1	R5F100PHAFB (16 K/8 K)*1 R5F101PHAFB (16 K/—)*1	R5F100PHAFB (16 K/8 K)*1 R5F101PHAFB (16 K/—)*1	R5F100SHAFB (16 K/8 K)*2 R5F101SHAFB (16 K/—)*2		
128 K	R5F100JGAFB (12 K/8 K)*1 R5F101JGAFB (12 K/—)*1	R5F100LGAFB (12 K/8 K)*1 R5F101LGAFB (12 K/—)*1	R5F100LGAFB (12 K/8 K)*1 R5F101LGAFB (12 K/—)*1	R5F100LGABG (12 K/8 K)*3 R5F101LGABG (12 K/—)*3	R5F100MGAFB (12 K/8 K)*1 R5F101MGAFB (12 K/—)*1	R5F100MGAFB (12 K/8 K)*1 R5F101MGAFB (12 K/—)*1	R5F100PGAFB (12 K/8 K)*1 R5F101PGAFB (12 K/—)*1	R5F100PGAFB (12 K/8 K)*1 R5F101PGAFB (12 K/—)*1	R5F100PGAFB (12 K/8 K)*1 R5F101PGAFB (12 K/—)*1		
96 K	R5F100JFAFA (8 K/8 K)*1 R5F101JFAFA (8 K/—)*1	R5F100LFAFB (8 K/8 K)*1 R5F101LFAFB (8 K/—)*1	R5F100LFAFA (8 K/8 K)*1 R5F101LFAFA (8 K/—)*1	R5F100LFABG (8 K/8 K)*3 R5F101LFABG (8 K/—)*3	R5F100MFAFB (8 K/8 K)*1 R5F101MFAFB (8 K/—)*1	R5F100MFAFA (8 K/8 K)*1 R5F101MFAFA (8 K/—)*1	R5F100PFAFB (8 K/8 K)*1 R5F101PFAFB (8 K/—)*1	R5F100PFAFA (8 K/8 K)*1 R5F101PFAFA (8 K/—)*1	R5F100PFAFB (8 K/8 K)*1 R5F101PFAFB (8 K/—)*1		
64 K	R5F100JEAFB (4 K/4 K)*1 R5F101JEAFB (4 K/—)*1	R5F100LEAFB (4 K/4 K)*1 R5F101LEAFB (4 K/—)*1	R5F100LEAFB (4 K/4 K)*1 R5F101LEAFB (4 K/—)*1	R5F100LEABG (4 K/4 K)*3 R5F101LEABG (4 K/—)*3							
48 K	R5F100JDAFA (3 K/4 K)*1 R5F101JDAFA (3 K/—)*1	R5F100LDAFB (3 K/4 K)*1 R5F101LDAFB (3 K/—)*1	R5F100LDAFA (3 K/4 K)*1 R5F101LDAFA (3 K/—)*1	R5F100LDABG (3 K/4 K)*3 R5F101LDABG (3 K/—)*3							
32 K	R5F100JCAFA (2 K/4 K)*1 R5F101JCAFA (2 K/—)*1	R5F100LCAFB (2 K/4 K)*1 R5F101LCAFB (2 K/—)*1	R5F100LCAFA (2 K/4 K)*1 R5F101LCAFA (2 K/—)*1	R5F100LCABG (2 K/4 K)*3 R5F101LCABG (2 K/—)*3							
16 K											
12 K											
8 K											
4 K											
2 K											
1 K											
Package	52-pin LQFP FA thickness: 1.70 mm 10 × 10 mm Pitch: 0.65 mm 	64-pin LQFP FB thickness: 1.60 mm 10 × 10 mm Pitch: 0.50 mm 	64-pin LQFP FA thickness: 1.60 mm 12 × 12 mm Pitch: 0.65 mm 	64-pin VFBGA BG thickness: 0.99 mm 4 × 4 mm Pitch: 0.40 mm 	80-pin LQFP FB thickness: 1.60 mm 12 × 12 mm Pitch: 0.50 mm 	80-pin LQFP FA thickness: 1.70 mm 14 × 14 mm Pitch: 0.65 mm 	100-pin LQFP FB thickness: 1.60 mm 14 × 14 mm Pitch: 0.50 mm 	100-pin LQFP FA thickness: 1.60 mm 14 × 20 mm Pitch: 0.65 mm 	128-pin LQFP FB thickness: 1.60 mm 14 × 20 mm Pitch: 0.50 mm 		

Notes: 1. D version for industrial applications with operating temperature range of -40 to +85°C and G version for industrial applications with operating temperature range of -40 to +105°C also available.
2. D version for industrial applications with operating temperature range of -40 to +85°C also available.
3. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup
RL78/G14 (30 to 100 pins)

R5F104AGASP — Top: Product name
 (16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G14																		
	Pin count	30-pin		32-pin		36-pin	40-pin	44-pin	48-pin		52-pin	64-pin			80-pin		100-pin		
ROM (bytes)																			
512 K									R5F104GLAFB*2 (48 K/8 K)	R5F104GLANA*2 (48 K/8 K)		R5F104LLAFB*2 (48 K/8 K)	R5F104LLAFA*2 (48 K/8 K)		R5F104LLALA*2 (48 K/8 K)	R5F104MLAFB*2 (48 K/8 K)	R5F104MLAFA*2 (48 K/8 K)	R5F104PLAFB*2 (48 K/8 K)	R5F104PLAFA*2 (48 K/8 K)
384 K									R5F104GKAFB*2 (32 K/8 K)	R5F104GKANA*2 (32 K/8 K)		R5F104LKAFB*2 (32 K/8 K)	R5F104LKafa*2 (32 K/8 K)		R5F104LKALA*2 (32 K/8 K)	R5F104MKAFB*2 (32 K/8 K)	R5F104MKafa*2 (32 K/8 K)	R5F104PKAFB*2 (32 K/8 K)	R5F104PKafa*2 (32 K/8 K)
256 K								R5F104FJAFP*1 (24 K/8 K)	R5F104GJAFB*1 (24 K/8 K)	R5F104GJANA*1 (24 K/8 K)	R5F104JJafa*1 (24 K/8 K)	R5F104LJAFB*1 (24 K/8 K)	R5F104LJafa*1 (24 K/8 K)	R5F104LJAFP*1 (24 K/8 K)	R5F104LJALA*2 (24 K/8 K)	R5F104MJAFB*1 (24 K/8 K)	R5F104MJafa*1 (24 K/8 K)	R5F104PJAFB*1 (24 K/8 K)	R5F104PJafa*1 (24 K/8 K)
192 K					R5F104EHANA*1 (20 K/8 K)	R5F104FHAFP*1 (20 K/8 K)	R5F104GHAFB*1 (20 K/8 K)	R5F104GHANA*1 (20 K/8 K)	R5F104JHafa*1 (20 K/8 K)	R5F104LHAFB*1 (20 K/8 K)	R5F104LHafa*1 (20 K/8 K)	R5F104LHAFP*1 (20 K/8 K)	R5F104LHALA*2 (20 K/8 K)	R5F104MHAFB*1 (20 K/8 K)	R5F104MHafa*1 (20 K/8 K)	R5F104PHAFB*1 (20 K/8 K)	R5F104PHafa*1 (20 K/8 K)		
128 K	R5F104AGASP*1 (16 K/8 K)	R5F104BGANA*1 (16 K/8 K)	R5F104BGAFP*1 (16 K/8 K)	R5F104CGALA*2 (16 K/8 K)	R5F104EGANA*1 (16 K/8 K)	R5F104FGAFP*1 (16 K/8 K)	R5F104GGAFB*1 (16 K/8 K)	R5F104GGANA*1 (16 K/8 K)	R5F104JGafa*1 (16 K/8 K)	R5F104LGAFB*1 (16 K/8 K)	R5F104LGafa*1 (16 K/8 K)	R5F104LGAFP*1 (16 K/8 K)	R5F104LGALA*2 (16 K/8 K)	R5F104MGAFB*1 (16 K/8 K)	R5F104MGafa*1 (16 K/8 K)	R5F104PGAFB*1 (16 K/8 K)	R5F104PGafa*1 (16 K/8 K)		
96 K	R5F104AFASP*1 (12 K/8 K)	R5F104BFANA*1 (12 K/8 K)	R5F104BFAFP*1 (12 K/8 K)	R5F104CFALA*2 (12 K/8 K)	R5F104EFANA*1 (12 K/8 K)	R5F104FFAFP*1 (12 K/8 K)	R5F104GFAFB*1 (12 K/8 K)	R5F104GFANA*1 (12 K/8 K)	R5F104JFafa*1 (12 K/8 K)	R5F104LFAFB*1 (12 K/8 K)	R5F104LFafa*1 (12 K/8 K)	R5F104LFAFP*1 (12 K/8 K)	R5F104LFALA*2 (12 K/8 K)	R5F104MFAFB*1 (12 K/8 K)	R5F104MFafa*1 (12 K/8 K)	R5F104PFAFB*1 (12 K/8 K)	R5F104PFafa*1 (12 K/8 K)		
64 K	R5F104AEASP*1 (5.5 K/4 K)	R5F104BEANA*1 (5.5 K/4 K)	R5F104BEAFP*1 (5.5 K/4 K)	R5F104CEALA*2 (5.5 K/4 K)	R5F104EEANA*1 (5.5 K/4 K)	R5F104FEAFP*1 (5.5 K/4 K)	R5F104GEAFB*1 (5.5 K/4 K)	R5F104GEANA*1 (5.5 K/4 K)	R5F104JEafa*1 (5.5 K/4 K)	R5F104LEAFB*1 (5.5 K/4 K)	R5F104LEafa*1 (5.5 K/4 K)	R5F104LEAFP*1 (5.5 K/4 K)	R5F104LEALA*2 (5.5 K/4 K)						
48 K	R5F104ADASP*1 (5.5 K/4 K)	R5F104BDANA*1 (5.5 K/4 K)	R5F104BDAFP*1 (5.5 K/4 K)	R5F104CDALA*2 (5.5 K/4 K)	R5F104EDANA*1 (5.5 K/4 K)	R5F104FDAFP*1 (5.5 K/4 K)	R5F104GDAFB*1 (5.5 K/4 K)	R5F104GDANA*1 (5.5 K/4 K)	R5F104JDafa*1 (5.5 K/4 K)	R5F104LDAFB*1 (5.5 K/4 K)	R5F104LDafa*1 (5.5 K/4 K)	R5F104LDAFP*1 (5.5 K/4 K)	R5F104LDALA*2 (5.5 K/4 K)						
32 K	R5F104ACASP*1 (4 K/4 K)	R5F104BCANA*1 (4 K/4 K)	R5F104BCAFP*1 (4 K/4 K)	R5F104CCALA*2 (4 K/4 K)	R5F104ECANA*1 (4 K/4 K)	R5F104FCAFP*1 (4 K/4 K)	R5F104GCAFB*1 (4 K/4 K)	R5F104GCANA*1 (4 K/4 K)	R5F104JCAafa*1 (4 K/4 K)	R5F104LCAFB*1 (4 K/4 K)	R5F104LCAafa*1 (4 K/4 K)	R5F104LCAFP*1 (4 K/4 K)	R5F104LCALA*2 (4 K/4 K)						
16 K	R5F104AAASP*1 (2.5 K/4 K)	R5F104BAANA*1 (2.5 K/4 K)	R5F104BAAFP*1 (2.5 K/4 K)	R5F104CAALA*2 (2.5 K/4 K)	R5F104EAANA*1 (2.5 K/4 K)	R5F104FAAFP*1 (2.5 K/4 K)	R5F104GAAFB*1 (2.5 K/4 K)	R5F104GAANA*1 (2.5 K/4 K)											
12 K																			
8 K																			
4 K																			
2 K																			
1 K																			
Package	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	32-pin HWQFN NA thickness: 0.80 mm 5 x 5 mm Pitch: 0.50 mm 	32-pin LQFP FP thickness: 1.70 mm 7 x 7 mm Pitch: 0.80 mm 	36-pin WFLGA LA thickness: 0.76 mm 4 x 4 mm Pitch: 0.50 mm 	40-pin HWQFN NA thickness: 0.80 mm 6 x 6 mm Pitch: 0.50 mm 	44-pin LQFP FP thickness: 1.60 mm 10 x 10 mm Pitch: 0.80 mm 	48-pin LFQFP FB thickness: 1.60 mm*3 7 x 7 mm Pitch: 0.50 mm 	48-pin HWQFN NA thickness: 0.80 mm 7 x 7 mm Pitch: 0.50 mm 	52-pin LQFP FA thickness: 1.70 mm 10 x 10 mm Pitch: 0.65 mm 	64-pin LFQFP FB thickness: 1.60 mm*3 10 x 10 mm Pitch: 0.50 mm 	64-pin LQFP FA thickness: 1.60 mm 12 x 12 mm Pitch: 0.65 mm 	64-pin LQFP FP thickness: 1.70 mm 14 x 14 mm Pitch: 0.80 mm 	64-pin WFLGA LA thickness: 0.76 mm 5 x 5 mm Pitch: 0.50 mm 	80-pin LFQFP FB thickness: 1.60 mm*3 12 x 12 mm Pitch: 0.50 mm 	80-pin LQFP FA thickness: 1.70 mm 14 x 14 mm Pitch: 0.65 mm 	100-pin LFQFP FB thickness: 1.60 mm*3 14 x 14 mm Pitch: 0.50 mm 	100-pin LQFP FA thickness: 1.60 mm 14 x 20 mm Pitch: 0.65 mm 		

Notes: 1. D version for industrial applications with operating temperature range of -40 to +85°C and G version for industrial applications with operating temperature range of -40 to +105°C also available.
 2. G version for industrial applications with operating temperature range of -40 to +105°C also available.
 3. Products with 384 KB or 512 KB of ROM are 1.70 mm thick.

RL78 lineup RL78/G1A (25 to 64 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G1A					
	Pin count		48-pin		64-pin	
ROM (bytes)	25-pin	32-pin	48-pin		64-pin	
512 K						
384 K						
256 K						
192 K						
128 K						
96 K						
64 K	R5F10E8EALA* ¹ (4 K/4 K)	R5F10E8EANA* ¹ (4 K/4 K)	R5F10EGEAFB* ¹ (4 K/4 K)	R5F10EGEANA* ¹ (4 K/4 K)	R5F10ELEAFB* ¹ (4 K/4 K)	R5F10ELEABG* ¹ (4 K/4 K)
48 K	R5F10E8DALA* ¹ (3 K/4 K)	R5F10EBDANA* ¹ (3 K/4 K)	R5F10EGDAFB* ¹ (3 K/4 K)	R5F10EGDANA* ¹ (3 K/4 K)	R5F10ELDAFB* ¹ (3 K/4 K)	R5F10ELDABG* ¹ (3 K/4 K)
32 K	R5F10E8CALA* ¹ (2 K/4 K)	R5F10EBCANA* ¹ (2 K/4 K)	R5F10EGCAF* ¹ (2 K/4 K)	R5F10EGCANA* ¹ (2 K/4 K)	R5F10ELCAF* ¹ (2 K/4 K)	R5F10ELCABG* ¹ (2 K/4 K)
16 K	R5F10E8AALA* ¹ (2 K/4 K)	R5F10E8AANA* ¹ (2 K/4 K)	R5F10E8AAB* ¹ (2 K/4 K)	R5F10E8AANA* ¹ (2 K/4 K)		
12 K						
8 K						
4 K						
2 K						
1 K						
Package	25-pin WFLGA LA thickness: 0.76 mm 3 × 3 mm Pitch: 0.50 mm	32-pin HWQFN NA thickness: 0.80 mm 5 × 5 mm Pitch: 0.50 mm	48-pin LQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm	48-pin HWQFN NA thickness: 0.80 mm 7 × 7 mm Pitch: 0.50 mm	64-pin LQFP FB thickness: 1.60 mm 10 × 10 mm Pitch: 0.50 mm	64-pin VFPGA BG thickness: 0.99 mm 4 × 4 mm Pitch: 0.40 mm

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup RL78/G1C (32 to 48 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G1C							
	Pin count				48-pin			
ROM (bytes)	32-pin				48-pin			
512 K								
384 K								
256 K								
192 K								
128 K								
96 K								
64 K								
48 K								
32 K	R5F10JBCANA* ¹ (5.5 K/2 K) Host/Function	R5F10JBCAFP* ¹ (5.5 K/2 K) Host/Function	R5F10 KBCANA* ¹ (5.5 K/2 K) Function only	R5F10 KBCAFP* ¹ (5.5 K/2 K) Function only	R5F10JGCANA* ¹ (5.5 K/2 K) Host/Function	R5F10JGCABF* ¹ (5.5 K/2 K) Host/Function	R5F10 KGCANA* ¹ (5.5 K/2 K) Function only	R5F10 KGCABF* ¹ (5.5 K/2 K) Function only
24 K								
16 K								
8 K								
4 K								
2 K								
1 K								
Package	32-pin HWQFN NA thickness: 0.80 mm 5 × 5 mm Pitch: 0.50 mm	32-pin LQFP FP thickness: 1.70 mm 7 × 7 mm Pitch: 0.80 mm	32-pin HWQFN NA thickness: 0.80 mm 5 × 5 mm Pitch: 0.50 mm	32-pin LQFP FP thickness: 1.70 mm 7 × 7 mm Pitch: 0.80 mm	48-pin HWQFN NA thickness: 0.80 mm 7 × 7 mm Pitch: 0.50 mm	48-pin LQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm	48-pin HWQFN NA thickness: 0.80 mm 7 × 7 mm Pitch: 0.50 mm	48-pin LQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup RL78/G1D (48 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G1D	
Pin count	48-pin	
ROM (bytes)		
512 K		
384 K		
256 K	R5F11AGJANB*1 (20 K/8 K)	
192 K	R5F11AGHANB*1 (16 K/8 K)	
128 K	R5F11AGGANB*1 (12 K/8 K)	
96 K		
64 K		
48 K		
32 K		
16 K		
12 K		
8 K		
4 K		
2 K		
1 K		
Package	48-pin HWQFN NA thickness: 0.80 mm 6 × 6 mm Pitch: 0.40 mm 	

Note: 1. D version for industrial applications with operating temperature range of -40 to +85°C also available.

