To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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Renesas MCU

M16C Family

R32C / M32C / M16C / R8C

M16C Family (R32C/M32C/M16C/R8C)

Powerful Processor
Easy to Use

Renesas Electronics
www.renesas.com

2008.07

World's No. 1 Flash MCUs !!

World's No. 1 Flash MCUs
Proof No. 1

Total shipments of 1,200,000,000*1 units!!

Thanks to strong demand, total flash MCU shipments reached the 1.2 billion mark in March 2007. Renesas flash MCUs are used in a wide range of consumer, industrial and automotive applications.

(*1 : Based on fiscal 2007 results and the planned value in fiscal 2008.)

World's No. 1 Flash MCUs
Proof No. 2

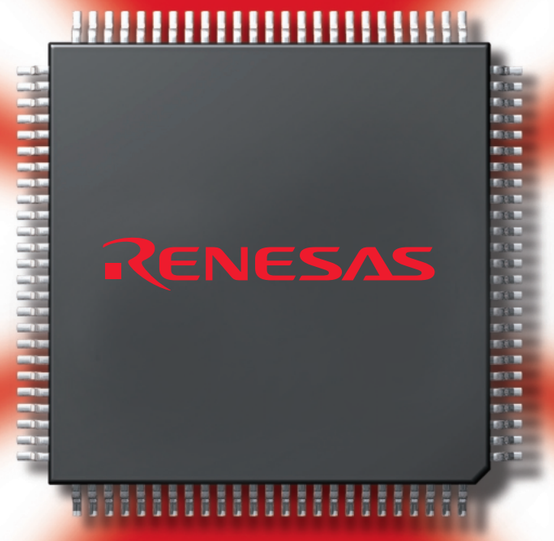
No. 1 lineup of flash MCUs with over 470 products in 40 series!!

Divided into high-end, middle, and low-end classes, the flash MCU lineup is built on the most advanced technology. Flexible support is provided for increasingly large and complex software.

World's No. 1 Flash MCUs
Proof No. 3

High-speed flash memory supporting up to 100MHz operation!!

Renesas flash technology provides direct memory access and no-wait-state operation at up to 100MHz to bring out the full capabilities of the MCU.



World's No. 1 Flash MCUs
Proof No. 4

Rewriting possible during operation, and program/erase cycles increased to 100,000!

E2dataFlash substantially improves the functionality and performance of data flash, allowing data to be rewritten independently while the MCU is operating. Guaranteed program/erase cycles have been increased to 100,000, and data save times are two orders of magnitude faster than external E2PROM. (E2dataFlash: E2PROM emulation data flash memory)

World's No. 1 Flash MCUs
Proof No. 5

40µsec./byte high-speed flash programming!!

Flash MCU technology supports high-speed programming at a rate of 512KB every 20 seconds (total time required for reprogramming, including erasing and programming).

World's No. 1 Flash MCUs
Proof No. 6

Comprehensive support and service to assist developers!!

Renesas delivers seamless integrated development environments and up-to-date technical information for 8-bit to 32-bit MCUs alongside a quick and responsive support system.

Exceeding expectations for flash MCUs— FLASH & FLEXIBLE.

MCUs with embedded flash memory are now the main focus of MCU system development. Since its introduction, Flash MCUs from Renesas has been the industry leader in this product category. Over 470 individual products in 40 series are available, with processors ranging from 8 to 32 bits. Total shipments reached 1,200 million units in March 2007, making Renesas MCU the world's No. 1 flash MCU. With a wide selection of development tools from Renesas and our partner companies as well as comprehensive Web based support, it is now easier than ever to develop products around Flash MCU, and new advances are being made continuously.

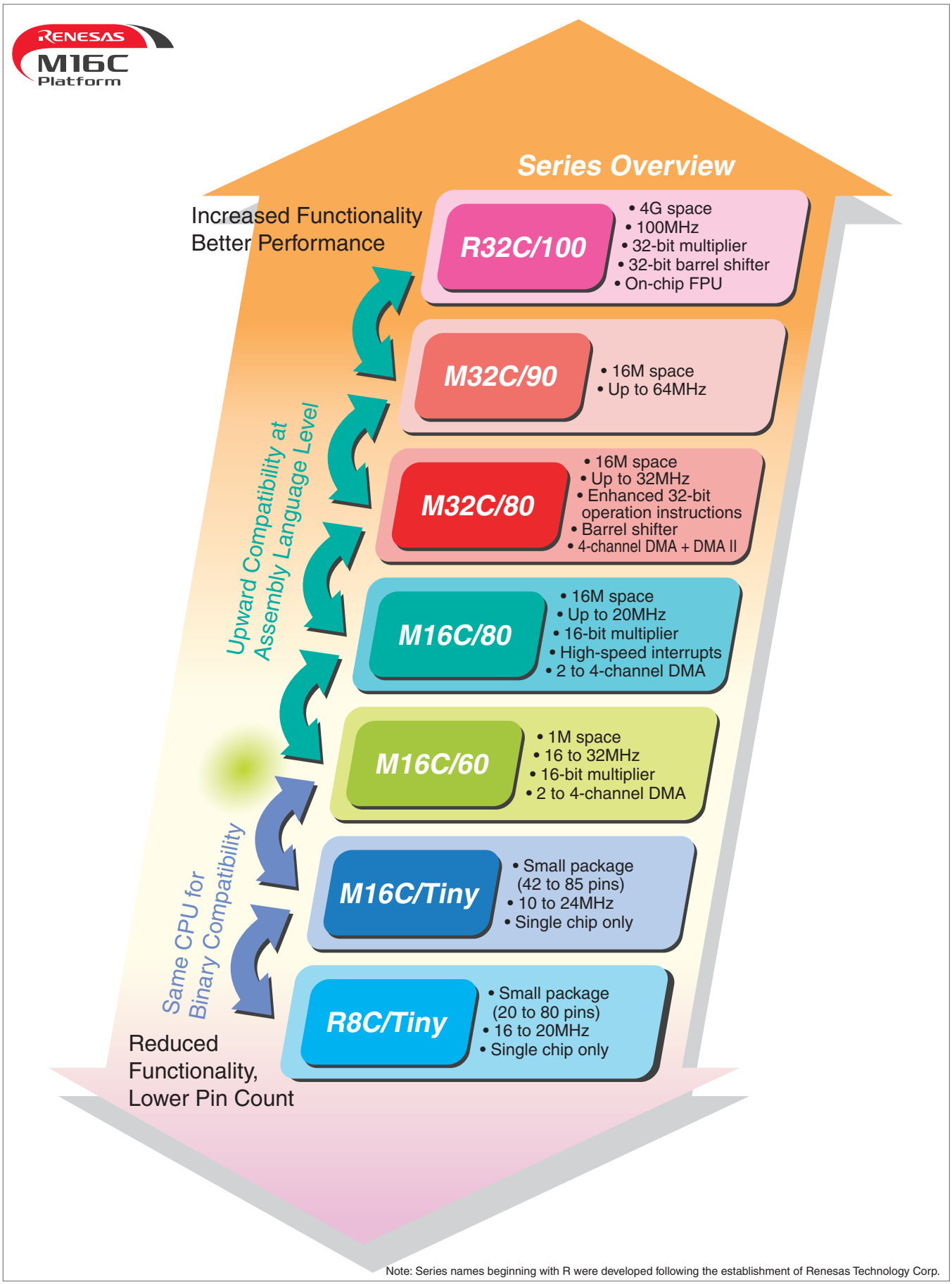
index

The M16C Family is a complete development platform in all respects. It provides total support for the customer's system.

The M16C Family overcomes most of the design issues that traditionally affect MCUs, while still reducing total system costs and supporting a wide range of applications.

Roadmap

Overall Roadmap

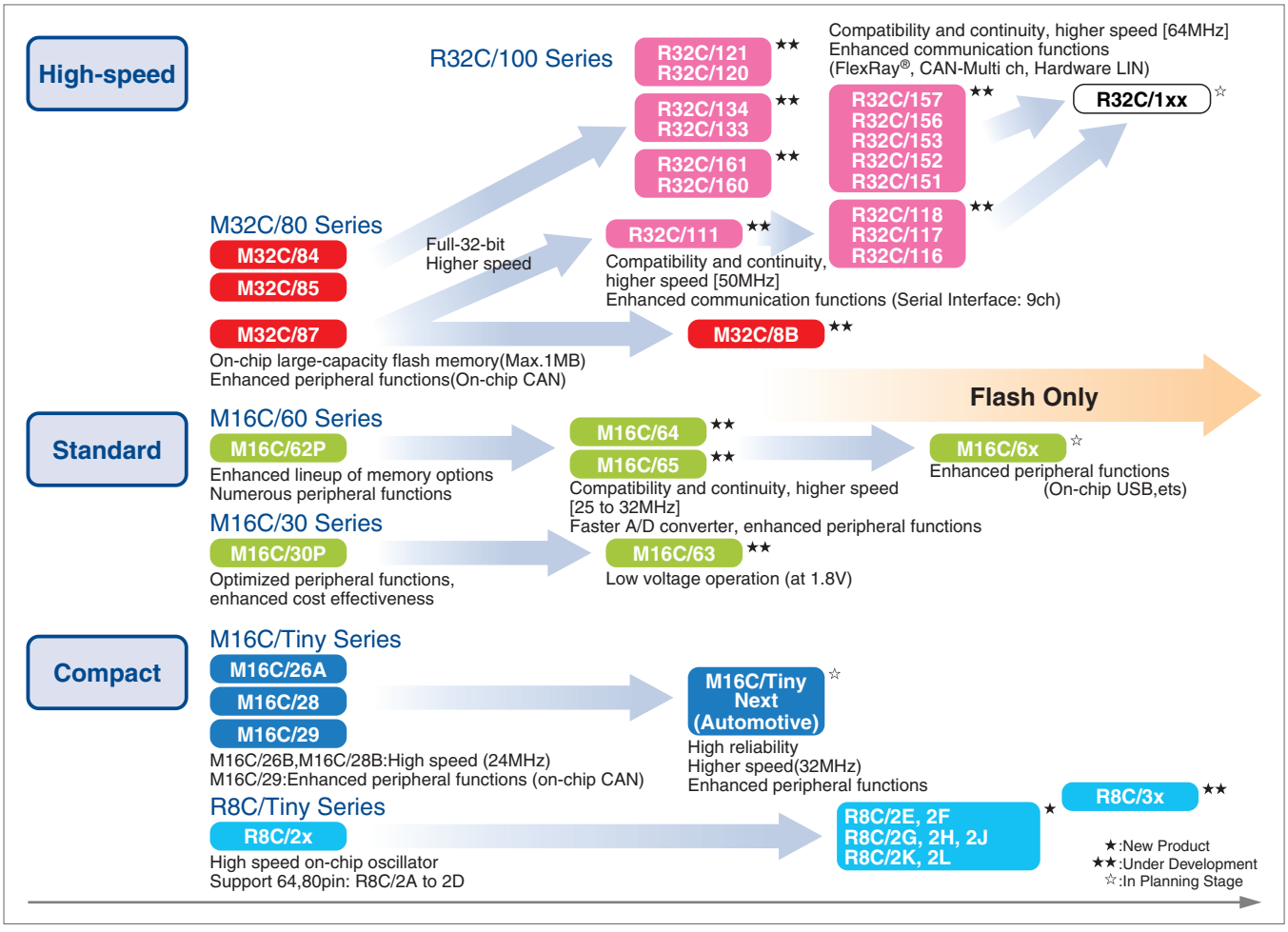


Note: Series names beginning with R were developed following the establishment of Renesas Technology Corp.

Series Comparison

CPU Core	R8C	M16C/60		M16C/80	M32C/80		R32C/100
Address Space	1MB			16MB			4GB
DMA	No	2 to 4ch		4ch			
DMA II	No				Yes		
Operation Instructions	16-Bit Operation Instructions				32-Bit Operation Instructions		
Barrel Shifter	No				Yes		
Series	R8C/Tiny	M16C/Tiny	M16C/6X	M16C/80	M32C/8X	M32C/9X	R32C/1XX
Max. Operating Frequency	20MHz	24MHz	32MHz	20MHz	32MHz	64MHz	50MH/64MHz
Max. On-Chip Memory	128KB	128KB	768KB	256KB	1MB	512KB	1MB
External Bus Extension	No		Yes				
Other	8bit I/O	8bit + 16bit I/O			Intelligent I/O		FPU

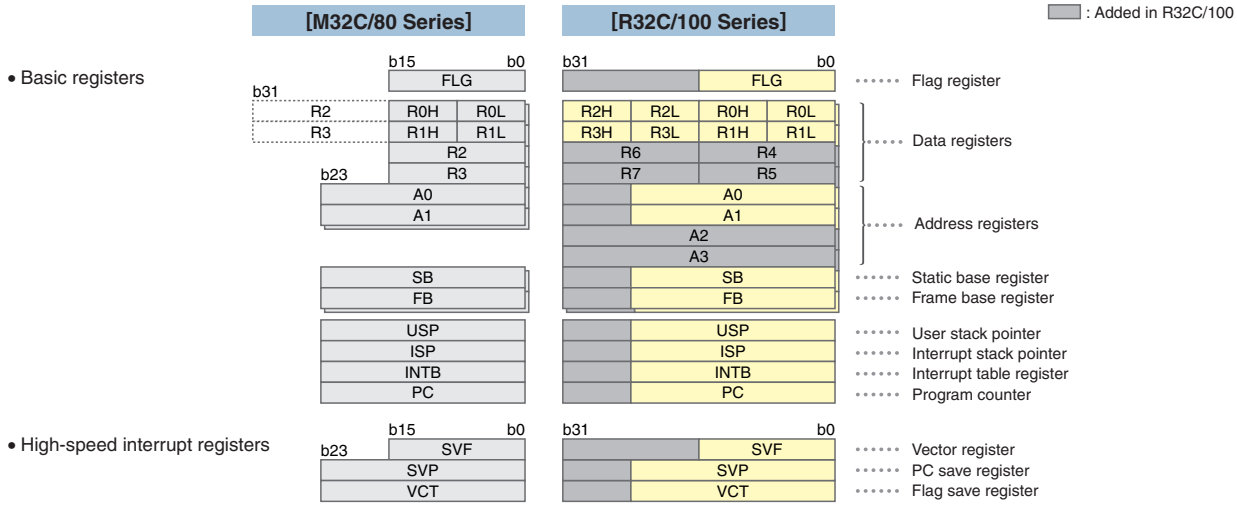
Family Evolution



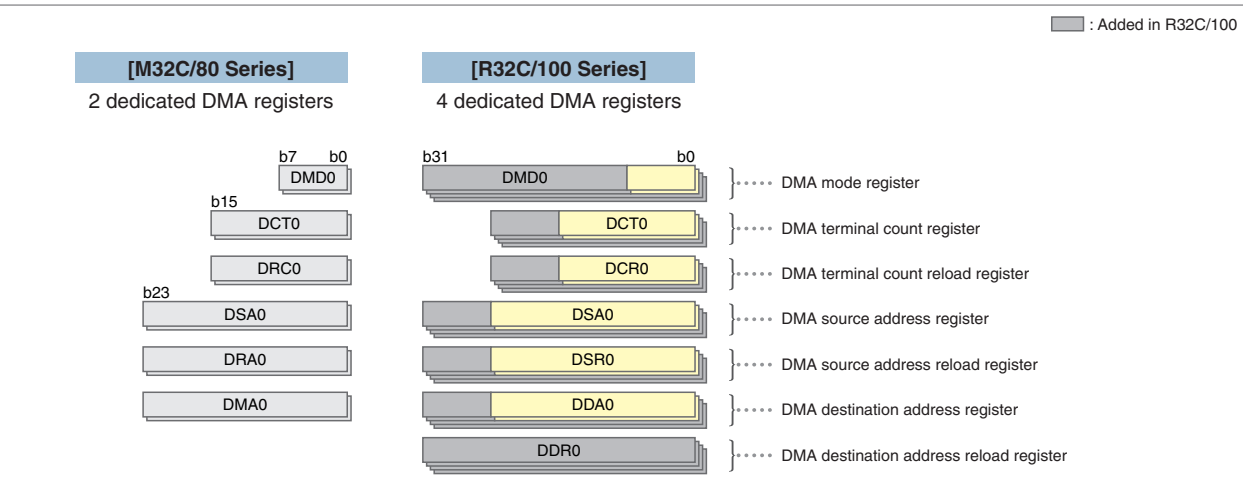
CPU Architecture

The register layout and addressing of the M16C Family are optimized for embedded applications.
Naturally, development using high-level languages (C, C++) is supported.

R32C/M32C Register Model



R32C/M32C Register Model (DMA Related)

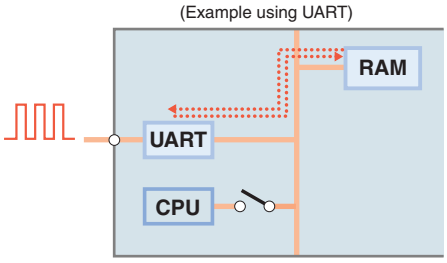


DMA Function

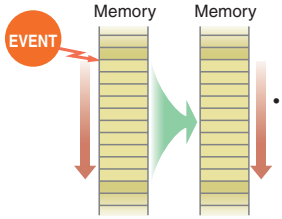
DMA, which transfers data without CPU intervention, supports up to four channels
The DMAII/DTC function provides many other memory transfer capabilities, such as transfer of multiple bytes by a single event and transfer of data to multiple addresses by a single event
(M32C/80 core, R32C/100 core).

DMA Applications

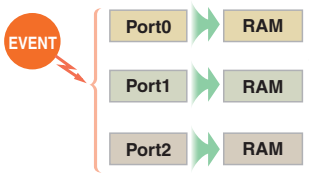
- Automatic serial I/O transfers
- Motor drive using microsteps
- Multichannel PWM output (max. 64)



DMAII/DTC Applications



• Transfer of multiple bytes by a single event



• Transfer of data to multiple addresses by a single event

Basic Instructions

Frequently used instructions are executed in one cycle.

List of Instructions with 1-Cycle Execution Addressing (36 of 108 Total Instructions in the M32C/80)

Type	Instruction	Function
Arithmetic	ABS	Absolute value
	ADC	Add with carry
	ADCF	Add carry flag
	ADD	Add without carry
	CMP	Compare
	DEC	Decrement
	EXTS	Extend sign
	EXTZ	Extend zero
	INC	Increment
	NEG	Two's complement
	SBB	Subtract with borrow
	SBU	Subtract without borrow
Logic	AND	Logical AND
	NOT	Invert all bits
	OR	Logical OR
	TST	Test
	XOR	Exclusive OR
Transfer	MOV	Transfer
	PUSH	Save
	PUSHM	Save multiple registers

Type	Instruction	Function
Bit manipulation	BCLR	Clear bit
	BNOT	Invert bit
	BNTST	Test inverted bit
	BSET	Set bit
	BTST	Test bit
Shift	ROLC	Rotate left with carry
	RORC	Rotate right with carry
	ROT	Rotate
1-bit shift	SHA	Shift arithmetic
	SHL	Shift logical
Other	FCLR	Clear flag register bit
	FSET	Set flag register bit
	INDEX	Index
	INTO	Interrupt on overflow
	Jcnd	Jump on condition
	LDC	Transfer to control register
	NOP	No operation
	PUSHC	Save control register
	SCcnd	Store on condition

Advanced Instructions (Enhanced 32-Bit Instructions - R32C/100)

The R32C/100 CPU core features enhanced 32-bit instructions and many instructions with advanced functionality.

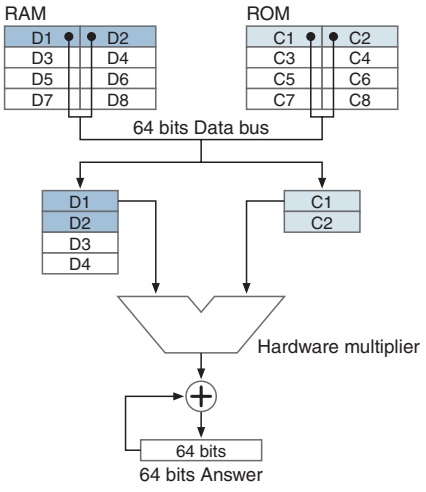
Category	Instruction	Description
Arithmetic instructions	ADSF	Sign flag add
	EDIV	Signed divide (64 ÷ 32 → 32-bit)
	EDIVU	Unsigned divide (64 ÷ 32 → 32-bit)
	EDIVX	Signed divide (32 ÷ 32 → 32-bit)
	EMUL	Signed multiply (32 ÷ 32 → 64-bit)
	MULX	Multiply with rounding
	EMULU	Unsigned multiply (32 ÷ 32 → 64-bit)
Floating point operation instructions	ADDF	Floating point add
	CMPF	Floating point compare
	CNVIF	Convert integer → floating point number
	DIVF	Floating point divide
	MULF	Floating point multiply
	ROUND	Convert floating point number → integer
	SUBF	Floating point subtract
	SUNTIL	Search until data matching search string found
	SWHILE	Search until data not matching search string found
High-level language support instructions	EXITI	Release interrupt stack frame
Other	STOP	Stop

Enhanced Multiply and Accumulate Instruction

The multiply and accumulate instruction has been further enhanced.

M32C/80 (2 cycles)
16bits × 16bits + 48bits → 48bits

R32C/100 (1 cycle)
32bits × 32bits + 64bits → 64bits

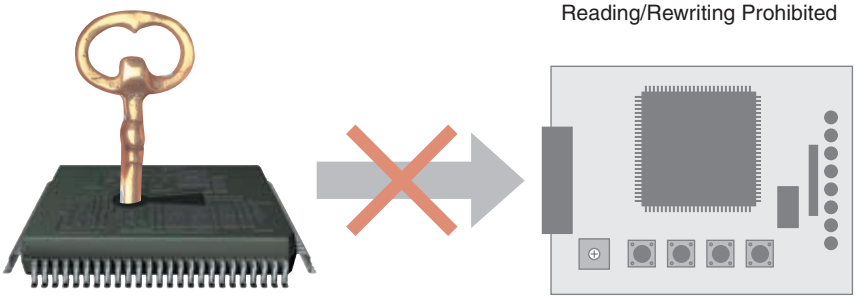


Concepts Security Functions

The M16C Family incorporates a number of security functions to prevent unauthorized access to its internal ROM contents.

Flash Memory ROM Code Protection

During parallel programming, the ROM protection bits prevent reading or overwriting of on-chip flash memory. It is not even possible to read the contents of flash memory using an external flash programmer. (The protect bits can only be changed by serial programming.)

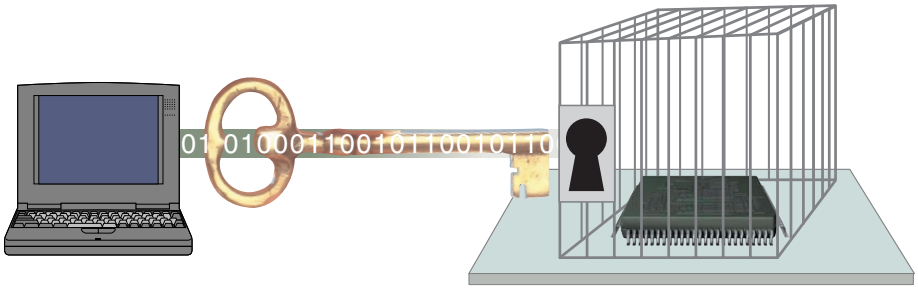


ROM Code Protection

Flash Writer (Parallel Support)

Flash Memory ID Code Protection

For a serial programming command to be accepted, the ID code sent from the serial programming must match the ID code programmed in internal ROM. This prevents unauthorized access. (Repeated ID verification is not allowed.)



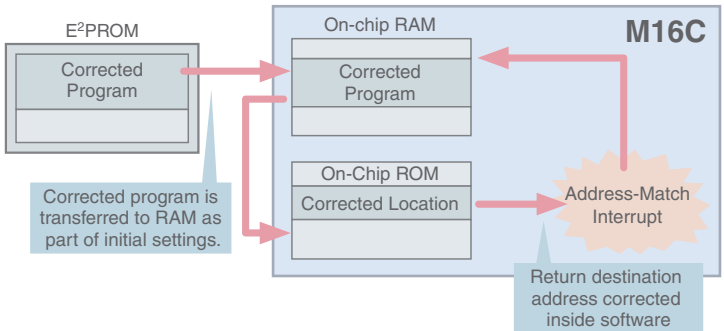
ID Code Protection

Rom Correction

The M16C can use the address-match interrupt registers make corrections to software stored in the mask ROM. This means it is not necessary to replace all the MCUs if a problem arises in the software stored in the mask ROM.

Correction of Software Stored in Mask ROM

By making use of address-match interrupts, it is possible to apply corrections in up to four locations to software stored in the mask ROM.



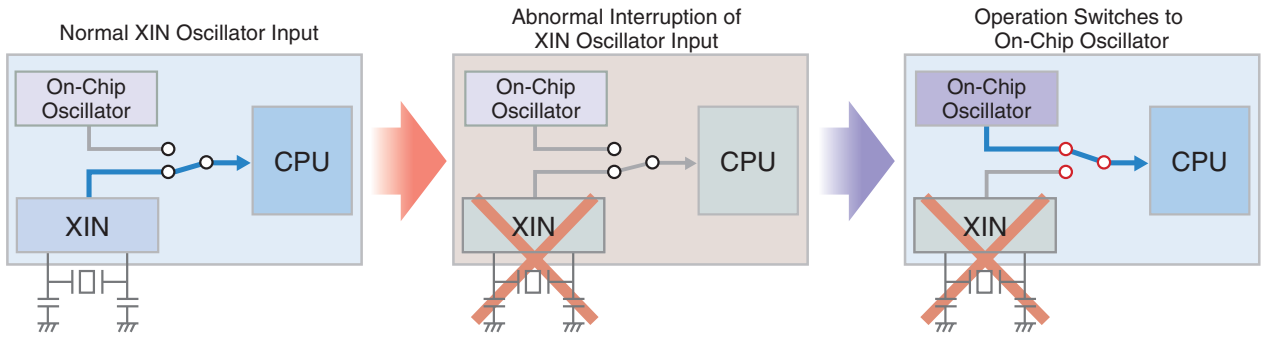
Concepts Excellent Reliability

The M16C Family incorporates many design features to ensure reliable operation under a variety of conditions.

On-Chip Oscillator with Fail Safe Feature

Enhanced Reliability with On-Chip Oscillator and Oscillation Stop Detection Circuit

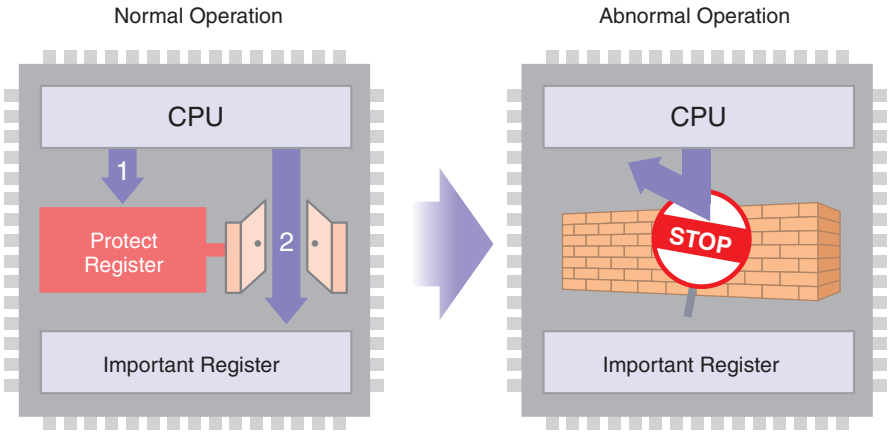
Detects abnormal interruption of XIN oscillator input and switches to the on-chip oscillator in order to continue microcomputer operation.



Other Features
- It is possible to use software to halt XIN oscillator input and MCU can operate using the high-speed on-chip oscillator instead. (This also reduces power consumption.)
- The watchdog timer can operate independently using the separate low-speed (125kHz) on-chip ascillator.

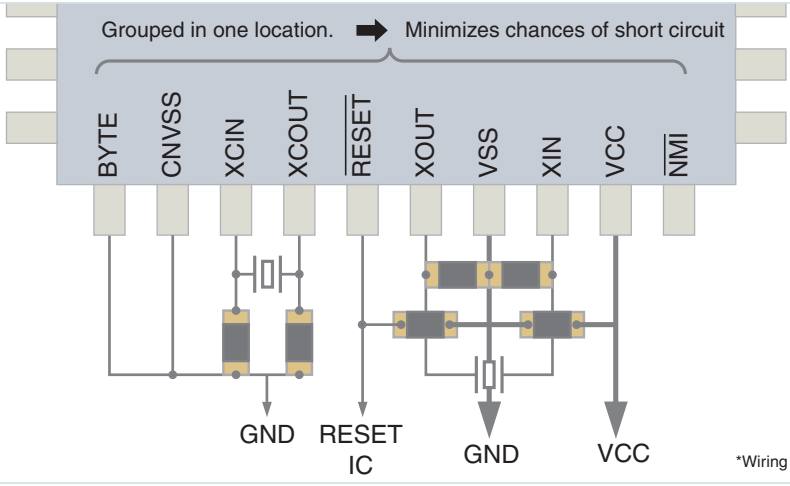
Protecting Critical Registers

The register protect feature can be used to safeguard access to important registers and ports. This can prevent unauthorized access to key registers should program runaway occur. It is necessary to set the protect register before accessing important registers.



Grouping Together of Important Pins

The pin layout is designed to simplify arrangement of power supply and ground lines and facilitate the connection of decoupling capacitors. This also minimizes the chances of short circuit.



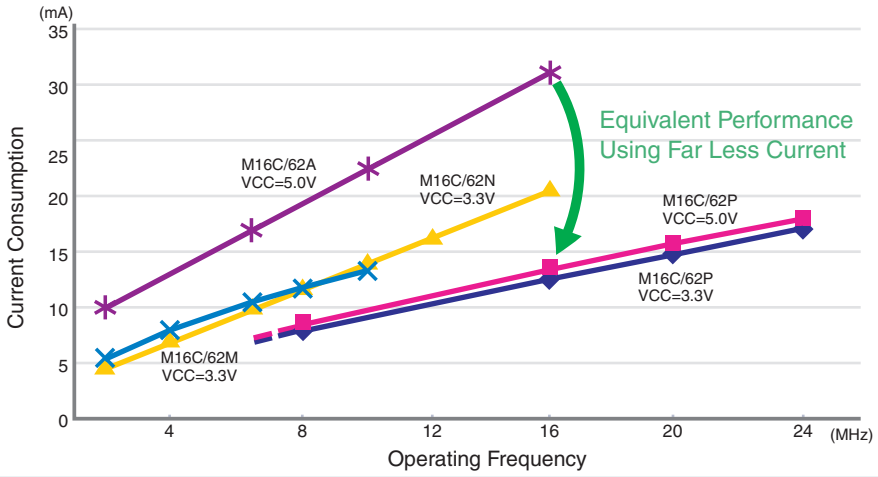
*Wiring example.

Concepts Low-Power Operation

M16C MCUs are designed to minimize power consumption.

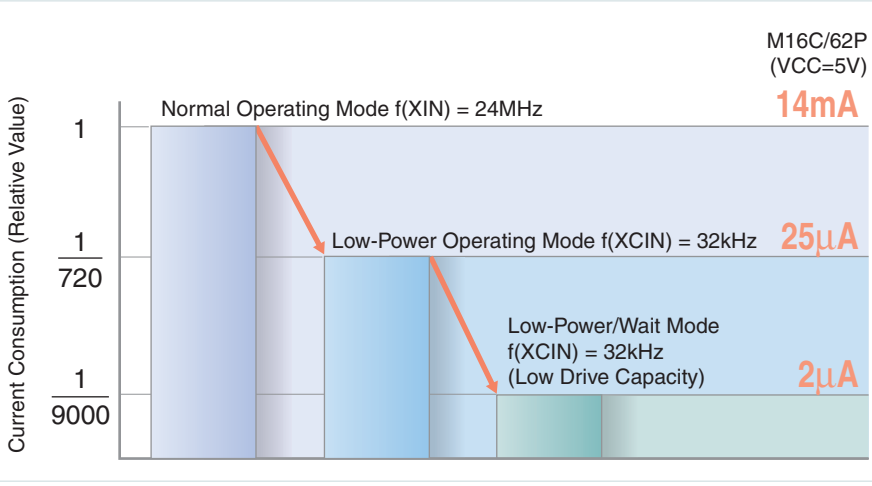
Low-Current Consumption through Advanced Processes

Advanced fabrication processes bring with them reductions in current consumption. The latest version's MCUs use far less current to provide equivalent processing performance.



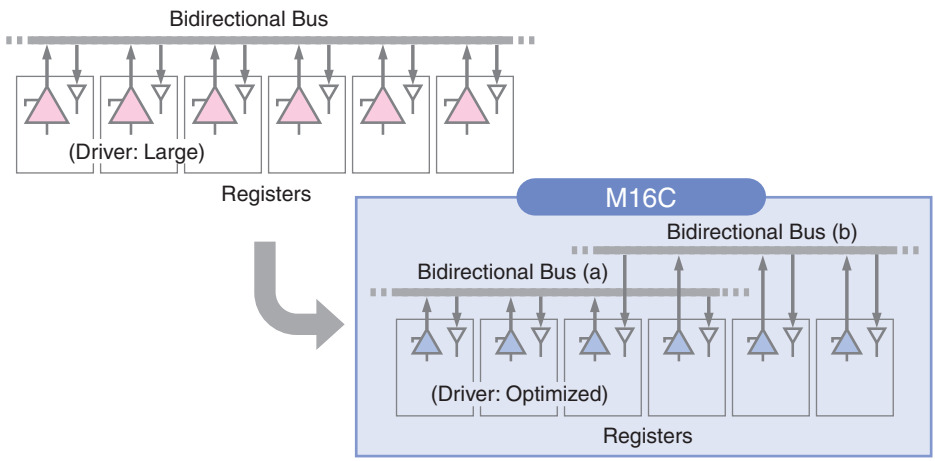
Multiple Power Management Functions

There are two on-chip clock generator circuits, main clock and subclock. It is possible to switch between them to reduce power consumption and noise (low-power mode switching).



Reduced Load Capacitance

Discrete buses distribute load capacitance and reduce power loss due to discharging. In addition, lower load capacitance permits faster bus operation.