RL78 lineup RL78/G1E (64 to 80 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G1E	
Pin count	64-pin	80-pin
ROM (bytes)		
512 K		
384 K		
256 K		
192 K		
128 K		
96 K		
64 K	R5F10FLEANA*1 (4 K/4 K)	R5F10FMEAFB*1 (4 K/4 K)
48 K	R5F10FLDANA*1 (3 K/4 K)	R5F10FMDAFB*1 (3 K/4 K)
32 K	R5F10FLCANA*1 (2 K/4 K)	R5F10FMCAFB*1 (2 K/4 K)
16 K		
12 K		
8 K		
4 K		
2 K		
1 K		
Package	64-pin HWQFN NA thickness: 0.80 mm 9 × 9 mm Pitch: 0.50 mm 	80-pin LFQFP FB thickness: 1.60 mm 12 × 12 mm Pitch: 0.50 mm 

Note: 1. D version for industrial applications with operating temperature range of -40 to +85°C also available.

RL78 lineup RL78/G1F (24 to 64 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G1F					
	Pin count	24-pin	32-pin	36-pin	48-pin	64-pin
ROM (bytes)						
512 K						
384 K						
256 K						
192 K						
128 K						
96 K						
64 K	R5F11B7EANA*1 (5.5 K/4 K)	R5F11BBEAFP*1 (5.5 K/4 K)	R5F11BCEALA*1 (5.5 K/4 K)	R5F11BGEAFB*1 (5.5 K/4 K)	R5F11BLEAFB*1 (5.5 K/4 K)	
48 K						
32 K	R5F11B7CANA*1 (5.5 K/4 K)	R5F11BBCAFP*1 (5.5 K/4 K)	R5F11BCCALA*1 (5.5 K/4 K)	R5F11BGCAF*1 (5.5 K/4 K)	R5F11BLCAF*1 (5.5 K/4 K)	
16 K						
12 K						
8 K						
4 K						
2 K						
1 K						
Package	24-pin HWQFN NA thickness: 0.80 mm 4 × 4 mm Pitch: 0.50 mm 	32-pin LQFP FP thickness: 1.70 mm 7 × 7 mm Pitch: 0.80 mm 	36-pin WFLGA LA thickness: 0.76 mm 4 × 4 mm Pitch: 0.50 mm 	48-pin LFQFP FB thickness: 1.70 mm 7 × 7 mm Pitch: 0.50 mm 	64-pin LFQFP FB thickness: 1.70 mm 10 × 10 mm Pitch: 0.50 mm 	

RL78 lineup RL78/G1G (30 to 44 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/G1G			
	Pin count	30-pin	32-pin	44-pin
ROM (bytes)				
512 K				
384 K				
256 K				
192 K				
128 K				
96 K				
64 K				
48 K				
32 K				
16 K	R5F11EAAAASP (1.5 K/—)	R5F11EBAAFP (1.5 K/—)	R5F11EFAAFP (1.5 K/—)	
12 K				
8 K	R5F11EA8ASP (1.5 K/—)	R5F11EB8AFP (1.5 K/—)	R5F11EF8AFP (1.5 K/—)	
4 K				
2 K				
1 K				
Package	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	32-pin LQFP FP thickness: 1.70 mm 7 × 7 mm Pitch: 0.80 mm 	44-pin LQFP FP thickness: 1.60 mm 10 × 10 mm Pitch: 0.80 mm 	

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup RL78/I1A (20 to 38 pins)

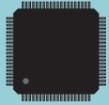
R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/I1A			
	Pin count	20-pin	30-pin	38-pin
ROM (bytes)				
512 K				
384 K				
256 K				
192 K				
128 K				
96 K				
64 K		R5F107AEGSP*1 R5F107AEMSP*2 (4 K/4 K)	R5F107DEGSP*1 R5F107DEMSP*2 (4 K/4 K)	
48 K				
32 K	R5F1076CGSP*1 R5F1076CMSP*2 (2 K/4 K)	R5F107ACGSP*1 R5F107ACMSP*2 (2 K/4 K)		
16 K				
12 K				
8 K				
4 K				
2 K				
1 K				
Package	20-pin LSSOP SP thickness: 1.45 mm 4.4 × 6.5 mm Pitch: 0.65 mm 	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	38-pin SSOP SP thickness: 2.00 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	

Notes: 1. Operating temperature range: -40 to +105°C
2. Operating temperature range: -40 to +125°C

RL78 lineup RL78/I1B (80 to 100 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/I1B		
	Pin count	80-pin	100-pin
ROM (bytes)			
512 K			
384 K			
256 K			
192 K			
128 K	R5F10MMGDFB (8 K/—)	R5F10MPGDFB (8 K/—)	
96 K			
64 K	R5F10MMEDFB (6 K/—)	R5F10MPEDFB (6 K/—)	
48 K			
32 K			
24 K			
16 K			
8 K			
4 K			
2 K			
1 K			
Package	80-pin LFQFP FB thickness: 1.70 mm 12 × 12 mm Pitch: 0.50 mm 	100-pin LFQFP FB thickness: 1.70 mm 14 × 14 mm Pitch: 0.50 mm 	

RL78 lineup RL78/I1D (20 to 48 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series		RL78/I1D					
ROM (bytes)	Pin count	20-pin	24-pin	30-pin	32-pin	48-pin	
	512 K						
384 K							
256 K							
192 K							
128 K							
96 K							
64 K							
48 K							
32 K				R5F117ACGSP (3 K/2 K)	R5F117BCGNA (3 K/2 K)	R5F117BCGFP (3 K/2 K)	R5F117GCGFB (3 K/2 K)
24 K							
16 K		R5F1176AGSP (2 K/2 K)	R5F1177AGNA (2 K/2 K)	R5F117AAGSP (2 K/2 K)	R5F117BAGNA (2 K/2 K)	R5F117BAGFP (2 K/2 K)	R5F117GAGFB (2 K/2 K)
8 K		R5F11768GSP (0.7 K/2 K)	R5F11778GNA (0.7 K/2 K)	R5F117A8GSP (0.7 K/2 K)			
4 K							
2 K							
1 K							
Package		20-pin LSSOP SP thickness: 1.45 mm 4.4 × 6.5 mm Pitch: 0.65 mm	24-pin HWQFN NA thickness: 0.80 mm 4 × 4 mm Pitch: 0.50 mm	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm	32-pin HWQFN NA thickness: 0.90 mm 5 × 5 mm Pitch: 0.50 mm	32-pin LQFP FP thickness: 1.70 mm 7 × 7 mm Pitch: 0.80 mm	48-pin LFQFP FB thickness: 1.70 mm 7 × 7 mm Pitch: 0.50 mm

RL78 lineup RL78/L12 (32 to 64 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series		RL78/L12						
ROM (bytes)	Pin count	32-pin	44-pin	48-pin	52-pin	64-pin		
	512 K							
384 K								
256 K								
192 K								
128 K								
96 K								
64 K								
48 K								
32 K		R5F10RBCAFP*1 (1.5 K/2 K)	R5F10RFCAFP*1 (1.5 K/2 K)	R5F10RGCAF*1 (1.5 K/2 K)	R5F10RJCAFA*1 (1.5 K/2 K)	R5F10RLCAF*1 (1.5 K/2 K)	R5F10RLCAFA*1 (1.5 K/2 K)	R5F10RLCANB*1 (1.5 K/2 K)
24 K								
16 K		R5F10RBAAFP*1 (1 K/2 K)	R5F10RFAAFP*1 (1 K/2 K)	R5F10RGA*1 (1 K/2 K)	R5F10RJA*1 (1 K/2 K)	R5F10RLA*1 (1 K/2 K)	R5F10RLA*1 (1 K/2 K)	R5F10RLAANB*1 (1 K/2 K)
8 K		R5F10RB8AFP*1 (1 K/2 K)	R5F10RF8AFP*1 (1 K/2 K)	R5F10RG8AFP*1 (1 K/2 K)	R5F10RJ8AFA*1 (1 K/2 K)			
4 K								
2 K								
1 K								
Package		32-pin LQFP FP thickness: 1.70 mm 7 × 7 mm Pitch: 0.80 mm	44-pin LQFP FP thickness: 1.60 mm 10 × 10 mm Pitch: 0.80 mm	48-pin LFQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm	52-pin LQFP FA thickness: 1.70 mm 10 × 10 mm Pitch: 0.65 mm	64-pin LFQFP FB thickness: 1.60 mm 10 × 10 mm Pitch: 0.50 mm	64-pin LQFP FA thickness: 1.60 mm 12 × 12 mm Pitch: 0.65 mm	64-pin HWQFN NB thickness: 0.80 mm 8 × 8 mm Pitch: 0.40 mm

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup RL78/L13 (64 to 80 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/L13			
	64-pin		80-pin	
512 K				
384 K				
256 K				
192 K				
128 K	R5F10WLGAFB*1 (8 K/4 K)	R5F10WLGAFB*1 (8 K/4 K)	R5F10WWMGAFB*1 (8 K/4 K)	R5F10WWMGAFB*1 (8 K/4 K)
96 K	R5F10WLFAB*1 (6 K/4 K)	R5F10WLFAB*1 (6 K/4 K)	R5F10WWMFAB*1 (6 K/4 K)	R5F10WWMFAB*1 (6 K/4 K)
64 K	R5F10WLEAFB*1 (4 K/4 K)	R5F10WLEAFB*1 (4 K/4 K)	R5F10WMEAFB*1 (4 K/4 K)	R5F10WMEAFB*1 (4 K/4 K)
48 K	R5F10WLDAFB*1 (2 K/4 K)	R5F10WLDAFB*1 (2 K/4 K)	R5F10WMDAFB*1 (2 K/4 K)	R5F10WMDAFB*1 (2 K/4 K)
32 K	R5F10WLCAFB*1 (1.5 K/4 K)	R5F10WLCAFB*1 (1.5 K/4 K)	R5F10WMCAB*1 (1.5 K/4 K)	R5F10WMCAB*1 (1.5 K/4 K)
24 K				
16 K	R5F10WLAAB*1 (1 K/4 K)	R5F10WLAAB*1 (1 K/4 K)	R5F10WMAAB*1 (1 K/4 K)	R5F10WMAAB*1 (1 K/4 K)
8 K				
4 K				
2 K				
1 K				
Package	64-pin LQFP FB thickness: 1.70 mm 10 × 10 mm Pitch: 0.50 mm 	64-pin LQFP FA thickness: 1.60 mm 12 × 12 mm Pitch: 0.65 mm 	80-pin LQFP FB thickness: 1.70 mm 12 × 12 mm Pitch: 0.50 mm 	80-pin LQFP FA thickness: 1.70 mm 14 × 14 mm Pitch: 0.65 mm

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup RL78/L1C (80 to 100 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/L1C (USB)			RL78/L1C (no USB)		
	80-pin	85-pin	100-pin	80-pin	85-pin	100-pin
512 K						
384 K						
256 K	R5F110MJAFB*1 (16 K/8 K)	R5F110NJALA*1 (16 K/8 K)	R5F110PJAFB*1 (16 K/8 K)	R5F111MJAFB*1 (16 K/8 K)	R5F111NJALA*1 (16 K/8 K)	R5F111PJAFB*1 (16 K/8 K)
192 K	R5F110MHAFB*1 (16 K/8 K)	R5F110NHALA*1 (16 K/8 K)	R5F110PHAFB*1 (16 K/8 K)	R5F111MHAFB*1 (16 K/8 K)	R5F111NHALA*1 (16 K/8 K)	R5F111PHAFB*1 (16 K/8 K)
128 K	R5F110MGAFB*1 (12 K/8 K)	R5F110NGALA*1 (12 K/8 K)	R5F110PGAFB*1 (12 K/8 K)	R5F111MGAFB*1 (12 K/8 K)	R5F111NGALA*1 (12 K/8 K)	R5F111PGAFB*1 (12 K/8 K)
96 K	R5F110MFAB*1 (10 K/8 K)	R5F110NFALA*1 (10 K/8 K)	R5F110PFAB*1 (10 K/8 K)	R5F111MFAB*1 (10 K/8 K)	R5F111NFALA*1 (10 K/8 K)	R5F111PFAB*1 (10 K/8 K)
64 K	R5F110MEAFB*1 (8 K/8 K)	R5F110NEALA*1 (8 K/8 K)	R5F110PEAFB*1 (8 K/8 K)	R5F111MEAFB*1 (8 K/8 K)	R5F111NEALA*1 (8 K/8 K)	R5F111PEAFB*1 (8 K/8 K)
48 K						
32 K						
24 K						
16 K						
8 K						
4 K						
2 K						
1 K						
Package	80-pin LQFP FB thickness: 1.70 mm 12 × 12 mm Pitch: 0.50 mm 	85-pin VFLGA LA thickness: 1.00 mm 7 × 7 mm Pitch: 0.65 mm 	100-pin LQFP FB thickness: 1.70 mm 14 × 14 mm Pitch: 0.50 mm 	80-pin LQFP FB thickness: 1.70 mm 12 × 12 mm Pitch: 0.50 mm 	85-pin VFLGA LA thickness: 1.00 mm 7 × 7 mm Pitch: 0.65 mm 	100-pin LQFP FB thickness: 1.70 mm 14 × 14 mm Pitch: 0.50 mm

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

Note: 1. G version for industrial applications with operating temperature range of -40 to +105°C also available.

RL78 lineup RL78/F13 (20 to 80 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/F13 (CAN&LIN)					
	30-pin	32-pin	48-pin		64-pin	80-pin
512 K						
384 K						
256 K						
192 K						
128 K	R5F10BAGLSP*1 (8 K/4 K)	R5F10BBGLNA*1 (8 K/4 K)	R5F10BGGLFB*1 (8 K/4 K)	R5F10BGGLNA*1 (8 K/4 K)	R5F10BLGLFB*1 (8 K/4 K)	R5F10BMGLFB*1 (8 K/4 K)
96 K	R5F10BAFLSP*1 (6 K/4 K)	R5F10BBFLNA*1 (6 K/4 K)	R5F10BGFLFB*1 (6 K/4 K)	R5F10BGFLNA*1 (6 K/4 K)	R5F10BLFLFB*1 (6 K/4 K)	R5F10BMFLFB*1 (6 K/4 K)
64 K	R5F10BAELSP*1 (4 K/4 K)	R5F10BBELNA*1 (4 K/4 K)	R5F10BGELFB*1 (4 K/4 K)	R5F10BGELNA*1 (4 K/4 K)	R5F10BLELFB*1 (4 K/4 K)	R5F10BMELFB*1 (4 K/4 K)
48 K	R5F10BADLSP*1 (3 K/4 K)	R5F10BBDLNA*1 (3 K/4 K)	R5F10BGDLFB*1 (3 K/4 K)	R5F10BGDLNA*1 (3 K/4 K)	R5F10BLDLFB*1 (3 K/4 K)	
32 K	R5F10BACLSP*1 (2 K/4 K)	R5F10BBCLNA*1 (2 K/4 K)	R5F10BGCLFB*1 (2 K/4 K)	R5F10BGCLNA*1 (2 K/4 K)	R5F10BLCLFB*1 (2 K/4 K)	
24 K						
16 K						
8 K						
4 K						
2 K						
1 K						
Package	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	32-pin HVQFN NA thickness: 0.90 mm 5 × 5 mm Pitch: 0.50 mm 	48-pin LQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm 	48-pin HVQFN NA thickness: 0.90 mm 7 × 7 mm Pitch: 0.50 mm 	64-pin LQFP FB thickness: 1.60 mm 10 × 10 mm Pitch: 0.50 mm 	80-pin LQFP FB thickness: 1.60 mm 12 × 12 mm Pitch: 0.50 mm

Note: 1. K version for automotive applications with operating temperature range of -40 to +125°C and Y version for automotive applications with operating temperature range of -40 to +150°C also available.

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/F13 (LIN)						
	20-pin	30-pin	32-pin	48-pin		64-pin	80-pin
512 K							
384 K							
256 K							
192 K							
128 K				R5F10AGLFB*1 (8 K/4 K)	R5F10AGLNA*1 (8 K/4 K)	R5F10ALGLFB*1 (8 K/4 K)	R5F10AMGLFB*1 (8 K/4 K)
96 K				R5F10AGLFB*1 (6 K/4 K)	R5F10AGFLNA*1 (6 K/4 K)	R5F10ALFLFB*1 (6 K/4 K)	R5F10AMFLFB*1 (6 K/4 K)
64 K	R5F10A6ELSP*1 (4 K/4 K)	R5F10AAELSP*1 (4 K/4 K)	R5F10ABELNA*1 (4 K/4 K)	R5F10AGELFB*1 (4 K/4 K)	R5F10AGELNA*1 (4 K/4 K)	R5F10ALELFB*1 (4 K/4 K)	R5F10AMELFB*1 (4 K/4 K)
48 K	R5F10A6DLSP*1 (3 K/4 K)	R5F10AADLSP*1 (3 K/4 K)	R5F10ABDLNA*1 (3 K/4 K)	R5F10AGDLFB*1 (3 K/4 K)	R5F10AGDLNA*1 (3 K/4 K)	R5F10ALDLFB*1 (3 K/4 K)	
32 K	R5F10A6CLSP*1 (2 K/4 K)	R5F10AACLSP*1 (2 K/4 K)	R5F10ABCLNA*1 (2 K/4 K)	R5F10AGCLFB*1 (2 K/4 K)	R5F10AGCLNA*1 (2 K/4 K)	R5F10ALCLFB*1 (2 K/4 K)	
24 K							
16 K	R5F10A6ALSP*1 (1 K/4 K)	R5F10AAALSP*1 (1 K/4 K)	R5F10ABALNA*1 (1 K/4 K)	R5F10AGALFB*1 (1 K/4 K)	R5F10AGALNA*1 (1 K/4 K)		
8 K							
4 K							
2 K							
1 K							
Package	20-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	32-pin HVQFN NA thickness: 0.90 mm 5 × 5 mm Pitch: 0.50 mm 	48-pin LQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm 	48-pin HVQFN NA thickness: 0.90 mm 7 × 7 mm Pitch: 0.50 mm 	64-pin LQFP FB thickness: 1.60 mm 10 × 10 mm Pitch: 0.50 mm 	80-pin LQFP FB thickness: 1.60 mm 12 × 12 mm Pitch: 0.50 mm

Note: 1. K version for automotive applications with operating temperature range of -40 to +125°C and Y version for automotive applications with operating temperature range of -40 to +150°C also available.

RL78 lineup RL78/F14 (30 to 100 pins)

R5F104AGASP — Top: Product name
(16 K/8 K) — Bottom: (RAM/Data flash (bytes))

Series	RL78/F14						
	30-pin	32-pin	48-pin		64-pin	80-pin	100-pin
512 K							
384 K							
256 K			R5F10PGJLFB*1 (20 K/8 K)	R5F10PGJLNA*1 (20 K/8 K)	R5F10PLJLFB*1 (20 K/8 K)	R5F10PMJLFB*1 (20 K/8 K)	R5F10PPJLFB*1 (20 K/8 K)
192 K			R5F10PGHLFB*1 (16 K/8 K)	R5F10PGHLNA*1 (16 K/8 K)	R5F10PLHLFB*1 (16 K/8 K)	R5F10PMHLFB*1 (16 K/8 K)	R5F10PPHLFB*1 (16 K/8 K)
128 K			R5F10PGGLFB*1 (10 K/8 K)	R5F10PGGLNA*1 (10 K/8 K)	R5F10PLGLFB*1 (10 K/8 K)	R5F10PMGLFB*1 (10 K/8 K)	R5F10PPGLFB*1 (10 K/8 K)
96 K			R5F10PGFLFB*1 (8 K/4 K)	R5F10PGFLNA*1 (8 K/4 K)	R5F10PLFLFB*1 (8 K/4 K)	R5F10PMFLFB*1 (8 K/4 K)	R5F10PPFLFB*1 (8 K/4 K)
64 K	R5F10PAELSP*1 (6 K/4 K)	R5F10PBELNA*1 (6 K/4 K)	R5F10PGLF*1 (6 K/4 K)	R5F10PGLNA*1 (6 K/4 K)	R5F10PLELFB*1 (6 K/4 K)	R5F10PMELFB*1 (6 K/4 K)	R5F10PELFB*1 (6 K/4 K)
48 K	R5F10PADLSP*1 (4 K/4 K)	R5F10PBDLNA*1 (4 K/4 K)	R5F10PGDLF*1 (4 K/4 K)	R5F10PGDLNA*1 (4 K/4 K)			
32 K							
24 K							
16 K							
8 K							
4 K							
2 K							
1 K							
Package	30-pin LSSOP SP thickness: 1.40 mm 7.62 mm (300 mil) Pitch: 0.65 mm 	32-pin HVQFN NA thickness: 0.90 mm 5 × 5 mm Pitch: 0.50 mm 	48-pin LQFP FB thickness: 1.60 mm 7 × 7 mm Pitch: 0.50 mm 	48-pin HVQFN NA thickness: 0.90 mm 7 × 7 mm Pitch: 0.50 mm 	64-pin LQFP FB thickness: 1.60 mm 10 × 10 mm Pitch: 0.50 mm 	80-pin LQFP FB thickness: 1.60 mm 12 × 12 mm Pitch: 0.50 mm 	100-pin LQFP FB thickness: 1.60 mm 14 × 14 mm Pitch: 0.50 mm

Note: 1. K version for automotive applications with operating temperature range of -40 to +125°C and Y version for automotive applications with operating temperature range of -40 to +150°C also available.

RL78 specifications RL78/G10 (10 to 16 pins)

Series	RL78/G10						
	10-pin			16-pin			
Pin count							
Product name	R5F10Y14ASP ^{1,2}	R5F10Y16ASP ^{1,2}	R5F10Y17ASP ^{1,2}	R5F10Y44ASP ^{1,2}	R5F10Y46ASP ^{1,2}	R5F10Y47ASP ^{1,2}	
CPU	RL78 CPU core						
Memory	Flash ROM [bytes]	1 K	2 K	4 K	1 K	2 K	
	Data flash [bytes]	—					
	RAM [bytes]	128	256	512	128	256	
Operating clocks	Maximum operating frequency [Hz]	20 MHz				20 MHz	
	On-chip oscillator clock	—				20 MHz	
Clock generator circuit	Crystal/ceramic oscillator [Hz]	—				1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 5 MHz (V _{DD} = 2.0 to 5.5 V) ¹	
	High-speed on-chip oscillator [Hz]	1.25 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1.25 to 5 MHz (V _{DD} = 2.0 to 5.5 V) ¹					
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.0 to 5.5 V) ¹					
	Subclock (32.768 kHz)	—					
I/O	I/O ports	8			14		
	N-channel open drain (6 V tolerance)	—					
	N-channel open drain (V _{DD} tolerance)	2			4		
Timers	16-bit timer TAU [channels]	2, PWM output × 1			4, PWM output × 3		
	Real-time clock (RTC) [channels]	—					
	Watchdog timer (WDT) [channels]	1					
	Interval timer [channels]	—			12-bit × 1		
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1			—		
	CSI × 2, UART × 1, simplified I ² C × 1	—			1		
	I ² C × 1	—			1		
DMA [channels]	—						
External interrupt pins [count]	8			10			
OCD	On-chip debugging	Yes					
Peripheral functions	8/10-bit A/D converter [channels]	4			7		
	Comparator [channels]	—			1		
	Multiplier/divider/multiply-accumulator	Multiplier (8-bit × 8-bit)					
	Other functions	Selectable power-on reset (SPOR), clock/buzzer output × 1					
Safety functions	Internal reset at illegal instruction execution ²						
Other	Power supply voltage [V]	V _{DD} = 2.0 to 5.5 V ¹					
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications, D: Industrial applications) ³					
	Package (size [mm])	10-LSSOP (4.4 × 3.6 mm)			16-SSOP (4.4 × 5.0 mm)		

Notes: 1. Selectable power-on reset (SPOR) includes a detection voltage (VSPOR), which should be within the range of 2.25 to 5.5 V.
2. An internal reset is generated when the FFH instruction code is executed. No reset occurs when an illegal instruction is executed during emulation using OCD.
3. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10YxxDxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/G12 (20 to 30 pins)

Series		RL78/G12																																
Pin count		20-pin										24-pin								30-pin														
Product name		R5F10266ASP ^{*1, *2}	R5F10267ASP ^{*1, *2}	R5F10268ASP ^{*1, *2}	R5F10269ASP ^{*1, *2}	R5F1026AASP ^{*1, *2}	R5F10366ASP ^{*1}	R5F10367ASP ^{*1}	R5F10368ASP ^{*1}	R5F10369ASP ^{*1}	R5F1036AASP ^{*1}	R5F10277AMA ^{*1, *2}	R5F10278AMA ^{*1, *2}	R5F10279AMA ^{*1, *2}	R5F1027AAMA ^{*1, *2}	R5F10377AMA ^{*1}	R5F10378AMA ^{*1}	R5F10379AMA ^{*1}	R5F1037AAMA ^{*1}	R5F102A7ASP ^{*1, *2}	R5F102A8ASP ^{*1, *2}	R5F102A9ASP ^{*1, *2}	R5F102AAASP ^{*1, *2}	R5F103A7ASP ^{*1}	R5F103A8ASP ^{*1}	R5F103A9ASP ^{*1}	R5F103AAASP ^{*1}							
CPU		RL78 CPU core																																
Memory	Flash ROM [bytes]	2 K	4 K	8 K	12 K	16 K	2 K	4 K	8 K	12 K	16 K	4 K	8 K	12 K	16 K	4 K	8 K	12 K	16 K	4 K	8 K	12 K	16 K	4 K	8 K	12 K	16 K							
	Data flash [bytes]	2 K					—					2 K				—				2 K					—									
	RAM [bytes]	256	512	768	1 K	1.5 K	256	512	768	1 K	1.5 K	512	768	1 K	1.5 K	512	768	1 K	1.5 K	512	768	1 K	2 K	512	768	1 K	2 K							
Operating clocks	Maximum operating frequency [Hz]	24 MHz																																
	On-chip oscillator clock	20 MHz																																
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V)																																
	High-speed on-chip oscillator [Hz]	1 to 24 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V)																																
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.8 to 5.5 V)																																
	Subclock (32.768 kHz)	—																																
I/O	I/O ports	18										22								26														
	N-channel open drain (6 V tolerance)	—										2								—														
	N-channel open drain (V _{DD} tolerance)	4										5								9														
Timers	16-bit timer TAU [channels]	4, PWM output × 3										—								8, PWM output × 3 (7) ^{*3}														
	Real-time clock (RTC) [channels]	—																																
	Watchdog timer (WDT) [channels]	1																																
	Interval timer [channels]	12-bit × 1																																
Serial interfaces	CSI × 1, UART × 1	—					1					—				1				—					1									
	CSI × 2, UART × 1, simplified I ² C × 2	1					—					1				—				—														
	CSI × 1, UART × 1, simplified I ² C × 1	—										—								3										—				
	I ² C × 1	—										—								1										—				
DMA [channels]	2					—					2				—				2					—										
External interrupt pins [count]	10										14								6															
OCD	On-chip debugging	Yes																																
Peripheral functions	8/10-bit A/D converter [channels]	11										—								8														
	Multiplier/divider/multiply-accumulator	Library support for										multiply/divide/multiply-accumulate operations (equipped with functional unit)								—														
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD),										clock/buzzer output × 1				Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																		
Safety functions	RAM parity error detection function, illegal memory access, detection function, frequency detection function, A/D converter test function																																	
	CRC calculation function (general-purpose), RAM guard function, SFR guard function	—					CRC calculation function (general-purpose), RAM guard function, SFR guard function				—				CRC calculation function (general-purpose), RAM guard function, SFR guard function					—														
Other	Power supply voltage [V]	V _{DD} = 1.8 to 5.5 V																																
	Operating ambient temperature [°C]	T _A = -40 to										+ 85°C (A: Consumer applications, D: Industrial applications) ^{*1}																						
	Package (size [mm])	20-LSSOP (4.4 × 6.5 mm)										24-HWQFN (4 × 4 mm)								30-LSSOP (7.62 mm (300 mil))														

Notes: A dedicated library (approx. 8.1 KB) is required to use the data flash.

1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10xxxDxx. For details, see "How to read RL78 family product numbers" on page 95.

2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10xxxGxx. For details, see "How to read RL78 family product numbers" on page 95.

3. Figures in parentheses () are when the PIOR function is used.



RL78 specifications (2/5)

RL78/G13 (36 pins to 44 pins)

Series		RL78/G13																																													
Pin count		36-pin												40-pin												44-pin																					
Product name		R5F100CAALA ^{*3}	R5F100CCALA ^{*3}	R5F100CDALA ^{*3}	R5F100CEALA ^{*3}	R5F100CFALA ^{*3}	R5F100CGALA ^{*3}	R5F101CAALA	R5F101CCALA	R5F101CDALA	R5F101CEALA	R5F101CFALA	R5F101CGALA	R5F100EAANA ^{*2,*3}	R5F100ECANA ^{*2,*3}	R5F100EDANA ^{*2,*3}	R5F100EEANA ^{*2,*3}	R5F100EFANA ^{*2,*3}	R5F100EGANA ^{*2,*3}	R5F100EHANA ^{*2,*3}	R5F101EAANA ^{*2}	R5F101ECANA ^{*2}	R5F101EDANA ^{*2}	R5F101EEANA ^{*2}	R5F101EFANA ^{*2}	R5F101EGANA ^{*2}	R5F101EHANA ^{*2}	R5F100FAAFP ^{*2,*3}	R5F100FCAFP ^{*2,*3}	R5F100FDAPP ^{*2,*3}	R5F100FEAFP ^{*2,*3}	R5F100FFAFP ^{*2,*3}	R5F100FGAFP ^{*2,*3}	R5F100FHAFP ^{*2,*3}	R5F100FJAFP ^{*2,*3}	R5F100FKAFP ^{*2}	R5F100FLAFP ^{*2}	R5F101FAAFP ^{*2}	R5F101FCAFP ^{*2}	R5F101FDAPP ^{*2}	R5F101FEAFP ^{*2}	R5F101FFAFP ^{*2}	R5F101FGAFP ^{*2}	R5F101FHAFP ^{*2}	R5F101FJAFP ^{*2}	R5F101FKAFP ^{*2}	R5F101FLAFP ^{*2}
CPU		RL78 CPU core																																													
Memory	Flash ROM [bytes]	16 K	32 K	48 K	64 K	96 K	128 K	16 K	32 K	48 K	64 K	96 K	128 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K
	Data flash [bytes]	4 K				8 K				—				4 K				8 K				—				4 K				8 K				—													
	RAM [bytes]	2 K	2 K	3 K	4 K	8 K	12 K	2 K	2 K	3 K	4 K	8 K	12 K	2 K	2 K	3 K	4 K	8 K	12 K	16 K	2 K	2 K	3 K	4 K	8 K	12 K	16 K	2 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K	2 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K
Operating clocks	Maximum operating frequency [Hz]	32 MHz																																													
	On-chip oscillator clock	32 MHz																																													
	External resonator	20 MHz																																													
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V),																1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																													
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V),																1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																													
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																																													
	Subclock (32.768 kHz)	—																32.768 KHz (V _{DD} = 1.6 to 5.5 V)																													
I/O	I/O ports	32												36												40																					
	N-channel open drain (6 V tolerance)	—												3												4																					
	N-channel open drain (V _{DD} tolerance)	—												—												10																					
Timers	16-bit timer TAU [channels]	8, PWM output × 3 (7) ^{**4}																8, PWM output × 4 (7) ^{**4}																													
	Real-time clock (RTC) [channels]	1 ^{*1}												1																																	
	Watchdog timer (WDT) [channels]	1																																													
	Interval timer [channels]	12-bit × 1																																													
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	—																2																													
	CSI × 2, UART × 1, simplified I ² C × 2	—																																													
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	—																																													
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	—																1																													
	I ² C × 1	1																																													
DMA [channels]		—																2																													
External interrupt pins [count]		6												9												10																					
OCD	On-chip debugging	Yes																																													
Peripheral functions	8/10-bit A/D converter [channels]	8												9												10																					
	Multiplier/divider/multiply-accumulator	Library support for																multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned)																													
	Other functions	Power-on reset																(POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																													
Safety functions		Flash memory CRC calculation function (high-speed), CRC illegal memory access																calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, detection function, frequency detection function, A/D converter test function																													
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V																																													
	Operating ambient temperature [°C]	T _A = -40																to +85°C (A: Consumer applications, D: Industrial applications) ^{**2} T _A = -40 to +105°C (G: Industrial applications) ^{**3}																													
	Package (size [mm])	36-WFLGA (4 × 4 mm)												40-HWQFN (6 × 6 mm)												44-LQFP (10 × 10 mm)																					

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] - [Flash Programming Tools] - [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
 1. Products with a pin count of 36 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 kHz) is available.
 2. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10xxxDxx. For details, see "How to read RL78 family product numbers" on page 95.
 3. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10xxxGxx. For details, see "How to read RL78 family product numbers" on page 95.
 4. Figures in parentheses () are when the PIOR function is used.

www.renesas.com/flash_libraries for use.