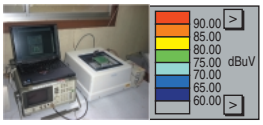
Concepts Low EMI/Excellent EMS

The M16C Family is designed to maximize EMI/EMS performance. This reduces costs associated with EMI/EMS countermeasures for application developers.

Low Electromagnetic Interference (EMI)

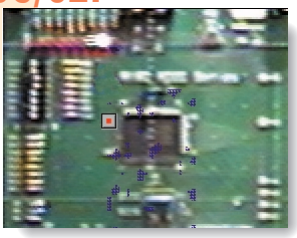
The M16C Family is designed to minimize switching noise. Noise output is reduced by as much as 20dB.

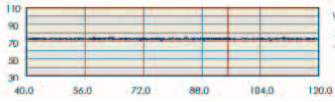
EM Scan
Measurement method:
EM scan measurement using electromagnetic field probe
Measurement conditions:
Measurement frequency range 40 to 120MHz



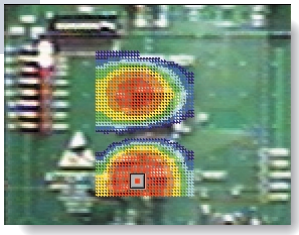
Measuring device: EPS-M1 EM scanner, Noise Laboratory Co., Ltd.
Measurement location: Kansai Electronic Industry Development Center
Measurement frequency range: 30 to 110MHz
Measurement unit: 2mm²

M16C/62P Power supply: 5 V Clock: 24MHz (PLL)

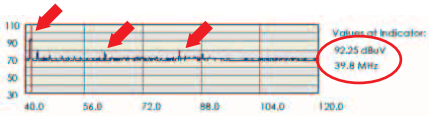




Company A RISC-A Power supply: 5 V Clock: 20MHz (PLL)



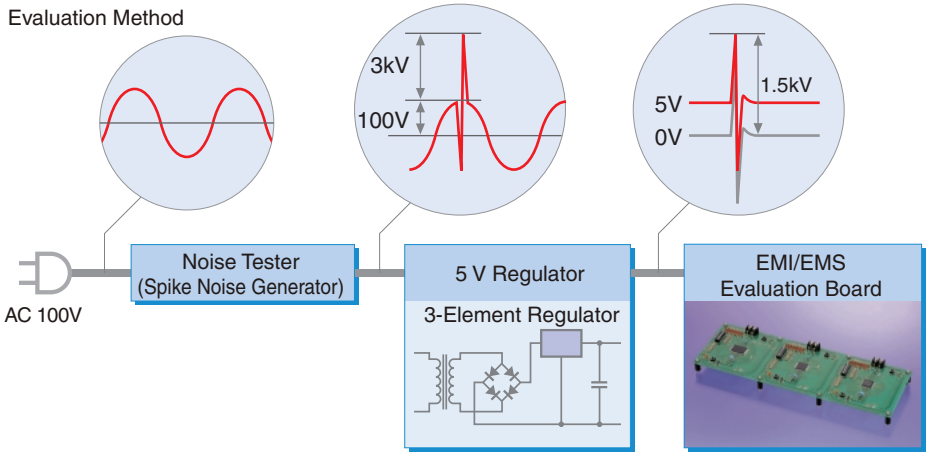
Note noise peaks!



Note: Evaluation is also performed using the VDE and TEM cell methods. Only products that meet uniform standards are produced in volume.

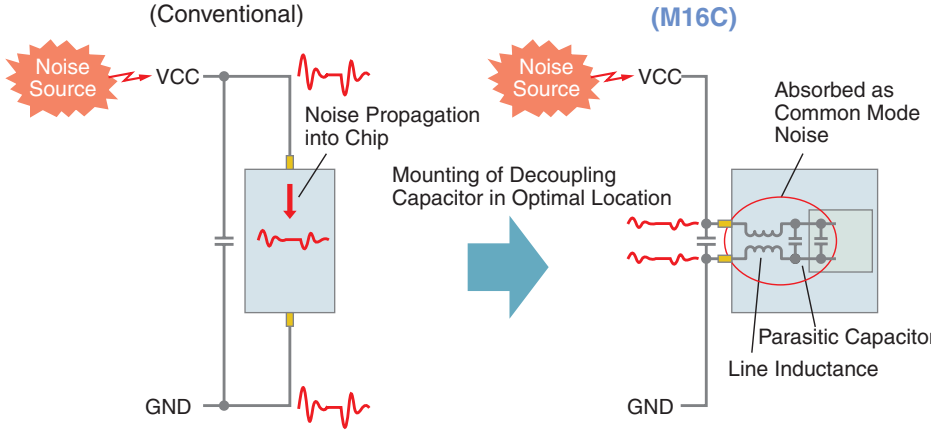
Excellent Ability to Withstand Noise (EMS)

All M16C/M32C MCUs are designed using various noise reduction techniques. These MCUs are extensively tested using different noise test methods.



Short Distance between VCC and VSS

The VCC and VSS pins are arranged close together on M16C MCUs to prevent noise from entering via the VCC and ground wiring. Internal parasitic capacitors provide further protection against noise at the VCC and VSS pins. This design also helps suppress unwanted noise emission from the chip itself.

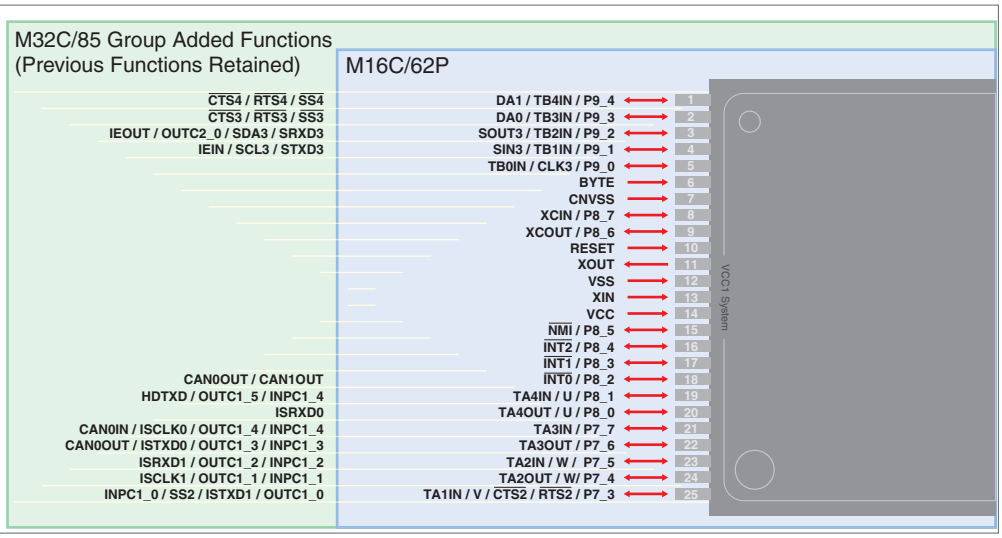


Concepts Excellent Compatibility

The M16C Family provides compatibility in all aspects, allowing easy transition to higher end models.

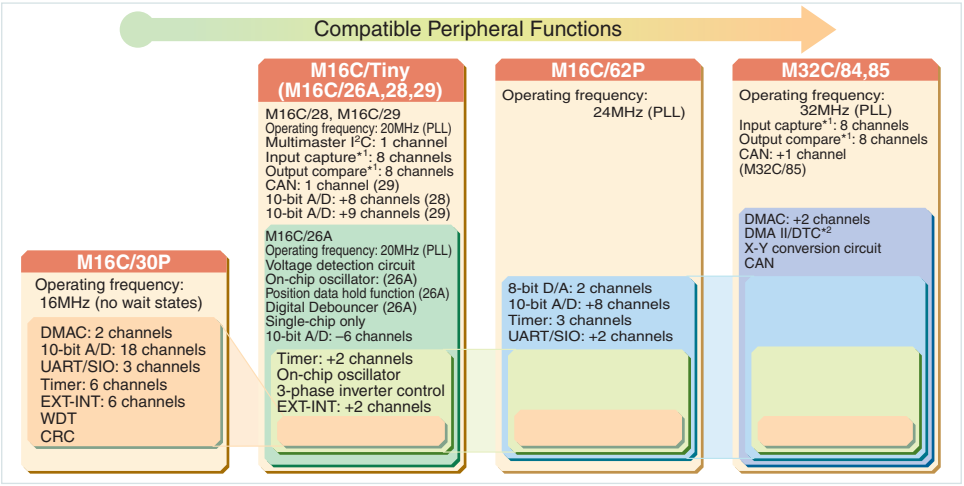
Pin Compatible

The products in the M16C Family are pin compatible, so there is almost no need for wiring changes on the board when switching to newer versions or changing to different MCUs within the same family.



Compatible Peripheral Functions

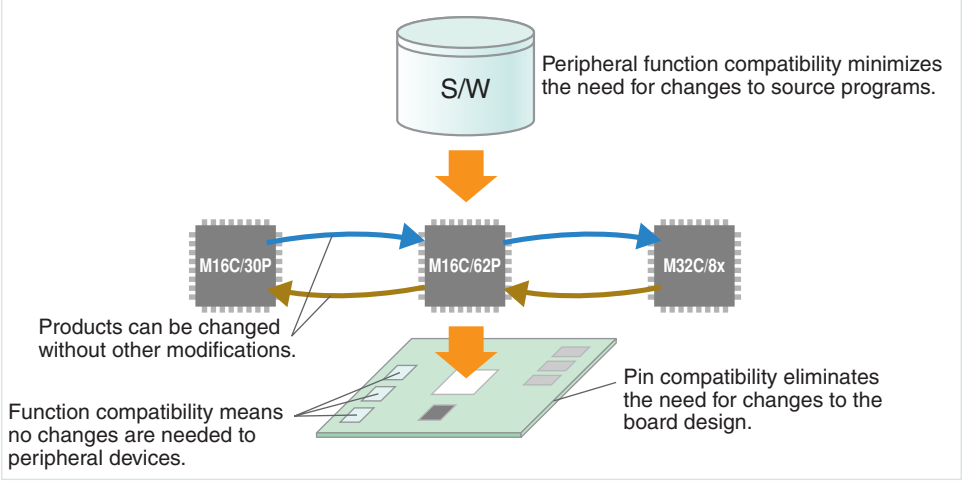
Products in the M16C Family have compatible CPU cores and peripheral functions.



Notes
1. High-function timer with communication function.
2. DMA II and DTC are DMA functions that can be initiated by peripheral I/O requests.

Advantages of Compatibility

Pin compatibility and peripheral function compatibility minimize the need for changes to the board design or software.

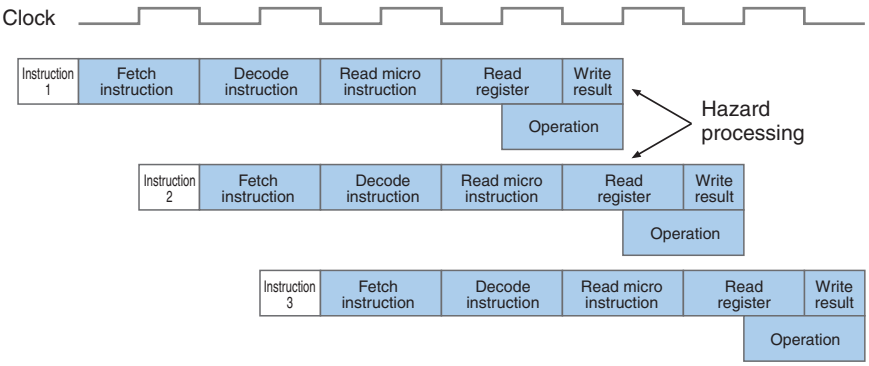


Concepts High-Speed Processing

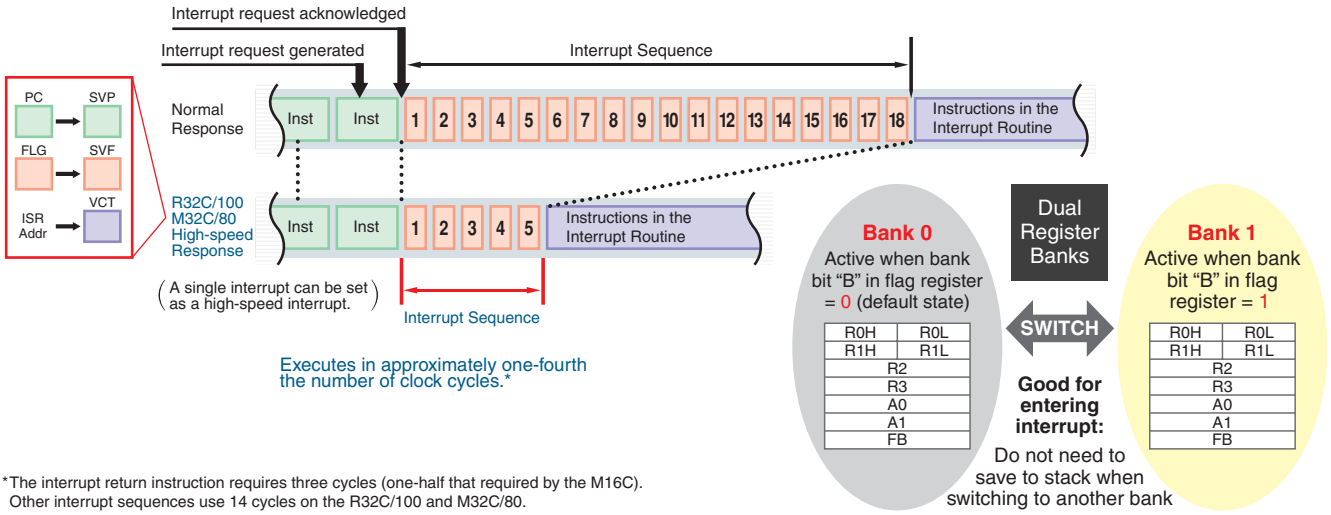
The M16C Family provides high-speed processing under a variety of conditions.

R32C CPU Core Pipeline

The number of pipeline stages has been increased from three (previous version) to five to boost processing speed.



High-Speed Interrupt Processing (R32C/M32C)



*The interrupt return instruction requires three cycles (one-half that required by the M16C). Other interrupt sequences use 14 cycles on the R32C/100 and M32C/80.

Floating Point Instructions (R32C)

The R32C incorporates a single-precision 32-bit FPU and supports floating point instructions.

Instruction set

CNVIF: Convert integer → floating point number
ROUND: Convert floating point number → integer
ADDF: Floating point add
SUBF: Floating point subtract
MULF: Floating point multiply
DIVF: Floating point divide
CMPF: Floating point compare

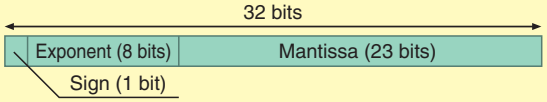
Rounding modes

- Round to nearest value
- Round towards zero
- Round towards negative infinity

Exception processing

- Illegal input
- Overflow
- Underflow

Data format (single-precision floating point number)



$(-1)^{sign} \times 2^{exponent-127} \times (1 + mantissa)$

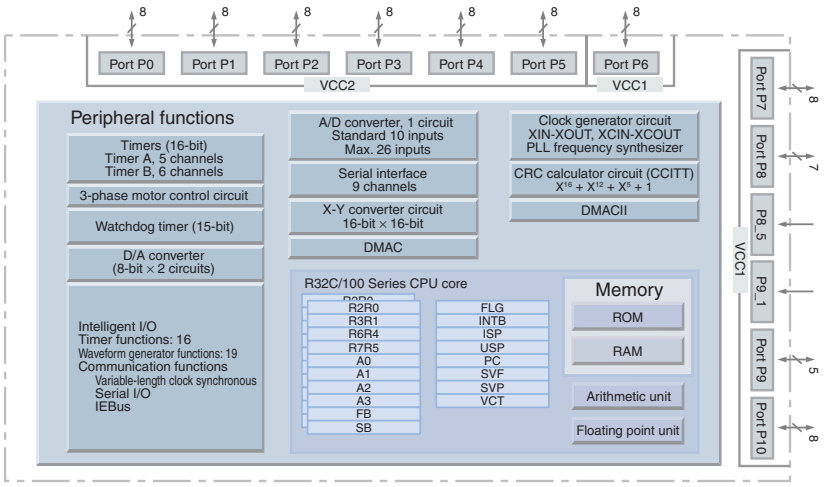
Supported numeric values
- Normalized numbers: 0 < exponent < 255
- Zero: 0 and mantissa = 0

Unsupported numeric values
- Not a number (Nan): Exponent = 255 and mantissa ≠ 0
- Infinity: Exponent = 255 and mantissa = 0
- Subnormal numbers: Exponent = 0 and mantissa ≠ 0

Concepts Abundant Peripheral Functions

The M16C Family includes high-performance on-chip functions for a variety of applications.

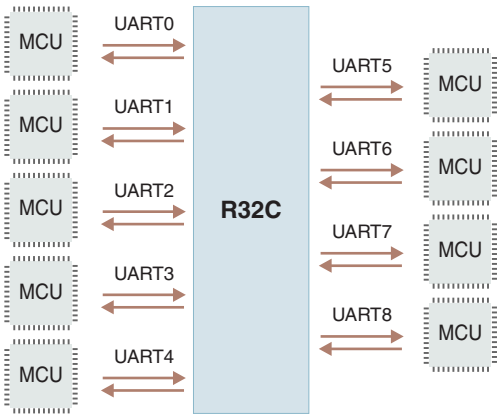
Block Diagram – R32C/111



Serial Interface

UART/Clock-Synchronous Serial I/O

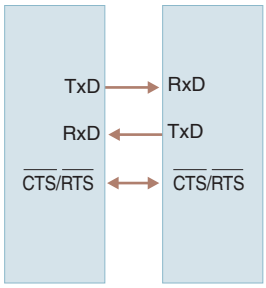
The R32C/100 has **nine on-chip** UART/clock-synchronous serial I/O channels.



UART Function

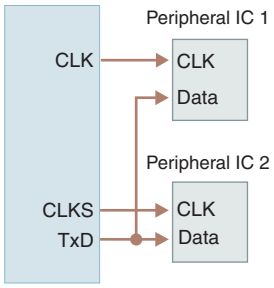
In addition to normal UART capabilities, special functions are also supported.

CTS/RTS Control



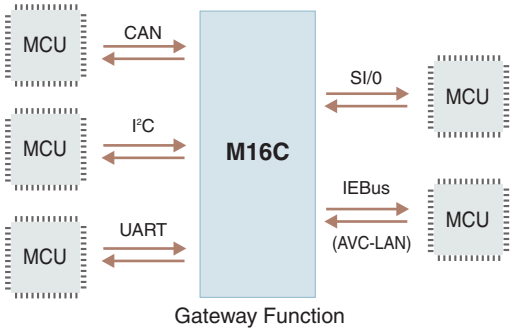
(Does not apply to M16C/Tiny.)

Capability to Connect 2 Peripheral ICs



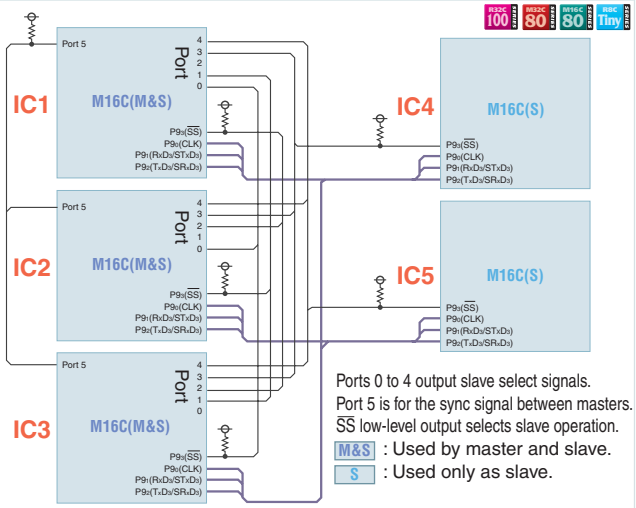
Gateway Function

Broad range of communication peripherals provides gateway functionality.



Gateway Function

Synchronous Serial Communication Unit



Ports 0 to 4 output slave select signals.
Port 5 is for the sync signal between masters.
SS low-level output selects slave operation.
M&S : Used by master and slave.
S : Used only as slave.

I²C Bus Interface

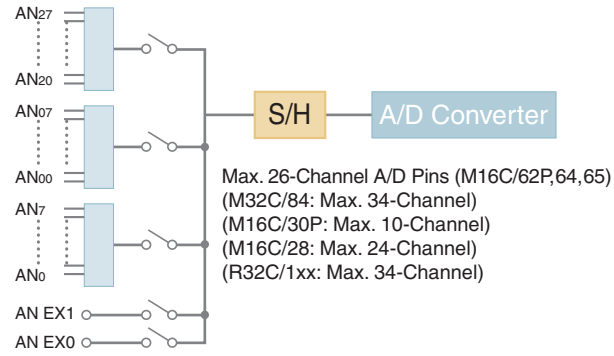
The I²C Bus is supported as a serial interface.

Supported MCUs	M16C/62P, M16C/64, M32C, R32C	M16C/63, M16C/65, M16C/Tiny, R8C/Tiny
Communication control method	Partial software control	Hardware control
Start condition overlap detection	No detection	Detection supported
Arbitration lost detection	Requires flag to be initialized for each byte	Does not require flag to be initialized for each byte
Slave address match determination	Match determination by software	Match determination by hardware, interrupt generated only on match
Initial acknowledge generation	Generated by software after slave address determined	Automatic processing by hardware
Timeout detection function	None	Supported (dedicated timer)
Max. communication speed	384 kbps (because the SCL low duration ≥ 1.3 µs standard is not met at faster speeds)	400 kbps (max. value of I²C Bus standard high-speed mode)

A/D Converter

High-Speed A/D Converter with Sample-and-Hold

(1) Conversion Speed (ØAD = 25MHz)
(M16C/65) 10-Bit: 1.72 µs
(2) Successive Conversion ±3 LSB Accuracy
(3) High-Speed Sample-and-Hold
10MHz Operation: 0.3 µs, 20MHz Operation: 0.15 µs



Max. 26-Channel A/D Pins (M16C/62P,64,65)
(M32C/84: Max. 34-Channel)
(M16C/30P: Max. 10-Channel)
(M16C/28: Max. 24-Channel)
(R32C/1xx: Max. 34-Channel)

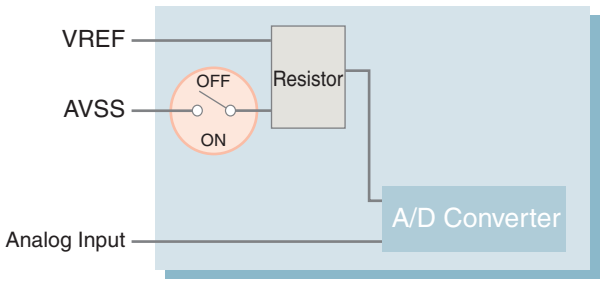
Improved A/D Converter Characteristics

The M16C/64 and M16C/65 deliver better A/D conversion accuracy than other M16C models.

Max. A/D conversion error		M16C/63, 64, 65	
At AVCC	Analog input (ANi, ANj_i)	±3 LSB	
= VREF = 5V	Extended analog input (ANEXi)	±3 LSB	Better accuracy
At AVCC	Analog input (ANi, ANj_i)	±3 LSB	Better accuracy
= VREF = 3.3V	Extended analog input (ANEXi)	±3 LSB	Better accuracy
At AVCC	Analog input (ANi, ANj_i)	±3 LSB	Better accuracy
= VREF = 3V	Extended analog input (ANEXi)	±3 LSB	Better accuracy

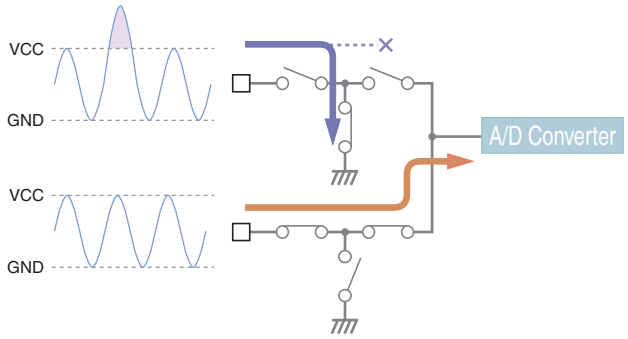
VREF Cutoff

The analog circuit reference voltage, VREF, can be turned on or off. Turning off VREF when the A/D converter is not being used can help reduce current consumption.



Measurement Error Avoidance (Unused A/D Overvoltage Processing)

This feature helps prevent measurement error due to wraparound between channels, even if the other A/D inputs include input that exceeds the VCC level. It also provides more accurate A/D conversion values.

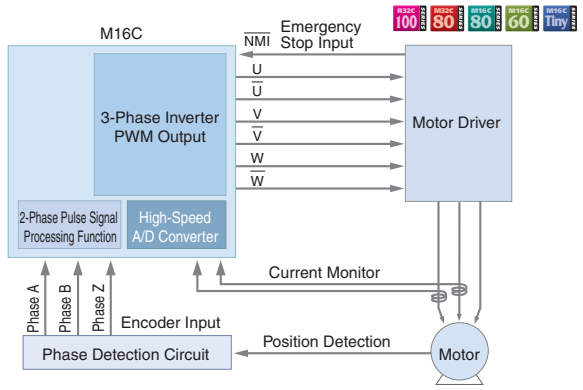


Concepts Abundant Peripheral Functions

Highly Functional Timers

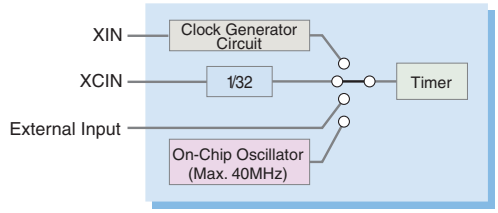
M16C MCUs have input and output timers that are used in combination with other peripheral functions.

3-Phase Inverter PWM Output (Applicable to Motor Control Systems)



Independent Timer Operation

The timer's count operation is independent of the operation of the CPU. Even if the CPU is stopped, it is possible to operate the timer by means of external signals or a subclock (32kHz, etc.), thereby reducing current consumption.



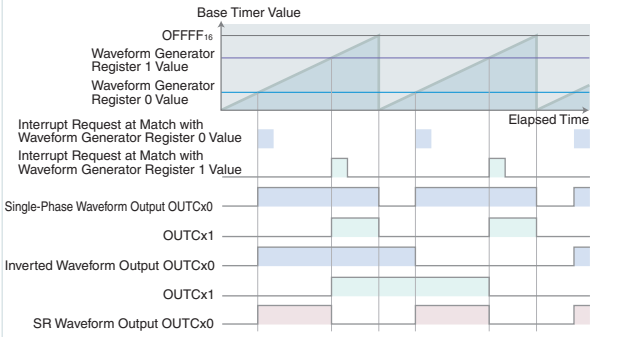
Intelligent I/O

I/O ports can be configured to implement different peripheral functions.

Output Compare (Waveform Generator Function)

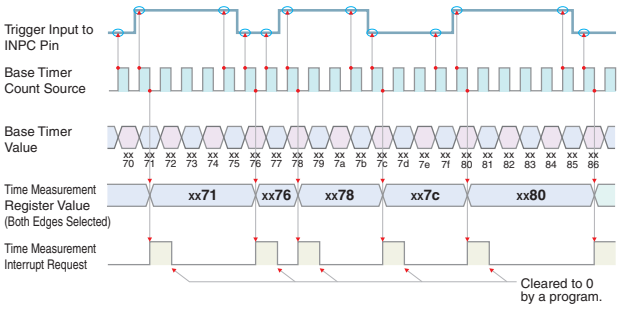
Interrupts are generated when matches occur between the base timer and waveform generator register values, generating a PWM waveform.

The following waveform output modes are implemented on all groups.
(1) Single-Phase Waveform Output (2) Inverted Waveform Output
(3) SR Waveform Output



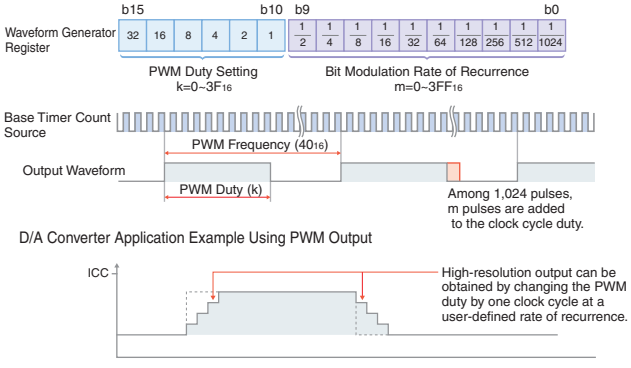
Input Capture (Time Measurement Function)

At trigger input the timer value is stored in the time measurement register, and an interrupt is generated



Bit Modulation PWM

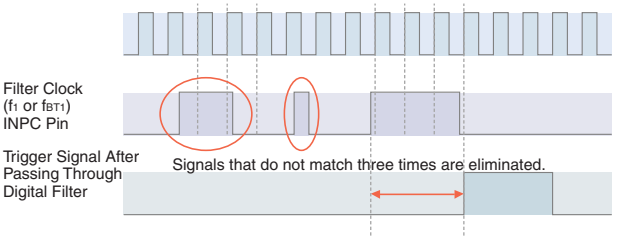
High-frequency PWM output can be produced based on any bit between 6 and 16.



Input Capture Digital Filter Function

Digital Filter Function (INPC10 to INPC17)

The trigger input level is determined every f_1 or f_{BT1} and pulses are allowed to pass through when three matches occur. (The clock of the digital filter can be selected to match the noise band.)



Signal Delay Caused by Digital Filter (Max. 3.5 Cycles of Filter Clock)

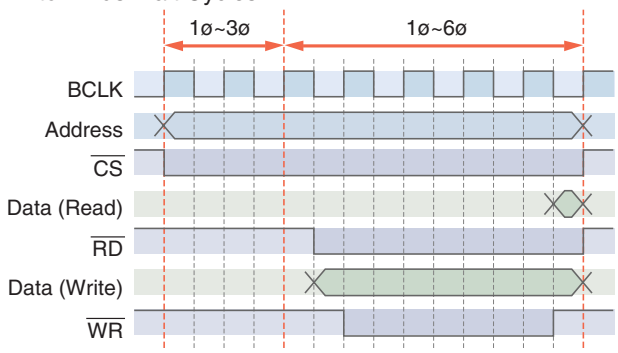
Bus Control

As the CPU operation speed increases, timing control of the external devices becomes more difficult.

Enhanced External Bus Access Functions

Expanded Number of Wait Cycles

1 to 7 Bus Wait Cycles



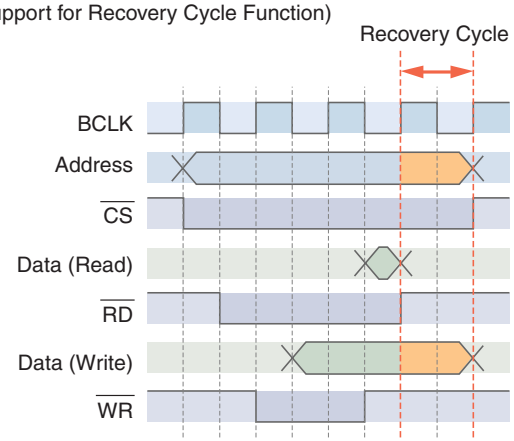
Access Cycles to External Area (32MHz)

0 Wait Cycles	62.4ns	
1 Wait Cycles	93.6ns	
2 Wait Cycles	124.8ns	
3 Wait Cycles	156.0ns	
4 Wait Cycles	187.2ns	Function Extension
5 Wait Cycles	218.4ns	
6 Wait Cycles	249.6ns	
7 Wait Cycles	280.8ns	

Possible to connect external ASIC or slow memory even when CPU operates at high speed.

Expanded Number of Address and Data Hold Cycles

(Support for Recovery Cycle Function)



Recovery cycle insertion can be selected by a program.

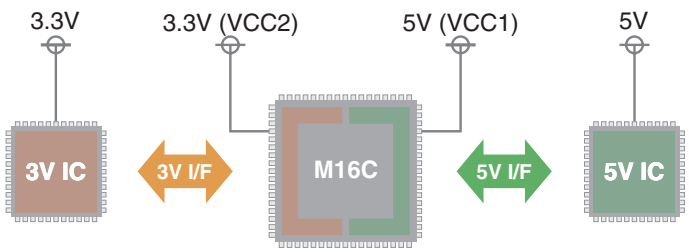
Address Hold → Extended Address Hold

Data Hold → Extended Data Hold

Dual Peripheral Power Supplies (5V and 3V)

Possible to connect external 5V and 3V peripheral ICs without adding external circuitry.

P6 to P10, P11, P14 : 2.7V ≦ VCC1 ≦ 5.5V
P0 to P5, P12, P13 : 2.7V ≦ VCC2 ≦ VCC1

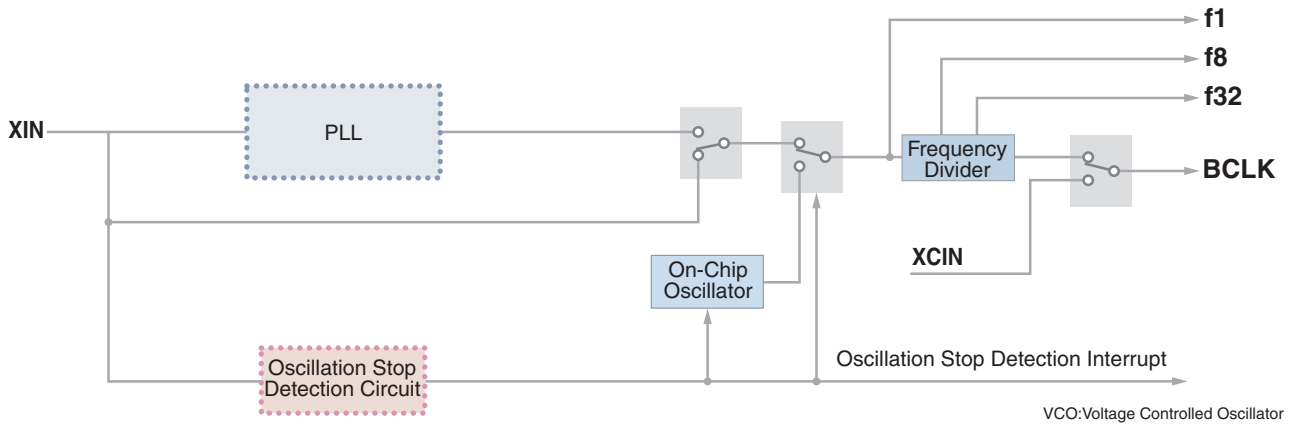


Note: This specification applies to consumer products only.

Concepts Abundant Peripheral Functions

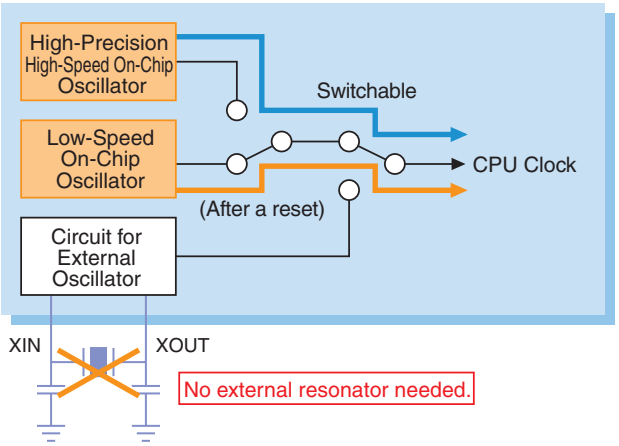
PLL Oscillator Circuit and Oscillation Stop Detection Circuit

- The on-chip PLL supports a maximum operating frequency of 20MHz to 64MHz.
- When XIN is interrupted, the oscillation stop detection circuit switches to the on-chip oscillator as a backup, allowing operation to continue.



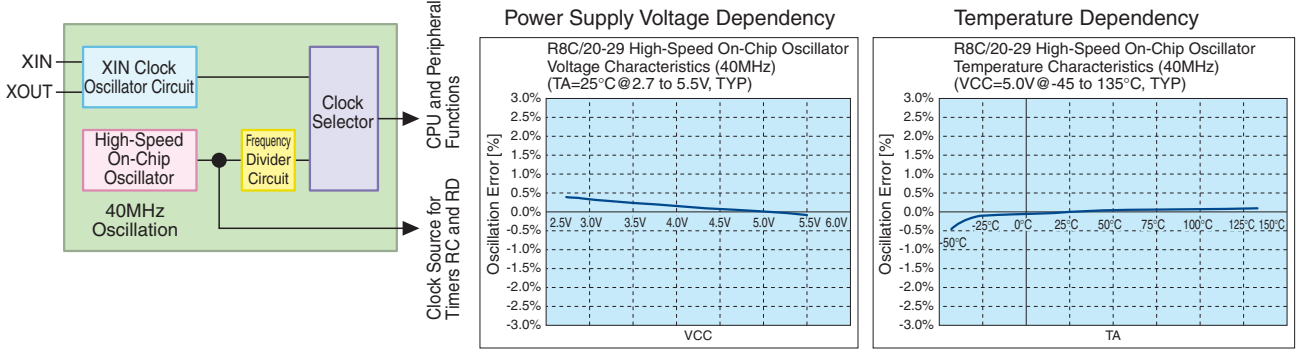
On-Chip Oscillator Startup

After a reset is cleared, operation starts using the low-speed on-chip oscillator. By using the high-precision high-speed on-chip oscillator, it is possible to configure a system that does not require an external resonator.



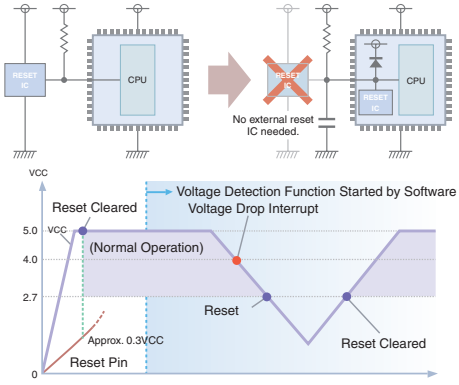
High-Precision High-Speed On-Chip Oscillator

- Highest precision in the industry over a range of temperatures and voltages.
- The 40MHz clock generated can be used to operate 16-bit timers (Max. 20MHz clock in R8C/Tiny Series).

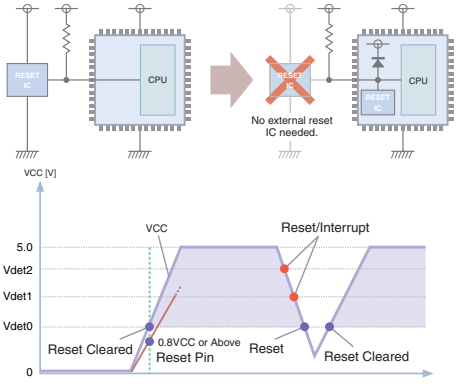


Reset Function (On-Chip Reset Circuit)

- Voltage-Drop Interrupt (Enabled/Disabled by Software)
  Enables software detection of power supply voltage drops without external circuitry.
- On-Chip Reset Circuit (Enabled/Disabled by Software)
  Prevents malfunctions caused by voltage dropping below the guaranteed operation voltage.



- The number of external reset ICs can be reduced.
- Setting can be made before reset clearing using the optional function select register.



Watchdog Timer

Optional Function Select Register (Address 0FFFFH)

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
CSPROINI	Reserved	LVD0ON	Reserved	ROMCP1	ROMCR	Reserved	WDTON

CSPROINI
1: Count source protect mode disabled after a reset (uses CPU clock)
0: Count source protect mode enabled after a reset (uses low-speed on-chip oscillator)

Clock is separate from CPU and does not stop!

WDTON
1: Watchdog timer remains stopped after a reset
0: Watchdog timer automatically restarts after a reset

Constant monitoring of reset start setting!

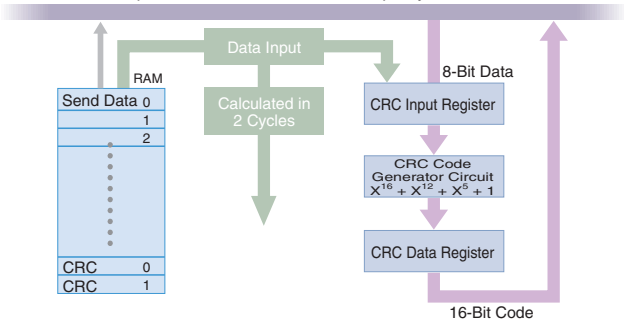
Note: Does not apply to R8C/12 and R8C/13.

Other Functions

CRC

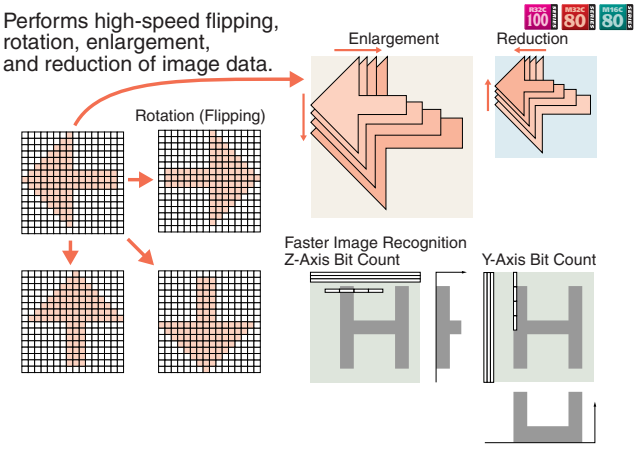
The CRC function can be used to improve data reliability.

- On-chip hardware performs CRC calculations in two cycles.
- Generating polynomial: $X^{16} + X^{12} + X^5 + 1$ (CCITT standard), $X^{16} + X^{15} + X^2 + 1$ (CRC-16 standard, M16C/29, 65)
- Provides more powerful error verification than parity or checksum methods.



X-Y Data Converter

Performs high-speed flipping, rotation, enlargement, and reduction of image data.



Lineup of Products with On-Chip Flash Memory

All series in the M16C Family include products with on-chip flash memory.

Features of M16C MCUs with On-Chip Flash Memory

1. High-Speed Programming/Erasing

Programming 256KB of flash memory takes only four seconds (serial rewrite mode). This greatly reduces the programming burden in the volume production process. (M16C/62P)

2. High Reliability

High data storage reliability, erasing reliability, and programming reliability help prevent problems following mounting.

3. ROM Code Protect Function

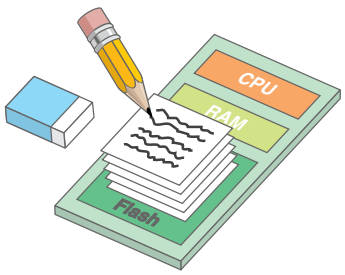
High-level security functionality is built in.

4. Support for On-Line Programming (CPU Rewrite Mode)

High-level security functionality is built in.

5. Support for Data Flash Memory

Products are available with extra-high guaranteed write/erase counts up to 10,000 times



List of Flash Programmers

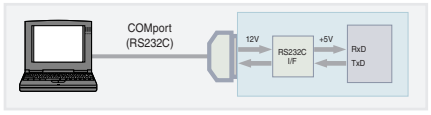
Renesas/Partner Vendor	Product Model	Programming Mode
BPM Microsystems	BP-2610, BP-2710, BP-2710M	Parallel (Gang)
Data I/O Corporation	UNISITE, 3980(3900), Optima, Dual, Qctal, PP100	Parallel (Gang)
	Image Writer	Serial
System General Corp.	T9600	Parallel (Gang)
Sunny Giken Inc.	S550-SFWv3, S550-SFW1U	Serial
	S550-MFW1U	Parallel (Gang) and Serial
Suisei Electronics System Co., Ltd.	EFP-S2/S2V	Parallel and Serial
	EFP-RC	Serial
Yokogawa Digital Computer Corporation	MegaNETIMPRESS	Serial
	C"arNETIMPRESS	Serial and CAN
Hokuto Denshi Co., Ltd.	FLASH2, FLASHMATE5V1, FM-ONE	Serial
Renesas Technology Corp.	R0E00008AKCE00(E8a)	Serial
	M3A-08006	Serial

See the “Partners Tools” for details on programmers.

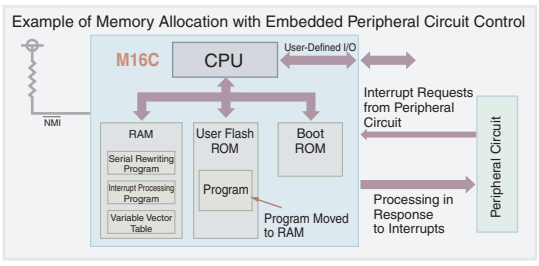
On-Chip Flash Memory Functions

Flash Programming Mode

Using flash rewriting program prepared by the customer, the user area can be erased and programmed.

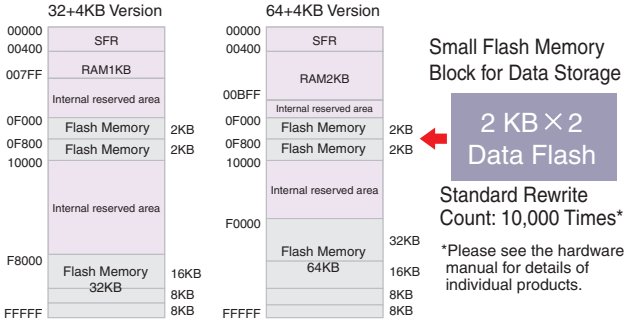


Example of Memory Allocation with Embedded Peripheral Circuit Control



Data Flash

A small block of flash memory called data flash memory is provided separately from the program flash memory. This area supports a maximum erase count of 10,000 times. It can also be used as a substitute for external EEPROM.

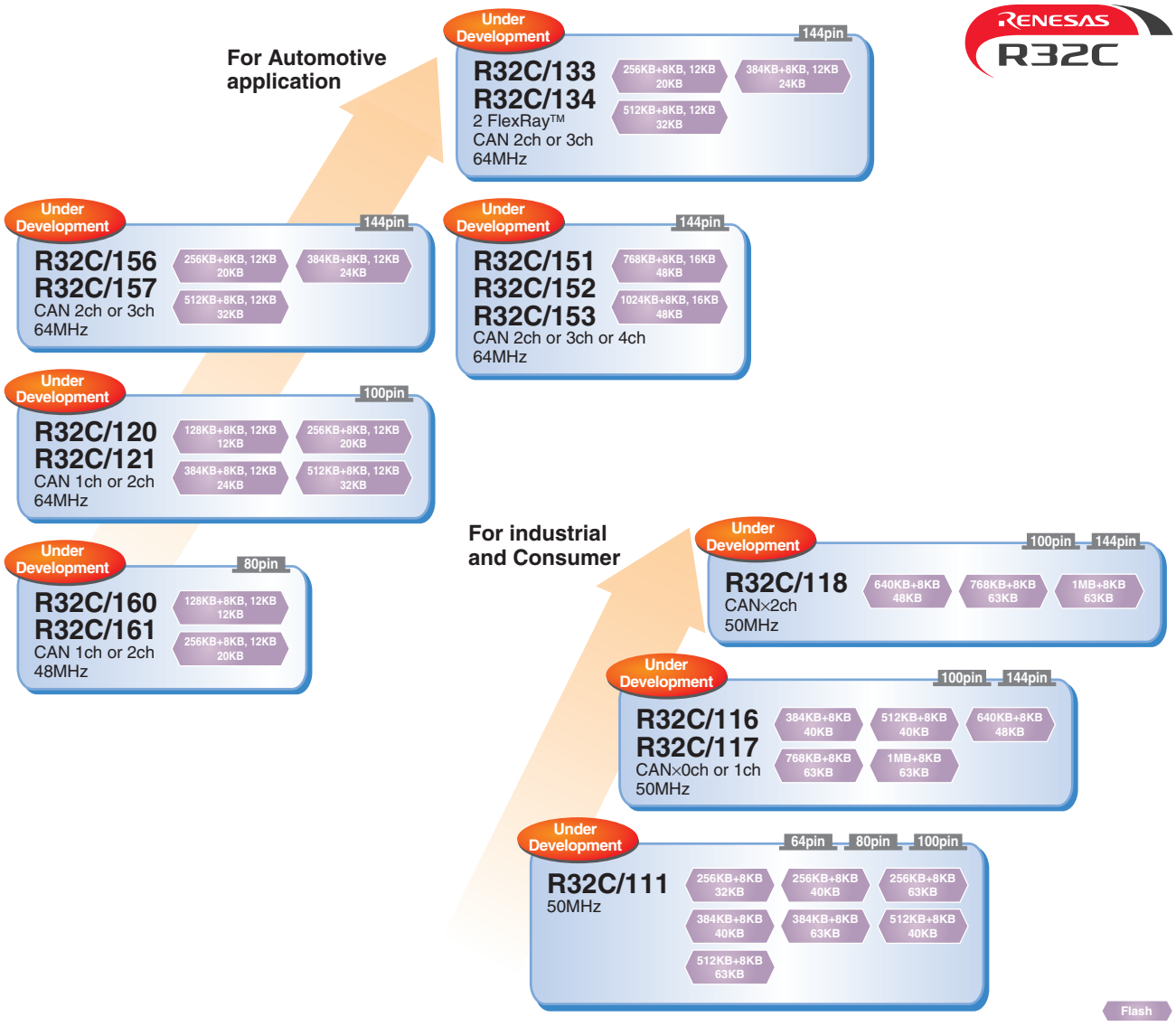


Product Lineup

http://www.renesas.com/r32c100

M32C/100 Series

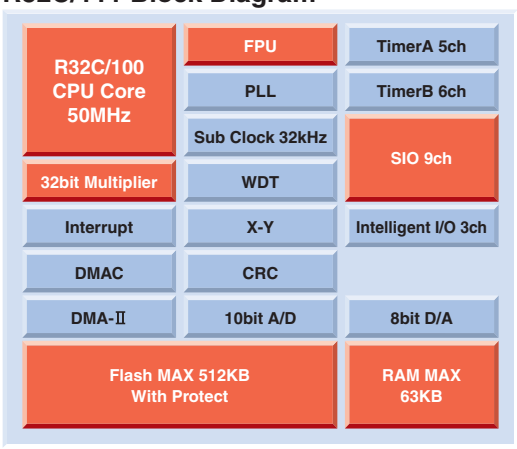
R32C/100 Series Roadmap



R32C/111 Group Features

- 32-bit CICS MCUs inheriting the M16C/M32C features and employing R32C/100 Series CPU core.
- 32-bit barrel shifter, 32-bit multiplier, and high-precision FPU on-chip
- Performs 32-bitX32-bit multiply-accumulate operations in one clock cycle.
- Register bit length extended from M32C/80 and number of registers increased.
- 64-bit internal memory bus
- Short jumps with no penalty
- Enhanced Communication Function (SIO x 9 channels)

R32C/111 Block Diagram

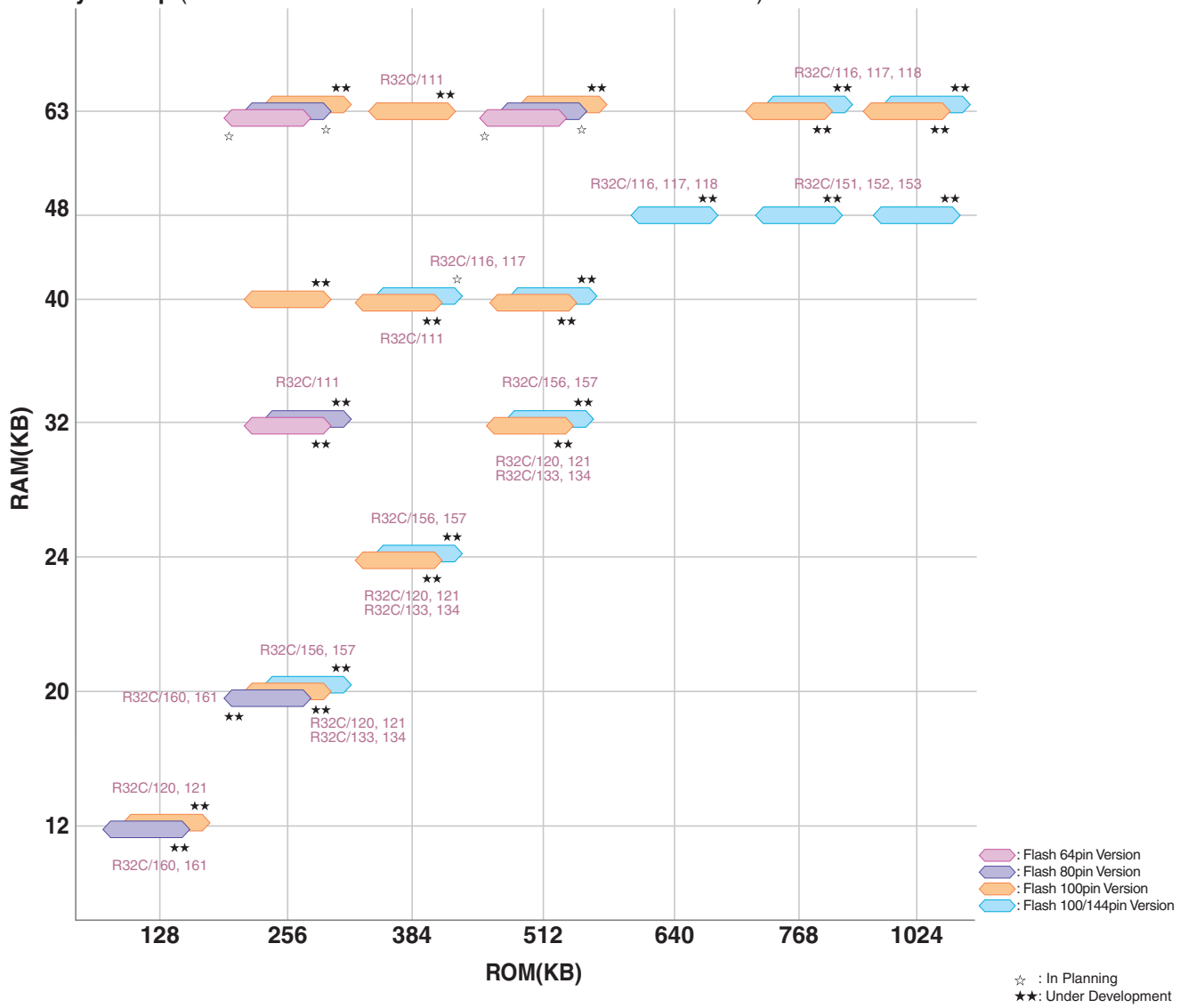


Product Lineup

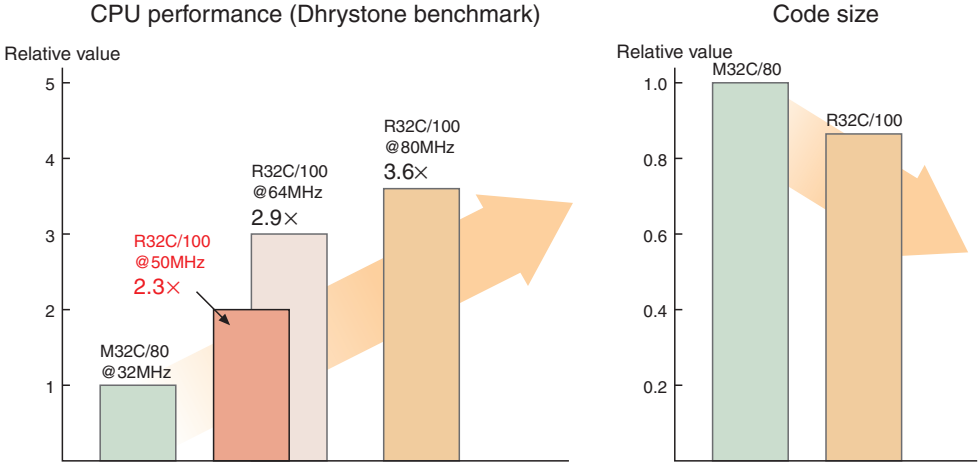
M32C/100 Series

Memory Lineup

Memory Lineup (Flash versions include an additional 8KB of data flash.)



R32C/100 Series Performance (On-Chip ROM/RAM)



Product Lineup

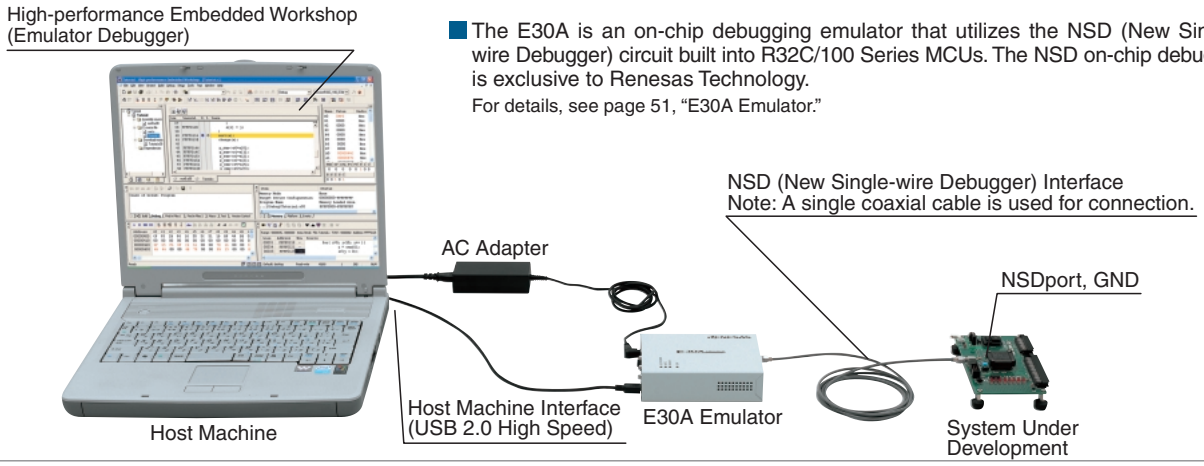
M32C/100 Series

R32C/100 CPU Core Performance Overview

Item	M32C/80	R32C/100
Basic instructions	108 instructions	108 instructions
Hardware multiplier	16 × 16 = 32	32 × 32 = 64
Multiply and accumulate	16 × 16 + 48 = 48	32 × 32 + 64 = 64
FPU	No	Yes (IEEE 754 single-precision)
Barrel shifter	16-bit	32-bit
Address match interrupt	8 points settable	No
DMA transfer unit	8-bit, 16-bit	8-bit, 16-bit, 32-bit
DMA transfer space	Fixed address from 16Mbyte user-specified space (16Mbyte space) 16Mbyte user-specified space from fixed address (16Mbyte space)	User-specified 64MB space from 64MB (00000000h–01FFFFFFh) and (FE000000h–FFFFFFFFh) user-specified space
DMA transfer address direction	Forward direction, fixed (not possible to set both transfer source and destination to forward direction or to fixed)	Forward direction, fixed (possible to set both transfer source and destination to forward direction or to fixed)
DMAC II transfer space	64 Kbytes	User-specified 64MB space from 64MB (00000000h–01FFFFFFh) and (FE000000h–FFFFFFFFh) user-specified space

Single-Wire Debugging Interface (NSD: New Single-wire Debugger)

Connection is made using a single wire, which is ideal when only limited space is available, when performing debugging with the MCU mounted on a board, or when checking RAM contents.



■ The E30A is an on-chip debugging emulator that utilizes the NSD (New Single-wire Debugger) circuit built into R32C/100 Series MCUs. The NSD on-chip debugger is exclusive to Renesas Technology.

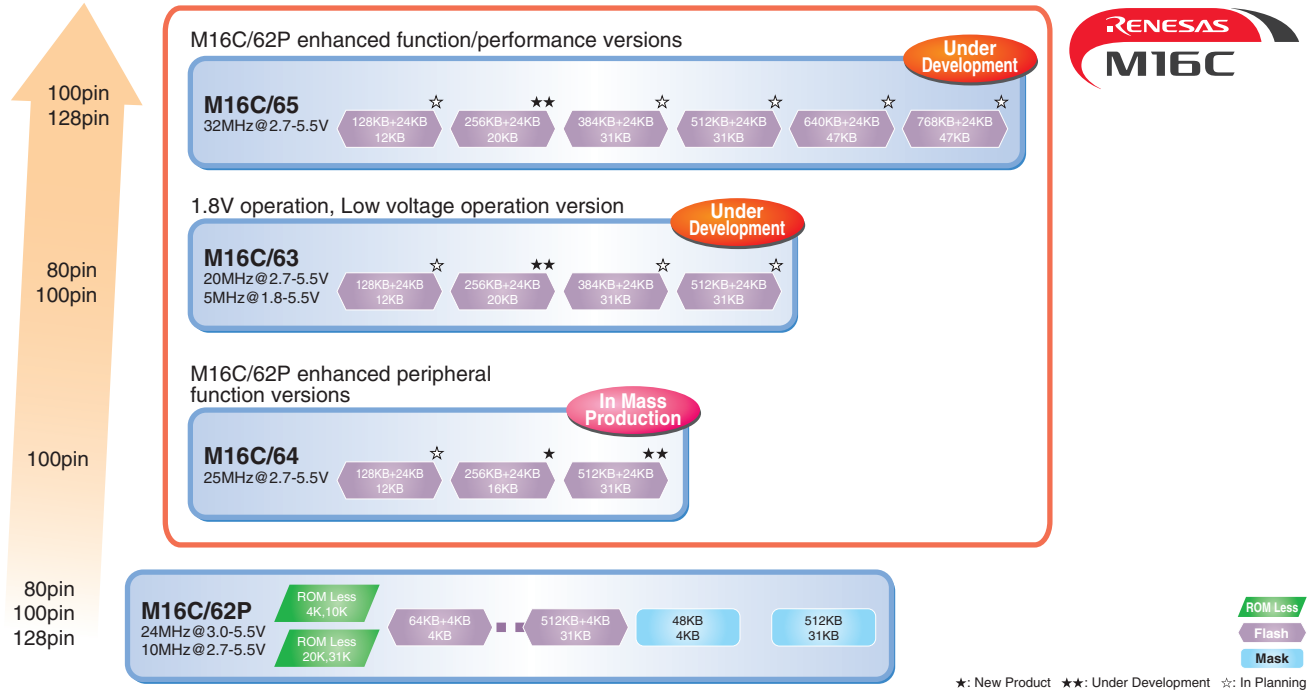
For details, see page 51, “E30A Emulator.”

Product Lineup

http://www.renesas.com/en/m16c

M16C/63, 64, 65 Group

M16C/63, 64, 65 Group Roadmap



M16C/65 Group Features

- Continuation of features from M16C/62P
  - Maintains compatibility with M16C and M32C (pin compatibility, compatibility with peripheral functions).
  - Retains features such as low EMI noise and low current consumption.

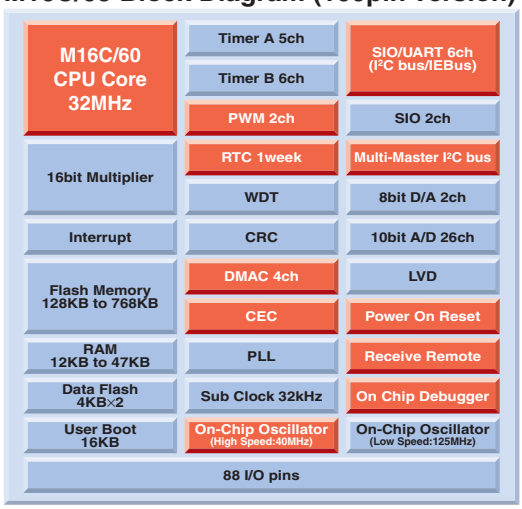
- Improved performance
  - Faster operation: 24MHz (M16C/62P) → 32MHz

- Contributions to reduced system cost
  - On-chip power-on reset function
    → Enables elimination of external reset IC/circuit.
  - High-speed (40MHz) on-chip oscillator
    → Enables elimination of external oscillator.

- Other main performance and function enhancements
  - On-chip flash memory enhanced (512KB/31KB to 768KB/47KB)
  - Improved DMA (2 channels (M16C/62P)
    → 4 channels
  - Improved serial communication (5 channels (M16C/62P)
    → 8 channels @100 pins
  - Faster A/D conversion (2.75 µs @12MHz (M16C/62P)
    → 1.72 µs @25MHz
  - On-chip realtime clock (1-week timer)
  - On-chip remote control receiver
  - On-chip CEC* circuit
  - Enhanced on-chip debugging function (OCD)

*: CEC - Consumer Electronics Control (Device control signal and protocol regulated by HDMI)
HDMI - High Definition Multimedia Interface

M16C/65 Block Diagram (100pin Version)



Product Lineup

M16C/63, 64, 65 Group

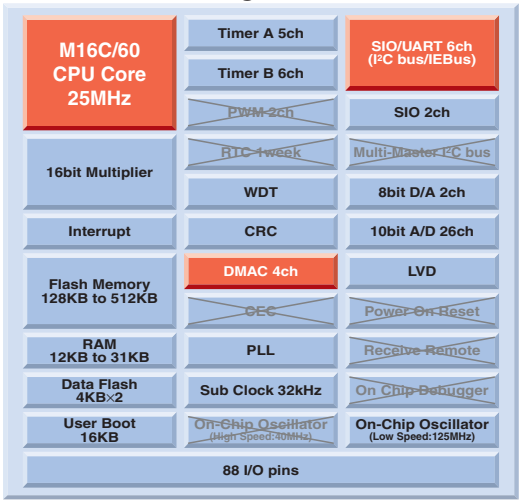
M16C/64 Group Features

- Continuation of features from M16C/62P
  - Maintains compatibility with M16C and M32C (pin compatibility, compatibility with peripheral functions).
  - Retains features such as low EMI noise and low current consumption.

- Improved performance
  - Faster operation: 24MHz (M16C/62P) → 25MHz (M16C/64)

- Other main performance and function enhancements
  - Improved DMA (2 channels (M16C/62P))
    → 4 channels
  - Improved serial communication (5 channels (M16C/62P))
    → 8 channels @100 pins
  - Faster A/D conversion (2.75 µs @12MHz (M16C/62P)
    → 1.72 µs @25MHz

M16C/64 Block Diagram



M16C/63 Group Features

- Continuation of features from M16C/62P
  - Maintains compatibility with M16C and M32C (pin compatibility, compatibility with peripheral functions).
  - Retains features such as low EMI noise and low current consumption.

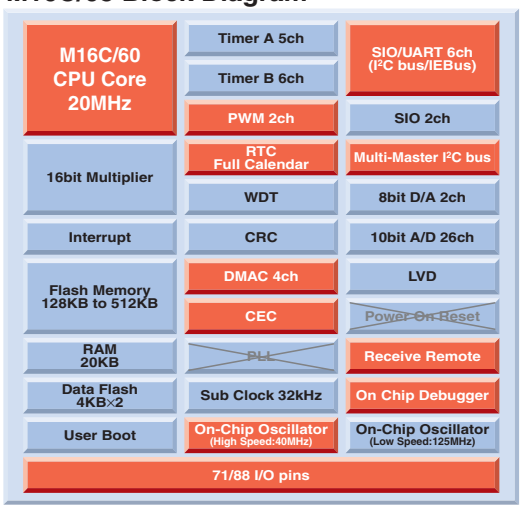
- Improved performance
  - Low voltage at 1.8 V

- Contributions to reduced system cost
  - High-speed (40MHz) on-chip oscillator
    → Enables elimination of external oscillator.