RL78 specifications (3/5) RL78/G13 (48 to 52 pins)

Series		RL78/G13																																																	
Pin count		48-pin																				52-pin																													
Product name		① R5F100GAAAFB ^{*1, *2}	② R5F100GAANA ^{*1, *2}	① R5F100GCACAFB ^{*1, *2}	② R5F100GCANA ^{*1, *2}	① R5F100GDADF ^{*1, *2}	② R5F100GDANA ^{*1, *2}	① R5F100GEAFB ^{*1, *2}	② R5F100GEANA ^{*1, *2}	① R5F100GFADF ^{*1, *2}	② R5F100GFANA ^{*1, *2}	① R5F100GGAFB ^{*1, *2}	② R5F100GGANA ^{*1, *2}	① R5F100GHAFB ^{*1, *2}	② R5F100GHANA ^{*1, *2}	① R5F100GLAFB ^{*1, *2}	② R5F100GLANA ^{*1, *2}	① R5F100GAAFB ^{*1, *2}	② R5F100GAANA ^{*1, *2}	① R5F100GCACAFB ^{*1, *2}	② R5F100GCANA ^{*1, *2}	① R5F100GDADF ^{*1, *2}	② R5F100GDANA ^{*1, *2}	① R5F100GEAFB ^{*1, *2}	② R5F100GEANA ^{*1, *2}	① R5F100GFADF ^{*1, *2}	② R5F100GFANA ^{*1, *2}	① R5F100GGAFB ^{*1, *2}	② R5F100GGANA ^{*1, *2}	① R5F100GHAFB ^{*1, *2}	② R5F100GHANA ^{*1, *2}	① R5F100GLAFB ^{*1, *2}	② R5F100GLANA ^{*1, *2}	R5F100JCAFA ^{*1, *2}	R5F100JDAFA ^{*1, *2}	R5F100JEAFA ^{*1, *2}	R5F100JFAFA ^{*1, *2}	R5F100JGAFA ^{*1, *2}	R5F100JHAFA ^{*1, *2}	R5F100JJAFA ^{*1, *2}	R5F100JKFAFA ^{*1, *2}	R5F100JLAFA ^{*1, *2}	R5F101JCAFA ^{*1, *2}	R5F101JDAFA ^{*1, *2}	R5F101JEAFA ^{*1, *2}	R5F101JFAFA ^{*1, *2}	R5F101JGAFA ^{*1, *2}	R5F101JHAFA ^{*1, *2}	R5F101JJAFA ^{*1, *2}	R5F101JKFAFA ^{*1, *2}	R5F101JLAFA ^{*1, *2}
CPU		RL78 CPU core																																																	
Memory	Flash ROM [bytes]	16 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K												
	Data flash [bytes]	4 K				8 K				—				—				4 K				8 K				—																									
	RAM [bytes]	2 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K	2 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K												
Operating clocks	Maximum operating frequency [Hz]	32 MHz																																																	
	On-chip oscillator clock	20 MHz																																																	
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V),																1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																																	
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V),																1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																																	
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																																																	
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 5.5 V)																																																	
I/O	I/O ports	44																				48																													
	N-channel open drain (6 V tolerance)	—																				4																													
	N-channel open drain (V _{DD} tolerance)	11																				13																													
Timers	16-bit timer TAU [channels]	8, PWM output × 4 (7) ^{*3}																																																	
	Real-time clock (RTC) [channels]	1																																																	
	Watchdog timer (WDT) [channels]	1																																																	
	Interval timer [channels]	12-bit × 1																																																	
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1																																																	
	CSI × 2, UART × 1, simplified I ² C × 2	1																																																	
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	—																																																	
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	1																																																	
	I ² C × 1	1																																																	
DMA [channels]		2																																																	
External interrupt pins [count]		13																				15																													
OCD	On-chip debugging	Yes																																																	
Peripheral functions	8/10-bit A/D converter [channels]	10																				12																													
	Multiplier/divider/multiply-accumulator	Library support for																multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																																	
	Other functions	Power-on reset																(POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																																	
Safety functions		Flash memory CRC calculation function (high-speed), CRC illegal memory access																				calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, detection function, frequency detection function, A/D converter test function																													
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V																																																	
	Operating ambient temperature [°C]	T _A = -40																				to +85°C (A: Consumer applications, D: Industrial applications) ^{*1} T _A = -40 to +105°C (G: Industrial applications) ^{*2}																													
	Package (size [mm])	① 48-LFQFP (7 × 7 mm) ② 48-HWQFN (7 × 7 mm)																				52-LQFP (10 × 10 mm)																													

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
 1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10xxxDxx. For details, see "How to read RL78 family product numbers" on page 95.
 2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10xxxGxx. For details, see "How to read RL78 family product numbers" on page 95.
 3. Figures in parentheses () are when the PIOR function is used.

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RL78 specifications (4/5) RL78/G13 (64 pins)

Series		RL78/G13																													
Pin count		64-pin																													
Product name		① R5F100LCAFA ^{*1, *2}	② R5F100LCAFBB ^{*1, *2}	③ R5F100LCAFBG ^{*2}	① R5F100LDAFA ^{*1, *2}	② R5F100LDAFBB ^{*1, *2}	③ R5F100LDABG ^{*2}	① R5F100LEAFA ^{*1, *2}	② R5F100LEAFBB ^{*1, *2}	③ R5F100LEABG ^{*2}	① R5F100LFAFA ^{*1, *2}	② R5F100LFAFBB ^{*1, *2}	③ R5F100LFABG ^{*2}	① R5F100LGFAFA ^{*1, *2}	② R5F100LGFABBB ^{*1, *2}	③ R5F100LGABG ^{*2}	① R5F100LHFAFA ^{*1, *2}	② R5F100LHFAFBB ^{*1, *2}	③ R5F100LHABG ^{*2}	① R5F100LJAFA ^{*1, *2}	② R5F100LJAFBB ^{*1, *2}	③ R5F100LJABG ^{*2}	① R5F100LKFAFA ^{*1}	② R5F100LKAFBB ^{*1}	③ R5F100LKABG ^{*1}	① R5F100LLAFA ^{*1}	② R5F100LLAFBB ^{*1}	③ R5F100LLABG ^{*1}			
CPU		RL78 CPU core																													
Memory	Flash ROM [bytes]	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K												
	Data flash [bytes]	4 K				8 K																									
	RAM [bytes]	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K	2 K	3 K	4 K	8 K	12 K	16 K	20 K	24 K	32 K												
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz																											
		External resonator		20 MHz																											
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V),																	1 to 16 MHz (V _{DD} = 2.4 to 5.5 V),		1 to 8 MHz (V _{DD} = 1.8 to 5.5 V),		1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)								
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V),																	1 to 16 MHz (V _{DD} = 2.4 to 5.5 V),		1 to 8 MHz (V _{DD} = 1.8 to 5.5 V),		1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)								
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																													
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 5.5 V)																													
I/O	I/O ports		58																												
	N-channel open drain (6 V tolerance)		4																												
	N-channel open drain (V _{DD} tolerance)		15																												
Timers	16-bit timer TAU [channels]		8, PWM output × 7																												
	Real-time clock (RTC) [channels]		1																												
	Watchdog timer (WDT) [channels]		1																												
	Interval timer [channels]		12-bit × 1																												
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1		—																												
	CSI × 2, UART × 1, simplified I ² C × 2		2																												
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1		—																												
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2		1																												
	I ² C × 1		1																												
DMA [channels]		2																													
External interrupt pins [count]		16 (18) ^{*3}																													
OCD	On-chip debugging		Yes																												
Peripheral functions	8/10-bit A/D converter [channels]		12																												
	Multiplier/divider/multiply-accumulator		Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																												
	Other functions		Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																												
Safety functions		Flash memory CRC calculation function (high-speed), CRC illegal memory access calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, detection function, frequency detection function, A/D converter test function																													
Other	Power supply voltage [V]		V _{DD} = 1.6 to 5.5 V																												
	Operating ambient temperature [°C]		T _A = -40 to +85°C (A: Consumer applications, D: Industrial applications) ^{*1} T _A = -40 to +105°C (G: Industrial applications) ^{*2}																												
	Package (size [mm])		① 64-LQFP (12 × 12 mm)			② 64-LFQFP (10 × 10 mm)			③ 64-VFBGA (4 × 4 mm)																						

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
 1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10xxxDxx. For details, see "How to read RL78 family product numbers" on page 95.
 2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10xxxGxx. For details, see "How to read RL78 family product numbers" on page 95.
 3. Figures in parentheses () are when the PIOR function is used.

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RL78 specifications (5/5) RL78/G13 (80 to 128 pins)

Series		RL78/G13																																																							
Pin count		80-pin												100-pin										128-pin																																	
Product name		①R5F100MFAFB ^{*1, *2}	②R5F100MFAFA ^{*1, *2}	①R5F100MGAFB ^{*1, *2}	②R5F100MGAFB ^{*1, *2}	①R5F100MHAFB ^{*1, *2}	②R5F100MHAFB ^{*1, *2}	①R5F100MJAFB ^{*1, *2}	②R5F100MJAFB ^{*1, *2}	①R5F100MKAFB ^{*1, *2}	②R5F100MKAFB ^{*1, *2}	①R5F100MLAFB ^{*1, *2}	②R5F100MLAFB ^{*1, *2}	①R5F101MFAFB ^{*1, *2}	②R5F101MFAFA ^{*1, *2}	①R5F101MGAFB ^{*1, *2}	②R5F101MGAFB ^{*1, *2}	①R5F101MHAFB ^{*1, *2}	②R5F101MHAFB ^{*1, *2}	①R5F101MJAFB ^{*1, *2}	②R5F101MJAFB ^{*1, *2}	①R5F101MKAFB ^{*1, *2}	②R5F101MKAFB ^{*1, *2}	①R5F101MLAFB ^{*1, *2}	②R5F101MLAFB ^{*1, *2}	①R5F100PFAFB ^{*1, *2}	②R5F100PFAFA ^{*1, *2}	①R5F100PGAFB ^{*1, *2}	②R5F100PGAFB ^{*1, *2}	①R5F100PHAFB ^{*1, *2}	②R5F100PHAFB ^{*1, *2}	①R5F100PJAFB ^{*1, *2}	②R5F100PJAFB ^{*1, *2}	①R5F100PKAFB ^{*1, *2}	②R5F100PKAFB ^{*1, *2}	①R5F100PLAFB ^{*1, *2}	②R5F100PLAFB ^{*1, *2}	①R5F101PFAFB ^{*1, *2}	②R5F101PFAFA ^{*1, *2}	①R5F101PGAFB ^{*1, *2}	②R5F101PGAFB ^{*1, *2}	①R5F101PHAFB ^{*1, *2}	②R5F101PHAFB ^{*1, *2}	①R5F101PJAFB ^{*1, *2}	②R5F101PJAFB ^{*1, *2}	①R5F101PKAFB ^{*1, *2}	②R5F101PKAFB ^{*1, *2}	①R5F101PLAFB ^{*1, *2}	②R5F101PLAFB ^{*1, *2}	R5F100SHAFAFB ^{*1}	R5F100SJAFAFB ^{*1}	R5F100SKAFAFB ^{*1}	R5F100SLAFAFB ^{*1}	R5F101SHAFAFB ^{*1}	R5F101SJAFAFB ^{*1}	R5F101SKAFAFB ^{*1}	R5F101SLAFAFB ^{*1}
CPU		RL78 CPU core																																																							
Memory	Flash ROM [bytes]	96 K	128 K	192 K	256 K	384 K	512 K	96 K	128 K	192 K	256 K	384 K	512 K	96 K	128 K	192 K	256 K	384 K	512 K	96 K	128 K	192 K	256 K	384 K	512 K	192 K	256 K	384 K	512 K	192 K	256 K	384 K	512 K	192 K	256 K	384 K	512 K																				
	Data flash [bytes]	8 K												—						8 K						8 K						—																									
	RAM [bytes]	8 K	12 K	16 K	20 K	24 K	32 K	8 K	12 K	16 K	20 K	24 K	32 K	8 K	12 K	16 K	20 K	24 K	32 K	8 K	12 K	16 K	20 K	24 K	32 K	8 K	12 K	16 K	20 K	24 K	32 K	16 K	20 K	24 K	32 K	16 K	20 K	24 K	32 K																		
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz																																																					
		External resonator		20 MHz																																																					
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V),												1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																																											
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V),												1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																																											
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																																																							
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 5.5 V)																																																							
I/O	I/O ports	74												92										120																																	
	N-channel open drain (6 V tolerance)	—												4										—																																	
	N-channel open drain (V _{DD} tolerance)	21												24										25																																	
Timers	16-bit timer TAU [channels]	12, PWM												output × 10																16, PWM output × 14																											
	Real-time clock (RTC) [channels]	1																																																							
	Watchdog timer (WDT) [channels]	1																																																							
	Interval timer [channels]	12-bit × 1																																																							
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	—																																																							
	CSI × 2, UART × 1, simplified I ² C × 2	3																																																							
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	—																																																							
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	1																																																							
	I ² C × 1	2																																																							
DMA [channels]		4																																																							
External interrupt pins [count]		16 (18) ^{*3}												16 (20) ^{*3}																																											
OCD	On-chip debugging	Yes																																																							
Peripheral functions	8/10-bit A/D converter [channels]	17												20										26																																	
	Multiplier/divider/multiply-accumulator	Library support for												multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																																											
	Other functions	Power-on reset												(POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																																											
Safety functions		Flash memory CRC calculation function (high-speed), CRC illegal memory access												calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, detection function, frequency detection function, A/D converter test function																																											
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V																																																							
	Operating ambient temperature [°C]	T _A = -40												to +85°C (A: Consumer applications, D: Industrial applications) ^{*1} T _A = -40 to +105°C (G: Industrial applications) ^{*2}																																											
	Package (size [mm])	①80-LQFP (12 × 12 mm) ②80-LQFP (14 × 14 mm)												①100-LQFP (14 × 14 mm) ②100-LQFP (14 × 20 mm)										128-LQFP (14 × 20 mm)																																	

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
 1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10xxxDxx. For details, see "How to read RL78 family product numbers" on page 95.
 2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10xxxGxx. For details, see "How to read RL78 family product numbers" on page 95.
 3. Figures in parentheses () are when the PIOR function is used.

www.renesas.com/flash_libraries



RL78 specifications (1/2) RL78/G14 (30 to 48 pins)

Series		RL78/G14																																																						
Pin count		30-pin						32-pin						36-pin						40-pin						44-pin						48-pin																								
Product name		R5F104AAASP ^{*2, *3}	R5F104ACASP ^{*2, *3}	R5F104ADASP ^{*2, *3}	R5F104AEASP ^{*2, *3}	R5F104AFASP ^{*2, *3}	R5F104AGASP ^{*2, *3}	①R5F104BAANA ^{*2, *3}	②R5F104BAAFP ^{*2, *3}	①R5F104BCANA ^{*2, *3}	②R5F104BCAFP ^{*2, *3}	①R5F104BDANA ^{*2, *3}	②R5F104BDAFP ^{*2, *3}	①R5F104BEANA ^{*2, *3}	②R5F104BEAFP ^{*2, *3}	①R5F104BFANA ^{*2, *3}	②R5F104BFAFP ^{*2, *3}	①R5F104BGANA ^{*2, *3}	②R5F104BGAFP ^{*2, *3}	R5F104CAALA ^{*3}	R5F104CCALA ^{*3}	R5F104CDALA ^{*3}	R5F104CEALA ^{*3}	R5F104CFALA ^{*3}	R5F104CGALA ^{*3}	R5F104EAANA ^{*2, *3}	R5F104ECANA ^{*2, *3}	R5F104EDANA ^{*2, *3}	R5F104EEANA ^{*2, *3}	R5F104EFANA ^{*2, *3}	R5F104EGANA ^{*2, *3}	R5F104EHANA ^{*2, *3}	R5F104FAAFP ^{*2, *3}	R5F104FCAFP ^{*2, *3}	R5F104FDAFP ^{*2, *3}	R5F104FEAFP ^{*2, *3}	R5F104FFAFP ^{*2, *3}	R5F104FGAFP ^{*2, *3}	R5F104FHAFP ^{*2, *3}	R5F104FJAFP ^{*2, *3}	①R5F104GAAFB ^{*2, *3}	②R5F104GAANA ^{*2, *3}	①R5F104GCAFEB ^{*2, *3}	②R5F104GCANA ^{*2, *3}	①R5F104GDADF ^{*2, *3}	②R5F104GDANA ^{*2, *3}	①R5F104GEAFB ^{*2, *3}	②R5F104GEANA ^{*2, *3}	①R5F104GFAFB ^{*2, *3}	②R5F104GFANA ^{*2, *3}	①R5F104GGAFB ^{*2, *3}	②R5F104GGANA ^{*2, *3}	①R5F104GHAFB ^{*2, *3}	②R5F104GHANA ^{*2, *3}	①R5F104GLAFB ^{*2, *3}	②R5F104GLANA ^{*2, *3}
CPU		RL78 CPU core																																																						
Memory	Flash ROM [bytes]	16 K	32 K	48 K	64 K	96 K	128 K	16 K	32 K	48 K	64 K	96 K	128 K	16 K	32 K	48 K	64 K	96 K	128 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	16 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K												
	Data flash [bytes]	4 K		8 K		4 K		8 K		4 K		8 K		4 K		8 K		4 K		8 K		4 K		8 K		4 K		8 K		4 K		8 K		4 K		8 K																				
	RAM [bytes]	2.5 K	4 K	5.5 K	12 K	16 K	2.5 K	4 K	5.5 K	12 K	16 K	2.5 K	4 K	5.5 K	12 K	16 K	2.5 K	4 K	5.5 K	12 K	16 K	2.5 K	4 K	5.5 K	12 K	16 K	20 K	2.5 K	4 K	5.5 K	12 K	16 K	20 K	24 K	2.5 K	4 K	5.5 K	12 K	16 K	20 K	24 K	32 K	48 K													
Operating clocks	Maximum operating frequency [Hz]	32 MHz																																																						
	On-chip oscillator clock	20 MHz																																																						
	External resonator	64 MHz (V _{DD} = 2.7 to 5.5 V)																																																						
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V),														1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																																								
	High-speed on-chip oscillator [Hz]	1 to 64 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V) *Timer RD only, operation at 48 or 64 MHz supported																																																						
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																																																						
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 5.5 V)																																																						
I/O	I/O ports	26						28						32						36						40						44																								
	N-channel open drain (6 V tolerance)	2						3						4						5						6						7																								
	N-channel open drain (V _{DD} tolerance)	10						11						12						13						14						15																								
Timers	16-bit timer TAU [channels]	4, PWM output × 3																																																						
	16-bit timer RJ [channels]	1																																																						
	16-bit timer RD [channels]	2, PWM output × 6																																																						
	16-bit timer RG [channels]	1, PWM output × 1																																																						
	Real-time clock (RTC) [channels]	1*1																																																						
	Watchdog timer (WDT) [channels]	1																																																						
	Interval timer [channels]	12-bit × 1																																																						
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	2						3						4						5						6						7																								
	CSI × 2, UART × 1, simplified I ² C × 2	—						1						2						3						4						5																								
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	—						1						2						3						4						5																								
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	—						1						2						3						4						5																								
	I ² C × 1	1																																																						
DTC (sources)	28	30	28	30	28	30	29	31	29	31	30	32																																												
ELC (inputs/trigger outputs)	19/7	21/8	19/7	21/9	19/7	21/9	20/7	22/9	20/7	22/9	20/7	22/9																																												
External interrupt pins [count]	6						7						8						9						10						11																									
OCD	On-chip debugging	Yes																																																						
Peripheral functions	8/10-bit A/D converter [channels]	8						9						10						11						12																														
	8-bit D/A converter [channels]	—	1	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2																			
	Multiplier/divider/multiply-accumulator	Multiply/divide/														multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																																								
	Comparator	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2	—	2																			
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																																																						
Safety functions	Flash memory CRC calculation function (high-speed), CRC illegal memory access detection function,														calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, frequency detection function, A/D converter test function, I/O power output signal level detection function																																									
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V																																																						
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications, D: Industrial applications)* ² , T _A = -40 to +105°C (G: Industrial applications)* ³																																																						
	Package (size [mm])	30-LSSOP (7.62 mm (300 mil))	①32-HWQFN (5 × 5 mm) ②32-LQFP (7 × 7 mm)		36-WFLGA (4 × 4 mm)		40-HWQFN (6 × 6 mm)		44-LQFP (10 × 10 mm)		①48-LFQFP (7 × 7 mm) ②8-HWQFN (7 × 7 mm)																																													

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] - [Flash Programming Tools] - [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
 1. Products with pin counts from 30 to 36 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 kHz) is available.
 2. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F104xxDxx. For details, see "How to read RL78 family product numbers" on page 95.
 3. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F104xxGxx. For details, see "How to read RL78 family product numbers" on page 95.

www.renesas.com/flash_libraries available for use.



RL78 specifications (2/2)

RL78/G14 (52 to 100 pins)

Series		RL78/G14																																																																
Pin count		52-pin								64-pin								80-pin								100-pin																																								
Product name		R5F104JCAFA ^{*1, *2}	R5F104JDAFA ^{*1, *2}	R5F104JEFA ^{*1, *2}	R5F104JFAFA ^{*1, *2}	R5F104JGAFA ^{*1, *2}	R5F104JHAFA ^{*1, *2}	R5F104JJAFA ^{*1, *2}	① R5F104LCAFB ^{*1, *2}	② R5F104CAFA ^{*1, *2}	③ R5F104CAFP ^{*1, *2}	④ R5F104CALA ^{*2}	① R5F104DAFB ^{*1, *2}	② R5F104DAFA ^{*1, *2}	③ R5F104DAFP ^{*1, *2}	④ R5F104DALA ^{*2}	① R5F104EAFB ^{*1, *2}	② R5F104EFAFA ^{*1, *2}	③ R5F104EAFP ^{*1, *2}	④ R5F104EALA ^{*2}	① R5F104FAFB ^{*1, *2}	② R5F104FAFA ^{*1, *2}	③ R5F104FAP ^{*1, *2}	④ R5F104FALA ^{*2}	① R5F104GAFB ^{*1, *2}	② R5F104GAFA ^{*1, *2}	③ R5F104GAFP ^{*1, *2}	④ R5F104GALA ^{*2}	① R5F104HAFB ^{*1, *2}	② R5F104HAFA ^{*1, *2}	③ R5F104HAFP ^{*1, *2}	④ R5F104HALA ^{*2}	① R5F104JAFB ^{*1, *2}	② R5F104JAFA ^{*1, *2}	③ R5F104JAFP ^{*1, *2}	④ R5F104JALA ^{*2}	① R5F104KAFB ^{*2}	② R5F104KAFA ^{*2}	③ R5F104KAL ^{*2}	① R5F104LAFB ^{*2}	② R5F104LAFA ^{*2}	③ R5F104LAL ^{*2}	① R5F104MAFB ^{*2}	② R5F104MAFA ^{*2}	① R5F104MGAFB ^{*2}	② R5F104MGAFA ^{*2}	① R5F104MHAFB ^{*2}	② R5F104MHFAFA ^{*2}	① R5F104MJAFB ^{*2}	② R5F104MJFAFA ^{*2}	① R5F104MKAFB ^{*2}	② R5F104MKKAFA ^{*2}	① R5F104MLAFB ^{*2}	② R5F104MLLAFA ^{*2}	① R5F104PFAFB ^{*2}	② R5F104PFAFA ^{*2}	① R5F104PGAFA ^{*2}	② R5F104PGAFA ^{*2}	① R5F104PHAFB ^{*2}	② R5F104PHFAFA ^{*2}	① R5F104PJAFB ^{*2}	② R5F104PJFAFA ^{*2}	① R5F104PKAFB ^{*2}	② R5F104PKKAFA ^{*2}	① R5F104PLAFB ^{*2}	② R5F104PLLAFA ^{*2}
CPU		RL78 CPU core																																																																
Memory	Flash ROM [bytes]	32 K	48 K	64 K	96 K	128 K	192 K	256 K	32 K	48 K	64 K	96 K	128 K	192 K	256 K	384 K	512 K	96 K	128 K	192 K	256 K	384 K	512 K	96 K	128 K	192 K	256 K	384 K	512 K	96 K	128 K	192 K	256 K	384 K	512 K																															
	Data flash [bytes]	4 K				8 K				4 K				8 K				8 K				8 K				8 K				8 K																																				
	RAM [bytes]	4 K	5.5 K	12 K	16 K	20 K	24 K	4 K	5.5 K				12 K	16 K	20 K	24 K	32 K	48 K	12 K	16 K	20 K	24 K	32 K	48 K	12 K	16 K	20 K	24 K	32 K	48 K	12 K	16 K	20 K	24 K	32 K	48 K																														
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz																																																														
		External resonator		20 MHz																																																														
		Timer RD clock		64 MHz (V _{DD} = 2.7 to 5.5 V)																																																														
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																																																																
	High-speed on-chip oscillator [Hz]	1 to 64 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V) *Timer RD only, operation at 48 or 64 MHz supported																																																																
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																																																																
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 5.5 V)																																																																
I/O	I/O ports	48								58								74								92																																								
	N-channel open drain (6 V tolerance)	—								4								—								—																																								
	N-channel open drain (V _{DD} tolerance)	14								16								25								28																																								
Timers	16-bit timer TAU [channels]	4, PWM output × 3																																																																
	16-bit timer RJ [channels]	1																																																																
	16-bit timer RD [channels]	2, PWM output × 6																																																																
	16-bit timer RG [channels]	1, PWM output × 1																																																																
	Real-time clock (RTC) [channels]	1																																																																
	Watchdog timer (WDT) [channels]	1																																																																
	Interval timer [channels]	12-bit × 1																																																																
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1								—								—								—																																								
	CSI × 2, UART × 1, simplified I ² C × 2	1								2								3								3																																								
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	—																																																																
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	1																																																																
	I ² C × 1	1																																																																
DTC (sources)	30	32	31				33				39																																																							
ELC (inputs/trigger outputs)	20/7	22/9	20/7				22/9				26/9																																																							
External interrupt pins [count]	15								15 (19) ^{*3}								15 (19) ^{*3}								16 (20) ^{*3}																																									
OCD	On-chip debugging		Yes																																																															
Peripheral functions	8/10-bit A/D converter [channels]	12																																																																
	8-bit D/A converter [channels]	—								2								2								2																																								
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																																																																
	Comparator	—								2								2								2																																								
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output × 2																																																																
Safety functions	Flash memory CRC calculation function (high-speed), CRC illegal memory access detection function, calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, frequency detection function, A/D converter test function, I/O power output signal level detection function																																																																	
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V																																																																
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications, D: Industrial applications) ^{*1} , T _A = -40 to +105°C (G: Industrial applications) ^{*2}																																																																
	Package (size [mm])	52-LQFP (10 × 10 mm)	①64-LFQFP (10 × 10 mm) ②64-LQFP (12 × 12 mm) ③64-LQFP (14 × 14 mm)				②64-WFLGA (5 × 5 mm)				①80-LFQFP (12 × 12 mm) ②80-LQFP (14 × 14 mm)				①100-LFQFP (14 × 14 mm) ②100-LQFP (14 × 20 mm)																																																			

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
 1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F104xxDxx. For details, see "How to read RL78 family product numbers" on page 95.
 2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F104xxGxx. For details, see "How to read RL78 family product numbers" on page 95.
 3. Figures in parentheses () are when the PIOR function is used.

www.renesas.com/flash_libraries

RL78 specifications RL78/G1A (25 to 64 pins)

Series		RL78/G1A																						
Pin count		25-pin				32-pin				48-pin				64-pin										
Product name		R5F10E8AALA ^{*)}	R5F10E8CALA ^{*)}	R5F10E8DALA ^{*)}	R5F10E8EALA ^{*)}	R5F10E8AAMA ^{*)}	R5F10E8CAMA ^{*)}	R5F10E8DAMA ^{*)}	R5F10E8EAMA ^{*)}	①R5F10EGAAFB ^{*)}	②R5F10EGANA ^{*)}	①R5F10EGCAF ^{*)}	②R5F10EGCANA ^{*)}	①R5F10EGDAFB ^{*)}	②R5F10EGDANA ^{*)}	①R5F10EGEAFB ^{*)}	②R5F10EGEANA ^{*)}	①R5F10ELCAF ^{*)}	②R5F10ELCAG ^{*)}	①R5F10ELDADF ^{*)}	②R5F10ELDABG ^{*)}	①R5F10ELEAFB ^{*)}	②R5F10ELEABG ^{*)}	
CPU		RL78 CPU core																						
Memory	Flash ROM [bytes]	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	32 K	48 K	64 K								
	Data flash [bytes]	4 K																						
	RAM [bytes]	2 K	3 K	4 K	2 K	3 K	4 K	2 K	3 K	4 K	2 K	3 K	4 K	2 K	3 K	4 K								
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz																				
		External resonator		20 MHz																				
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)																						
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)																						
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 3.6 V)																						
	Subclock (32.768 kHz)	—																						
I/O	I/O ports	19				26				42				56										
		N-channel open drain (6 V tolerance)		2		3		4		11		12												
		N-channel open drain (V _{DD} tolerance)		6		9		11		12														
Timers	16-bit timer TAU [channels]	8, PWM output × 1				8, PWM output × 3				8, PWM output × 6														
	Real-time clock (RTC) [channels]	1 ^{*)}																						
	Watchdog timer (WDT) [channels]	1																						
	Interval timer [channels]	12-bit × 1																						
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	2				1				—														
	CSI × 2, UART × 1, simplified I ² C × 2	—				1				2														
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	—				1				—														
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	—				1				1														
	I ² C × 1	1																						
DMA [channels]	2																							
External interrupts	6				10				13															
OCD	On-chip debugging	Yes																						
Peripheral functions	8/12-bit A/D converter [channels]	13				18				24				28										
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																						
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD)																						
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function																							
Other	Power supply voltage [V]	V _{DD} = 1.6 to 3.6 V																						
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications), T _A = -40 to +105°C (G: Industrial applications) ^{*)}																						
	Package (size [mm])	25-WFLGA (3 × 3 mm)	32-HWQFN (5 × 5 mm)	①48-LFQFP (7 × 7 mm) ②48-HWQFN (7 × 7 mm)				①64-LFQFP (10 × 10 mm) ②64-VFBGA (4 × 4 mm)																

Notes: A dedicated library is required to overwrite the data flash.
Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website. http://www.renesas.com/flash_libraries
1. Products with pin counts from 25 or 32 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 kHz) is available for use.
2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10ExxGxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/G1C (32 to 48 pins)

Series		RL78/G1C							
Pin count		32-pin				48-pin			
Product name		①R5F10JBCANA ^{*)} ②R5F10JBCAFP ^{*)}		①R5F10KBCANA ^{*)} ②R5F10KBCAFP ^{*)}		①R5F10JGCANA ^{*)} ②R5F10JGC AFP ^{*)}		①R5F10KGCANA ^{*)} ②R5F10KGC AFP ^{*)}	
CPU		RL78 CPU core							
Memory	Flash ROM [bytes]	32 K							
	Data flash [bytes]	2 K							
	RAM [bytes]	5.5 K							
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		24 MHz					
		External resonator		20 MHz					
		USB clock		48 MHz					
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V)							
	High-speed on-chip oscillator [Hz]	1 to 48 MHz (V _{DD} = 2.7 to 5.5 V)							
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.4 to 5.5 V)							
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 2.4 to 5.5 V)							
I/O	Total I/O ports and dedicated USB pins	28 ^{*)}		26 ^{*)}		44 ^{*)}		42 ^{*)}	
		I/O ports		22		38			
		N-channel open drain (6 V tolerance)		3		4			
Timers	16-bit timer TAU [channels]	4							
	Real-time clock (RTC) [channels]	1							
	Watchdog timer (WDT) [channels]	1							
	Interval timer [channels]	12-bit × 1							
Serial interfaces	CSI × 2, UART × 1, simplified I ² C × 2	1							
	I ² C × 1	1							
USB	Host [channels]	2		—		2		—	
	Function [channels]	1							
DMA [channels]	2								
External interrupts [channels]	8				10				
OCD	On-chip debugging	Yes							
Peripheral functions	8/10-bit A/D converter [channels]	8				9			
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)							
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output × 2				RTC output (1Hz) × 1			
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function								
Other	Power supply voltage [V]	V _{DD} = 2.4 to 5.5 V							
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications), T _A = -40 to +105°C (G: Industrial applications) ^{*)}							
	Package (size [mm])	①32-HWQFN (5 × 5 mm)		②32-LFQFP (7 × 7 mm)		①48-HWQFN (7 × 7 mm)		②48-LFQFP (7 × 7 mm)	

Notes: 1. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10xxxGxx. For details, see "How to read RL78 family product numbers" on page 95.
2. USB uses pins UV_{BUS}, UV_{DD}, UDP0, UDM0, UDP1, and UDM1.
3. USB uses pins UV_{BUS}, UV_{DD}, UDP0, and UDM0.

RL78 specifications RL78/G1D (48 pins)

Series		RL78/G1D		
Pin count		48-pin		
Product name		R5F11AGGAMB [†]	R5F11AGHAMB [†]	R5F11AGJAMB [†]
CPU		RL78 CPU core		
Memory	Flash ROM [bytes]	128 K	192 K	256 K
	Data flash [bytes]	8 K		
	RAM [bytes]	12 K	16 K	20 K
Operating clocks	Maximum operating frequency [Hz]	32 MHz		
	On-chip oscillator clock External resonator	20 MHz		
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)		
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (2.7 to 3.6 V), 1 to 16 MHz (2.4 to 3.6 V), 1 to 8 MHz (1.8 to 3.6 V), 1 to 4 MHz (1.6 to 3.6 V)		
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 3.6 V)		
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 3.6 V)		
	Crystal resonator for RF [Hz]	32 MHz		
	Low-speed on-chip oscillator for RF	32.768 KHz (with calibration)		
I/O	I/O ports	32		
	N-channel open drain (6 V tolerance)	2		
	N-channel open drain (V _{DD} tolerance)	9		
Timers	16-bit timer TAU [channels]	8, PWM output × 7		
	Real-time clock (RTC) [channels]	1		
	Watchdog timer (WDT) [channels]	1		
	12-bit Interval timer [channels]	12-bit × 1		
	8-/10-bit resolution A/D converter	8		
Serial interfaces	CSI, simplified I ² C, UART	1		
	CSI, simplified I ² C	1		
	UART	1		
	I ² C bus	1		
DMA [channels]	4			
External interrupts [channels]	4 (When using RF, this includes connections between the MCU and the RF transceiver via pins externally connected on the board by the user.)			
OCD	On-chip debugging	Yes		
Peripheral functions	8/10-bit A/D converter [channels]	8		
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)		
	2.4 GHz RF transceiver	Bluetooth v4.1 specification (single mode) supported 2.4 GHz ISM band, GFSK modulation, TDMA/TDD frequency hopping (on-chip AES encryption circuit), adapter function (during slave operation only)		
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output × 1		
Safety functions	WDT, TRAP instruction, flash memory CRC calculation, RAM parity error detection, illegal memory access detection function, frequency detection function, RAM guard function, SFR guard function, A/D test			
Other	Power supply voltage [V]	1.6 to 3.6 V (V _{DD} = 1.8 to 3.6 V: using DC-DC converter)		
	Operating ambient temperature [°C]	T _A = -40 to +85°C		
	Package (size [mm])	48-HWQFN (6 × 6 mm)		

Note: 1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F11AxxDxx.