- Other main performance and function enhancements
  - Improved DMA (2 channels (M16C/62P)
    → 4 channels
  - Improved serial communication (5 channels (M16C/62P)
    → 8 channels @100 pins
  - Faster A/D conversion (2.75 µs @12MHz (M16C/62P)
    → 2.15 µs @20MHz
  - On-chip realtime clock (Full calendar)
  - On-chip remote control receiver
  - On-chip CEC* circuit
  - Enhanced on-chip debugging function (OCD)

*: CEC - Consumer Electronics Control (Device control signal and protocol regulated by HDMI)
HDMI - High Definition Multimedia Interface

M16C/63 Block Diagram



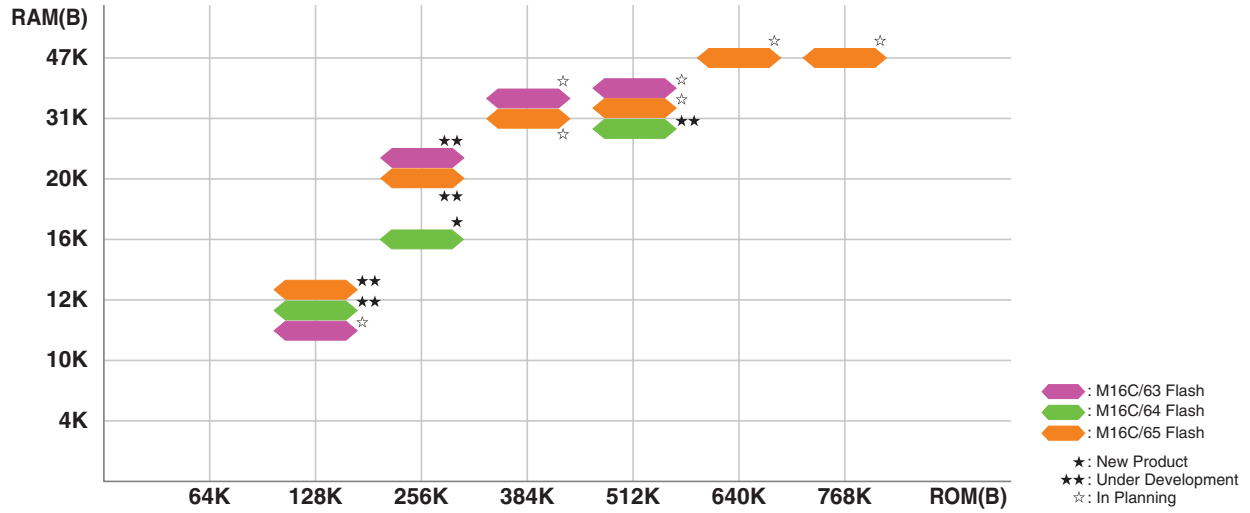
- IEBus is a trademark of NEC Electronics Corporation.

Product Lineup

http://www.renesas.com/en/m16c

M16C/63, 64, 65 Group

M16C/63, 64, 65 Flash Memory Lineup



M16C/63, 64, 65 New Functions

Item	M16C/62P	M16C/63	M16C/64	M16C/65	
Max. CPU speed	24MHz (VCC = 3.0 to 5.5V)	**20MHz** (VCC = **2.7** to 5.5V)	**25MHz** (VCC = **2.7** to 5.5V)	**32MHz** (VCC = **2.7** to 5.5V)	Faster
I²C Bus	Simple I²C Bus	No	Simple I²C Bus	**Multimaster I²C Bus**	New function
Realtime clock	No	No	No	**Yes**	New function
8-bit PWM	No	**2 channels**	No	**2 channels**	New function
UART	3 channels	**6 channels**			More channels
DMA	2 channels (24 sources)	**4 channels (43 sources)**			More channels
External interrupts	6 interrupts	**8 interrupts**			More interrupts
Port 8_5	Input only	**I/O (N channel open drain output)**			More output support ports
Timer clock source	f64 not settable	**f64 settable**			New function
Flash memory erase suspend	No	No	No	**Yes**	New function
Flash memory user boot area	No	No	No	**Yes**	New function

M16C/63, 64, 65 Specification Comparison

Item		M16C/63 (100 pin version)	M16C/64 (100-pin version)	M16C/65 (100-pin version)
Basic instructions		91 instructions	←	←
Min. instruction time		50ns (20MHz, 0 wait, VCC = 2.7 to 5.5V) 200ns (5MHz, 0 wait, VCC = 1.8 to 5.5V)	40ns (25MHz, 0 wait states, VCC = 2.7 to 5.5V)	31.2ns (32MHz, 0 wait states, VCC = 2.7 to 5.5V)
Memory	ROM	128KB, 256KB, 384KB, 512KB	128KB, 256KB, 512KB	128KB, 256KB, 384KB, 512KB, 640KB, 768KB
	RAM	12KB, 20KB, 31KB	12KB, 16KB, 31KB	12KB, 20KB, 31KB, 47KB
I/O ports	P0 to P10	8-bit × 11 (N channel O.D. × 3 (P70, P71, P85))	←	←
Input ports	P85	—	—	—
Timers		11 (timer A × 5, timer B × 6)	←	←
PWM		8-bit × 2 channels	—	8-bit × 2 channels
RTC		1ch (Full Calendar)	—	1 channel (1 week)
Serial interface		Synchronous/asynchronous × 6 channels (I²C Bus and IEBus support × 6 channels), synchronous × 2 channels	←	←
Multimaster I²C Bus		1 channel	—	1 channel
A/D converter		10bit × max. 26 channels, ±3LSB (at 3V, 5V) Resolution: 10bit Conversion speed (10bit): 2.15 µs at 5V/ϕAD 20MHz (single, repeat, single sweep, repeat sweep 0, 1)	10-bit × max. 26 channels, ±3 LSB (at 3V and 5V) Resolution: 10-bit Conversion speed (10-bit): 1.72 µs at 5V/ϕAD 25MHz (single, repeat, single sweep, repeat sweep 0, 1)	←
D/A converter		8bit × 2	←	←
DMAC		4 channels	←	←
CRC		With SFR access monitor function	Yes	With SFR access monitor function
Watchdog timer		15-bit × 1 channel (with prescaler) Reset start function selectable	←	←
External interrupts		NMI, INT0, INT1, INT2, INT3, INT4, INT5, INT6, INT7, key input (10 sources)	←	←
Address match circuits		4	←	←
Remote control reception circuit		Yes	—	Yes
CEC circuit		Yes	—	Yes
Clock generator circuit		5 circuits: PLL high-speed, high-precision (32MHz at ±1.0%) on-chip oscillator, low-speed (125kHz) on-chip oscillator, XIN, XCIN (built-in feedback resistor, external ceramic resonator or crystal oscillator)	4 circuits: PLL low-speed (125kHz) on-chip oscillator, XIN, XCIN (built-in feedback resistor, external ceramic resonator or crystal oscillator)	5 circuits: PLL high-speed, high-precision (32MHz at ±1.0%) on-chip oscillator, low-speed (125kHz) on-chip oscillator, XIN, XCIN (built-in feedback resistor, external ceramic resonator or crystal oscillator)
Voltage drop detection circuit		Yes (selectable between 3 values)	Yes (selectable between 2 values)	Yes (selectable among 3 values)
Power-on reset		Yes	—	Yes
Power supply voltage		2.7 to 5.5V (20MHz), 1.8 to 5.5V (5MHz)	2.7 to 5.5V (25MHz)	2.7 to 5.5V (32MHz)
Package		80 pin (0.5mm pin pitch)	100-pin (0.5/0.65mm pin pitch)	80-pin (0.65mm pin pitch), 100-pin (0.5/0.65mm pin pitch), 128-pin (0.5mm pin pitch)
Operating modes		Single-chip, memory expansion, microprocessor	←	←
Tools		E8a	E100, E8a	←

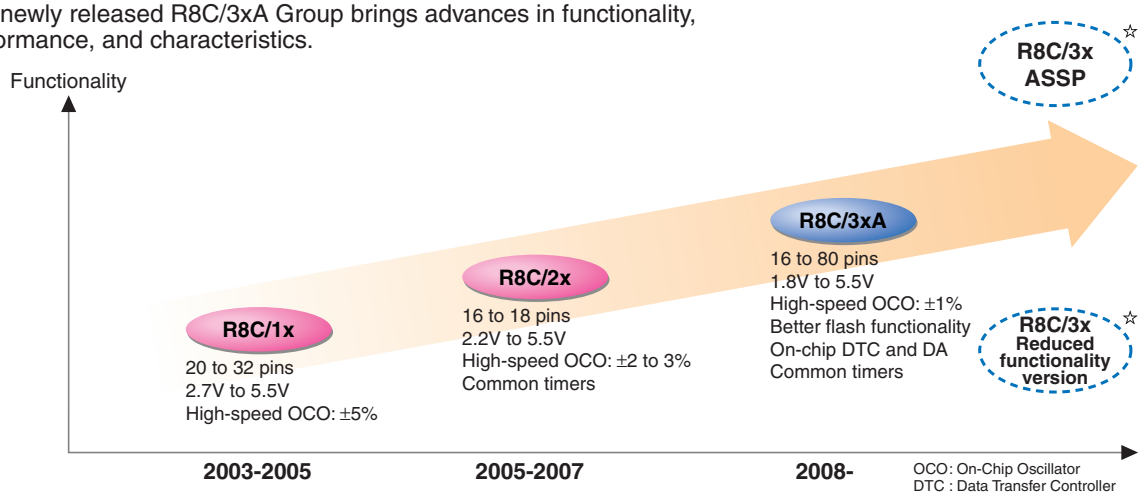
Difference between M16C/63 and M16C/64 Difference between M16C/64 and M16C/65 CEC: Consumer Electronics Control (Device control signals and control protocol standardized by HDMI. HDMI: High-Definition Multimedia Interface)

Product Lineup

R8C/3xA Group

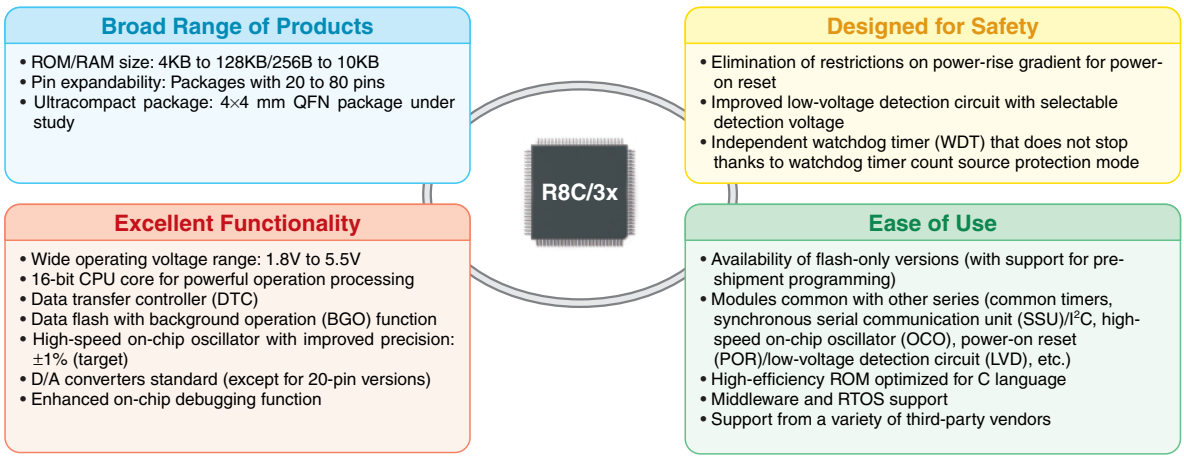
R8C/Tiny Series Roadmap

The newly released R8C/3xA Group brings advances in functionality, performance, and characteristics.



R8C/3xA Group Product Concept

Four key concepts: Broad range of products, excellent functionality, designed for safety, and ease of use.

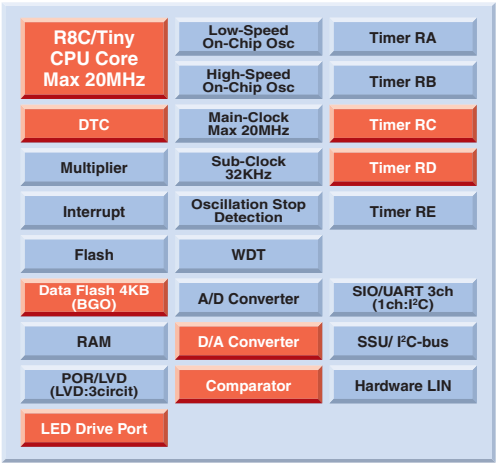


R8C/35A Group Features

Under Development

- Support for 1.8V operating voltage
  VCC = **1.8V to 5.5V** (f(XIN) = 2MHz)
  VCC = 2.2V to 5.5V (f(XIN) = 5MHz)
  VCC = 2.7V to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0V to 5.5V (f(XIN) = 20MHz)
- High-precision (target ±1%), high-speed on-chip oscillator (40MHz)
- Subclock oscillator circuit (32.768KHz)
- Data transfer controller (DTC) 1 channel
- D/A converter
- Additional 16-bit timer (timer RC)
- Support for motor control using timer RD
- Synchronous serial communication unit (SSU)
- I²C-bus (also functions as SSU)
- Data flash area that can substitute for external E²PROM
  The data flash is equipped with a background operation (BGO) function.
- Power-on reset function and low-voltage detection function that eliminate the need for an external reset chip; support for external voltage monitoring using comparator
- Large-current drive ports switchable between sink and source modes
- Compatible with E8a low-cost on-chip debugging emulator
- 52-pin package

R8C/35A Block Diagram

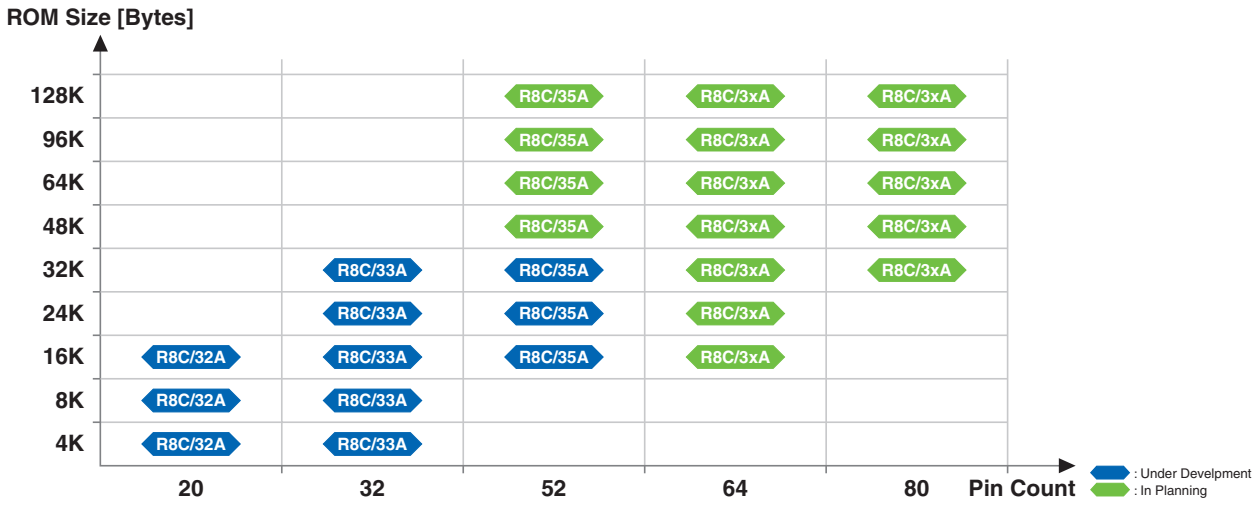


Product Lineup

http://www.renesas.com/en/r8ctiny

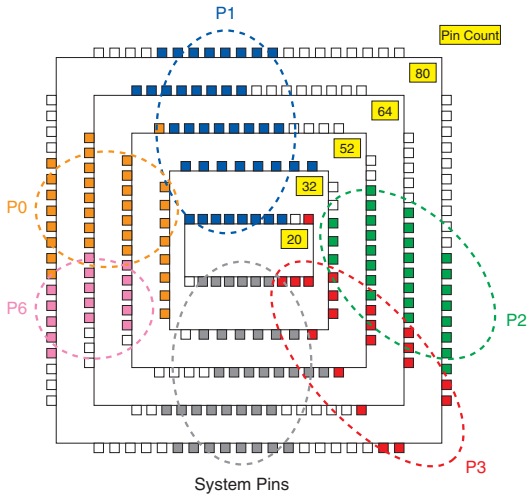
R8C/3xA Group

R8C/3xA Group Lineup



R8C/3xA Group Pin Assignments

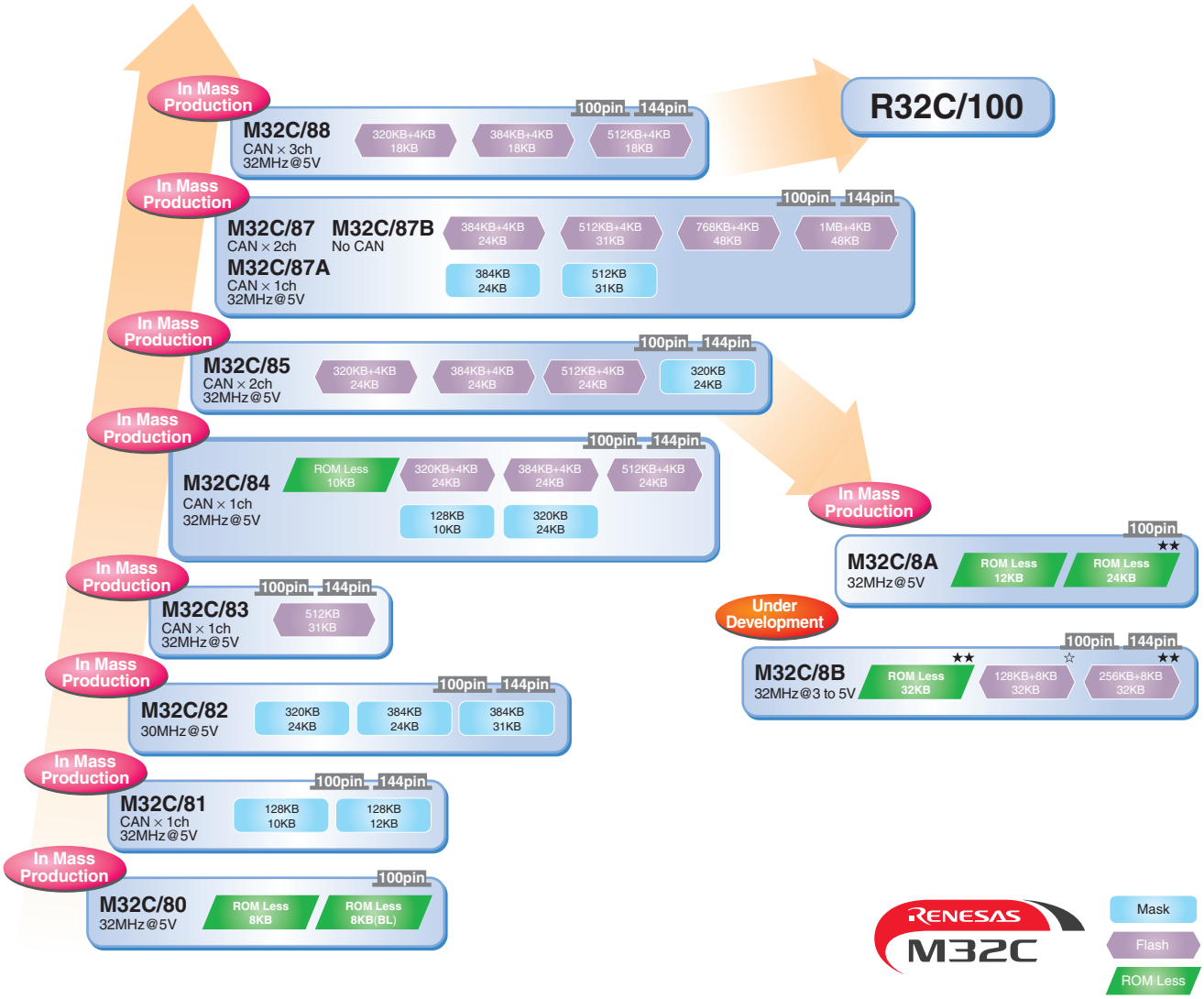
The same pins are oriented in the same direction even when the pin count differs. This simplifies board changes.



Product Lineup

M32C/80 Series

M32C/80 Series Roadmap



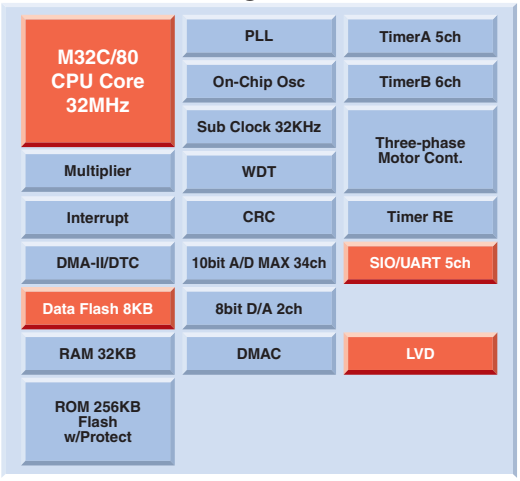
BL: On-chipbootloader ★: New Product ★★: Under Develpment ☆: In Planning

M32C/8B Group Features

Under Development

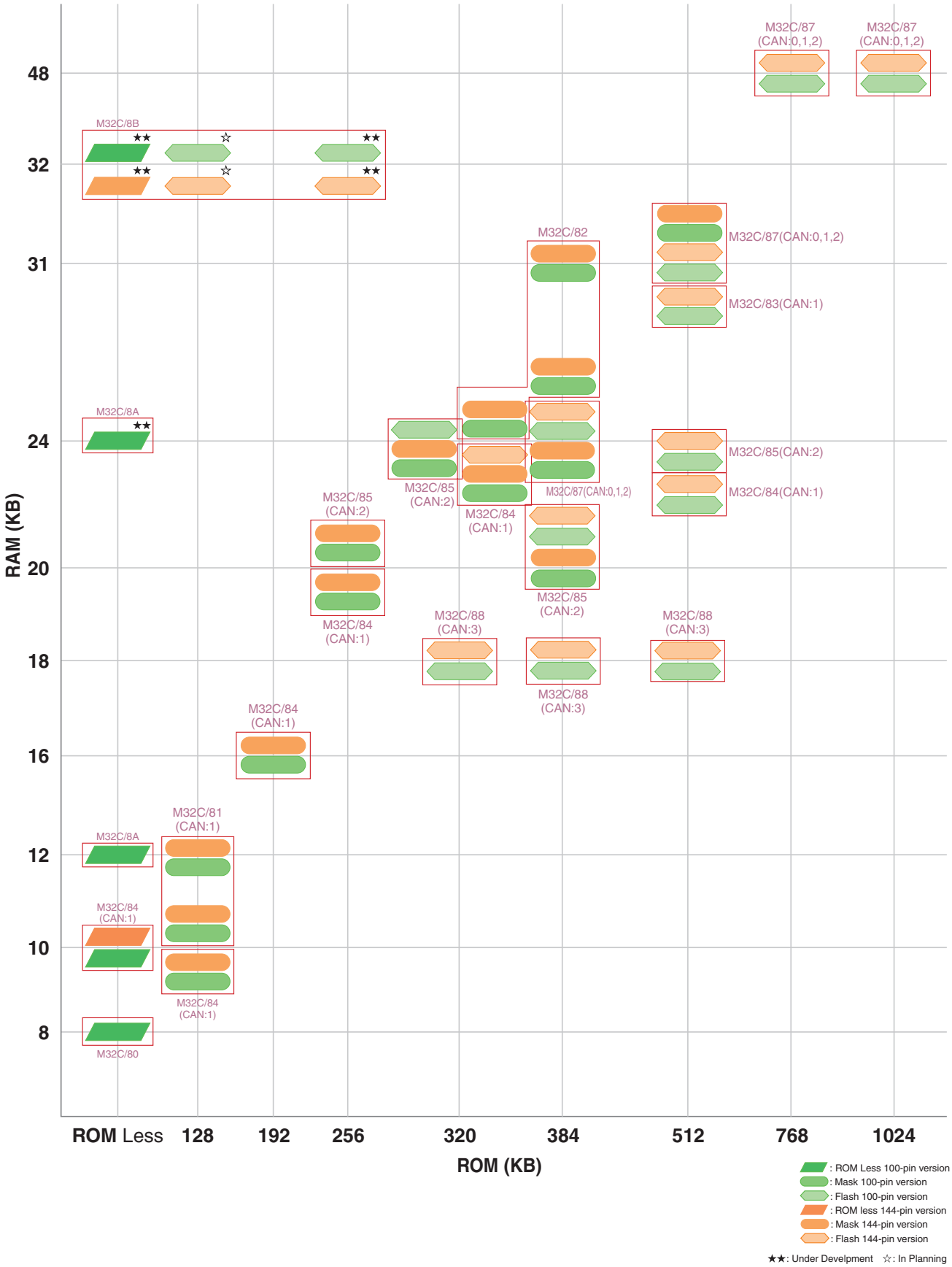
- Backward compatibility with the M16C/80, allowing for easy upgrading when high-speed operation (32MHz @ 3V to 5V) is required
- 32-bit arithmetic and transfer instructions as well as high-speed 32-bit multiple-shift instructions (using on-chip barrel shifter) for rapid operation processing
- Low-voltage detection (LVD) function (option)
- Ability to use data flash area as substitute for external E^2PROM (flash versions only)

M32C/8B Block Diagram



M32C/80 Series Memory Lineup

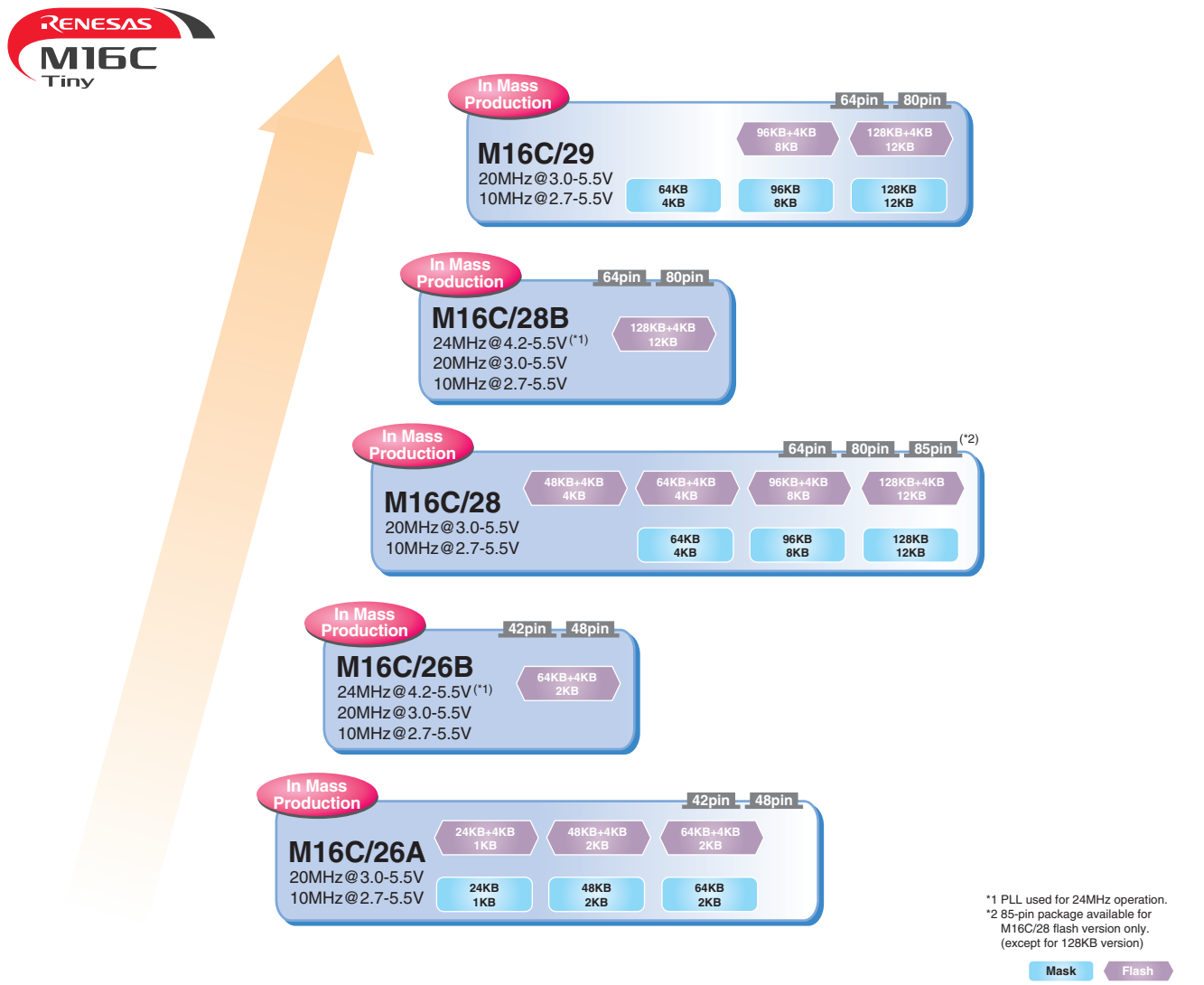
Memory Line up (Flash versions include an additional 4KB of data flash.)



Product Lineup

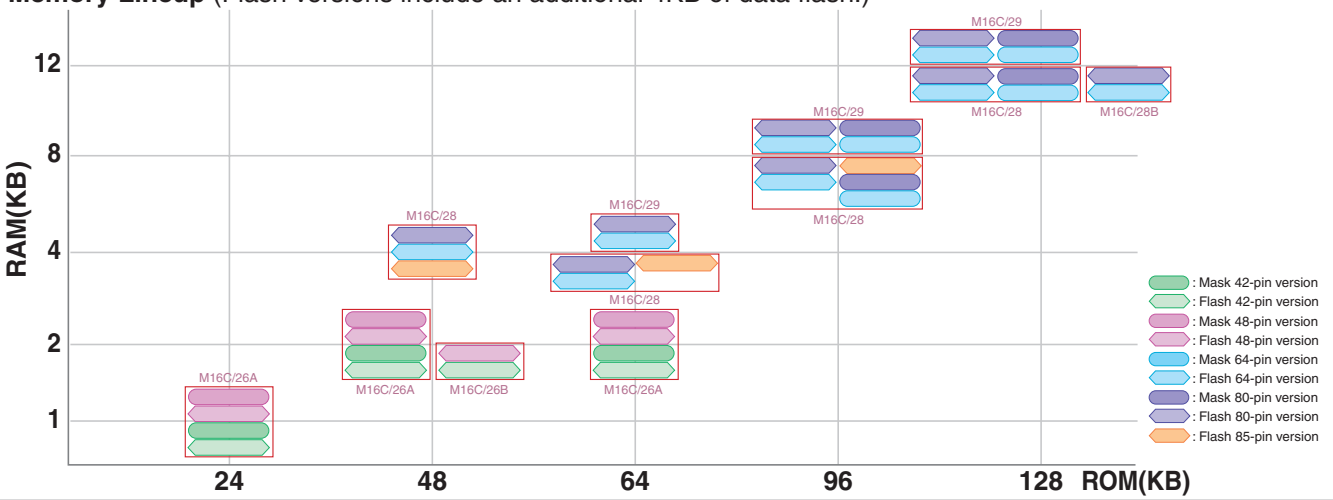
M16C/Tiny Series

M16C/Tiny Series Roadmap



Memory Lineup

Memory Lineup (Flash versions include an additional 4KB of data flash.)



Product Lineup

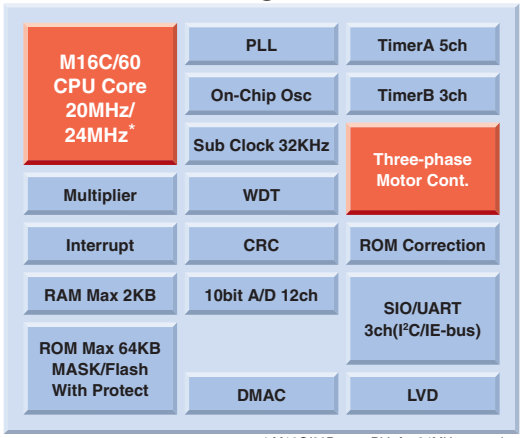
http://www.renesas.com/m16ctiny

M16C/Tiny Series

M16C/26A Group Features

- Small foot print (7mm square, 48pins) and high-speed operation (20MHz@5V).
- Instructions and peripheral functions are compatible with M16C/62P for easy program portability.
- 3-phase motor control timer, enabling motor control in compact products.
- Data flash area can be used in place of external EEPROM.
- Higher frequency version (24MHz@5V) also available (M16C/26B).

M16C/26A Block Diagram

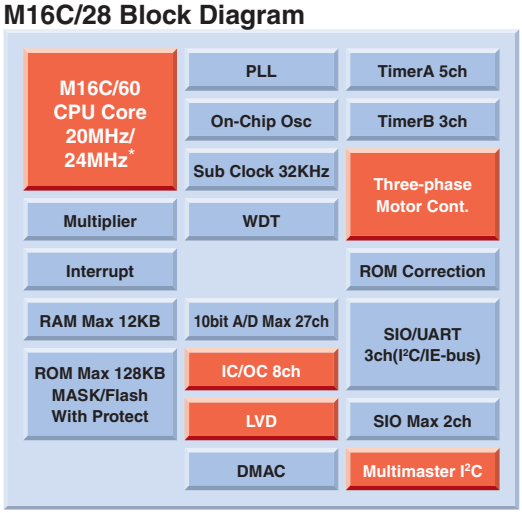


* M16C/26B uses PLL for 24MHz operation.

M16C/28 Group Features

- Small foot print and high-speed operation (20MHz@5V)
- Instructions and peripheral functions are compatible with M16C/62P for easy program portability.
- 3-phase motor control timer, enabling motor control in compact products.
- Support for max. 2 I²C-bus channels using multimaster I²C-bus
- Data flash area can be used in place of external EEPROM.
- Higher frequency version (24MHz@5V) also available (M16C/28B).
- Small package (7mm×7mm: 85pins) available for flash versions only (except for 128KB products of M16C/28 and M16C/28B).

M16C/28 Block Diagram

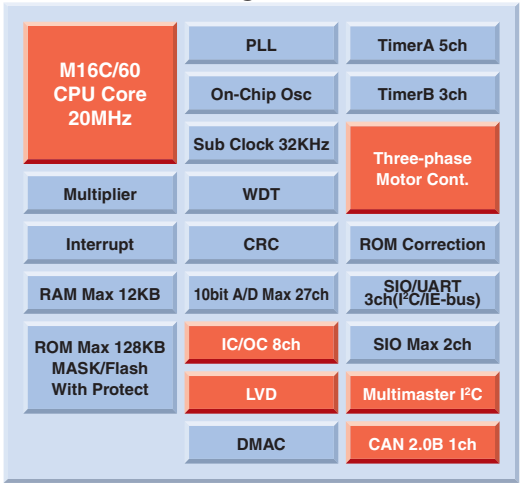


IC:Input Capture OC:Output Compare * M16C/28B uses PLL for 24MHz operation.

M16C/29 Group Features

- Adds CAN 2.0B to M16C/28. Compatible with M16C/28.
- Small mounting area and high-speed operation (20MHz@5V)
- Instructions and peripheral functions are compatible with M16C/62P for easy program portability.
- Retains 3-phase motor control timer, enabling motor control in compact products.
- Input-capture and output-compare functions for more flexible signal control
- Support for max. 2 I²C-bus channels using multimaster I²C-bus
- Data flash area can be used in place of external EEPROM.