RL78 specifications RL78/G1E (64 to 80 pins)

Series		RL78/G1E					
Pin count		64-pin			80-pin		
Product name		R5F10FLCANA [†]	R5F10FLDANA [†]	R5F10FLEANA [†]	R5F10FMCAFB [†]	R5F10MDAFB [†]	R5F10MEAFB [†]
CPU		RL78 CPU core					
Memory	Flash ROM [bytes]	32 K	48 K	64 K	32 K	48 K	64 K
	Data flash [bytes]	4 K					
	RAM [bytes]	2 K	3 K	4 K	2 K	3 K	4 K
Operating clocks	Maximum operating frequency [Hz]	32 MHz					
	On-chip oscillator clock External resonator	20 MHz					
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)					
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)					
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)					
	Subclock (32.768 kHz)	—					
	Crystal resonator for RF [Hz]	—					
I/O	I/O ports	24			30		
	N-channel open drain (6 V tolerance)	—					
	N-channel open drain (V _{DD} tolerance)	7			10		
Timers	16-bit timer TAU [channels]	8, PWM output × 2					
	Real-time clock (RTC) [channels]	—					
	Watchdog timer (WDT) [channels]	1					
	Interval timer [channels]	1					
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1			2		
	UART × 1	1			—		
	CSI × 1, UART (LIN bus support) × 1	1			—		
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 1	—			1		
DMA [channels]	2						
External interrupts [channels]	2			5			
OCD	On-chip debugging	Yes					
Peripheral functions	8/12-bit A/D converter [channels]	13			17		
	8-bit D/A converter [channels]	4					
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)					
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), configurable amplifier, adjustable-gain amplifier, low-pass filter, output voltage variable regulator, reference voltage generation circuit, temperature sensor			Power-on reset (POR), low-voltage detection circuit (LVD), configurable amplifier, adjustable-gain amplifier,* low-pass filter, high-pass filter, output voltage variable regulator, reference voltage generation circuit, temperature sensor		
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function						
Other	Power supply voltage [V]	Microcontroller block: 1.6 to 5.5 V (AV _{DD} = 1.6 to 3.6 V), analog block: 3.0 to 5.5 V					
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications, D: Industrial applications) *1					
	Package (size [mm])	64-HWQFN (9 × 9 mm)			80-LFQFP (12 × 12 mm)		

Notes: With synchronous wave detection function

1. The version for industrial applications with an operating temperature range of -40 to +85°C is the R5F10FxxDxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/G1F (24 to 64 pins)

Series		RL78/G1F										
Pin count		24-pin		32-pin		36-pin		48-pin		64-pin		
Product name		R5F1B7CANA ^{※2}	R5F1B7EANA ^{※2}	R5F1BBGAFP ^{※2}	R5F1BBEAFP ^{※2}	R5F1BCCALA ^{※2}	R5F1BCEALA ^{※2}	R5F1BGGAFB ^{※2}	R5F1BGEAFB ^{※2}	R5F1BLCAFB ^{※2}	R5F1BLEAFB ^{※2}	
CPU		RL78 CPU core										
Memory	Flash ROM [bytes]	32 K	64 K	32 K	64 K	32 K	64 K	32 K	64 K	32 K	64 K	
	Data flash [bytes]	4 K										
	RAM [bytes]	5.5 K										
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz								
		External resonator		20 MHz								
		Clock for timer RD/RX		64 MHz (V _{DD} = 2.7 to 5.5 V)								
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 Hz (V _{DD} = 1.6 to 5.5 V)										
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 Hz (V _{DD} = 1.6 to 5.5 V) *Timer RD, RX only, operation at 48 or 64 MHz supported										
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)										
	Subclock (32.768 kHz)	—		32.768 KHz (V _{DD} = 1.6 to 5.5 V)								
I/O ports	I/O ports	20	28	31	44	58						
	N-channel open drain (6 V tolerance)	—	—	2	4	4						
	N-channel open drain (V _{DD} tolerance)	10	12	10	12	16						
Timers	16-bit timer TAU [channels]	4, PWM output × 3										
	16-bit timer RJ [channels]	1										
	16-bit timer RD [channels]	2, PWM output × 6										
	16-bit timer RG [channels]	1, PWM output × 1										
	16-bit timer RX [channels]	1										
	Real-time clock (RTC) [channels]	1 ^{※1}										
	Watchdog timer (WDT) [channels]	1										
	Interval timer [channels]	12-bit × 1										
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	2 (including 1 UART with IrDA support)				1		—				
	CSI × 2, UART × 1, simplified I ² C × 2	—				1 (including 1 UART with IrDA support)		2 (including 1 UART with IrDA support)				
	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	1		—								
	CSI × 2, UART (LIN bus support) × 1, simplified I ² C × 2	—				1		—				
	I ² C × 1	1										
DTC (sources)	30	32	31	32	33							
ELC (inputs/trigger outputs)	21											
External interrupt pins [count]	9	11	10	16	20							
OCD	On-chip debugging	Yes										
Peripheral functions	8/10-bit A/D converter [channels]	8	13	15	17	17						
	8-bit D/A converter [channels]	1	2									
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)										
	Comparator	2										
	Programmable-gain amplifier	1										
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output (48-pin: 1 channel, 64-pin: 2 channels)										
	Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function										
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V		V _{DD} = 1.6 to 5.5 V (EV _{DD} support)		V _{DD} = 1.6 to 5.5 V		V _{DD} = 1.6 to 5.5 V (EV _{DD} support)				
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications), T _A = -40 to +105°C (G: Industrial applications) ^{※2}										
	Package (size [mm])	24-HWQFN (4 × 4 mm)	32-LQFP (7 × 7 mm)	36-WFLGA (4 × 4 mm)	48-LFQFP (7 × 7 mm)	64-LFQFP (10 × 10 mm)						

Notes: A dedicated library is required to use the data flash.

1. Products with pin counts from 24 or 32 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 kHz) is available for use.

2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F11BxxGxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/G1G (30 to 44 pins)

Series		RL78/G1G					
Pin count		30-pin		32-pin		44-pin	
Product name		R5F1E8ASP	R5F1EAAASP	R5F1EB8AFP	R5F1EBAAFP	R5F1EF8AFP	R5F1EFAAFP
CPU		RL78 CPU core					
Memory	Flash ROM [bytes]	8 K	16 K	8 K	16 K	8 K	16 K
	Data flash [bytes]	—					
	RAM [bytes]	1.5 K					
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		24 MHz			
		External resonator		20 MHz			
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V)					
	High-speed on-chip oscillator [Hz]	1 to 24 MHz (V _{DD} = 2.7 to 5.5 V)					
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.7 to 5.5 V)					
	Subclock (32.768 kHz)	—					
I/O ports	I/O ports	26	28	40			
	N-channel open drain (6 V tolerance)	—					
	N-channel open drain (V _{DD} tolerance)	7					
Timers	16-bit timer TAU [channels]	4, PWM output × 3					
	16-bit timer RJ [channels]	1					
	16-bit timer RD [channels]	2, PWM output × 6					
	Real-time clock (RTC) [channels]	—					
	Watchdog timer (WDT) [channels]	1					
	Interval timer [channels]	12-bit × 1					
	Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1		—		
UART × 1	1						
ELC (inputs/trigger outputs)	18/6		19/6				
External interrupts [channels]	6		7				
OCD	On-chip debugging	Yes					
Peripheral functions	8/10-bit A/D converter [channels]	8		12			
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)					
	Comparator [channels]	2					
	Programmable-gain amplifier	1					
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output					
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function						
Other	Power supply voltage [V]	V _{DD} = 2.7 to 5.5 V					
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications)					
	Package (size [mm])	30-LSSOP (7.62 mm)	32-LQFP (7 × 7 mm)	44-LQFP (10 × 10 mm)			

RL78 specifications RL78/I1A (20 to 38 pins)

Series		RL78/I1A		
Pin count		20-pin	30-pin	38-pin
Product name		① R5F1076CGSP ② R5F1076CMSP	① R5F107ACGSP ② R5F107ACMSP	① R5F107AEGSP ② R5F107AEMSP
CPU		RL78 CPU core		
Memory	Flash ROM [bytes]	32 K		64 K
	Data flash [bytes]	4 K		
	RAM [bytes]	2 K		4 K
Operating clocks	Maximum operating frequency [Hz]	32 MHz (T _A = -40 to +105°C), 16 MHz (T _A = 105 to 125°C)		
	On-chip oscillator clock External resonator	20 MHz		
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V)		
	High-speed on-chip oscillator [Hz]	1 to 32 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 8 MHz (V _{DD} = 2.7 to 5.5 V)		
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.7 to 5.5 V)		
	Subclock (32.768 kHz)	—		32.768 KHz (V _{DD} = 2.7 to 5.5 V)
I/O	I/O ports	16	26	34
	N-channel open drain (6 V tolerance)	—		
	N-channel open drain (V _{DD} tolerance)	6	10	11
Timers	16-bit timer TAU [channels]	8	8, PWM output × 1	8, PWM output × 3
	16-bit timer KB	2, PWM output × 4	3, PWM output × 6	3, PWM output × 6
	16-bit timer KC	1, PWM output × 3	1, PWM output × 6	1, PWM output × 6
	Real-time clock (RTC) [channels]	1*		
	Watchdog timer (WDT) [channels]	1		
	Interval timer [channels]	12-bit × 1		
Serial interfaces	UART × 1	—		1
	CSI × 1, UART (LIN bus and DMX512 support) × 1	—		1
	UART (LIN bus and DMX512 support) × 1	1		—
	UART (DALI communication support) × 1	1		—
	I ² C × 1	1		—
DMA [channels]	2			
External interrupts [channels]	7	10	11	
OCD	On-chip debugging	Yes		
Peripheral functions	8/10-bit A/D converter [channels]	6	11	
	Comparator [channels]	4	6	
	PGA [channels]	1		
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)		
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD)		
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function			
Other	Power supply voltage [V]	V _{DD} = 2.7 to 5.5 V		
	Operating ambient temperature [°C]	① T _A = -40 to +105°C (G: Industrial applications), ② T _A = -40 to +125°C (M: Industrial applications)		
	Package (size [mm])	20-LSSOP (4.4 × 6.5 mm)	30-LSSOP (7.62 mm (300 mil))	38-SSOP (7.62 mm (300 mil))

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website.
http://www.renesas.com/flash_libraries
1. Products with pin counts from 20 or 30 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 KHz) is available for use.

RL78 specifications RL78/I1B (80 to 100 pins)

Series		RL78/I1B			
Pin count		80-pin		100-pin	
Product name		R5F10MMEDFB	R5F10MMGDFB	R5F10MPEDFB	R5F10MPGDFB
CPU		RL78 CPU core			
Memory	Flash ROM [bytes]	64 K	128 K	64 K	128 K
	Data flash [bytes]	—			
	RAM [bytes]	6 K	8 K	6 K	8 K
Operating clocks	Maximum operating frequency [Hz]	24 MHz			
	On-chip oscillator clock External resonator	20 MHz			
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.9 to 5.5 V)			
	High-speed on-chip oscillator [Hz]	24/12/6/3 MHz (V _{DD} = 2.7 to 5.5 V), 12/6/3 MHz (V _{DD} = 2.4 to 5.5 V), 6/3 MHz (V _{DD} = 1.9 to 5.5 V)			
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.9 to 5.5 V)			
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.9 to 5.5 V)			
I/O	Total I/O ports and LCD pins (SEG and COM)	61		77	
	I/O ports	53		69	
	N-channel open drain (6 V tolerance)	3			
Timers	16-bit timer TAU [channels]	8, PWM output × 7			
	Real-time clock (RTC) [channels]	1 (high-precision, 0.96 ppm minimum resolution)			
	Watchdog timer (WDT) [channels]	1			
	Interval timer [channels]	12-bit × 1, 8-bit × 4			
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1			
	UART × 1, simplified I ² C × 1	1			
	UART × 1, IrDA × 1	1			
	I ² C × 1	1			
LCD controller	LCD drive voltage generation method	Selectable among internal voltage boost, capacitor split, and external resistance division			
	Segment signal outputs	34 (30) *		42 (38) *	
	Common signal outputs	4 (8) *			
DTC (sources)	30				
External interrupts [channels]	10				
OCD	On-chip debugging	Yes			
Peripheral functions	8/10-bit A/D converter [channels]	4		6	
	24-bit ΔΣ A/D converter [channels]	3		4	
	Comparator [channels]	2			
	PGA [channels]	1			
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)			
Safety functions	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), battery backup function, RTC output (1 Hz) × 1			
	Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function			
Other	Power supply voltage [V]	V _{DD} = 1.9 to 5.5 V			
	Operating ambient temperature [°C]	T _A = -40 to +85°C (D: Industrial applications)			
	Package (size [mm])	80-LFQFP (12 × 12 mm)		100-LFQFP (14 × 14 mm)	

Note: 1. Figure in parentheses () is number of signal lines when using 8 COM.

RL78 specifications RL78/I1D (20 to 48 pins)

Series		RL78/I1D												
Pin count		20-pin		24-pin		30-pin		32-pin				48-pin		
Product name		R5F11768GSP	R5F1176AGSP	R5F11778GNA	R5F1177AGNA	R5F117A8GSP	R5F117AAGSP	R5F117ACGSP	R5F117BAGNA	R5F117BCGNA	R5F117BAGFP	R5F117BCGFP	R5F117GAGFB	R5F117CGGFB
CPU		RL78 CPU core												
Memory	Flash ROM [bytes]	8 K	16 K	8 K	16 K	8 K	16 K	32 K	16 K	32 K	16 K	32 K	16 K	32 K
	Data flash [bytes]	2 K												
	RAM [bytes]	0.7 K	2 K	0.7 K	2 K	0.7 K	2 K	3 K	2 K	3 K	2 K	3 K	2 K	3 K
Operating clocks	Maximum operating frequency [Hz]	24 MHz												
	On-chip oscillator clock	20 MHz												
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 2.7 V), 1 to 4 MHz (V _{DD} = 1.6 to 1.8 V)												
	High-speed on-chip oscillator [Hz]	1 to 24 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V), 1 MHz (V _{DD} = 1.8 to 3.6 V)												
	Middle-speed on-chip oscillator [Hz]	1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V), 1 MHz (V _{DD} = 1.8 to 3.6 V)												
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 3.6 V)												
	Subclock (32.768 kHz)	—												
I/O	I/O ports	14	18	24	26	42								
	N-channel open drain (6 V tolerance)	—	—	—	—	4								
	N-channel open drain (V _{DD} tolerance)	—												
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 3.6 V)												
Timers	16-bit timer TAU [channels]	4												
	Real-time clock (RTC) [channels]	1 ¹												
	Watchdog timer (WDT) [channels]	1												
	Interval timer [channels]	8-bit × 4 (or 16-bit × 2), 12-bit × 1												
Serial interfaces	CSI × 1, UART × 1, simplified I ² C × 1	1	—	1	—	—								
	CSI × 2, UART × 1, simplified I ² C × 2	—	1	—	1	1								
DTC (sources)	16	20	19	20	23									
ELC (inputs/trigger outputs)	13/5	17/5	16/7	17/7	20/7									
External interrupt pins [count]	3	5	5	8										
OCD	On-chip debugging	Yes												
Peripheral functions	12-bit A/D converter [channels]	6	12	17										
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)												
	Op-amp [channels]	2	4											
	Comparator [channels]	2												
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output, Data operation circuit (DOC)												
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function													
Other	Power supply voltage [V]	V _{DD} = 1.6 to 3.6												
	Operating ambient temperature [°C]	-40 to +105°C (G: Industrial applications)												
	Package (size [mm])	20-LSSOP (4.4 × 6.5 mm)	24-HWQFN (4 × 4 mm)	30-LSSOP (7.62 mm (300 mil))	32-HVQFN (5 × 5 mm)	32-LQFP (7 × 7 mm)	48-LFQFP (7 × 7 mm)							

Notes: A dedicated library is required to overwrite the data flash. Refer to [Development Environments] – [Flash Programming Tools] – [Self-Programming Library] on the Renesas website.
http://www.renesas.com/flash_libraries
 1. Products with pin counts from 20 or 24 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 kHz) is available for use.

RL78 specifications RL78/L12 (32 to 64 pins)

Series		RL78/L12																	
Pin count		32-pin			44-pin			48-pin			52-pin			64-pin					
Product name		R5F10RB8AFP ¹	R5F10RBAAFP ¹	R5F10RBCAFP ¹	R5F10RF8AFP ¹	R5F10RFAAFP ¹	R5F10RFCAFP ¹	R5F10RG8AFB ¹	R5F10RGAAFB ¹	R5F10RGCAFB ¹	R5F10RJBFA ¹	R5F10RJAFA ¹	R5F10RJCAFA ¹	① R5F10RLAAFB ¹	② R5F10RLAAFA ¹	③ R5F10RLAANB ¹	① R5F10RLCAFB ¹	② R5F10RLCAFA ¹	③ R5F10RLCANB ¹
CPU		RL78 CPU core																	
Memory	Flash ROM [bytes]	8 K	16 K	32 K	8 K	16 K	32 K	8 K	16 K	32 K	8 K	16 K	32 K	8 K	16 K	32 K	16 K	32 K	
	Data flash [bytes]	2 K																	
	RAM [bytes] ¹	1 K	1 K	1.5 K	1 K	1 K	1.5 K	1 K	1 K	1.5 K	1 K	1 K	1.5 K	1 K	1 K	1.5 K	1 K	1.5 K	
Operating clocks	Maximum operating frequency [Hz]	24 MHz																	
	On-chip oscillator clock	20 MHz																	
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																	
	High-speed on-chip oscillator [Hz]	1 to 24 MHz (V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)																	
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)																	
	Subclock (32.768 kHz)	—																	
I/O	Total I/O ports and LCD pins (SEG and COM)	28	40	44	48	58													
	I/O ports	20	29	33	37	47													
	N-channel open drain (E _{VDD} tolerance)	2																	
LCD controller/Driver	Segment signal outputs	13	22 (18) ^{*2}	26 (22) ^{*2}	30 (26) ^{*2}	39 (35) ^{*2}													
	Common signal outputs	4	4 (8) ^{*2}																
Timers	16-bit timer TAU [channels]	4, PWM output × 3	5, PWM output × 4	6, PWM output × 5	8, PWM output × 7														
	Real-time clock (RTC) [channels]	1 ³																	
	Watchdog timer (WDT) [channels]	1																	
	Interval timer [channels]	1																	
Serial interfaces	CSI × 2, UART (LIN bus support) × 1	1																	
	I ² C × 1	1																	
DMA [channels]	2																		
External interrupts [channels]	4	6	7	9															
OCD	On-chip debugging	Yes																	
Peripheral functions	8/10-bit A/D converter [channels]	4	7	9	10														
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																	
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), clock/buzzer output, Remote control carrier wave output × 1																	
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function																		
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V																	
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications) T _A = -40 to +105°C (G: Industrial applications) ^{*4}																	
	Package (size [mm])	32-LQFP (7 × 7 mm)	44-LQFP (10 × 10 mm)	48-LFQFP (7 × 7 mm)	52-LQFP (10 × 10 mm)	① 64-LFQFP (10 × 10 mm)	② 64-LQFP (12 × 12 mm)	③ 64-HWQFN (8 × 8 mm)	① 64-LFQFP (10 × 10 mm)	② 64-LQFP (12 × 12 mm)	③ 64-HWQFN (8 × 8 mm)								