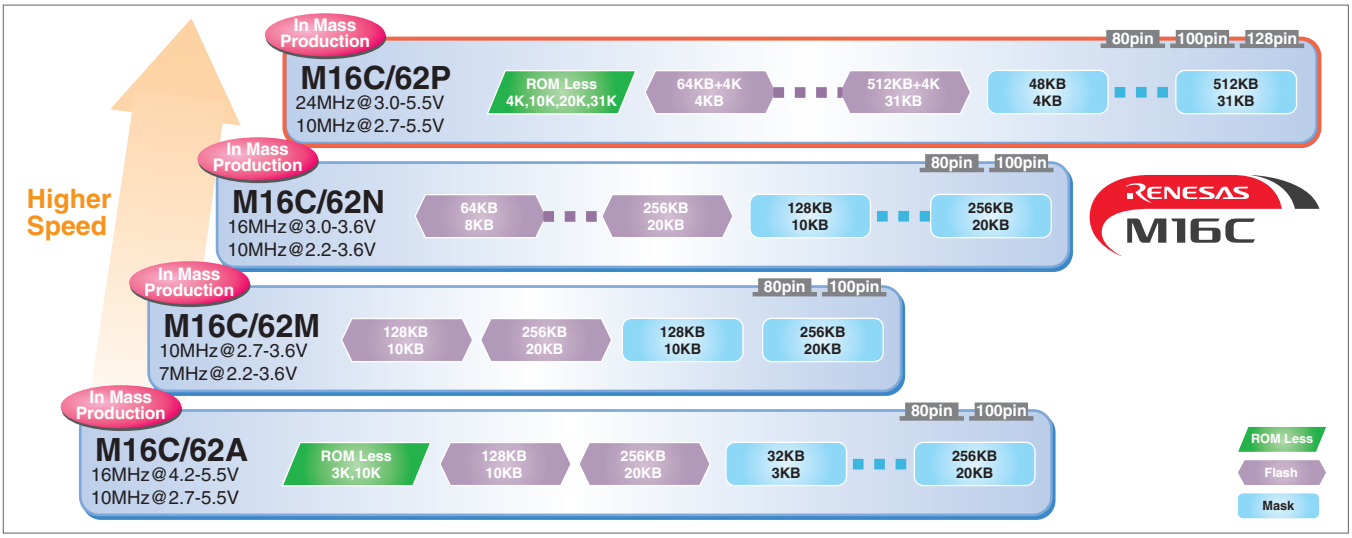
M16C/29 Block Diagram



Product Lineup

M16C/62

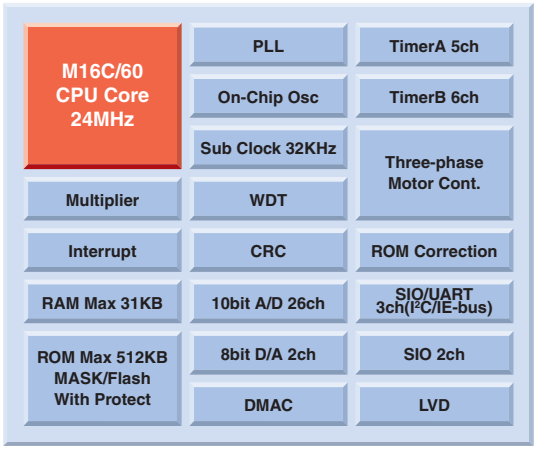
M16C/62 Roadmap



M16C/62P Group Features

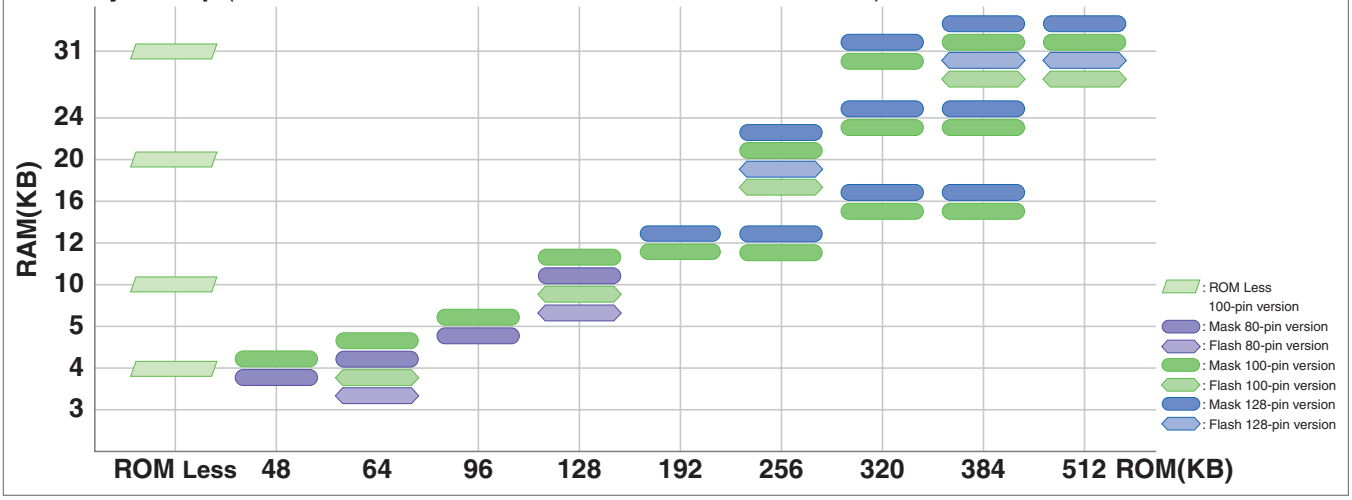
- Wide range of memory options (ROM/RAM: ROM Less/4KB to 512KB/31KB)
- Supports 3V and 5V peripheral power supplies, allowing direct connection to 3V memory and 5V devices.
- SIO (3 channels) supports a subset of the IEBus and I²C-bus standards, allowing connection of a large number of devices.
- Insertion of from 0 to 3 wait states can be selected, allowing connection of slower devices.
- Enhanced watchdog timer, oscillation stop detection circuit, and new reset circuit on-chip

M16C/62P Block Diagram



Memory Lineup

Memory Lineup (Flash versions include an additional 4KB of data flash.)

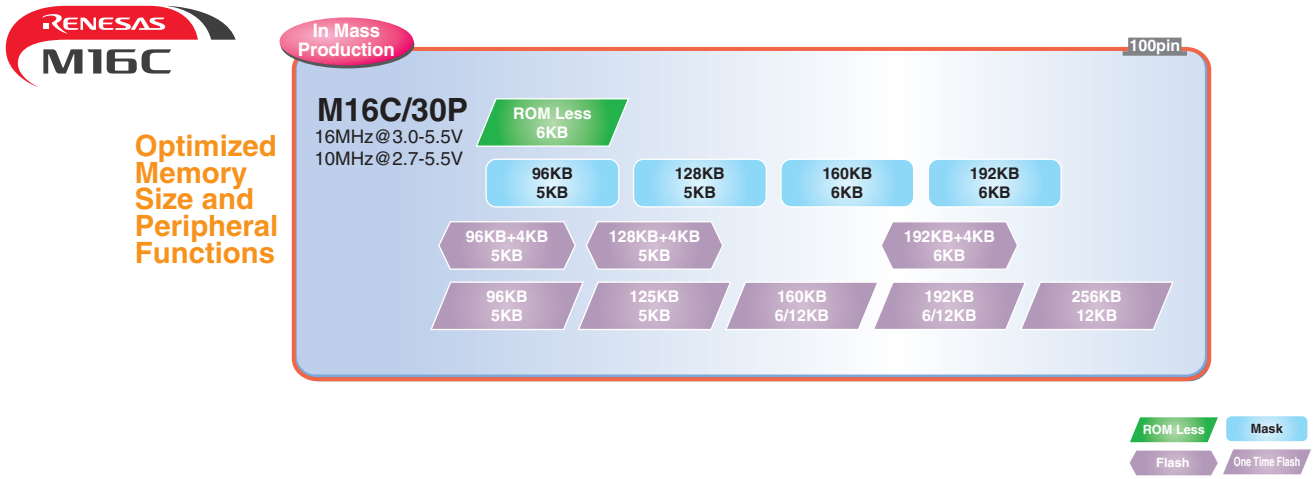


Product Lineup

http://www.renesas.com/en/m16c

M16C/30P Group

M16C/30P Group Roadmap

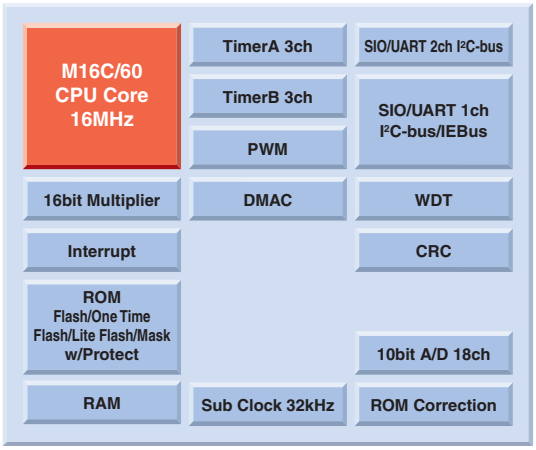


One time flash: Product with on-chip flash memory that can be programmed only once (and cannot be erased).

M16C/30P Group Features

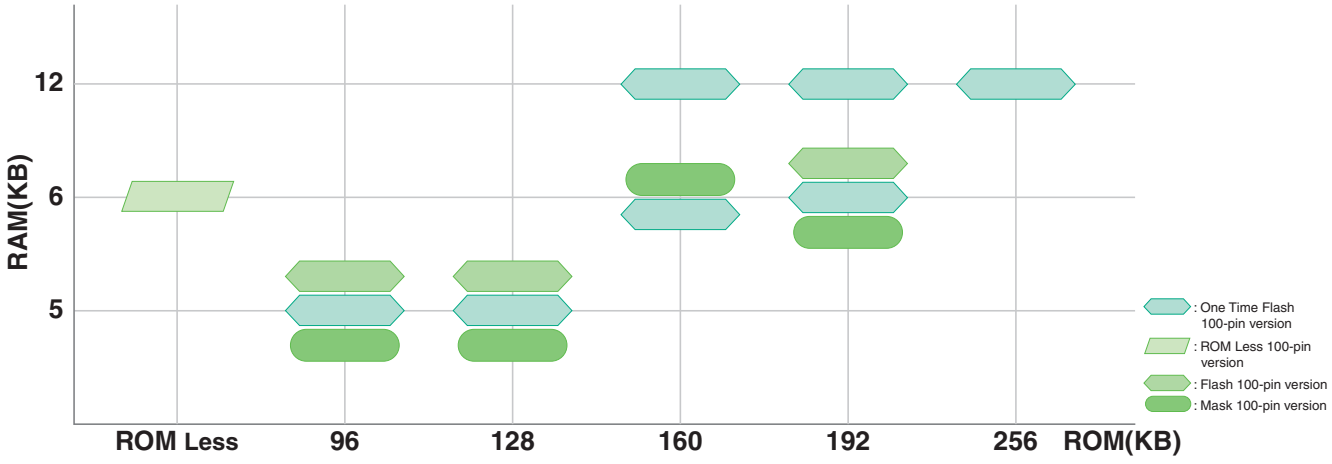
- Compatible with M16C/62P while achieving lower cost through reduced functions and ROM/RAM capacity.
- Operating frequency of 16MHz (3V to 5V)
- Reduced peripheral functions (timer: 6 channels, SIO: 3 channels, A/D; 18 channels), limited to most commonly used functions.
- Package: 100-pin package only.
- Support for single-chip, memory expansion, and microprocessor modes
- Wide variety of on-chip memory options: Mask ROM, flash, one time flash and ROM Less versions available.
- Compatible with development support tools for the M16C/62P.

M16C/30P Block Diagram



Memory Lineup

Memory Lineup (Flash versions include an additional 4KB of data flash.)

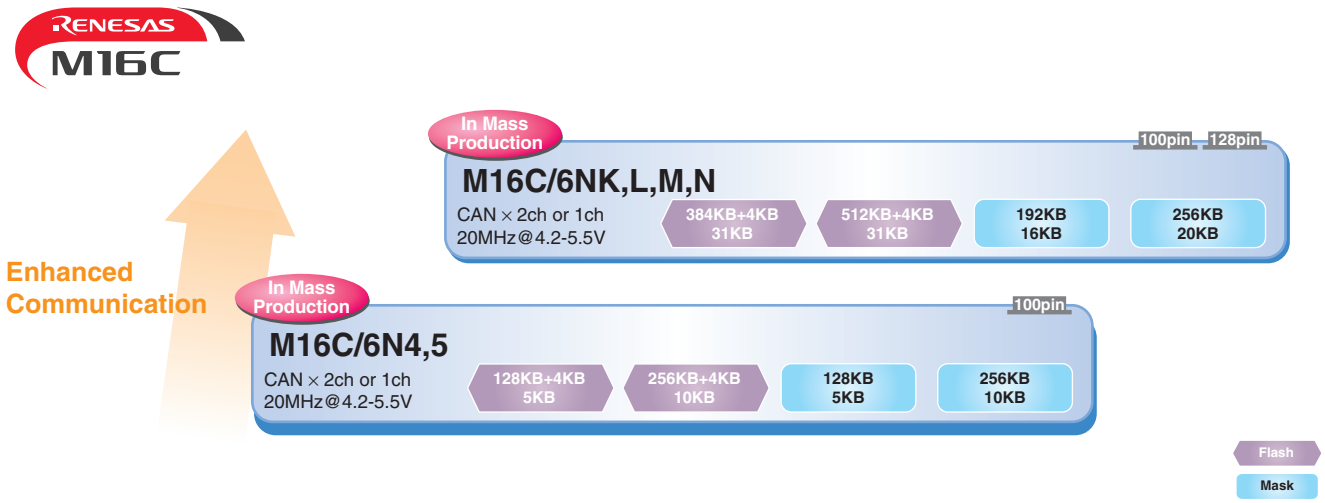


Product Lineup

http://www.renesas.com/en/m16c

M16C/6N

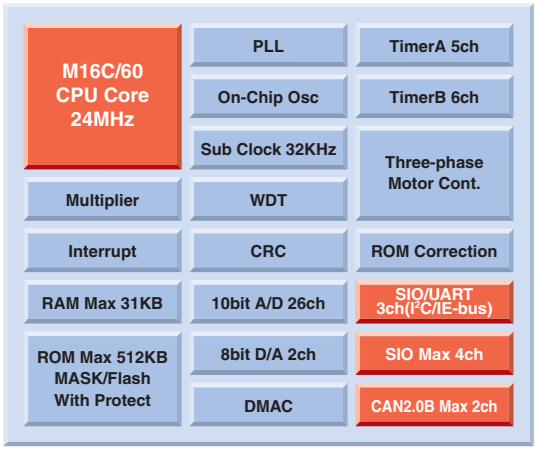
M16C/6N Roadmap



M16C/6NK Group Features

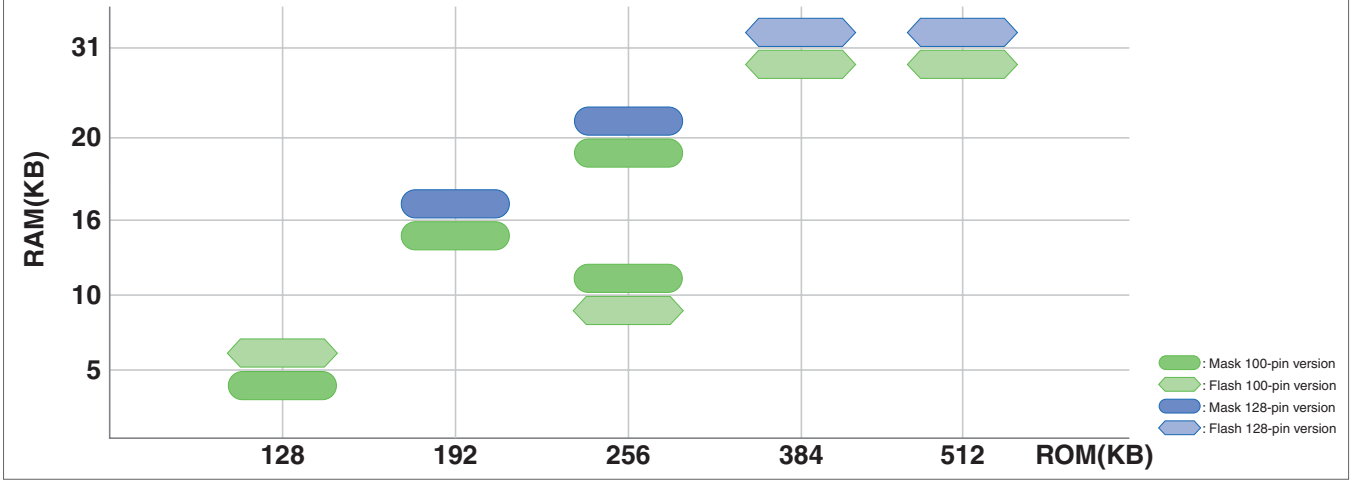
- Retains the features of the M16C/62P (CPU core, low power consumption, EMI characteristics, peripheral functions) and adds CAN (2.0B) support.
  M16C/6NK, M16C/6NM: CAN 2.0B 2 channels,
  M16C/6NL, M16C/6NN: CAN 2.0B 1 channel
- Additional communication functions (CAN, serial interface:
  5 channels (M16C/6NK, M16C/6NL)/
  7 channels (M16C/6NM, M16C/6NN))
- Improved failsafe functions such as enhanced watchdog timer and oscillation stop detection circuit, additional external interrupts (9 channels: M16C/6NM, M16C/6NN)

M16C/6NK Block Diagram



Memory Lineup

Memory Lineup (Flash versions include an additional 4KB of data flash.)

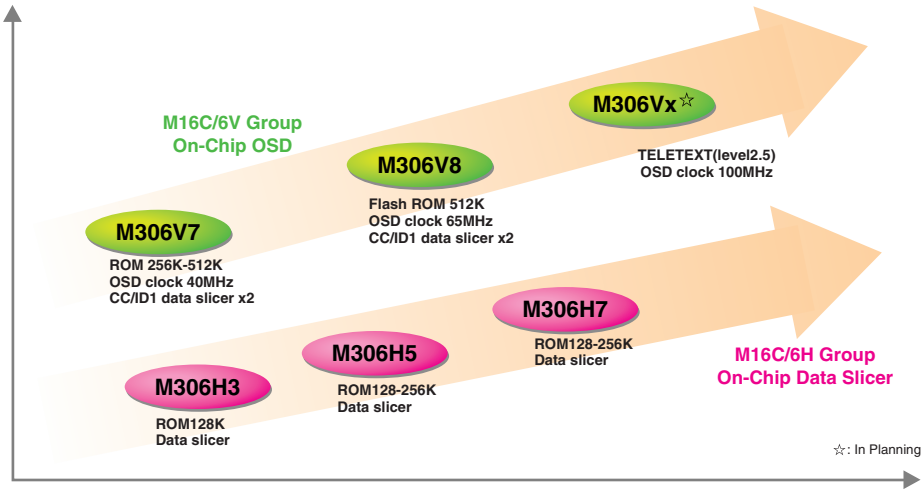


Product Lineup

http://www.renesas.com/en/m16c

ASSP

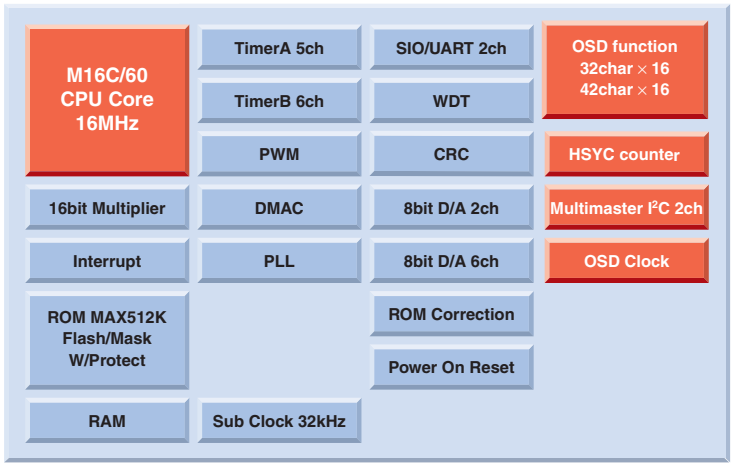
M16C/6V, M16C/6H Roadmap



M16C/6V Group Features (OSD, on-chip data-slicer)

- On-chip OSD or data slicer for control of closed caption function or TV with ID1 function
- Memory options from 256KB to 512KB
- OSD supports display of 636 to 890 characters: 32 charactersX16 lines or 40 charactersX16 lines.
- Retains the features of the M16C/62P (low power consumption, EMI/EMS characteristics, peripheral functions).

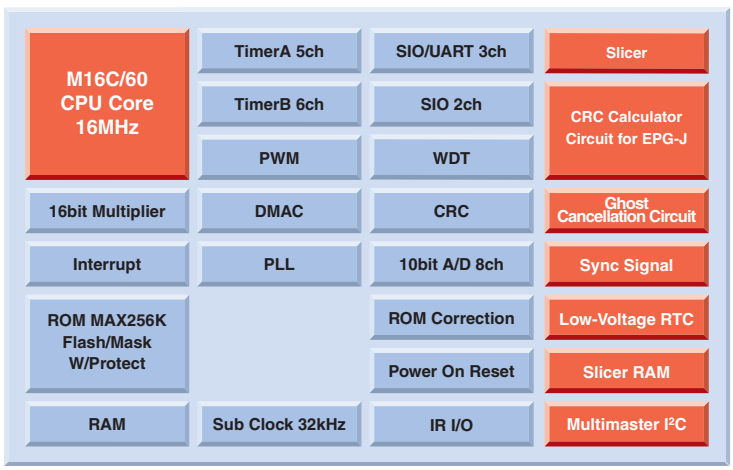
M16C/6V7 Block Diagram



M16C/6H Group Features (on-chip multi-slicer)

- MCU with on-chip multi-slicer with worldwide compatibility and designed for DVD/HDD recorders.
- Support for TELETEXT, PDC, VPS, EPG-J, XDS, WSS, VideoID, etc.
- Retains the features of the M16C/62P (low power consumption, EMI/EMS characteristics, peripheral functions).

M16C/6H7 Block Diagram



Product Lineup

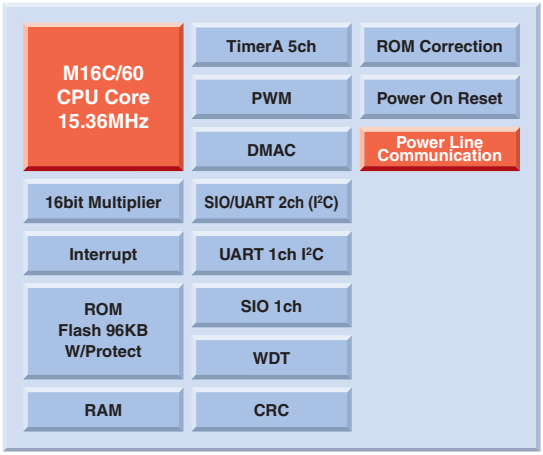
http://www.renesas.com/en/m16c

ASSP

M16C/6S Group Features (on-chip power line communication)

- MCU with on-chip power line modem developed by Yitran (IT800) for power line communication
- Uses frequency band from 100kHz to 400kHz for power line communication, enabling a data transfer rate of 7.5kbps.
- Retains the features of the M16C/62P (low power consumption, EMI/EMS characteristics, peripheral functions).

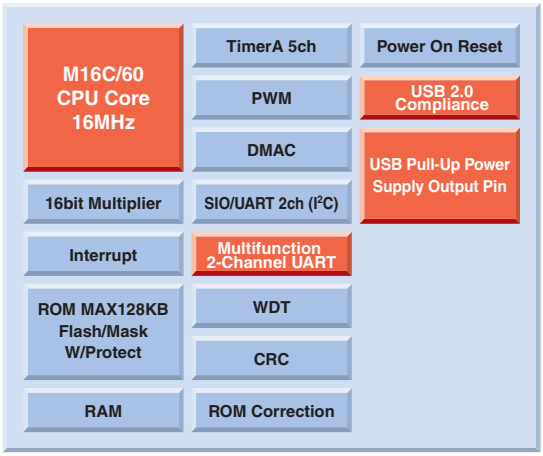
M16C/6S Block Diagram



M16C/24 Group Features (on-chip USB controller)

- On-chip USB controller with full-speed support
- USB pull-up power supply circuit, USB clock generator circuit, many USB control functions
- Audio interface function implemented through addition of multi-bit serial I/O, memory card interface enhanced by strengthened CRC calculation function.
- Retains the features of the M16C/62P (low power consumption, EMI/EMS characteristics, peripheral functions).

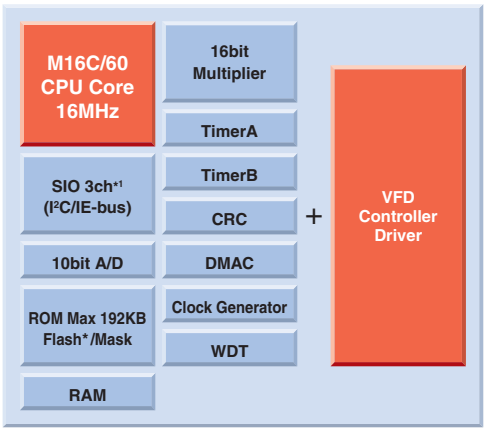
M16C/24 Block Diagram



M16C/39P Group Features (SiP combining VFD controller/driver)

- SiP combining M16C/30P general MCU and VFD controller/driver
- Retains features of the M16C/62P while slimming down ROM/RAM and peripheral functions.
- 34 user-configurable high-voltage ports (setting support for 2 to 16 digits)
- Dimmer function, variable frame cycle SiP: Solution Integrated Product™

M16C/39P Block Diagram



*1. One of the three SIO channels is used for VFD control. Therefore, two SIO channels are available to the user.
*(Note): Flash version is under development.

Product Lineup

R8C/Tiny Series

R8C/Tiny Series Roadmap

Flash-only versions of all models are available.

*: Includes data flash

★★: Under Development ★: New Product ☆: In Planning : In Mass Production

Expanded lineup, 20 to 80-pin/4 to 128KB → **ASSP extension Slim-down functions** → **Operation at 1.8 to 5.5V On-chip DTC*1, improved flash versions**

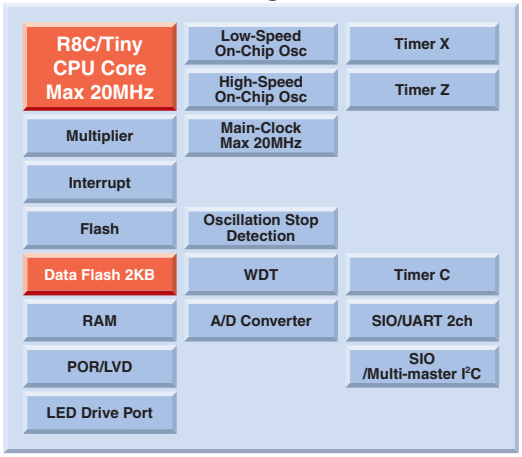
80-pin	R8C/2C, 2D*	Low-voltage support On-chip D/A converter		☆ R8C/3xA*
64-pin	R8C/2A, 2B*	Low-voltage support On-chip D/A converter		☆ R8C/3xA*
48,52-pin	R8C/24, 25*	Low-voltage support		
	R8C/22, 23*	For automotive and industrial applications On-chip CAN		★★ R8C/35A*
	R8C/20, 21*	For automotive applications		
32-pin	R8C/26, 27*	For general and automotive applications Low-voltage support	★ R8C/2K, 2L* Motor control ★ R8C/2E, 2F* Lighting control ★ R8C/2G General-purpose	★★ R8C/33A*
20-pin	R8C/18, 19* 1A, 1B* / R8C/28, 29*	For general and automotive applications Low-voltage support	★ R8C/2H General-purpose	★★ R8C/32A*
16-pin			★ R8C/2J General-purpose 16-pin	☆ R8C/3xA*

*1: Data Transfer Controller

R8C/18-1B Group Features

- High-precision, high-speed on-chip oscillator (8MHz)
- On-chip multimaster I²C-bus
- On-chip clock-synchronous serial I/O with chip select
- Data flash area can be used in place of external EEPROM. R8C/19 Group, R8C/1B Group
- On-chip switchable sink or source-type large-current drive ports.
- On-chip power-on reset function and voltage detection function eliminate need for separate reset IC.
- 20pin Packages

R8C/18-1B Block Diagram



Product Lineup

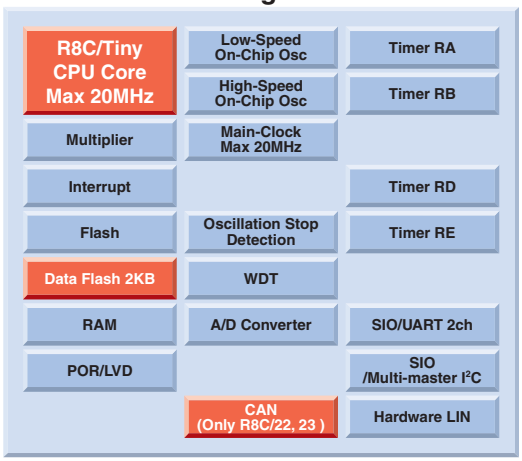
http://www.renesas.com/en/r8ctiny

R8C/Tiny Series

R8C/20-23 Group Features

- R8C/Tiny Series for automotive applications
- CAN 2.0B added. Upward compatible with R8C/22 Group, R8C/23 Group, R8C/20 Group, and R8C/21 Group.
- Support for high-temperature operation
  D version : -40 to 85°C
  J version : -40 to 85°C
  K version : -40 to 125°C
- Support for high-speed operation
  D version : VCC = 2.7 to 3.0V (f(XIN) = 10MHz)
  D version : VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
  J version : VCC = 2.7 to 3.0V (f(XIN) = 10MHz)
  J version : VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
  K version : VCC = 2.7 to 3.0V (f(XIN) = 10MHz)
  K version : VCC = 3.0 to 5.5V (f(XIN) = 16MHz)
- High-precision, high-speed on-chip oscillator (40MHz)
- Data flash area can be used in place of external EEPROM. (R8C/21 Group, R8C/23 Group)
- On-chip power-on reset function and voltage detection function eliminate need for separate reset IC.
- 48pin Packages

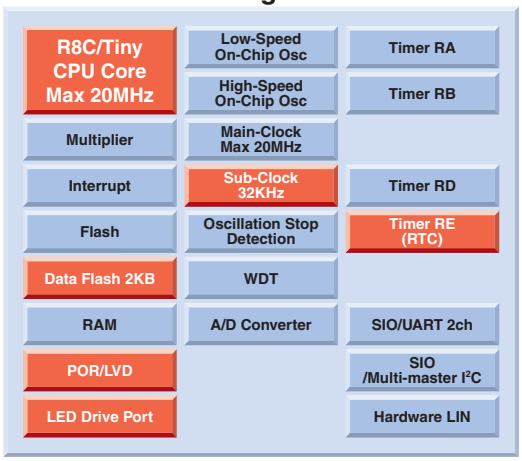
R8C/20-23 Block Diagram



R8C/24-25 Group Features

- Support for low-voltage operation
  VCC = **2.2 to 5.5V** (f(XIN) = 5MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
- High-precision, high-speed on-chip oscillator (40MHz)
- On-chip subclock oscillator circuit (32.768kHz)
- On-chip timer RD for motor control
- On-chip multimaster I²C-bus
- On-chip clock-synchronous serial I/O with chip select
- Data flash area can be used in place of external EEPROM. (R8C/25 Group)
- On-chip power-on reset function and voltage detection function eliminate need for separate reset IC.
- On-chip switchable sink- or source-type large-current drive ports.
- 52pin Packages

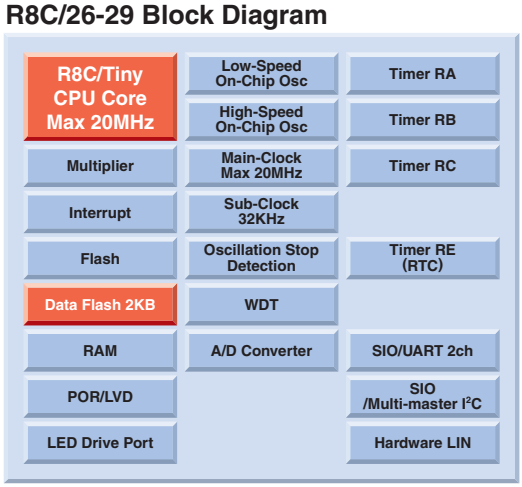
R8C/24-25 Block Diagram



R8C/26-29 Group Features

- Support for low-voltage operation
  VCC = **2.2 to 5.5V** (f(XIN) = 5MHz) (N and D versions)
  VCC = 2.7 to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 16MHz) (K version)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz) (other than K version)
- High-precision, high-speed on-chip oscillator (40MHz)
- On-chip subclock oscillator circuit (32.768kHz) (N and D versions)
- On-chip multimaster I²C-bus
- On-chip clock-synchronous serial I/O with chip select
- Data flash area can be used in place of external EEPROM. (R8C/27 Group, R8C/29 Group)
- On-chip power-on reset function and voltage detection function eliminate need for separate reset IC.
- On-chip switchable sink- or source-type large-current drive ports. (N and D versions)
- 32pin Packages (R8C/26, R8C/27 Group)
- 20pin Packages (R8C/28, R8C/29 Group)

R8C/26-29 Block Diagram



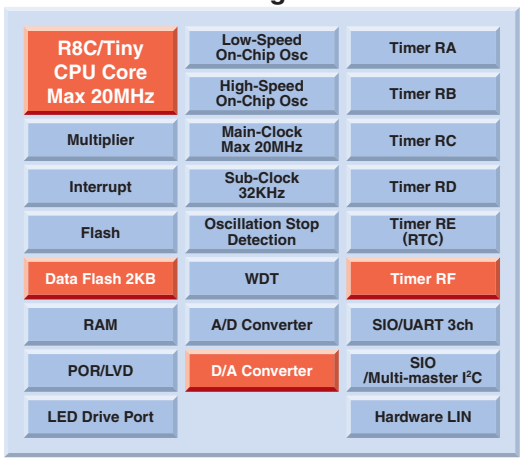
Product Lineup

R8C/Tiny Series

R8C/2A-2D Group Features

- Support for low-voltage operation
  VCC = **2.2 to 5.0V** (f(XIN) = 5MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
- High-precision, high-speed on-chip oscillator (40MHz)
- On-chip subclock oscillator circuit (32.768kHz)
- On-chip D/A converter
- Additional 16-bit timer channel (timer RF)
- Support for motor control by on-chip timer RD
- On-chip multimaster I^2C-bus
- On-chip clock-synchronous serial I/O with chip select
- Data flash area can be used in place of external EEPROM. (R8C/2B Group, R8C/2D Group)
- On-chip power-on reset function and voltage detection function eliminate need for separate reset IC.
- On-chip switchable sink- or source-type large-current drive ports.
- 64pin Packages (R8C/2A, R8C/2B Group)
- 80pin Packages (R8C/2C, R8C/2D Group)

R8C/2A-2D Block Diagram

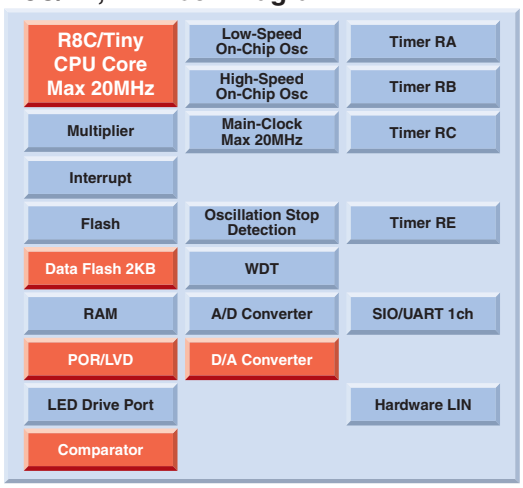


R8C/2E and R8C/2F Group Features

New Product

- Operating voltage
  VCC = 2.7 to 5 .5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
- High-precision, high-speed on-chip oscillator (40MHz)
- On-chip D/A converter
- On-chip comparator enabling comparison with external power supply
- Data flash area that can be used as substitute for external EEPROM (R8C/2F Group)
- No need for separate reset chip thanks to power-on reset function and voltage detection function
- On-chip switchable sink- or source-type large-current drive ports.
- Compatible with low-cost on-chip debugging emulator
- 32-pin package

R8C/2E, 2F Block Diagram

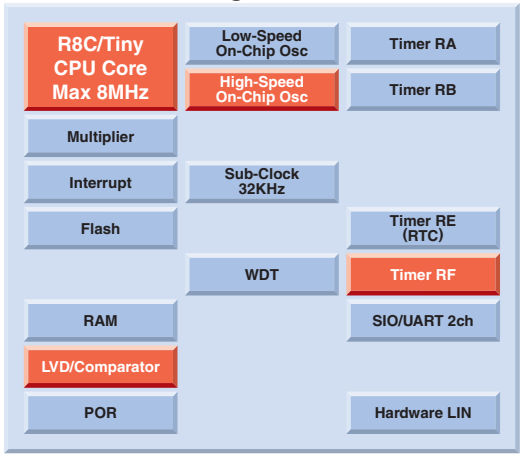


R8C/2G Group Features

New Product

- Low-voltage operation possible
  VCC = **2.2 to 5.5V** (f(XIN) = 4MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 8MHz)
- High-precision, high-speed on-chip oscillator (8MHz)
- On-chip subclock generator circuit (32.768kHz)
- 1-channel 16-bit timer (timer RF)
- On-chip voltage detection circuit (comparison with external power supply possible in comparator mode)
- Compatible with low-cost on-chip debugging emulator
- On-chip hardware LIN (using 1 timer channel)
- 32-pin package

R8C/2G Block Diagram



Product Lineup

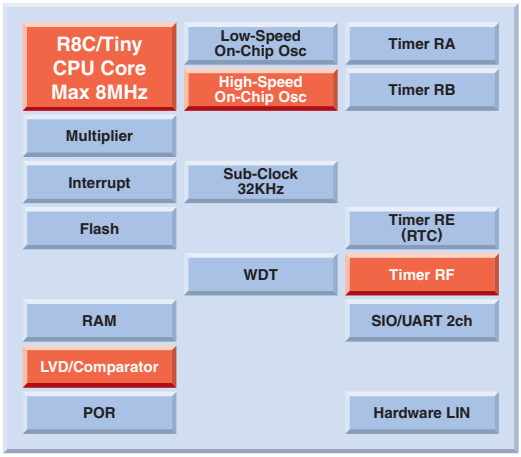
R8C/Tiny Series

R8C/2H Group Features

New Product

- Low-voltage operation possible
  VCC = **2.2 to 5.5V** (f(XIN) = 4MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 8MHz)
- High-precision, high-speed on-chip oscillator (8MHz)
- On-chip subclock generator circuit (32.768kHz)
- 1-channel 16-bit timer (timer RF)
- On-chip voltage detection circuit (comparison with external power supply possible in comparator mode)
- Compatible with low-cost on-chip debugging emulator
- On-chip hardware LIN (using 1 timer channel)
- 20-pin package

R8C/2H Block Diagram

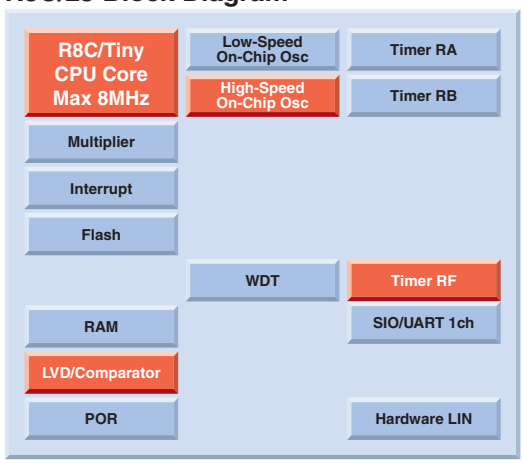


R8C/2J Group Features

New Product

- Low-voltage operation possible
  VCC = **2.2 to 5.5V** (f(XIN) = 4MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 8MHz)
- High-precision, high-speed on-chip oscillator (8MHz)
- 1-channel 16-bit timer (timer RF)
- On-chip voltage detection circuit (comparison with external power supply possible in comparator mode)
- Compatible with low-cost on-chip debugging emulator
- On-chip hardware LIN (using 1 timer channel)
- 20-pin package (only 16 pins enabled)

R8C/2J Block Diagram

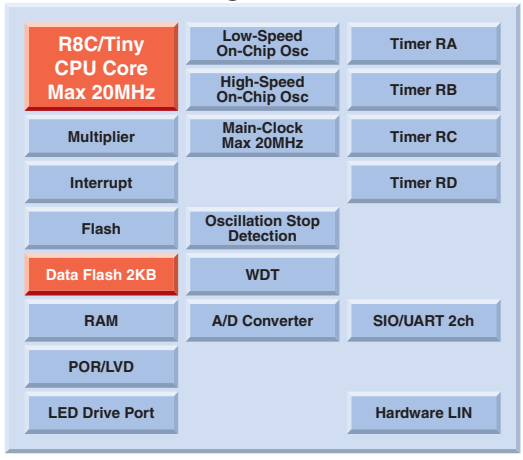


R8C/2K and R8C/2L Group Features

New Product

- Low-voltage operation possible
  VCC = **2.2 to 5.5V** (f(XIN) = 5MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
- High-precision, high-speed on-chip oscillator (40MHz)
- Motor control possible using on-chip timer RD
- Data flash area that can be used as substitute for external EEPROM (R8C/2L Group)
- No need for separate reset chip thanks to power-on reset function and voltage detection function
- On-chip switchable sink- or source-type large-current drive ports.
- Compatible with low-cost on-chip debugging emulator
- 32-pin package

R8C/2L Block Diagram



Product Lineup

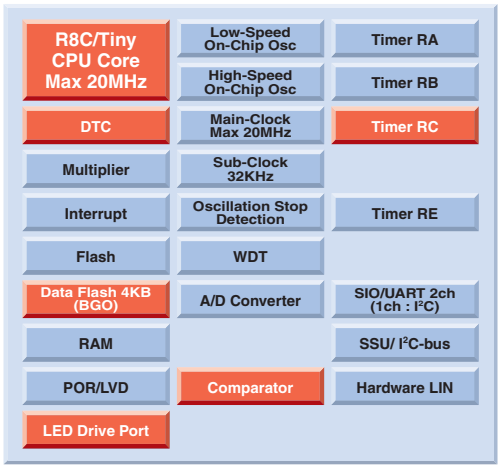
R8C/3xA Series

R8C/32A Group Features

Under Development

- 1.8V operation possible
  VCC = **1.8 to 5.5V** (f(XIN) = 2MHz)
  VCC = 2.2 to 5.5V (f(XIN) = 5MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
- High-precision(Target: 1%), high-speed on-chip oscillator (40MHz)
- Sub clock oscillator(32.768kHz)
- Data Transfer Controller(DTC) 1ch
- Synchronous serial communication unit
- I²C-bus(Shared with Synchronous Serial Communication unit)
- Data flash area that can be used as substitute for external EEPROM and added BGA(Back Ground Operation) function to Data flash area
- No need for separate reset chip thanks to power-on reset function and voltage detection function and possible to monitor the external supply voltage by comparator
- On-chip switchable sink- or source-type large-current drive ports.
- Compatible with low-cost on-chip debugging emulator E8a
- 20-pin SSOP package

R8C/32A Block Diagram

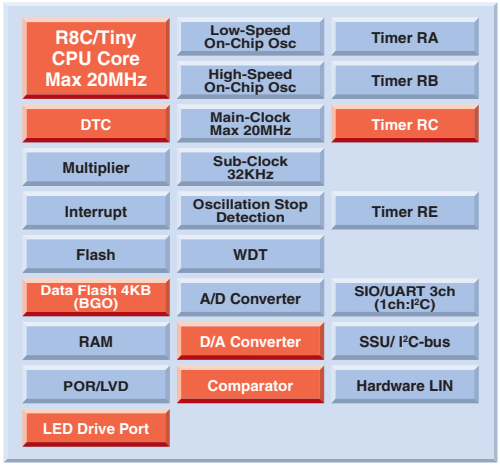


R8C/33A Group Features

Under Development

- 1.8V operation possible
  VCC = **1.8 to 5.5V** (f(XIN) = 2MHz)
  VCC = 2.2 to 5.5V (f(XIN) = 5MHz)
  VCC = 2.7 to 5.5V (f(XIN) = 10MHz)
  VCC = 3.0 to 5.5V (f(XIN) = 20MHz)
- High-precision(Target: 1%), high-speed on-chip oscillator (40MHz)
- Sub clock oscillator(32.768kHz)
- Data Transfer Controller(DTC) 1ch
- D/A converter
- Synchronous serial communication unit
- I²C-bus(Shared with Synchronous Serial Communication unit)
- Data flash area that can be used as substitute for external EEPROM and added BGA(Back Ground Operation) function to Data flash area
- No need for separate reset chip thanks to power-on reset function and voltage detection function and possible to monitor the external supply voltage by comparator
- On-chip switchable sink- or source-type large-current drive ports.
- Compatible with low-cost on-chip debugging emulator E8a
- 32-pin package

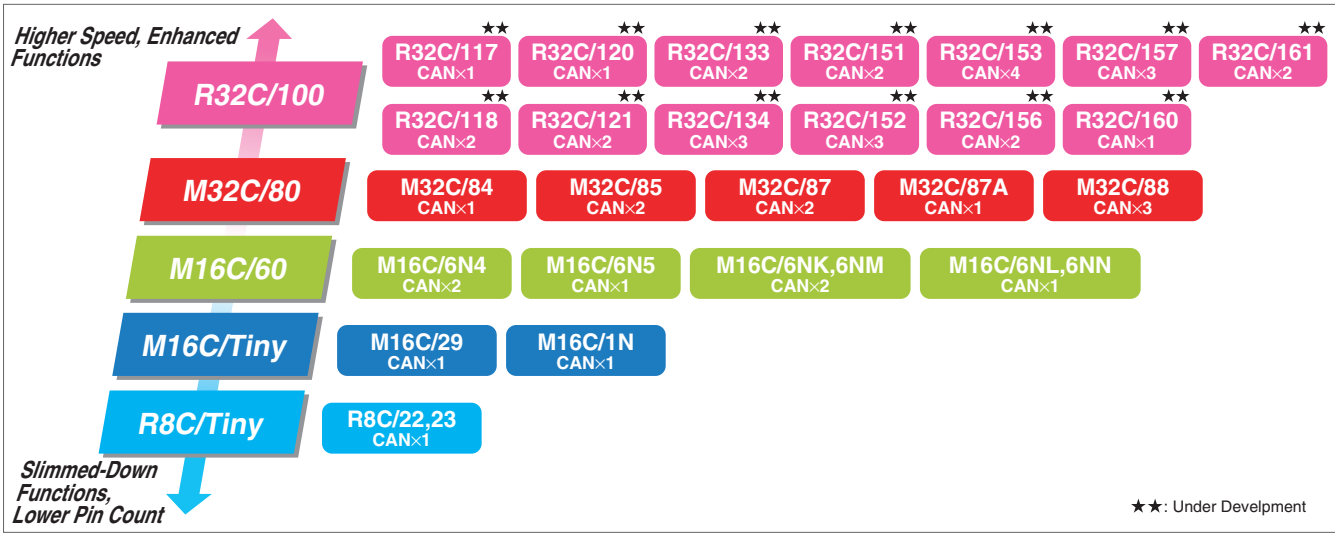
R8C/33A Block Diagram



Product Lineup

On-Chip CAN

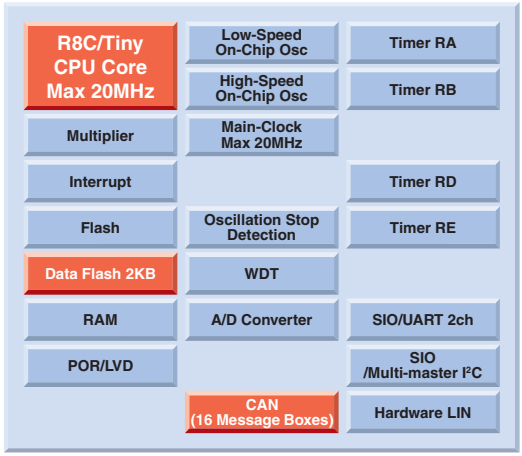
On-Chip CAN Lineup



R8C/22, 23 Group Features

- Power supply voltage: 3.0 to 5.5 V/Max. 20MHz, 2.7 to 5.5V/Max. 10MHz
- ROM/RAM capacity: 32KB/2KB, 48KB/2.5KB, 64KB/3KB, 96KB/5KB, 128KB/6KB
  - Data flash 1KB 2 blocks (R8C/23 only)
- Clock generator circuits: 3 on-chip circuits
  - XIN-XOUT main clock (on-chip oscillation stop detection circuit)
  - High-speed (40MHz)/low-speed on-chip oscillators
- Voltage detection circuits (LVD): 3 circuits
- Power-on reset (POR)
- Multifunction timers
  8-bit timer: 3 channels (timer RA, timer RB, timer RE)
  16-bit timer: 2 channels (timer RD)
- Serial I/O
  Clock-synchronous/UART: 1 channel, UART: 1 channel
  I^2C-bus/SIO: 1 channel
  H/W-LIN (uses UART and timer RA)
- CAN: 16 message boxes: 1 channel
- A/D converter: 10-bit 12 channels
- Ports
  - Pull-up resistor: Settable for all ports (excluding dedicated input ports)
- Watchdog timer: 1 channel (supports hardware resets)
- Package: 48-pin LQFP (7mm 7mm, 0.5mm pitch)

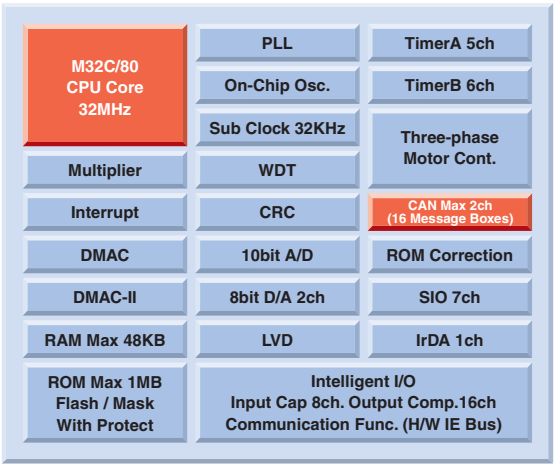
R8C/22, 23 Block Diagram



M32C/87 Group Features

- High-speed operation and large-capacity on-chip memory
  - M32C/80 core, 32MHz@5V operation
  - On-chip 1MB flash and 48KB RAM is tops in the M16C Family.
- Abundant on-chip peripheral functions
  - Abundant on-chip peripheral functions such as CAN, serial, and IrDA
    - M32C/87: CAN 2 channels
    - M32C/87A: CAN 1 channel
  - On-chip intelligent I/O
    Implementation of functions such as PWM output and SIO communication based on 16-bit timer.
- Support for easier to use functions
  - Supports 3V and 5V peripheral power function, allowing direct connection to 3V memory and 5V devices.
- Backward compatibility
  - Pin compatible and peripheral function compatible with products such as the M16C/62P, while retaining features including low noise, low power consumption, and high ROM efficiency.

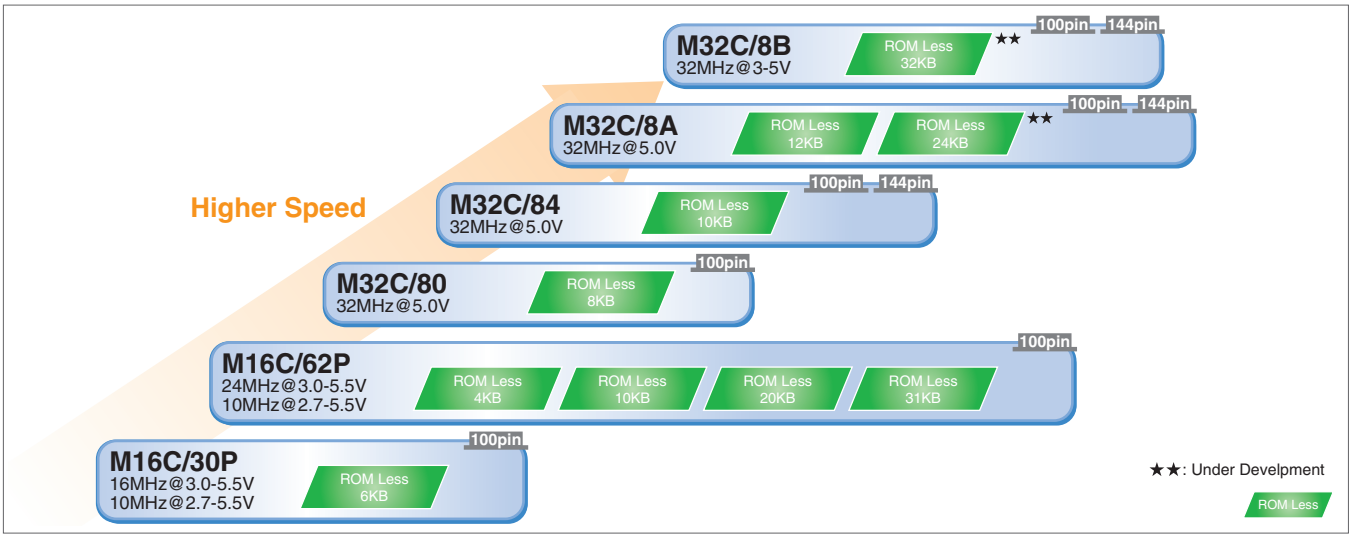
M32C/87 Block Diagram



Product Lineup

ROM Less Versions

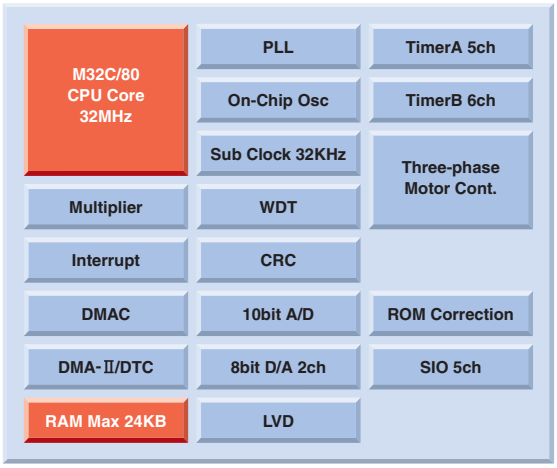
M16C/M32C ROM Less Versions



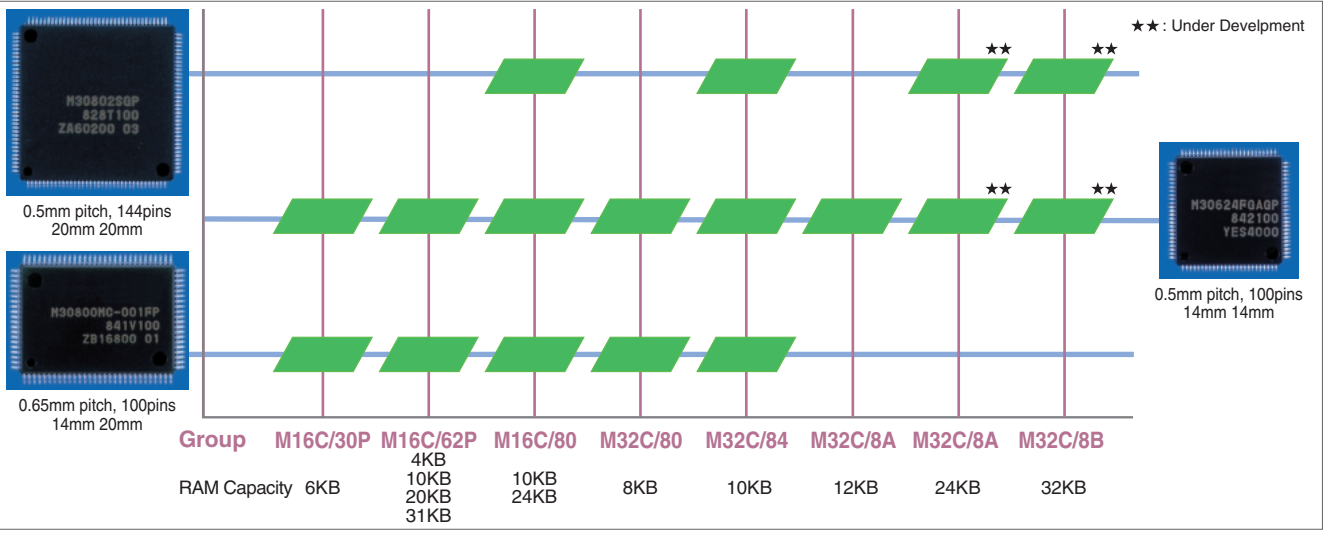
M16C/M32C ROM Less Product Features

- External ROM products ranging from M16C core to M32C core
- Support for function (separate bus) facilitating connection of external memory if large memory capacity is required and function (multiplex bus) to reduce the number of pins used
- Products are available with enhanced bus interfaces supporting a variety of timing requirements.
- Support for simultaneous connection of two voltages, 3.3V for memory interface and 5V for peripheral functions
- Retains the features of the M16C Family (low power consumption, EMI/EMS characteristics, peripheral functions).
- In addition to a full emulator, a compact emulator is under development.

M32C/8A Block Diagram



Product Lineup



Development Tools

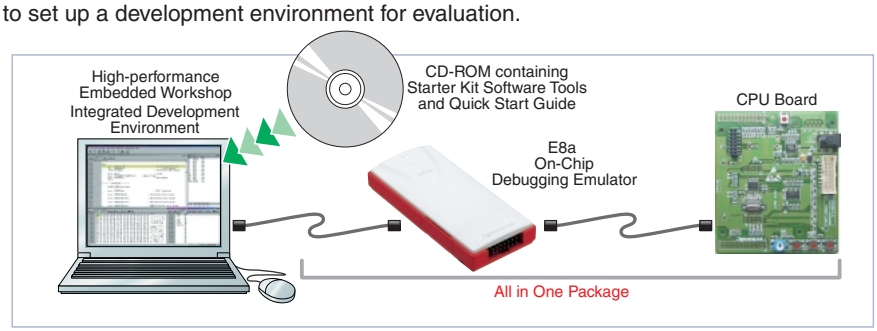
http://www.renesas.com/tools

Renesas provides customers with comprehensive product development support in partnership with leading third-party vendors.

Renesas Starter Kit for Initial Development

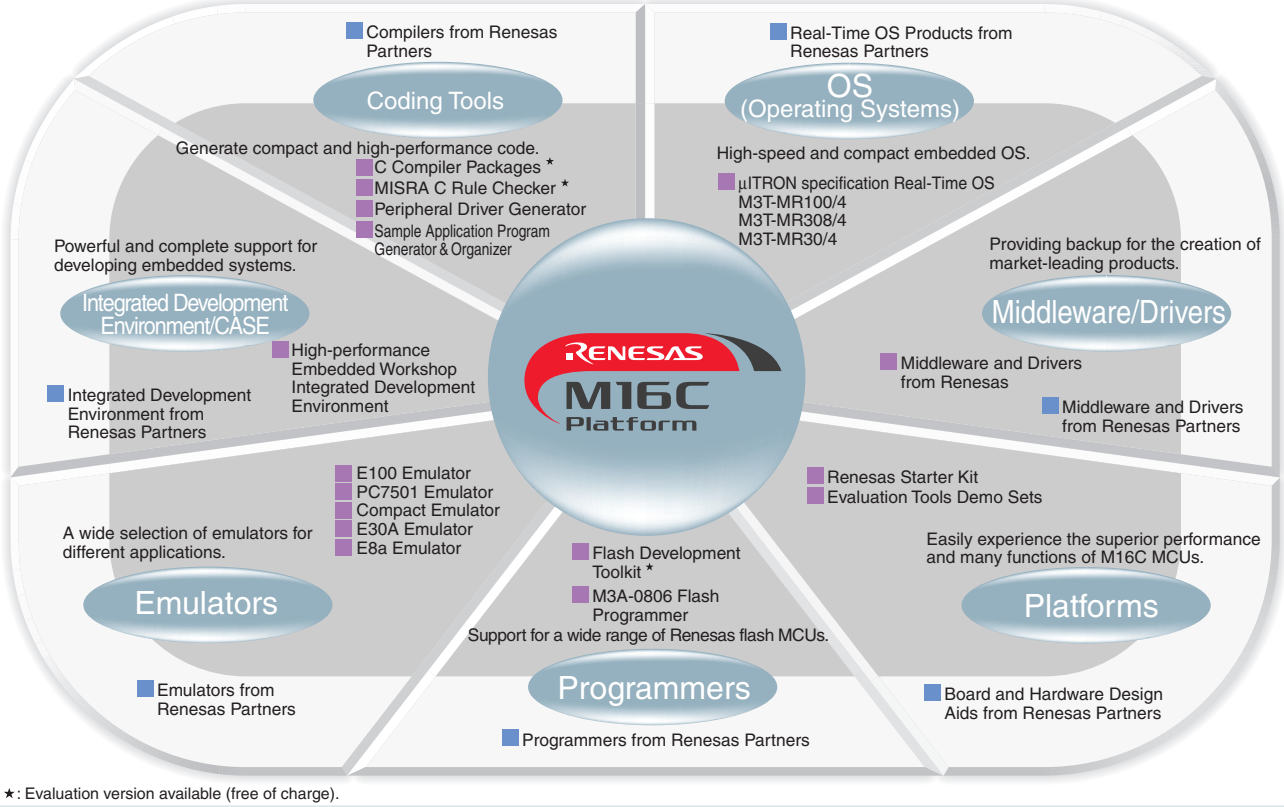
See page 55 for details.

These development tools make it easy to set up a development environment for evaluation.



Development Environment for Maximizing the Performance of Renesas MCUs

We supply customers with development environment optimized for product development.



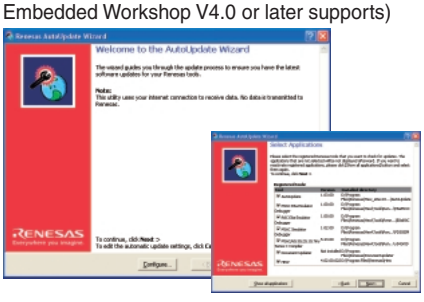
★: Evaluation version available (free of charge).

Internet-Based Update Utilities

Renesas helps you keep your development environment up to date with support via the Web.

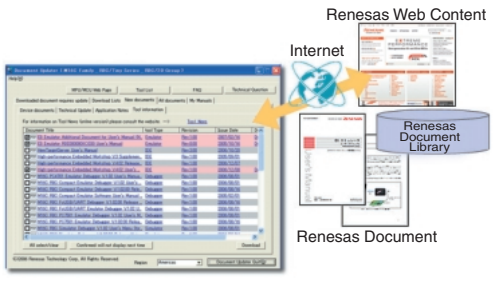
Auto-Update Utility

This utility notifies you when free upgrades are available for software you have installed on your PC. Simply follow the instructions displayed by the auto-update wizard to upgrade your software to the latest version. (bundled with the software products that High-performance Embedded Workshop V4.0 or later supports)



Document Updater

This utility finds documents related to the target MCU and displays them on a list. It provides an easy way to review, download and update essential documentation. You can download from our web site (free of charge): URL: http://www.renesas.com/du



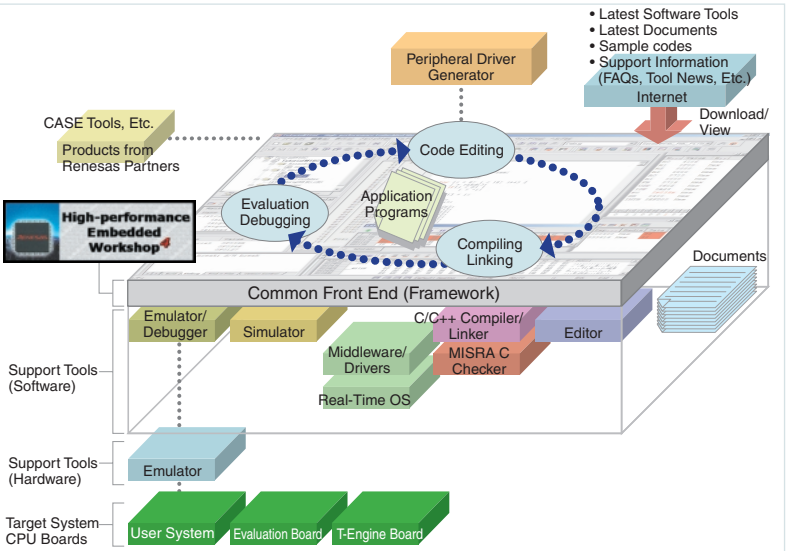
Integrated Development Environment Providing Powerful and Complete Support for Developing Embedded Systems

Renesas integrated development environment brings together the tools needed for developing applications, including a compiler and debugger (emulator software). All steps from coding to evaluation and verification can be performed using a single application.

High-performance Embedded Workshop Integrated Development Environment

- Integrated and centralized control over all tools, from the editor to the debugger
- Flexible support for multiple build*1 configurations (support for saving multiple optionally specified configurations, support for addition of external build tools, etc.)
- Per-project management of source files
- Easy-to-use GUI based on Microsoft Windows
- Generation of C startup code customized for individual MCUs
- Test support function for improving debugging efficiency
- Always up to date tools and documents
  - Auto-update utility (See page 47 for details.)
  - Document updater (See page 47 for details.)
- Flexible customization functions
  - Custom build phase
  - TargetServer (extended COM functions)
  - Extended Tcl/Tk functions and scripting
- Works with products from Renesas partner companies
  - CASE*2 tools to support upstream process design
  - I/F provided for version control tools

*1 Build: The sequence of operations involved in generating object code, including compiling, assembling and linking.
*2 CASE: Computer Aided Software Engineering



Integrated Conceptual Image of High-performance Embedded Workshop

C Compiler Packages

C Compiler

- Conforms to ANSI*1 language standard.
- Optimization features and many #pragma extended functions for extracting top performance from the MCU
- Support for use of near/far designations with variables
- Function for calculating the stack size to be used
- Support for embedding of SQMlint MISRA-C*2 rule checker
- Possible to download the latest manuals and sample codes by using document updater

*1. ANSI : American National Standards Institute
*2. MISRA : Motor Industry Software Reliability Association
"MISRA" is a registered trademark of MISRA Ltd, held on behalf of the MISRA Consortium.

Simulator debugger

- Support for target-less evaluation
- C language and assembly language source-level debugging
- Support for source file editing
- Trace function
- RAM monitor function
- Virtual port I/O and virtual interrupts functions
- GUI implementation of target I/O functions

Package lineup

Product name	Part No.
C-compiler package for R32C Series	R0C56400XSW01R
C-compiler package for M32C Series [M3T-NC308WA]	R0C30800CLW05R
C-compiler package for M16C Tiny/R8CTiny Series [M3T-NC30WA]	R0C30600CLW05R

Package product contents

- Compiler
- Simulator debugger
- High-performance Embedded Workshop Integrated Development Environment
- Auto-update utility

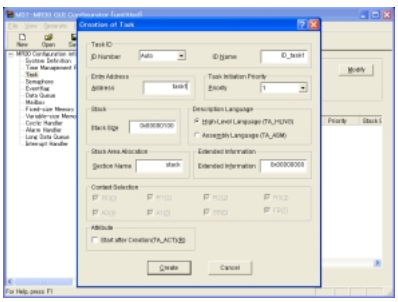
Note: MISRA-C rule checker SQMint is the compiler optional product and sold separately.

Real-Time OS

Provides easy control of large-scale and complex applications in real time. Reduces program development time and improves reusability and maintainability.

- Conforms to µITRON4.0 standard.
- Compact size suitable for ROM programming.
- Context selection function allows reduction of amount of RAM used.
- Excellent real-time functionality (interrupt response time, task switching time)
- Simple initial setup of application programs for use with real-time OS
- Configurator provided.
- Wide array of operating system debugging functions when integrated debugging in High-performance Embedded Workshop

Note: See the "Development Tools List" listing for the individual MCU for details on available real-time OS packages as well as information on the operating environment.