Notes: 1. 630 bytes when using self-programming function and data flash function
 2. Figure in parentheses () is number of signal lines when using 8 COM.
 3. Products with a pin count of 32 pins are not equipped with a subsystem clock, so only the fixed-cycle interrupt function using the low-speed on-chip oscillator clock (15 kHz) is available for use.
 4. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10RxxGxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/L13 (64 to 80 pins)

Series		RL78/L13												
Pin count		64-pin						80-pin						
Product name		① R5F10WLAAFB ② R5F10WLAFA	① R5F10WLCAFB ② R5F10WLCFA	① R5F10WLDAFB ② R5F10WLDFA	① R5F10WLEAFB ② R5F10WLEAFA	① R5F10WLFAB ② R5F10WLFABA	① R5F10WLGAFB ② R5F10WLGFA	① R5F10WMAAFB ② R5F10WMAFA	① R5F10WMCAB ② R5F10WMCFA	① R5F10WMDAFB ② R5F10WMDFA	① R5F10WMEAFB ② R5F10WMEFA	① R5F10WMAFB ② R5F10WMAFA	① R5F10WMAFB ② R5F10WMAFA	
CPU		RL78 CPU core												
Memory	Flash ROM [bytes]	16 K	32 K	48 K	64 K	96 K	128 K	16 K	32 K	48 K	64 K	96 K	128 K	
	Data flash [bytes]	4 K												
	RAM [bytes]	1 K	1.5 K	2 K	4 K	6 K	8 K	1 K	1.5 K	2 K	4 K	6 K	8 K	
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock	24 MHz											
		External resonator	20 MHz											
		Timer KB20 clock	48 MHz (V _{DD} = 2.7 to 5.5 V)											
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V),						1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), 1 to 8 MHz (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)						
	High-speed on-chip oscillator [Hz]	1 to 24 MHz 1 to 8 MHz						(V _{DD} = 2.7 to 5.5 V), 1 to 16 MHz (V _{DD} = 2.4 to 5.5 V), (V _{DD} = 1.8 to 5.5 V), 1 to 4 MHz (V _{DD} = 1.6 to 5.5 V)						
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 5.5 V)												
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 5.5 V)												
I/O	Total I/O ports and LCD pins (SEG and COM)	57						73						
	I/O ports	49						65						
	N-channel open drain (6 V tolerance)	2												
LCD controller	LCD drive voltage generation method	Selectable among internal voltage boost, capacitor split, and external resistance division												
	Segment signal outputs	36 (32) *1						51 (47) *1						
	Common signal outputs	4 (8) *1												
Timers	16-bit timer TAU [channels]	8, PWM output × 7												
	16-bit timer KB20 [channels]	1, PWM output × 2												
	Real-time clock2 (RTC2) [channels]	1 (0.96 ppm minimum resolution)												
	Watchdog timer (WDT) [channels]	1												
	Interval timer [channels]	12-bit × 1												
Serial interfaces	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	1						1						
	CSI × 1, UART × 1, simplified I ² C × 1	1						1						
	UART × 1	1						2						
	I ² C × 1	1						1						
DMA [channels]		4												
External interrupts [channels]		9												
OCD	On-chip debugging	Yes												
Peripheral functions	8/10-bit A/D converter [channels]	9						12						
	Comparator [channels]	2												
	Multiplier/divider/multiply-accumulator	Library support for multiply/divide/multiply-accumulate operations (equipped with functional unit)						Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)						
	Other functions	Power-on reset (POR), low-voltage detection						circuit (LVD), RTC output (1 Hz) × 1, clock/buzzer output × 2, remote control carrier wave output × 1						
Safety functions		Flash memory CRC calculation function (high-speed), CRC illegal memory access detection function,						calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, frequency detection function, A/D converter test function, I/O power output signal level detection function						
Other	Power supply voltage [V]	V _{DD} = 1.6 to 5.5 V												
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications) T _A = -40 to +105°C (G: Industrial applications) *2												
	Package (size [mm])	① 64-LFQFP (10 × 10 mm) ② 64-LQFP (12 × 12 mm)						① 80-LFQFP (12 × 12 mm) ② 80-LQFP (14 × 14 mm)						

Notes: 1. Figure in parentheses () is number of signal lines when using 8 COM.
2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F10WxxGxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/L1C (80 to 100 pins)

Series		RL78/L1C (USB)														
Pin count		80-pin					85-pin					100-pin				
Product name		R5F110MEAFB ^{*)}	R5F110MFAFB ^{*)}	R5F110MGAFB ^{*)}	R5F110MHAFB ^{*)}	R5F110MJAFB ^{*)}	R5F110NEALA ^{*)}	R5F110NFALA ^{*)}	R5F110NGALA ^{*)}	R5F110NHALA ^{*)}	R5F110NJALA ^{*)}	R5F110PEAFB ^{*)}	R5F110PFAFB ^{*)}	R5F110PGAFA ^{*)}	R5F110PHAFB ^{*)}	R5F110PJAFB ^{*)}
CPU		RL78 CPU core														
Memory	Flash ROM [bytes]	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K
	Data flash [bytes]	8 K														
	RAM [bytes]	8 K	10 K	12 K	16 K	16 K	8 K	10 K	12 K	16 K	16 K	8 K	10 K	12 K	16 K	16 K
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		24 MHz												
		External resonator		20 MHz												
		Timer KB2 clock, USB clock		48 MHz (V _{DD} = 2.7 to 3.6 V)												
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)														
	High-speed on-chip oscillator [Hz]	1 to 48 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)														
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 1.6 to 3.6 V)														
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 3.6 V)														
I/O	Total I/O ports and LCD and USB pins ^{*)}	71					89									
	I/O ports	59					77									
	N-channel open drain (6 V tolerance)	2														
LCD controller	LCD drive voltage generation method	Selectable among internal voltage boost, capacitor split, and external resistance division														
	Segment signal outputs	44 (40) ^{*)}					56 (52) ^{*)}									
	Common signal outputs	4 (8) ^{*)}														
Timers	16-bit timer TAU [channels]	8 (PWM output × 7)														
	16-bit timer KB20 [channels]	3 (PWM output × 6)														
	Real-time clock2 (RTC2) [channels]	1 (0.96 ppm accuracy correction)														
	Watchdog timer (WDT) [channels]	1														
	Interval timer [channels]	12-bit × 1														
Serial interfaces	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	1														
	CSI × 1, UART × 1, simplified I ² C × 1	3														
	I ² C × 1	1														
USB	Function [channels]	1														
DTC (sources)		32					33									
ELC (inputs/trigger outputs)		30					31									
External interrupts [channels]		9														
OCD	On-chip debugging	Yes														
Peripheral functions	8/12-bit A/D converter [channels]	9					13									
	8-bit D/A converter [channels]	2														
	Comparator [channels]	1					2									
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)														
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), RTC output (1 Hz) × 1, clock/buzzer output × 2, remote control carrier wave output × 1														
Safety functions		Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function														
Other	Power supply voltage [V]	V _{DD} = 1.6 to 3.6 V														
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications), T _A = -40 to +105°C (G: Industrial applications) ^{*)}														
	Package (size [mm])	80-LFQFP (12 × 12 mm)					85-VFLGA (7 × 7 mm)					100-LFQFP (14 × 14 mm)				

Notes: 1. Figure in parentheses () is number of signal lines when using 8 COM.
2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F110xxGxx. For details, see "How to read RL78 family product numbers" on page 95.
3. LCD uses SEG pins and COM pins. USB uses UV_{BUS}, U_{RECC}, UDP, and UDM pins.

RL78 specifications RL78/L1C (80 to 100 pins)

Series		RL78/L1C (no USB)														
Pin count		80-pin					85-pin					100-pin				
Product name		R5F111MEAFB ^{*)}	R5F111MFAFB ^{*)}	R5F111MGAFB ^{*)}	R5F111MHAFB ^{*)}	R5F111MJAFB ^{*)}	R5F111NEALA ^{*)}	R5F111NFALA ^{*)}	R5F111NGALA ^{*)}	R5F111NHALA ^{*)}	R5F111NJALA ^{*)}	R5F111PEAFB ^{*)}	R5F111PFAFB ^{*)}	R5F111PGAFA ^{*)}	R5F111PHAFB ^{*)}	R5F111PJAFB ^{*)}
CPU		RL78 CPU core														
Memory	Flash ROM [bytes]	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K
	Data flash [bytes]	8 K														
	RAM [bytes]	8 K	10 K	12 K	16 K	16 K	8 K	10 K	12 K	16 K	16 K	8 K	10 K	12 K	16 K	16 K
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		24 MHz												
		External resonator		20 MHz												
		Timer KB2 clock, USB clock		48 MHz (V _{DD} = 2.7 to 3.6 V)												
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)														
	High-speed on-chip oscillator [Hz]	1 to 48 MHz (V _{DD} = 2.7 to 3.6 V), 1 to 16 MHz (V _{DD} = 2.4 to 3.6 V), 1 to 8 MHz (V _{DD} = 1.8 to 3.6 V), 1 to 4 MHz (V _{DD} = 1.6 to 3.6 V)														
	Low-speed on-chip oscillator [Hz]	15 KHz (TYP.) : V _{DD} = 1.6 to 3.6 V														
	Subclock (32.768 kHz)	32.768 KHz (V _{DD} = 1.6 to 3.6 V)														
I/O	Total I/O ports and LCD pins (SEG and COM)	71					89									
	I/O ports	63					81									
	N-channel open drain (6 V tolerance)	2														
LCD controller	LCD drive voltage generation method	Selectable among internal voltage boost, capacitor split, and external resistance division														
	Segment signal outputs	44 (40) ^{*)}					56 (52) ^{*)}									
	Common signal outputs	4 (8) ^{*)}														
Timers	16-bit timer TAU [channels]	8 (PWM output × 7)														
	16-bit timer KB20 [channels]	3 (PWM output × 6)														
	Real-time clock2 (RTC2) [channels]	1 (0.96 ppm accuracy correction)														
	Watchdog timer (WDT) [channels]	1														
	Interval timer [channels]	12-bit × 1														
Serial interfaces	CSI × 1, UART (LIN bus support) × 1, simplified I ² C × 1	1														
	CSI × 1, UART × 1, simplified I ² C × 1	3														
	I ² C × 1	1														
DTC (sources)		30					31									
ELC (inputs/trigger outputs)		30					31									
External interrupts [channels]		9														
OCD	On-chip debugging	Yes														
Peripheral functions	8/12-bit A/D converter [channels]	11					13									
	8-bit D/A converter [channels]	2														
	Comparator [channels]	1					2									
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)														
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), RTC output (1 Hz) × 1, clock/buzzer output × 2, remote control carrier wave output × 1														
Safety functions		Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), RAM parity error detection function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function														
Other	Power supply voltage [V]	V _{DD} = 1.6 to 3.6 V														
	Operating ambient temperature [°C]	T _A = -40 to +85°C (A: Consumer applications), T _A = -40 to +105°C (G: Industrial applications) ^{*)}														
	Package (size [mm])	80-LFQFP (12 × 12 mm)					85-VFLGA (7 × 7 mm)					100-LFQFP (14 × 14 mm)				

Notes: 1. Figure in parentheses () is number of signal lines when using 8 COM.
2. The version for industrial applications with an operating temperature range of -40 to +105°C is the R5F111xxGxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/F13 (20 to 80 pins)

Series		RL78/F13 (CAN and LIN versions)																													
Pin count		30-pin				32-pin				48-pin				64-pin				80-pin													
Product name		R5F10BACLSP*	R5F10BADLSP*	R5F10BAELSP*	R5F10BAFLSP*	R5F10BAGLSP*	R5F10BBCLMA*	R5F10BBDLMA*	R5F10BBELMA*	R5F10BBFLMA*	R5F10BBGLMA*	① R5F10B6CLFB*	② R5F10B6GLMA*	① R5F10B6DLFB*	② R5F10B6GLMA*	① R5F10B6ELFB*	② R5F10B6GLMA*	① R5F10B6FLFB*	② R5F10B6GLMA*	① R5F10B6GLFB*	② R5F10B6GLMA*	R5F10BCLLFB*	R5F10BLDLFB*	R5F10BLELFB*	R5F10BLFLFB*	R5F10BLGLFB*	R5F10BMLLFB*	R5F10BMFLFB*	R5F10BMGLFB*		
CPU		RL78 CPU core																													
Memory	Flash ROM [bytes]	32 K	48 K	64 K	96 K	128 K	32 K	48 K	64 K	96 K	128 K	32 K	48 K	64 K	96 K	128 K	32 K	48 K	64 K	96 K	128 K	32 K	48 K	64 K	96 K	128 K	32 K	48 K	64 K	96 K	128 K
	Data flash [bytes]	4 K				4 K				4 K				4 K				4 K													
	RAM [bytes]	2 K	3 K	4 K	6 K	8 K	2 K	3 K	4 K	6 K	8 K	2 K	3 K	4 K	6 K	8 K	2 K	3 K	4 K	6 K	8 K	2 K	3 K	4 K	6 K	8 K	2 K	3 K	4 K	6 K	8 K
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz (automotive applications, T _A = -40 to +105°C), 24 MHz (automotive applications, T _A = -40 to +125°C)																											
		External resonator		20 MHz																											
		Timer RD clock		64 MHz (V _{DD} = 2.7 to 5.5 V)																											
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V)																													
	High-speed on-chip oscillator [Hz]	64 MHz (±2%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +105°C), 48 MHz (±3%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +125°C)																													
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.7 to 5.5 V)																													
	Subclock (32.768 kHz)	—				32.768 KHz (V _{DD} = 2.7 to 5.5 V)																									
	PLL	Multiplication factors: ×3, ×4, ×6, ×8																													
I/O ports	I/O ports	23				25				38				52				68													
	N-channel open drain (6 V tolerance)	—																													
	N-channel open drain (EV _{DD} tolerance)	9				13				16				—				—													
Timers	16-bit timer TAU [channels]	16																													
	Timer RJ	1																													
	Timer RD	2																													
	Real-time clock (RTC) [channels]	1																													
	Watchdog timer (WDT) [channels]	1																													
	Serial interfaces	CSI × 2, UART × 1, simplified I ² C × 2	1				—												—												
CSI × 4, UART × 2, simplified I ² C × 4	—				1												—														
UART × 1, LIN (RLIN3) × 1	1																														
CAN (RS-CAN lite) × 1	1																														
Multi-master I ² C × 1	—				1												—														
DTC (sources)	36				37												—														
External interrupts [channels]	9				13				14				—																		
OCD	On-chip debugging	Supported (hot plugin, trace)																													
Peripheral functions	8/10-bit A/D converter [channels]	12				10				15				19				20													
	8-bit D/A converter [channels]	—																													
	Comparator [channels]	—																													
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																													
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), RTC output (1 Hz) × 1 — clock/buzzer output × 1																													
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), SRAM ECC function, CPU stack pointer monitor function, clock monitor function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function																														
Other	Power supply voltage [V]	V _{DD} = 2.7 to 5.5 V																													
	Operating ambient temperature [°C]	T _A = -40 to +105°C (L: automotive applications), T _A = -40 to +125°C (K: automotive applications) *1																													
	Package (size [mm])	30-LSSOP (6.1 × 9.85 mm)				32-HVQFN (5 × 5 mm)				① 48-LFQFP (7 × 7 mm) ② 48-HVQFN (7 × 7 mm)				64-LFQFP (10 × 10 mm)				80-LFQFP (12 × 12 mm)													

Note: 1. The K version for industrial applications with an operating temperature range of -40 to +125°C is the R5F10BxxKxx, and the Y version for industrial applications with an operating temperature range of -40 to +150°C is the R5F10BxxYxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/F13 (20 to 80 pins)

Series		RL78/F13 (LIN version)																															
Pin count		20-pin				30-pin				32-pin				48-pin				64-pin				80-pin											
Product name		R5F10A6LSP*	R5F10A6CLSP*	R5F10A6DLS*	R5F10A6ELSP*	R5F10A6ALS*	R5F10A6CLSP*	R5F10A6DLS*	R5F10A6ELSP*	R5F10A6ALS*	R5F10A6CLSP*	R5F10A6DLS*	R5F10A6ELSP*	R5F10A6ALS*	① R5F10A6CLFB*	② R5F10A6GLMA*	① R5F10A6DLFB*	② R5F10A6GLMA*	① R5F10A6ELFB*	② R5F10A6GLMA*	① R5F10A6FLFB*	② R5F10A6GLMA*	R5F10ALCLFB*	R5F10ALDLFB*	R5F10ALELFB*	R5F10ALFLFB*	R5F10ALGLFB*	R5F10AMLLFB*	R5F10AMFLFB*	R5F10AMGLFB*			
CPU		RL78 CPU core																															
Memory	Flash ROM [bytes]	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	16 K	32 K	48 K	64 K	128 K	128 K		
	Data flash [bytes]	4 K				4 K				4 K				4 K				4 K															
	RAM [bytes]	1 K	2 K	3 K	4 K	1 K	2 K	3 K	4 K	1 K	2 K	3 K	4 K	1 K	2 K	3 K	4 K	1 K	2 K	3 K	4 K	6 K	8 K	2 K	3 K	4 K	6 K	8 K	4 K	6 K	8 K		
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz (automotive applications, T _A = -40 to +105°C), 24 MHz (automotive applications, T _A = -40 to +125°C)																													
		External resonator		20 MHz																													
		Timer RD clock		64 MHz (V _{DD} = 2.7 to 5.5 V)																													
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V)																															
	High-speed on-chip oscillator [Hz]	64 MHz (±2%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +105°C), 48 MHz (±3%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +125°C)																															
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.7 to 5.5 V)																															
	Subclock (32.768 kHz)	—				32.768 KHz (V _{DD} = 2.7 to 5.5 V)																											
	PLL	Multiplication factors: ×3, ×4, ×6, ×8																															
I/O ports	I/O ports	13				23				25				38				52				68											
	N-channel open drain (6 V tolerance)	—																															
	N-channel open drain (EV _{DD} tolerance)	6				10				16/13				16/13				16															
Timers	16-bit timer TAU [channels]	8																															
	Timer RJ	1																															
	Timer RD	2																															
	Real-time clock (RTC) [channels]	1																															
	Watchdog timer (WDT) [channels]	1																															
	Serial interfaces	CSI × 2, UART × 1, simplified I ² C × 2	—				1												—				1										
CSI × 4, UART × 2, simplified I ² C × 4	—				1												—																
UART × 1, LIN (RLIN3) × 1	1																																
CAN (RS-CAN lite) × 1	—																																
Multi-master I ² C × 1	—				1												—				1												
DTC (sources)	28				29				30				36				30				36												
External interrupts [channels]	7				8				10				12				10				13												
OCD	On-chip debugging	Supported (hot plugin, trace)																															
Peripheral functions	8/10-bit A/D converter [channels]	4				10				8				12				15				12				19				20			
	8-bit D/A converter [channels]	—																															
	Comparator [channels]	—																															
	Multiplier/divider/multiply-accumulator	Multiply/divide/multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) Multiply-accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																															
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), RTC output (1 Hz) × 1 — clock/buzzer output × 1																															
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function (general-purpose), SRAM ECC function, CPU stack pointer monitor function, clock monitor function, RAM guard function, SFR guard function, illegal memory access detection function, frequency detection function, A/D converter test function, I/O power output signal level detection function																																
Other	Power supply voltage [V]	V _{DD} = 2.7 to 5.5 V																															
	Operating ambient temperature [°C]	T _A = -40 to +105°C (L: automotive applications), T _A = -40 to +125°C (K: automotive applications) *1																															
	Package (size [mm])	20-LSSOP (6.1 × 6.65 mm)				30-LSSOP (6.1 × 9.85 mm)				32-HVQFN (5 × 5 mm)				① 48-LFQFP (7 × 7 mm) ② 48-HVQFN (7 × 7 mm)				64-LFQFP (10 × 10 mm)				80-LFQFP (12 × 12 mm)											

Note: 1. The K version for industrial applications with an operating temperature range of -40 to +125°C is the R5F10AxxKxx, and the Y version for industrial applications with an operating temperature range of -40 to +150°C is the R5F10AxxYxx. For details, see "How to read RL78 family product numbers" on page 95.

RL78 specifications RL78/F14 (30 to 100 pins)

Series		RL78/F14																											
Pin count		30-pin				32-pin				48-pin								64-pin				80-pin				100-pin			
Product name		R5F10PADLSP ^{*1}	R5F10PAELSP ^{*1}	R5F10PBDLMA ^{*1}	R5F10PBELMA ^{*1}	① R5F10PGDLFB ^{*1} ② R5F10PGDLMA ^{*1}	① R5F10PBELFB ^{*1} ② R5F10PGLMA ^{*1}	① R5F10PGFLFB ^{*1} ② R5F10PGLMA ^{*1}	① R5F10PGGLFB ^{*1} ② R5F10PGLMA ^{*1}	① R5F10PGLHFB ^{*1} ② R5F10PGLMA ^{*1}	① R5F10PGLJFB ^{*1} ② R5F10PGLMA ^{*1}	R5F10PLELFB ^{*1}	R5F10PLFLFB ^{*1}	R5F10PLGLFB ^{*1}	R5F10PLHLFB ^{*1}	R5F10PLJLFB ^{*1}	R5F10PMELFB ^{*1}	R5F10PMFLFB ^{*1}	R5F10PMGLFB ^{*1}	R5F10PMHLFB ^{*1}	R5F10PMJLFB ^{*1}	R5F10PELFB ^{*1}	R5F10PPLFLFB ^{*1}	R5F10PPGLFB ^{*1}	R5F10PPHLFB ^{*1}	R5F10PPJLFB ^{*1}			
CPU		RL78 CPU core																											
Memory	Flash ROM [bytes]	48 K	64 K	48 K	64 K	48 K	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K	64 K	96 K	128 K	192 K	256 K			
	Data flash [bytes]	4 K		4 K		4 K				8 K				4 K		8 K		4 K		8 K		4 K		8 K					
	RAM [bytes]	4 K	6 K	4 K	6 K	4 K	6 K	8 K	10 K	16 K	20 K	6 K	8 K	10 K	16 K	20 K	6 K	8 K	10 K	16 K	20 K	6 K	8 K	10 K	16 K	20 K			
Operating clocks	Maximum operating frequency [Hz]	On-chip oscillator clock		32 MHz (automotive applications, T _A = -40 to +105°C), 24 MHz (automotive applications, T _A = -40 to +125°C), 24 MHz (automotive applications, T _A = -40 to +150°C)																									
		External resonator		20 MHz																									
		Timer RD clock		64 MHz																									
Clock generator circuit	Crystal/ceramic oscillator [Hz]	1 to 20 MHz (V _{DD} = 2.7 to 5.5 V)																											
	High-speed on-chip oscillator [Hz]	64 MHz (±2%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +105°C), 48 MHz (±3%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +125°C), 48 MHz (±5%): V _{DD} = 2.7 to 5.5 V (automotive applications/T _A = -40 to +150°C)																											
	Low-speed on-chip oscillator [Hz]	15 KHz (V _{DD} = 2.7 to 5.5 V)																											
	Subclock (32.768 KHz)	32.768 KHz (V _{DD} = 2.7 to 5.5 V)																											
	PLL	Multiplication factors: ×3, ×4, ×6, ×8																											
I/O	I/O ports	23		25		38								52				68				86							
	N-channel open drain (6 V tolerance)	—																											
	N-channel open drain (E _{VDD} tolerance)	9		13		16								16				16				16							
Timers	16-bit timer TAU [channels]	12																											
	16-bit timer RJ [channels]	1																											
	16-bit timer RD [channels]	2																											
	Real-time clock (RTC) [channels]	1																											
	Watchdog timer (WDT) [channels]	1																											
Serial interfaces	CSI × 3, UART × 2, simplified I ² C × 3	1		—																									
	CSI × 4, UART × 2, simplified I ² C × 4	—		1																									
	UART × 1, LIN (RLIN3) × 1	1		2 or 1																									
	CAN (RS-CAN lite) × 1	1																											
	Multi-master I ² C × 1	—		1																									
DTC (sources)	37																												
ELC (inputs/trigger outputs)	20/7																												
External interrupts [channels]	9																												
OCD	On-chip debugging	Supported (hot plugin, trace)																											
Peripheral functions	8/10-bit A/D converter [channels]	10		8		13								17 or 16				18 or 16				24							
	8-bit D/A converter [channels]	1																											
	Comparator [channels]	1																											
	Multiplier/divider/multiply-accumulator	Multiply/divide/ multiply-accumulate instructions supported (included in CPU instruction set) Multiply: 16-bit × 16-bit = 32-bit (signed/unsigned) Divide: 32-bit ÷ 32-bit = 32-bit (unsigned) accumulate: 16-bit × 16-bit + 32-bit = 32-bit (signed/unsigned)																											
	Other functions	Power-on reset (POR), low-voltage detection circuit (LVD), RTC output (1 Hz) × 1, clock/buzzer output × 2																											
Safety functions	Flash memory CRC calculation function (high-speed), CRC calculation function illegal memory access detection function, (general-purpose), SRAM ECC function, CPU stack pointer monitor function, clock monitor function, RAM guard function, SFR guard function, frequency detection function, A/D converter test function, I/O power output signal level detection function																												
Other	Power supply voltage [V]	V _{DD} = 2.7 to 5.5 V																											
	Operating ambient temperature [°C]	T _A = -40 to +105°C (L: automotive applications), T _A = -40 to +125°C (K: automotive applications), T _A = -40 to +150°C (Y: automotive applications) ^{*1}																											
	Package (size [mm])	30-LSSOP (6.1 × 9.85 mm)	32-HVQFN (5 × 5 mm)	① 48-LFQFP (7 × 7 mm) ② 48-HVQFN (7 × 7 mm)								64-LFQFP (10 × 10 mm)				80-LFQFP (12 × 12 mm)				100-LFQFP (14 × 14 mm)									

Note: 1. The K version for industrial applications with an operating temperature range of -40 to +125°C is the R5F10PxxKxx, and the Y version for industrial applications with an operating temperature range of -40 to +150°C is the R5F10PxxYxx. For details, see "How to read RL78 family product numbers" on page 95.

Package lineup

LQFP

32-LQFP (7 × 7 mm)	44-LQFP (10 × 10 mm)	52-LQFP (10 × 10 mm)	64-LQFP (12 × 12 mm)
Pitch: 0.80 mm Thickness (max.): 1.70 mm Used by: RL78/G14, G1C, G1F, G1G, L12	Pitch: 0.80 mm Thickness (max.): 1.60 mm Used by: RL78/G13, G14, G1G, L12	Pitch: 0.65 mm Thickness (max.): 1.70 mm Used by: RL78/G13, G14, L12	Pitch: 0.65 mm Thickness (max.): 1.60 mm Used by: RL78/G13, G14, L12, L13
64-LQFP (14 × 14 mm)	80-LQFP (14 × 14 mm)	100-LQFP (14 × 20 mm)	
Pitch: 0.80 mm Thickness (max.): 1.70 mm Used by: RL78/G14	Pitch: 0.65 mm Thickness (max.): 1.70 mm Used by: RL78/G13, G14, L13	Pitch: 0.65 mm Thickness (max.): 1.60 mm Used by: RL78/G13, G14	

LFQFP

48-LFQFP (7 × 7 mm)	64-LFQFP (10 × 10 mm)	80-LFQFP (12 × 12 mm)	100-LFQFP (14 × 14 mm)	128-LFQFP (14 × 20 mm)
Pitch: 0.50 mm Thickness (max.): 1.60 mm Used by: RL78/G13, G14, G1A, G1C, L12, F13, F14, F1A	Pitch: 0.50 mm Thickness (max.): 1.70 mm Used by: RL78/G13, G14, G1A, G1C, L12, F13, F14	Pitch: 0.50 mm Thickness (max.): 1.70 mm Used by: RL78/G13, G14, G1E, F13, F14	Pitch: 0.50 mm Thickness (max.): 1.70 mm Used by: RL78/G13, G14, F14	Pitch: 0.50 mm Thickness (max.): 1.60 mm Used by: RL78/G13

SSOP

16-SSOP (4.4 × 5 mm)	38-SSOP (7.62 mm (300 mil))
Pitch: 0.65 mm Thickness (max.): 1.725 mm Used by: RL78/G10	Pitch: 0.65 mm Thickness (max.): 2.00 mm Used by: RL78/I1A

LSSOP

10-LSSOP (4.4 × 3.6 mm)	20-LSSOP (4.4 × 6.5 mm)	20-LSSOP (7.62 mm (300 mil))	30-LSSOP (7.62 mm (300 mil))
Pitch: 0.65 mm Thickness (max.): 1.45 mm Used by: RL78/G10	Pitch: 0.65 mm Thickness (max.): 1.45 mm Used by: RL78/G12, I1A	Pitch: 0.65 mm Thickness (max.): 1.40 mm Used by: RL78/G13, F13	Pitch: 0.65 mm Thickness (max.): 1.40 mm Used by: RL78/G12, G13, G14, G1G, I1A, F13, F14

HVQFN

32-HVQFN (5 × 5 mm)
Pitch: 0.50 mm Thickness (max.): 0.90 mm Used by: RL78/I1D, F13, F14

48-HVQFN (7 × 7 mm)
Pitch: 0.50 mm Thickness (max.): 0.90 mm Used by: RL78/F13, F14

HWQFN

24-HWQFN (4 × 4 mm)
Pitch: 0.50 mm Thickness (max.): 0.80 mm Used by: RL78/G12, G13, G1F

32-HWQFN (5 × 5 mm)
Pitch: 0.50 mm Thickness (max.): 0.80 mm Used by: RL78/G13, G14, G1A, G1C

40-HWQFN (6 × 6 mm)
Pitch: 0.50 mm Thickness (max.): 0.80 mm Used by: RL78/G13, G14

48-HWQFN (6 × 6 mm)
Pitch: 0.40 mm Thickness (max.): 0.80 mm Used by: RL78/G1D

48-HWQFN (7 × 7 mm)
Pitch: 0.50 mm Thickness (max.): 0.80 mm Used by: RL78/G13, G14, G1A, G1C

64-HWQFN (8 × 8 mm)
Pitch: 0.40 mm Thickness (max.): 0.80 mm Used by: RL78/L12

64-HWQFN (9 × 9 mm)
Pitch: 0.50 mm Thickness (max.): 0.80 mm Used by: RL78/G1E

VFBGA

64-VFBGA (4 × 4 mm)
Pitch: 0.40 mm Thickness (max.): 0.99 mm Used by: RL78/G13, G1A

VFLGA

85-VFLGA (7 × 7 mm)
Pitch: 0.65 mm Thickness (max.): 1.00 mm Used by: RL78/L1C

WFLGA

25-WFLGA (3 × 3 mm)
Pitch: 0.50 mm Thickness (max.): 0.76 mm Used by: RL78/G13, G1A

36-WFLGA (4 × 4 mm)
Pitch: 0.50 mm Thickness (max.): 0.76 mm Used by: RL78/G13, G14, G1F

64-WFLGA (5 × 5 mm)
Pitch: 0.50 mm Thickness (max.): 0.76 mm Used by: RL78/G14

How to read RL78 family product numbers

R5 F 1 00 6 E A SP #V*
 Renesas MCU ROM Type F: Flash RL78 Series

Product group

00		Data Flash
01	G13	No Data Flash
02		Data Flash
03	G12	No Data Flash
04	G14	
07	I1A	
09	F12	
0A		LIN
0B	F13	LIN & CAN
0E	G1A	
0F	G1E	
0J		USB Host & Function
0K	G1C	USB Function
0M	I1B	
0P	F14	
0R	L12	
0W	L13	
0Y	G10	
10		LCD & USB Function
11	L1C	LCD
17	I1D	
1A	G1D	
1B	G1F	
1E	G1G	

Pin count

1	10
4	16
6	20
7	24
8	25
A	30
B	32
C	36
D	38
E	40
F	44
G	48
J	52
L	64
M	80
P	100
S	128

ROM capacity (KB)

4	1
6	2
7	4
8	8
9	12
A	16
C	32
D	48
F	96
G	128
H	192
J	256
K	384
L	512

Packing specification

#U0, #20	Tray (HWQFN, HVQFN, VFBGA, WFLGA, VFBGA)
#V0, #30	Tray ¹ (LFQFP, LQFP, LSSOP, SSOP)
#W0, #40	Embossed Tape (HWQFN, HVQFN, VFBGA, WFLGA, VFBGA)
#X0, #50	Embossed Tape (LFQFP, LQFP, LSSOP, SSOP)

Package type

SP	SSOP 0.65 mm	LA	WFLGA 0.5 mm
	LSSOP 0.65 mm		VFLGA 0.65 mm
NA	HWQFN 0.5 mm	BG	VFBGA 0.4 mm
	HVQFN 0.5 mm	FA	LQFP 0.65 mm
NB	HWQFN 0.65 mm	FB	LFQFP 0.5 mm
		FP	LQFP 0.8 mm

Application category

A	-40 °C to 85 °C	Consumer
D	-40 °C to 85 °C	Industrial
G	-40 °C to 105 °C	Industrial
M	-40 °C to 125 °C	Industrial
J	-40 °C to 85 °C	Automotive
L	-40 °C to 105 °C	Automotive
K	-40 °C to 125 °C	Automotive
Y	-40 °C to 150 °C	Automotive

Notes: Product information for the RL78/G13 (20-Pin) with product number R5F1006EASP#V* is shown as an example.

1. For 20-pin RL78/G12 and RL78/I1A LSSOP products only the package specification is tube.

Introducing the Renesas RL78 Family page

It's the perfect place to find out what is going on at RL78 family right now.



<http://www.renesas.com/rl78>

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.



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Gadget Renesas (electronic project boards)

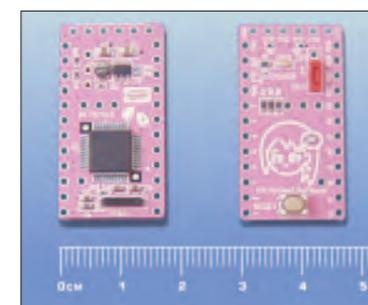
Gadget Renesas is a new endeavor designed to get people interested in building electronic projects. It provides information about compact gadgets (electronic project boards mounted with microcontrollers) called "GR reference boards" and hosts a cloud-based "web compiler" that people with no specialized knowledge can use to easily create programs for microcontrollers.

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

GR-KURUMI

This is a compact electronic project board mounted with the G13 (48-pin product) from the RL78 microcontroller family.

- **Accessible electronic projects**
These electronic projects using microcontrollers are accessible to everyone, from beginners to experienced hobbyists.
- **Software development in your web browser**
The cloud based environment is available free of charge lets you edit and compile programs in your web browser.
- **Community site for sharing information**
Support communities such as Renesas Rulz are great places to exchange information.



GR-KURUMI board



Gadget Renesas Site

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