Example GUI Configuration Window

Coding Assistance Tool

Web http://www.renesas.com/coding_assistance

Renesas provides the coding assistance tool easy to use and to generate peripheral drivers and sample codes automatically

Peripheral Driver Generator

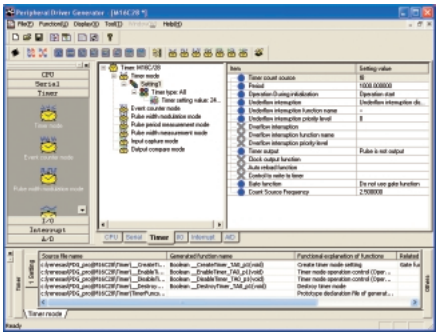
Back up of full-scale development

This utility automatically generates I/O drivers for MCU on-chip peripheral functions and setting routines (functions) based on settings entered via a simple GUI.

- Simple to use: Possible for developers to set registers via a simple GUI by eliminating developers having to do manual coding.
- Shorter development times: Making settings is easy since there is no need to do manual coding of peripheral I/O functions.
- Improved reliability: Avoid mistakes or omissions in peripheral I/O register settings.

Peripheral Driver Generator

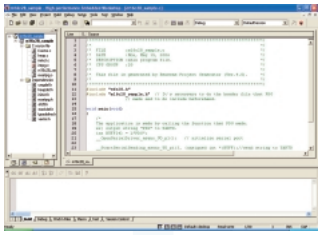
Peripheral Driver Generator
a support tool for creating the built-in peripheral I/O drivers of a microcomputer



Registrations

High-performance Embedded Workshop

High-performandeEmbeddeWorkshop Integrated Development Environment



Auto-generation

Various functions generated by Peripheral Driver Generator

Peripheral I/O library (included with Peripheral Driver Generator)

Compiling and linking

System Configurations

User applications

Peripheral I/O Drivers

Peripheral I/O modules(hardware)

Target MCUs

Series	Group
M16C/60	M16C/62P
M16C/Tiny	M16C/28, 28B, 29
R8C/Tiny	R8C/13, 22-29, 2A-2D

Supported peripheral I/O modules

- Serial, Timer, I/O, INT(external), A/D

Plan in the future

- Variations of supported peripheral I/O modules

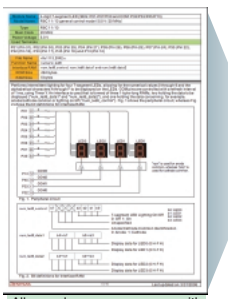
Available on the Web as a free download.
http://www.renesas.com/pdg

Sample Application Program Generator & Organizer

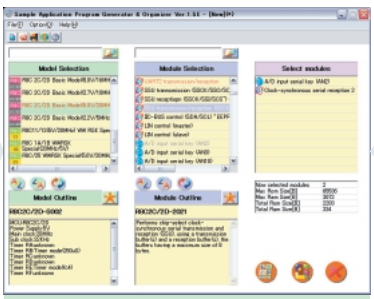
Perfect Introduction to MCUs

Sample Application Program Generator & Organizer is a utility program that is available free of charge.
It lets you generate sample program code by simply selecting the functions you wish to implement on the MCU.

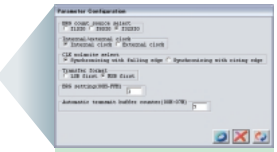
- **Simple Operation**
  Generate sample program code for the MCU of your choice without the need for complex environment settings.
- **Flexible Design**
  Program code for different applications, such as communication control or data flash control, can be combined freely.
- **High Efficiency**
  You can register your own program code and then combine it with other programs.
- **Instructional Materials**
  The package includes detailed reference materials in digital form, including MCU peripheral circuit diagrams and timing charts. Sango outputs C language source code containing detailed comments.
- **Target MCUs**
  R8C/Tiny Series
  R8C/11, R8C/13, R8C/1A, R8C/1B, R8C/24, R8C/25, R8C/26, R8C/27, R8C/2C, R8C/2D



All sample programs come with detailed documentation that can be viewed with a click of the mouse.



Simply select a function from the menu to generate usable sample program code.



You can even adjust the parameters of the sample programs from your PC.

Available on the Web as a free download.
http://www.renesas.com/sango

Emulator

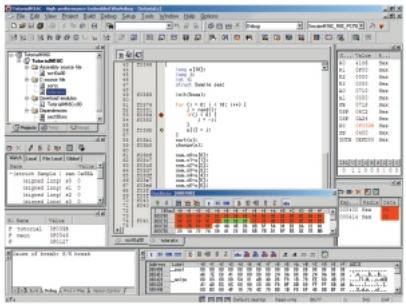
http://www.renesas.com/emulation_debugging

Wide variations of selectable emulators according to the customer's applications.

High-performance Embedded Workshop controls Emulators

* High-performance Embedded Workshop is included in Emulators.

- Easy and direct common GUI for all emulators
- Simple drag-and-drop operations
- Seamless development from coding to debugging
- On-line upgrades



Functions

High Performance
Low Price

New

E100 Emulator
Full-Spec Emulator

- In-circuit emulator with full bus trace capability to cover a wide range of new Renesas MCUs
- Compatibility with a variety of Renesas MCUs by plug-in personality modules*1
- Enhanced debugging functionality, including 4M cycle large-capacity trace and real-time profile functions

*1. SH Family, M32R Family, R32C Series, 740 Family and 720 Family (4-bit MCUs) not supported.

High Performance

PC7501 Emulator
Full-Spec Emulator

- Support for MCUs operating at over 20MHz
- Many debugging functions, including real-time trace and RTOS support

Full-Scale Development

Compact Emulators

Low Price

- In-circuit emulators combining solid functionality, low price, and compact size
- All-in-one packages including all software required for development
- Support for full-scale development with many functions such as real-time trace
- Frees up emulation resources, allowing full emulation.
- Support for main MCU products in the M16C Family

New

E30A Emulator
On-Chip Debugging Emulator

- Connection to emulator via new high speed single-pin New Single-wire Debugger interface.
- Full range debugging functions including realtime emulation.
- Since the actual MCU is used, evaluation can be performed under conditions, very close to those of the actual system such as electrical characteristics. It is also suitable for the functional evaluation of A/D converter, etc.

E8a Emulator
On-Chip Debugging Emulator

- Can also be used as a flash programming tool.
- Powered by USB bus; no external power supply required.
- Since the actual MCU is used, evaluation can be performed under conditions, very close to those of the actual system such as electrical characteristics. It is also suitable for the functional evaluation of A/D converter, etc.

Initial Evaluation/
Small-Scale Development

Starter Kit

- Product list:
  - CPU board
  - E8a Emulator
  - Compiler package evaluation version (free of change)

Monitor Debugger*2

- Can be embedded in user programs for on-board monitoring.
- Available on the Web as a free download.

*2 System in which a monitor program (control program for debugging) is written to the MCU and debugging is performed.

Evaluation/Medium- or Small-Scale Development — **Application** — Medium- or Large-Scale Development

Note: See "Development Tools List" for a list of products composing each emulator system.

E100 Emulator

New Product

http://www.renesas.com/e100

This in-circuit emulator has full bus trace capability and supports a wide range of new 8-bit to 32-bit Renesas MCUs.

The E100 emulator is designed to provide compatibility with the full range of Renesas MCU products scheduled for development over the next several years. Developers can accommodate new products appearing in future simply by changing the MCU unit and accessories. The E100 makes it possible to build a debugging environment supporting a variety of MCUs at minimum cost. It supports the development of a wide range of application products.

Target MCUs

Series	Group
M16C/60	M16C/64, M16C/65★★
R8C/Tiny	R8C/32A★★, R8C/33A★★, R8C/35A★★

★★ : Future support planned

See the following URL for details:
http://www.renesas.com/e100

Operating environment

- Windows® XP, Windows® 2000

Features

- Convenient and easy-to-use debugging environment
  - Visual display of settings for intuitive operation
- Useful debugging, evaluation, and analysis functions
  - High-capacity (4M) cycle trace capability
  - Newly added functions, including real-time profiling, C0/C1 coverage, stack access violation detection, and initialization omission detection
- Excellent extensibility to new MCU models and high cost-performance ratio
  - Compatibility with new MCU products by changing the MCU unit*1
  - Far cheaper and enhanced functionality compared with previous full-spec emulators from Renesas

*1. MCU unit sold separately. SH Family, M32R Family, R32C Series, 740 Family, and 720 Family (4-bit MCUs) not supported.

E100 Emulator
(with MCU Unit Attached)

Product contents

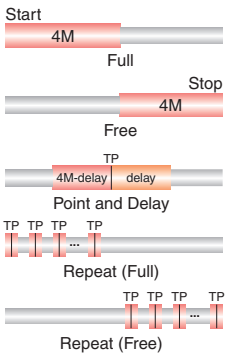
- Emulator main unit (E100)
- AC adapter (100V to 240V, 50/60Hz)
- Power cable
- USB interface cable
- MCU unit*1
  - Flexible cable for connection to system under development
  - Software CD-ROM (High-performance Embedded Workshop integrated development environment, emulator debugger)

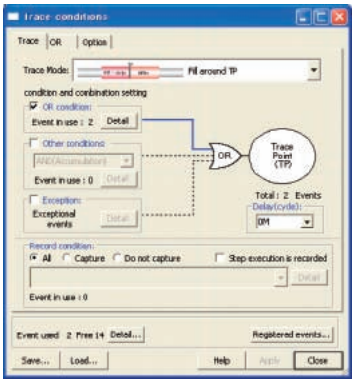
*1. MCU unit sold separately. Each supported MCU requires a separate MCU unit.

Refined and Easy-to-Use GUI

- Visual representation of functions makes it easier to grasp the settings overall and makes operation more intuitive.
- Settings can be made easily by dragging and dropping between windows.

Graphical Display of Modes



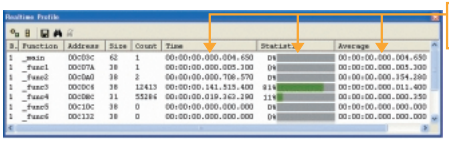


Trace Condition Settings Dialog

Real-Time Profiling

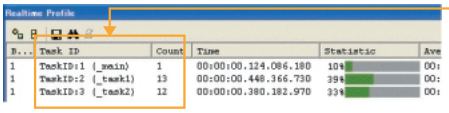
- Measures the execution time and the call frequency of up to 8,000 functions, making it easy to identify bottlenecks.
- Measurement does not require halting execution of the program under development.
- In addition to function profile mode, profile modes for individual tasks are supported.

Function Profile Mode



Ability to Sort Results by Column

Task Profile Mode



Task ID Indication

Function/TaskID	Function name, task name
Address	Start address of function or task
Size	Size of function or task
Count	Call count

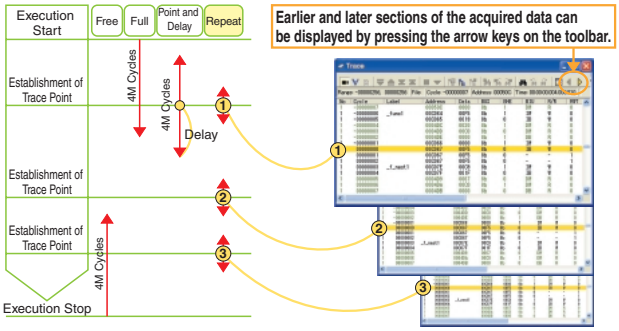
Time	Total execution time
Statistic	Utilization ratio
Average	Average execution time

High-Capacity (4M) Cycle Trace Capability for Enhanced Real-Time Trace Performance

- In addition to the trace modes offered on earlier emulators, the E100 has a repeat function to identify problems related to processes that are executed repeatedly.

Repeat Function Usage Example

By setting a trace point that corresponds with UART receive processing, it is possible repeatedly to record the 512 cycles preceding and following each receive operation. In this way, data corruption that occurs only occasionally can be identified.

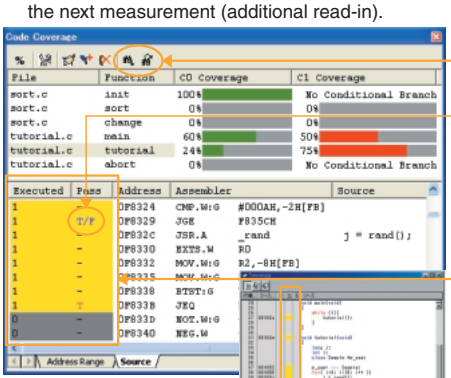


Earlier and later sections of the acquired data can be displayed by pressing the arrow keys on the toolbar.

Locations where problems have occurred can be located quickly by combining search functions.

C1 Coverage

- In addition to C0 coverage, which measures execution coverage, C1 coverage measures branch coverage, for more effective evaluation.
  Note: C1 coverage is not supported for the H8S/Tiny Series.
- Measurement results can be stored and then merged with the results of the next measurement (additional read-in).



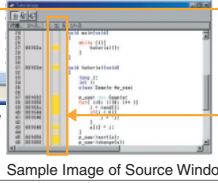
Sample Image of Code Coverage Window

The search function can also be used when a program is not running.

The C1 coverage function provides a T/F indication of which condition triggered the execution of a conditional branch instruction.
T : True
F : False
T/F : True/False

The C0 coverage function shows the lines of code that have already executed in yellow.

The measurement results can also be checked in the source window.



Sample Image of Source Window

PC7501 Emulator

http://www.renesas.com/pc7501

Full-Spec Emulator with Support for all of M16C Family MCUs

The PC7501 is a full-featured emulator that supports M16C Family MCUs.
Switchable emulation probes (sold separately) provide support for different MCU models in the M16C Family.

■ Target MCUs
- M32C/80 Series, M16C/60 Series, M16C/30 Series, M16C/Tiny Series, R8C/Tiny Series
  E100 Emulator (See page 51) supports new M16C family MCUs (except for R32C/100 Series) that wil be developed in the future.
  MCUs that are supported by PC7501 are shown below.
  http://www.renesas.com/pc7501

■ Operating environment
- Windows® XP, Windows® 2000

■ Features
- Full-bus-trace emulator for M16C Family MCUs
- Flexible support for different MCU products by changing the firmware
- Support for USB, LPT parallel, and LAN communication interfaces
- The MCU is positioned on the probe block directly above the user system for enhanced signal integrity.
- AC adapter complying with safety standards supplied.
- Support for power supply voltages of 100 to 240V, 50/60Hz

PC7501 Emulator Unit

■ Product contents
- Emulator unit
- Software CD-ROM
  (High-performance Embedded Workshop integrated development environment, etc.)
- Power, parallel, and USB cables
- Emulation probe connector cable
- User's manual

Compact Emulators

http://www.renesas.com/cpe

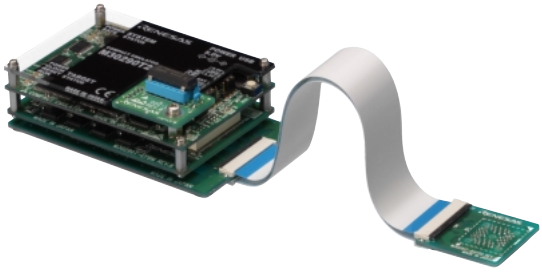
In-Circuit Emulators Combining Solid Functionality, Low Price, and Compact Size

Though small in size, these compact emulators provide the solid debugging functions of full-spec units such as real-time trace.
The product package includes software tools such as an integrated development environment, Emulator Debuggers, Compiler packages evaluation version (free of charge). Customers can begin development work on application programs right away after purchasing it.

■ Target MCUs
- M32C/80 Series, M16C/80 Series, M16C/60 Series, M16C/30 Series, M16C/Tiny Series, R8C/Tiny Series

■ Operating environment
- Windows® XP, Windows® 2000

■ Features
- All-in-one packages including all software required for development
- Compact design and Low price
- An emulation memory function and microprocessor mode can be added by connecting an optional emulation memory board.
- Solid debugging functions
  - Hardware break function
  - Real-time trace function
  - Real-time RAM monitor function
- USB interface support



■ Product contents
- Emulator unit
- Software CD-ROM (High-performance Embedded Workshop integrated development environment, compiler package evaluation version [free of charge])
- USB and power cables (separate 5V/2A power supply required for compact emulator)
- User's manual

E30A Emulator

New Product

http://www.renesas.com/e30a

Emulator with NSD interface allowing connection via a single pin

The E30A emulator features a NSD (New Single-wire Debugger) interface and supports the R32C/100 Series. It makes it simple to perform software verification functions such as on-chip debugging and data tuning in the actual operating environment.

■ Target MCUs
- R32C/100 Series

■ Operating environment
- Windows® XP, Windows® 2000

■ Features
- Connection to emulator via newly developed single-pin NSD interface. (A coaxial cable is the only additional item required to perform debugging.)
- OCD (On-Chip Debugger) functionality
  - It is not necessary to probe the foot pattern of the target MCU.
  - There is no MCU signal deterioration.
  - No need for custom evaluation chips or custom packages. (Debugging can be performed with the target MCU in place.)
- Full range debugging functions
  - Supports realtime emulation at the MCU's maximum operating frequency.
  - Break and trace functionality are implemented in the MCU's on-chip circuitry.
  - Unit incorporates large-capacity trace memory.
  - Supports interval time measurement from the data access starting point.

■ Product contents
- Emulator unit
- Oscillator circuit board
- AC Adaptor, AC power cable
- USB cable
- Coaxial cable, Optional cable
- Coaxial conversion board, Optional board
- Software CD-ROM (High-performance Embedded Workshop integrated development environment)

E8a Emulator

http://www.renesas.com/e8a

Low-priced on-chip debugging emulator that can also be used to program flash memory on 8-bit to 32-bit Renesas MCUs.

- A single unit provides support for on-chip debugging and flash programming.
- Evaluation can be performed under conditions, very close to those of the actual system such as electrical characteristics.
- The emulator uses USB bus power from the PC and does not require a separate power supply to operate.
- A 3.5V or 5.0V power supply may be provided to the target system via the emulator.
- The following software is bundled with the product, so you can start application development immediately after purchasing it.
  - High-performance Embedded Workshop integrated development environment
  - Compiler package evaluation version (free of charge)
  - Flash Development Toolkit evaluation version (free of charge)
- The bundled software can also be downloaded free of charge from the E8a emulator Web site.

Compact design: 92mm×42mm×15mm

Main Specifications:

Target MCUs in the M16C Family	Series	Group
	R32C/100	R32C/111★★, R32C/116★★, R32C/117★★, R32C/118★★
	M32C/80	M32C/84, M32C/85, M32C/87, M32C/88, M32C/8B★★
	M16C/60	M16C/62P, M16C/6N4, M16C/6N5, M16C/6NK, M16C/6NL, M16C/6NM, M16C/6NN, M16C/6S, M16C/64, M16C/63★★, M16C/65★★
	M16C/30	M16C/30P
	M16C/Tiny	M16C/26A, M16C/28, M16C/29
	R8C/Tiny	R8C/10~19, R8C/1A, R8C/1B, R8C/20~29, R8C/2A~2H, R8C/2J~2L, R8C/32A★★, R8C/33A★★, R8C/35A★★
Max. operating frequency	Max. operating frequency of target MCU	
Target MCU modes	Single-chip mode, memory expansion mode (supported MCU modes differ depending on the MCU product)	
Supported power supply voltage	2.7V to 5.5V (within guaranteed flash programming operation range of target MCU)	
Power supply to MCU	Supplied by emulator (3.3V or 5.0V, max. 300mA) or from Vcc on user board.	
Software breaks	255 points	
Hardware breaks	Number of break points differs depending on the MCU product.*1	
Special breaks	Forced break pushing the STOP button of debugger.	
Trace	Availability of this function and number of events recorded differ depending on the MCU product.*1	
Operating environment	Windows® XP, Windows® 2000	
User interface	14-pin connector [Product Type 2514-6002: 3M (Minnesota Mining and Manufacturing Company)]	
Connection to developer's system	Connects using supplied user interface cable. (Connection signals differ depending on the target MCU product.)*1	
Use of developer's resources	On some MCU models, the emulator may require access to some port peripheral functions and ROM or RAM.*1	

*1 Be sure to read the E8a user's manual corresponding to the target MCU before using the E8a emulator. See the E8a emulator Web site for details of target MCUs: http://www.renesas.com/e8a.

★★: To be supported soon.

■ E8 emulator (discontinued product)

Although the E8a has replaced to the E8, support for new MCU models will continue to be added to the E8 through July 2008. (This will consist mainly of adding support for versions of existing products with new ROM/RAM configurations.) However, there are no plans to provide support for MCU products (740 Family, M16C/65 ★★Group, R8C/32A ★★, 33A ★★, 35A ★★, etc.) that would require major changes to the emulator software.

Flash Development Toolkit

Web http://www.renesas.com/fdt

An On-Board Programming Tool from Renesas. (Flash Development Toolkit)

Supports on-board programming of Renesas flash MCUs using a graphical user interface (GUI) for ease of use.

Features

- GUI designed specifically for flash programming
- Comprehensive message log
- Identification code auto programming function
- Functions for preventing operation errors
- Evaluation version (free of charge) available for download on Web

Main specifications

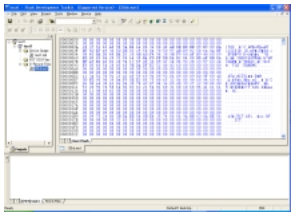
Target MCUs	Supports a wide variety of MCUs ranging from 8-bit to 32-bit models. (See Web site for details.)
Operating environment	Windows® XP, Windows® 2000
Distribution media	CD-ROM
Supported languages	Japanese/English
Main functions	• File download • Block erase • Upload • Blank check • File checksum • Edit file • Join files • Manage project • Select protection level for flash programming • Select output messages (standard/advanced) • Identification code auto programming function

Flexible GUI

Three programming operation window styles are available to match

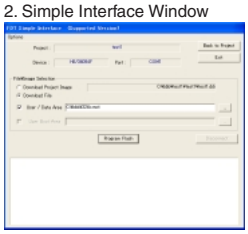
Using the Toolkit by Creating a Project

1. Main Window



Switchable

2. Simple Interface Window

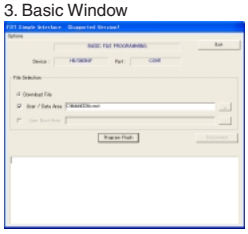


The project management function enables efficient data management for systems incorporating multiple MCUs or for different development phases. It is very convenient when using the toolkit for development work.

The simple interface window is called up from the main window. It allows the user to program flash memory for multiple projects easily using the project management function.

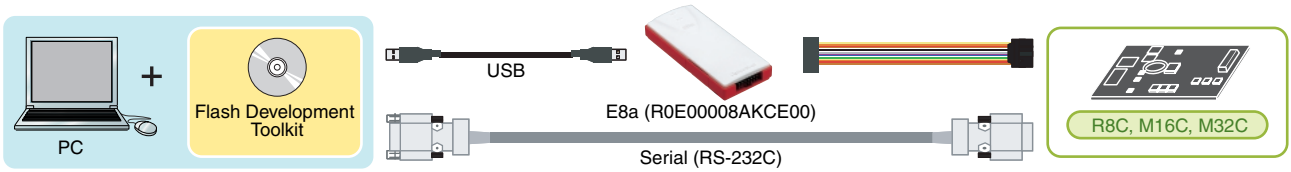
Using the Toolkit without Creating a Project

3. Basic Window



This window style can be used to program flash memory without first creating a project.
The number of files that can be programmed at one time is limited to one.
Note: Available since Flash Development Toolkit with version 3.

Programming Tool Configuration Diagram



Note: Support for programming of M16C Family and 740 Family MCUs via a serial connection (RS-232C) is being added to the Flash Development Toolkit incrementally.
See the Web site for details of supported MCUs: http://www.renesas.com/fdt.

Flash programmers from Renesas and partner vendors

There are two types of programmers that support Renesas flash MCUs. On-board programmers support programming of the MCU when mounted in the system, and PROM programmers are used to program the MCU without a target board. We work together with our partner vendors to ensure availability of a wide range of programmer products to meet a variety of requirements.
Please contact each partner makers for the latest informations of the partner's tools.

On-board programmer

Renesas Technology Corp.

- Adapter board
  - E8a (R0E00008AKCE00)
- Programming software
  - R0C00000FDW04R*1

Yokogawa Digital Computer Corporation

- MegaNETIMPRESS
- C"arNETIMPRESS

Sunny Giken Inc.

- S550-SFWv3
- S550-SFW1U

Suisei Electronics System Co., Ltd.

- EFP-RC

Hokuto Denshi Co., Ltd.

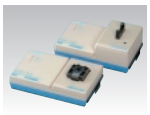
- FLASH2
- FLASHMATE5V1
- FM-ONE

PROM programmer

Sunny Giken Inc.

- S550-MFW1U

Suisei Electronics System Co., Ltd.

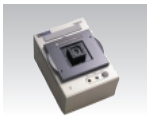


- EFP-S2/S2V

Data I/O Corporation

- UNISITE
- Optima
- Dual
- FlashPAKII

System General Corp.



- T9600

BPM Microsystems

- BP-2610
- BP-2710
- BP-2710M

*1. Part No. of Flash Development Toolkit V4.00.

Initial Implementation Tools

Low-priced and Support for Basic Functions

Renesas Starter Kit

This is a user-friendly evaluation tool for Renesas MCUs. The included E8a emulator and High-performance Embedded Workshop integrated development environment provide support for coding and debugging.
In addition, it is possible to perform on-board programming of MCUs using Flash Development Toolkit.

Lineup

Target MCUs		Product name	Part No.
Group	Series		
M32C/80	M32C/84, 85, 87, 88	Renesas Starter Kit for M32C/87	R0K330879S001BE
M16C/60	M16C/62P, 30P	Renesas Starter Kit for M16C/62P	R0K33062PS001BE
	M16C/6NK	Renesas Starter Kit for M16C/6NK	R0K3306NKS001BE
M16C/Tiny	M16C/28, 29	Renesas Starter Kit for M16C/29	R0K330290S001BE
	M16C/26A	Renesas Starter Kit for M16C/26A	R0K33026AS001BE
R8C/Tiny	R8C/1A,1B	Renesas Starter Kit for R8C/1B	R0K5211B4S001BE
	R8C/20-23	Renesas Starter Kit for R8C/23	R0K521237S001BE
	R8C/24, 25	Renesas Starter Kit for R8C/25	R0K521256S001BE
	R8C/26, 27	Renesas Starter Kit for R8C/27	R0K521276S001BE
	R8C/2C, 2D	Renesas Starter Kit for R8C/2D	R0K5212D8S001BE

Note: See the following URL for details on the latest lineup
http://www.renesas.com/renesas_starter_kits

Product contents

- CPU board
- E8a on-chip debugging emulator unit
- Software CD-ROM
  - High-performance Embedded Workshop integrated development environment
  - Compiler package evaluation version (free of charge)
  - E8a emulator debugger
  - Flash Development Toolkit evaluation version (free of charge)
- Connecting cable, etc.

Overview of Renesas Starter Kit Park Web Site

▶ http://www.renesas.com/rsk_park

The Renesas Starter Kit Park Web site presents a variety of information on Renesas starter kits equipped with Renesas MCUs. Here you will find product information, downloadable program code (application programs, libraries, and utilities) that can be run on Renesas starter kits, and details on items such as expansion boards.

In future even more items that will assist persons wishing to study or evaluate MCUs using Renesas starter kits will appear on the Web site. Please check back frequently.

M3A-0806

The M3A-0806 is a flash writer that uses standard serial I/O mode 2 (UART mode). It rewrites programs using only four lines (TxD, RxD, GND, and Vcc). If the supplied cable is used, there is no need for an RS-232C driver for the target board.
Note that the M3A-0806 does not support rewriting of the data area.

- Package includes flash reprogramming software and a custom serial cable.
- Very economically priced flash writer

Target MCUs

R8C/10 to 19, R8C/1A, R8C/1B, R8C/20 to R8C/29, R8C/2A to R8C/2D, M16C/26A, M16C/28, M16C/29, M16C/62A, M16C/62M, M16C/62P, M16C/6N, M16C/6S, M16C/80, M16C/30P, M32C/83, M32C/84, M32C/85, M32C/87

Operating environment

Windows® XP, Windows® 2000

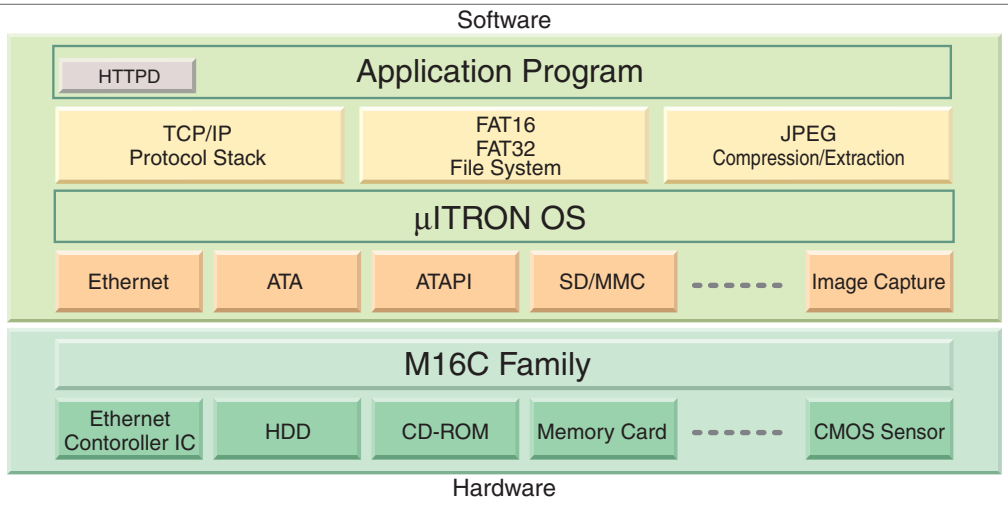
Note: The flash rewriting (Flashstarter) software used by the M3A-0806 is distributed free of charge.
The EXE file and source code are available for download from the Renesas Web site.
http://www.renesas.com/download

Note: The target board is not included.

Middleware

http://www.renesas.com/mw

M16C Middleware



Note: Operating system only required when using TCP/IP.
We provide RENESAS original Operating System for MR Series.

TCP/IP Protocol Stack

Two versions of the standard Internet protocol stack, slim and ultra-compact, are available for the M16C family. Both designed to use a minimum of ROM and RAM. Flexible support for a variety of applications.

Features

- Slim version (target MCUs: M16C/62 Group*1)
  - Essential functions and a compact design (uses approx. 33 Kbytes of ROM).
  - Enables protocol processing using the MCU's on-chip memory.
- Ultra-compact version (target MCUs: M16C/Tiny and R8C/Tiny Series)
  The ultra-compact version required no OS (uses approx. 8 Kbytes of ROM) and can be stored in the on-chip memory of the Tiny Series.

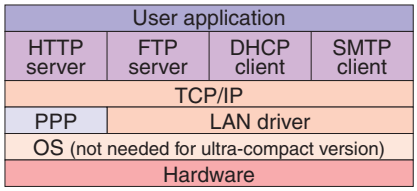
Note: See the lineup of Software Libraries to Support Tiny MCUs on the next page for details.

*1. Compatible with M16C/62A, M16C/62M, M16C/62N, and M16C/62P

Applications

Internet cameras, remote monitoring/control systems, Internet-capable home appliances, etc.

Implementation model



FAT File System

The FAT file system library provides data compatibility with PCs for various types of memory cards and enables storage of large-volume resources on hard disks to support the increasing popularity of broadband connections.

Features

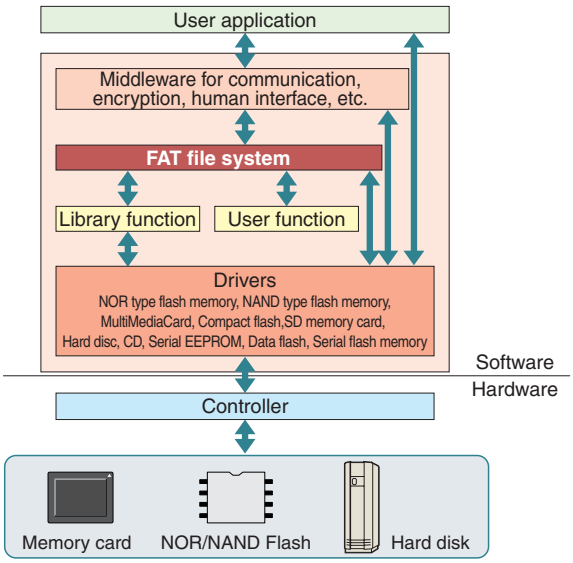
- Support for FAT12, FAT16, VFAT, and FAT32
- Support for multiple drives
- Support for long filenames and Japanese filenames
- Light version available with support for short filenames only (for M32C and M16C)
- Minimal memory usage, fast operation
- Includes sample source code for RAM disk driver

Applications

Digital cameras, digital camcorders, hard disk drive video recorders, hard disk drive audio recorders, other PC-compatible data storage devices

Total support from Renesas

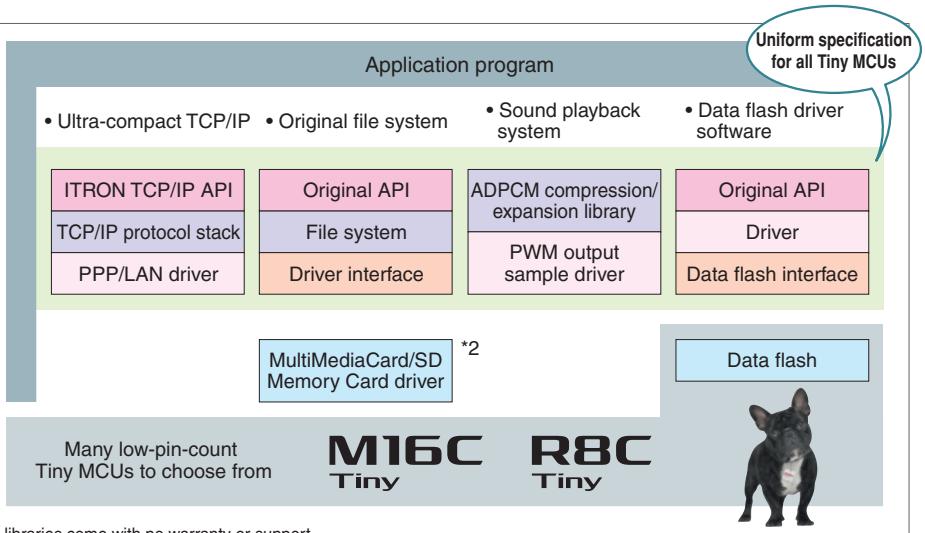
Renesas provides developers with total support in the form of drivers for MCU and memory as well as middleware to enable efficient implementation of functions.



Software Libraries to Support Tiny MCUs

Web http://www.renesas.com/tiny_swlib

Renesas supplies software libraries for evaluation purposes to customers using Tiny Series MCUs. Designed to be compact enough for embedding on a single chip, these programs are compatible with all Tiny MCUs. The software libraries for Tiny MCUs enable developers to create applied solutions for embedded devices essential in today's ubiquitously networked society, for example devices supporting remote operation via a network.
The programs composing the software libraries implement simple functions and are easy to use, making them ideal for use in training and evaluation. They can be embedded in systems that are mass produced,*1 thereby helping bring down the final market cost of the product. Feel free to try them out and see what they can do for you.



*1. Since they are intended for evaluation, these software libraries come with no warranty or support.
*2. MultiMediaCard and SD Memory Card drivers are sold separately. Development of systems using MultiMediaCard (MMC) or SD Memory Card technology requires purchase of a license. For information on licensing, contact the MultiMediaCard Association or SD Card Association.

Ultra-Compact TCP/IP Protocol Stack

This communication protocol software library achieves very compact size by keeping the number of functions to a bare minimum.
- Small memory requirements: Approx. 8 Kbytes of ROM and 0.5 Kbytes of RAM (in case of R8C/Tiny) (Enables TCP/IP protocol handling using the on-chip memory of a Tiny MCU.)
- No OS necessary.
- Conforms to ITRON TCP/IP API standard.
- Includes sample driver for LAN controller (RTL8019AS).
- Includes sample driver for PPP.

■ Applications
- Remote device control/monitoring using mobile phone packet communication terminal (vehicle position data management, remote equipment malfunction diagnostics, etc.)
- Security services (communication of information on visitors/intruders to mobile phones, etc.)
- Centralized equipment management in office buildings and factories (management of climate control systems, lighting, sensors, etc.)

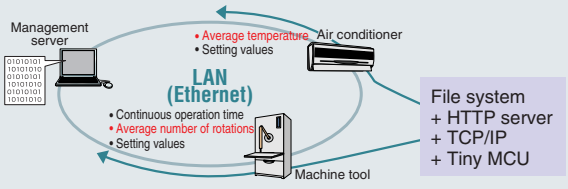
■ Advanced version
An ultra-compact TCP/IP protocol stack with support for multiple communication terminals and higher data transfer speeds is also available.

Original File System

The original file system supports storage of measurement data or history data and the reprogramming of internal memory with data stored on memory cards.
- Small memory requirements: Approx. 9.8 Kbytes of ROM and 256 bytes of RAM (in case of R8C/Tiny)
- No OS necessary. • File system uses original format.
- FAT file system conversion function provides compatibility with PC data.

■ Applications
- Data storage and data logging on devices of various kinds
- Storage of personal user data on healthcare products, etc.
- Updating of programs and data on memory cards or devices that utilize data

[Application example combining network middleware and file system]
Centralized equipment management in an office building or factory using a Web browser

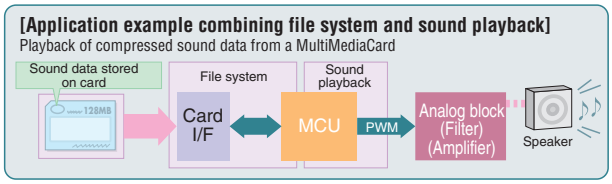


■ Advanced version (under development)
A version of the original file system with extended functionality, such as support for directory and user-defined filenames, is currently under development.

Sound Playback System

This software enables sound output on any system incorporating a Tiny MCU. It can be used to add true sound output functionality to devices that previously only provided visual indications or beeps.
- Sound compression and expansion using exclusive ADPCM format.
- Small memory requirements: Approx. 0.4 Kbytes of ROM and 20 bytes of RAM (in case of R8C/Tiny)
- High-speed expansion processing optimized for each MCU
  Enables expansion and playback by R8C/Tiny operating at 4 MHz of audio sampled at 8 kHz.
- Includes sound compression/expansion utility (PC application) for compressing recorded sound data (in WAV format) on a PC.
  (The compressed data can then be used by the MCU.)
- Includes sample driver for PWM output.

[Application example combining file system and sound playback]
Playback of compressed sound data from a MultiMediaCard



Data Flash Driver Software

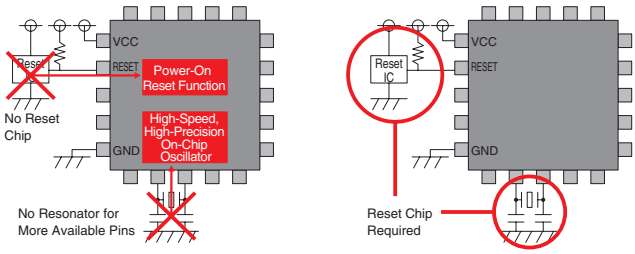
This block device driver enables the storing of data in data flash on R8C/Tiny and M16C/Tiny MCUs. It simplifies the task of building a data management system using data flash.
- Small memory requirements: Approx. 3 Kbytes of ROM and 100 bytes of RAM (R8C/Tiny, three data, including stack)
- Capable of handling different data sizes.
- Max. data update count: 1,000,000 times or more (depending on number and size of data units and the update count)
- Old data can be restored if system shutdown occurs during data update.
- Drive function interrupt/restart supported. This prevents the driver from monopolizing the CPU for an excessive length of time.

Demo Sets

M16C/65 Demo Set

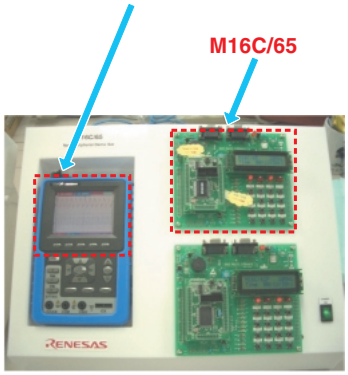
Description of New Functions — High-Speed, High-Precision On-Chip Oscillator and Power-On Reset

1. The high-speed on-chip oscillator (40MHz oscillation frequency, divided by 2) functions as the CPU clock. (The clock signal waveform is output to an oscilloscope, demonstrating that it is equivalent to an external resonator.)
2. The power-on reset function eliminates the need for an external reset chip (thereby reducing costs).



M16C/65 M16C/62P

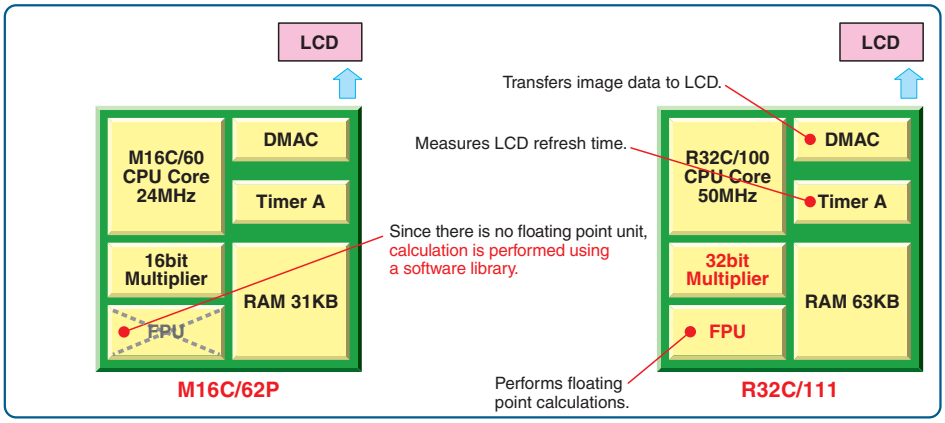
Display of Clock Output on Oscilloscope
(Actual Operating Frequency: Approx. 20.08MHz)



Demo Set Photo

R32C/111 Demo Set

A demonstration of high-speed arithmetic processing employing a 32-bit multiplier and single-precision FPU.
(In comparison with M16C/62P, 80 times the processing performance can be realized.)



■Operations Processed

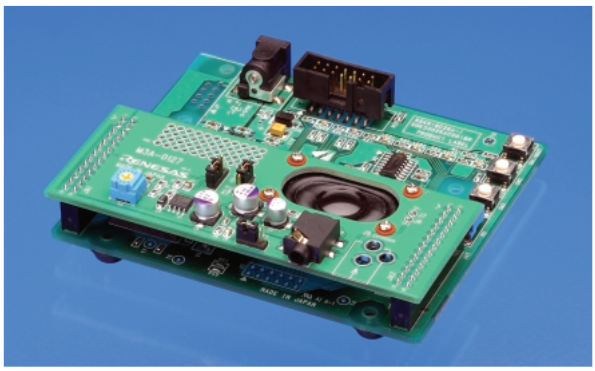
```
float x = 0.0, y = 0.0, x1, y1;
  for(int n=0; n < 2000; n++){
    x1=x*x - y*y -a;
    y1=2*x*y - b;
    if( x1*x1 + y1*y1 > 4 ) return;
    if( n > 500 ) g.pset( a, x1);
    x=x1; y=y1;
  }
```

Demo Set Photo

Audio Decompression/ Audio Output Demo Set(R8C/25)

■Features

- Decompresses compressed audio data stored in the MCU's on-chip flash memory and produces PWM output for audio playback. The data compression format is ADPCM.
- The demo kit consists of an audio board (board with an amplifier, LPF, and compact speaker mounted on it) connected to the Renesas Starterkit for R8C/25.



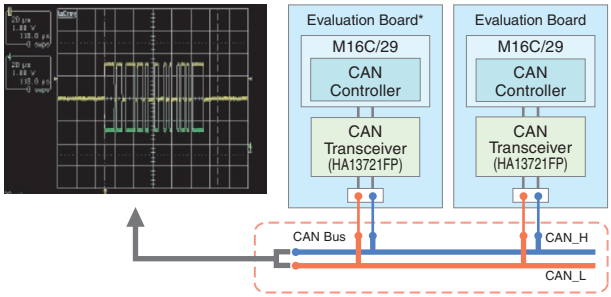
Industrial CAN Communication Demo Set (M16C/29)

■Features

- Direct measurement of CAN communication waveforms on the CAN bus using M16C/29 starter kit

CAN Controller Features

- Communication speed: Max. 1Mbps
- Bus length: 40m/1Mbps
- Protocol standard: Ver. 2.0B
- Hardware synchronization/resynchronization



* Incorporates OAKS16-29CAN from Oaks-Ele, Inc.

Functions/Applications

Applications

●: Ideal ○: Suitable

Series	Group	AV/Home Use				PC Related				Automotive (Applicable Products Available)					Mobile	Networking	Industrial/Security	Notes
		Audio	Video	Appliances	Amusement	PC	Storage	Imaging	Display	Engine	Driving Safety	Body/Chassis	Navigation/ Information	Car Audio				
R32C/100	R32C/160, 161**									○	●	●	○	○		○	○	
	R32C/156, 157**									○	●	●	○	○		○	○	
	R32C/151, 152, 153**									○	●	●	○	○		○	○	
	R32C/133, 134**									○	●	●	○	○		○	○	
	R32C/120, 121**									○	●	●	○	○		○	○	
	R32C/116, 117, 118**	●	○	●	○	○	○	○	○						○	●	●	
	R32C/111**	●	○	●	○	○	○	○	○						○	●	●	
M32C/80	M32C/8B**	●	○	●	○	○	○	○	○						○	●	●	
	M32C/8A	●	○	●	○	○	○	○	○						○	●	●	
	M32C/88	●	○	●	○	○	○	○	○	○	●	●	○	●	○	●	●	
	M32C/87	●	○	●	○	○	○	○	○	○	●	●	○	●	○	●	●	Large-capacity flash applications
	M32C/85	●	○	●	○	○	○	○	○	○	●	●	○	●	○	●	●	
	M32C/84	●	○	●	○	○	○	○	○	○	●	●	○	●	○	●	●	
	M32C/83	●	○	●	○	○	○	○	○	○	●	●	○	●	○	●	●	
	M32C/82	●	○	●	○	○	○	○	○						○	○	●	
	M32C/81	●	○	●	○	○	○	○	○	○	●	●	○	●	○	●	●	
	M32C/80	●	○	○	●	○	○	○	○				○	○	○	○	●	
M16C/80	M16C/80	○	○	○	●	○	○	○	○	○	●	●	○	○	○	○	●	
M16C/60	M16C/6S	○		○												●	○	
	M16C/6N			○							●	●	○	●		●	●	
	M16C/6V		●															
	M16C/6H		●															
	M16C/63**	●	○	○	○	○	○	○	○						○	○	●	
	M16C/64**	●	○	○	○	○	○	○	○						○	○	●	
	M16C/65**	●	○	○	○	○	○	○	○						○	○	●	
	M16C/62P	●	○	○	○	○	○	○	○		●	●	○	●	○	○	●	
	M16C/62A	●	○	○	○	○	○	○	○				○	●	○	○	●	
	M16C/62N	●	○	○	○	○	○	○	○				○	●	○	○	●	
M16C/30	M16C/30P	●	○	○	○									●	○	○	○	
	M16C/39P	●		○	○													
M16C/20	M16C/2N										●	●				●		
	M16C/24				○	●	●	○		○							○	
M16C/Tiny	M16C/29	●		○						○	●	●	○	○		●	●	
	M16C/28		○	●	○	○				○	●	●		○			●	
	M16C/26A		○	●	○	○					●	●		○			●	
M16C/10	M16C/1N				●	○		○			●	●				●	●	

★★: Under Development

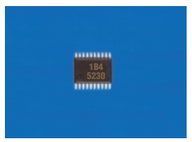
Applications

●: Ideal ○: Suitable

Series	Group	AV/Home Use				PC Related				Automotive (Applicable Products Available)					Mobile	Networking	Industrial/Security	Notes
		Audio	Video	Appliances	Amusement	PC	Storage	Imaging	Display	Engine	Driving Safety	Body/Chassis	Navigation/ Information	Car Audio				
R8C/Tiny	R8C/18	○	○	●	●	○		○							○	○	●	
	R8C/19	○	○	●	●	○		○							○	○	●	
	R8C/1A	○	○	●	●	○		○							○	○	●	
	R8C/1B	○	○	●	●	○		○							○	○	●	
	R8C/20										○	●		○		○	●	
	R8C/21										○	●		○		○	●	
	R8C/22										○	●		○		●	●	
	R8C/23										○	●		○		●	●	
	R8C/24	○	○	●	●	○		○							●	○	●	
	R8C/25	○	○	●	●	○		○							●	○	●	
	R8C/26	○	○	●	●	○		○			○	●		○	●	○	●	
	R8C/27	○	○	●	●	○		○			○	●		○	●	○	●	
	R8C/28	○	○	●	●	○		○			○	●		○	●	○	●	
	R8C/29	○	○	●	●	○		○			○	●		○	●	○	●	
	R8C/2A	○	○	●	●	○		○							●	○	●	
	R8C/2B	○	○	●	●	○		○							●	○	●	
	R8C/2C	○	○	●	●	○		○							●	○	●	
	R8C/2D	○	○	●	●	○		○							●	○	●	
	R8C/2E	○	○	●	●	○		○							●	○	●	
	R8C/2F	○	○	●	●	○		○							●	○	●	
	R8C/2G	○	○	●	●	○		○							●	○	●	
	R8C/2H	○	○	●	●	○		○							●	○	●	
	R8C/2J	○	○	●	●	○		○							●	○	●	
	R8C/2K	○	○	●	●	○		○							●	○	●	
	R8C/2L	○	○	●	●	○		○							●	○	●	
	R8C/32A**	○	○	●	●	○		○							●	○	●	
	R8C/33A**	○	○	●	●	○		○							●	○	●	
	R8C/35A**	○	○	●	●	○		○							●	○	●	

★★: Under Development

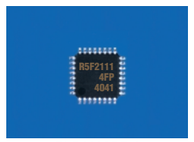
Package Photos



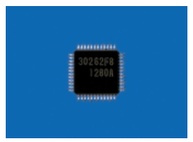
PLSP0020JB-A
(Previous code: 20P2F-A)
(0.65mm pitch/4.4mm×6.5mm)

PRDP0020BA-A
(Previous code: 20P4B)
(20mil/6.3mm×19.0mm)

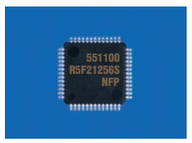
PWQN0028KA-B
(Previous code: 28PJW-B)
(5mm×5mm)



PLQ0032GB-A
(Previous code: 32P6U-A)
(0.8mm pitch/7mm×7mm)



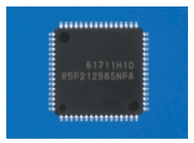
PLQP0048KB-A
(Previous code: 48P6Q-A)
(0.5mm pitch/7mm×7mm)



PLQP0052JA-A
(Previous code: 52P6A-A)
(0.5mm pitch/10mm×10mm)

PTLG0064JA-A
(Previous code: 64F0G)
(6mm×6mm)

PLQP0064KB-A
(Previous code: 64P6Q-A)
(0.5mm pitch/10mm×10mm)

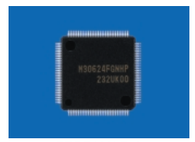


PLQP0064GA-A
(Previous code: 64P6U-A)
(0.8mm pitch/14mm×14mm)

PLQP0080KB-A
(Previous code: 80P6Q-A)
(0.5mm pitch/12mm×12mm)

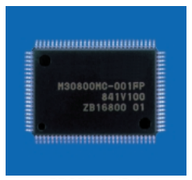
PRQP0080JA-A
(Previous code: 80P6S-A)
(0.65mm pitch/14mm×14mm)

PTLG0085JB-A
(Previous code: 85FOG)
(7mm×7mm)



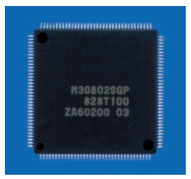
PTQP100LB-A
(Previous code: 100PFB)
(0.4mm pitch/12mm × 12mm/1mm Thickness)

PLQP0100KB-A
(Previous code: 100P6Q-A)
(0.5mm pitch/14mm×14mm)



PRQP0100JB-A
(Previous code: 100P6S-A)
(0.65mm pitch/14mm×20mm)

PLQP0128KB-A
(Previous code: 128P6Q-A)
(0.5mm pitch/14mm×20mm)



PLQP0144KA-A
(Previous code: 144P6Q-A)
(0.5mm pitch/20mm×20mm)

Functions/Applications

Standard Functions

	Series			R32C/100							M32C/80										M16C/80	M16C/60											M16C/30		M16C/20	M16C/Tiny			M16C/10
	Group			R32C/160, 161 ★★	R32C/156, 157 ★★	R32C/150, 152, 153 ★★	R32C/133, 134 ★★	R32C/120, 121 ★★	R32C/116, 117, 118 ★★	R32C/111 ★★	M32C/8B ★★	M32C/8A	M32C/88	M32C/87	M32C/85	M32C/84	M32C/83	M32C/82	M32C/81	M32C/80	M16C/80	M16C/6S	M16C/6N	M16C/6V	M16C/6H	M16C/63 ★★	M16C/64 ★★	M16C/65 ★★	M16C/62P	M16C/62A	M16C/62N	M16C/30P	M16C/39P	M16C/24	M16C/29	M16C/28, 28B	M16C/26A, 26B	M16C/1N
CPU, memory bus functions	CPU	Multiplier		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Multiply-accumulate instruction		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Barrel shifter		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
		FPU		●	●	●	●	●	●	●																														
	DMA	DMAC		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
		DTC/DMAII		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
	On-chip memory	RAM		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Flash memory		●	●	●	●	●	●	●	●		●	●	●	●					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Mask ROM												●	●	●		●	●		●		●	●				●	●	●	●	●					●	●
		One-time PROM																						●									●						
		QzROM																																					
		ROM Less									●	●				●				●	●							●			●	●							
		Data flash		●	●	●	●	●	●	●	●		●	●	●	●						●	●	●		●	●	●	●		●	●		●	●	●	●	●	●
		Program security		●	●	●	●	●	●	●	●		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	External bus extensions	Address/data separate buses		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●								
		Address/data multiplex bus		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●								
		DRAM controller															●	●	●	●																			
Clock power supply functions	Clocks	PLL		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●	●	●					●	●	●		
		Subclock/RTC		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		On-chip oscillator		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●	●	●					●	●	●	●		
		Oscillation stop detection		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●			●	●	●	●					●	●	●	●		
		Frequency divider circuit		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Low-power-consumption mechanism		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●	●	●	●	●	●		●	●	●	●	●	●
	Voltage detection	Low-voltage detection/LVD		●	●	●	●	●	●	●	●	●	●	●	●	●					●					●	●	●	●					●	●	●			
		Power-on reset																								●		●												
	Operating voltage	5V		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
		3V		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●		
Peripheral functions	A/D converters	8-bit		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		10-bit		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	●	●	●	●	●	●	●	●
		S & H		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	D/A converter	8-bit		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●	●	●	●	●								●
	Timers	Input capture		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●															●	●				
		Output compare		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●															●	●				
		bit	16-bit	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Functions	PWM output	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●		
			Real-time ports	●	●	●	●	●	●	●	●	●	●	●				●	●																				
			Event counter	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
			2-phase encoder input	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	●		●	●	●	●	●	●
			3-phase inverter output	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●			●	●	●			
	Real-time clock																									●		●												
	Watchdog			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Serial I/F	Clock non-synchronous serial		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Clock synchronous serial		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Advanced communication	I^2C bus		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		IEBus							●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	●	●	●	●	●	●			
		Smart card/SIM									●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	●	●							
		Synchronous serial communication unit/Special Serial I/O		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●									
		CAN		●	●	●	●	●	●				●	●	●	●	●		●			●													●				●
		LIN		●	●	●	●	●					●	●	●	●	●		●		●	●				●	●	●	●	●					●	●	●	●	●
		Flex Ray					●																																
		HDLC											●	●	●	●	●	●	●																				
		USB Function																																●					
		IrDA												●																										
	Display	OSD																					●	●															
		Data slicer																						●															
		Fluorescent display tube controller																													●								
	Operation functions	CRC		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		X/Y conversion		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●																			
	I/O ports	Large-current drive ports																																					●
		N-channel open-drain ports		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
		On-chip pull-up resistors		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	On-chip debugging functions	On-chip debugging		●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●
		On-board flash rewriting		●	●	●	●	●	●	●	●		●	●	●	●	●				●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●

★★: Under Development
* Multimaster I^2C

Standard Functions

Series				R8C/Tiny																												
Group				R8C/18	R8C/19	R8C/1A	R8C/1B	R8C/20	R8C/21	R8C/22	R8C/23	R8C/24	R8C/25	R8C/26	R8C/27	R8C/28	R8C/29	R8C/2A	R8C/2B	R8C/2C	R8C/2D	R8C/2E	R8C/2F	R8C/2G	R8C/2H	R8C/2J	R8C/2K	R8C/2L	R8C/32A**	R8C/33A**	R8C/35A**
CPU, memory bus functions	CPU	Multiplier		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Multiply-accumulate instruction		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Barrel shifter																														
	DMA	DMAC																														
		DTC/DMAII																											●	●	●	●
	On-chip memory	RAM		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Flash memory		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Mask ROM																														
		One-time PROM																														
		QzROM																														
		ROM Less																														
		Data flash			●		●		●		●		●		●		●		●		●		●					●				
		Data flash(with BGO)																											●	●	●	●
		Program security		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	External bus extensions	Address/data separate buses																														
		Address/data multiplex bus																														
		DRAM controller																														
Clock power supply functions	Clocks	PLL																														
		Subclock/RTC										●	●	Note	●	Note	●	Note	●	●	●	●	●			●	●			●	●	●	●
		On-chip oscillator		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Oscillation stop detection		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●
		Frequency divider circuit		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Low-power-consumption mechanism		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Voltage detection	Low-voltage detection/LVD		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Power-on reset		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Operating voltage	5V		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		3V		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Peripheral functions	A/D converters	8-bit				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●
		10-bit				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●
		S & H				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●
	Comparator			●	●																	●	●	●	●	●			●	●	●	●
	D/A converter	8-bit																●	●	●	●	●	●						●	●	●	●
	Timers	Input capture		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Output compare		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		bit	16-bit	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Functions	PWM output	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
			Real-time ports																													
			Event counter	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
			2-phase encoder input																													
			3-phase inverter output					●	●	●	●	●	●					●	●	●	●						●	●				●
	Real-time clock											●	●	●	●	●	●	●	●	●	●			●	●				●	●	●	●
	Watchdog			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Serial I/F	Clock non-synchronous serial		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Clock synchronous serial		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Advanced communication	I^2C bus				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●								●	●	●
		IEBus																														
		Smart card/SIM																														
		Synchronous serial communication unit				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●								●	●	●
		CAN								●	●																					
		LIN						●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		HDLC																														
		USB Function																														
		IrDA																														
	Display	OSD																														
		Data slicer																														
		Fluorescent display tube controller																														
	Operation functions	CRC																														
		X/Y conversion																														
	I/O ports	Large-current drive ports		●	●	●	●					●	●	Note	●	Note	●	Note	●	●	●	●	●			●	●			●	●	●	●
		N-channel open-drain ports																														
		On-chip pull-up resistors		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	On-chip debugging functions	On-chip debugging		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		On-board flash rewriting		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

★★: Under Development
Note: This function not implemented on J.K version.

Flash Memory Versions

Memory Options (ROM/RAM)

ROM size (bytes) \ RAM size (bytes)	256	384	512	768	1K	1.5K	2K	2.5K	3K	4K	5K	6K	7K	8K
2K	R8C/2J													
4K	R8C/2H	R8C/18 R8C/1A R8C/2J												
4K+2K		R8C/19 R8C/1B												
4K+4K			R8C/32A** R8C/33A**											
8K		R8C/2H	R8C/18 R8C/1A R8C/26 R8C/28 R8C/2E		R8C/2K									
8K+2K			R8C/19 R8C/1B R8C/27 R8C/29 R8C/2F		R8C/2L									
8K+4K					R8C/32A** R8C/33A**									
12K				R8C/18 R8C/1A										
12K+2K				R8C/19 R8C/1B										
16K			R8C/2G		R8C/18 R8C/1A R8C/24 R8C/26 R8C/28 R8C/2E	R8C/2K								
16K+2K					R8C/19 R8C/1B R8C/25 R8C/27 R8C/29 R8C/2F	R8C/2L								
16K+4K						R8C/32A** R8C/33A** R8C/35A**								
24K					R8C/2G	R8C/26	R8C/24							
24K+2K						R8C/27	R8C/25							
24K+4K					M16C/26A		R8C/33A** R8C/35A**							
32K					R8C/2G	R8C/26	R8C/20 R8C/22 R8C/24							
32K+2K						R8C/27	R8C/21 R8C/23 R8C/25							
32K+4K								R8C/33A** R8C/35A**						
48K								R8C/20 R8C/22 R8C/24 R8C/2A R8C/2C						
48K+2K								R8C/21 R8C/23 R8C/25 R8C/2B R8C/2D						
48K+4K							M16C/26A			M16C/28				
64K									R8C/20 R8C/22 R8C/24 R8C/2A R8C/2C					M16C/62N
64K+2K									R8C/21 R8C/23 R8C/25 R8C/2B R8C/2D					
64K+4K							M16C/26A		M16C/1N	M16C/28 M16C/62P				
96K											R8C/20 R8C/22 M16C/30P		R8C/2A R8C/2C	
96K+2K											R8C/21 R8C/23		R8C/2B R8C/2D	
96K+4K											M16C/30P			M16C/28 M16C/29

★★: Under Development

Memory Options (ROM/RAM)

ROM size (bytes)

	RAM size (bytes)																		
	2K	2.5K	3K	4K	5K	6K	7K	7.5K	8K	10K	12K	16K	18K	20K	24K	31K	32K	40K	48K	63K
128K					M16C/30P	R8C/20 R8C/22		R8C/2A R8C/2C		M16C/62A M16C/62N M16C/80										
128K+2K						R8C/21 R8C/23		R8C/2B R8C/2D												
128K+4K					M16C/6N M16C/30P					M16C/62P	M16C/28 M16C/29									
128K+8K											R32C/120** R32C/121** R32C/160** R32C/161**									
128K+12K											R32C/120** R32C/121** R32C/160** R32C/161**									
160K					M16C/30P						M16C/30P									
192K						M16C/30P					M16C/30P									
192K+4K						M16C/30P														
256K											M16C/30P			M16C/62A M16C/62N M16C/80						
256K+4K										M16C/6N				M16C/62P						
256K+8K														R32C/120** R32C/121** R32C/133** R32C/134** R32C/156** R32C/157** R32C/160** R32C/161**			M32C/88** R32C/118**	R32C/111**		R32C/111**
256K+12K														R32C/120** R32C/121** R32C/133** R32C/134** R32C/156** R32C/157** R32C/160** R32C/161**						
256K+24K												M16C/64*		M16C/65** M16C/63**						
320K+4K													M32C/88		M32C/84 M32C/85					
384K+4K													M32C/88		M32C/84 M32C/85 M32C/87	M16C/62P M16C/6N				
384K+8K															R32C/121** R32C/133** R32C/134** R32C/156** R32C/157**			R32C/111** R32C/116** R32C/117**		R32C/111**
384K+12K															R32C/121** R32C/133** R32C/134** R32C/156** R32C/157**					
512K																M32C/83				
512K+4K													M32C/88		M32C/84 M32C/85	M16C/62P M16C/6N M32C/87				
512K+8K																	R32C/121** R32C/133** R32C/134** R32C/156** R32C/157**	R32C/111** R32C/116** R32C/117**		R32C/111**
512K+12K																	R32C/121** R32C/133** R32C/134** R32C/156** R32C/157**			
512K+24K																M16C/64**				
640K+8K																			R32C/116** R32C/117** R32C/118**	
768K+4K																			M32C/87	
768K+8K																			R32C/151** R32C/152** R32C/153**	R32C/116** R32C/117** R32C/118**
768K+16K																			R32C/151** R32C/152** R32C/153**	
1MB+4K																			M32C/87	
1MB+8K																			R32C/151** R32C/152** R32C/153**	R32C/116** R32C/117** R32C/118**
1MB+16K																			R32C/151** R32C/152** R32C/153**	

★: New Product ★★: Under Development

Flash Memory Versions

Memory Options (Pin count)

ROM size (bytes)

	Pin count										
	20	32	42	48	52	64	80	85	100	128	144
2K	R8C/2J										
4K	R8C/18 R8C/1A R8C/2H R8C/2J										
4K+2K	R8C/19 R8C/1B										
4K+4K	R8C/32A**	R8C/33A**									
8K	R8C/18 R8C/1A R8C/28 R8C/2H	R8C/26 R8C/2E R8C/2K									
8K+2K	R8C/19 R8C/1B R8C/29	R8C/27 R8C/2F R8C/2L									
8K+4K	R8C/32A**	R8C/33A**									
12K	R8C/18 R8C/1A										
12K+2K	R8C/19 R8C/1B										
16K	R8C/18 R8C/1A R8C/28	R8C/26 R8C/2E R8C/2G R8C/2K			R8C/24						
16K+2K	R8C/19 R8C/1B R8C/29	R8C/27 R8C/2F R8C/2L			R8C/25						
16K+4K	R8C/32A**	R8C/33A**			R8C/35A**						
24K		R8C/26 R8C/2G			R8C/24						
24K+2K		R8C/27			R8C/25						
24K+4K		R8C/33A**	M16C/26A	M16C/26A	R8C/35A**						
32K		R8C/26 R8C/2G		R8C/20 R8C/22	R8C/24						
32K+2K		R8C/27		R8C/21 R8C/23	R8C/25						
32K+4K		R8C/33A**			R8C/35A**						
48K				R8C/20 R8C/22	R8C/24	R8C/2A	R8C/2C				
48K+2K				R8C/21 R8C/23	R8C/25	R8C/2B	R8C/2D				
48K+4K			M16C/26A	M16C/26A		M16C/28	M16C/28	M16C/28			
64K				R8C/20 R8C/22	R8C/24	R8C/2A	R8C/2C				
64K+2K				R8C/21 R8C/23	R8C/25	R8C/2B	R8C/2D				
64K+4K			M16C/26A	M16C/26A M16C/1N		M16C/28	M16C/28 M16C/62P	M16C/28			
96K				R8C/20 R8C/22		R8C/2A	R8C/2C		M16C/30P		
96K+2K				R8C/21 R8C/23		R8C/2B	R8C/2D				
96K+4K						M16C/28 M16C/29	M16C/28 M16C/29	M16C/28	M16C/30P		
128K				R8C/20 R8C/22		R8C/2A	R8C/2C		M16C/30P M16C/62A M16C/62N M16C/80		M16C/80
128K+2K				R8C/21 R8C/23		R8C/2B	R8C/2D				
128K+4K						M16C/28 M16C/29	M16C/28 M16C/29 M16C/62P		M16C/30P M16C/62A M16C/62N		
128K+8K							R32C/160** R32C/161**		R32C/120** R32C/121**		
128K+12K							R32C/160** R32C/161**		R32C/120** R32C/121**		

★★: Under Development

Memory Options (Pin count)

ROM size (bytes)

	Pin count								
	42	48	52	64	80	85	100	128	144
160K							M16C/30P		
192K							M16C/30P		
192K+4K							M16C/30P		
256K							M16C/62A M16C/30P M16C/62N M16C/80		M16C/80
256K+4K							M16C/62P M16C/6N	M16C/62P	
256K+8K				R32C/111**	R32C/111** R32C/160** R32C/161**		R32C/111** R32C/120** R32C/121** M32C/8B **		R32C/156** R32C/157** M32C/8B **
256K+12K					R32C/160** R32C/161**		R32C/120** R32C/121**		R32C/133** R32C/134** R32C/156** R32C/157**
256K+24K							M16C/64* M16C/65**		
320K+4K							M32C/84 M32C/85 M32C/88		M32C/84 M32C/85 M32C/88
384K+4K							M16C/62P M16C/6N M32C/84 M32C/85 M32C/87 M32C/88	M16C/62P M16C/6N	M32C/84 M32C/85 M32C/88 M32C/87
384K+8K							R32C/111** R32C/116** R32C/117** R32C/121**		R32C/116** R32C/117** R32C/156** R32C/157**
384K+12K							R32C/111** R32C/121**		R32C/133** R32C/134** R32C/156** R32C/157**
512K							M32C/83		M32C/83
512K+4K							M16C/62P M16C/6N M32C/84 M32C/85 M32C/87 M32C/88	M16C/62P M16C/6N	M32C/84 M32C/85 M32C/88 M32C/87
512K+8K							R32C/111** R32C/116** R32C/117** R32C/121**		R32C/156** R32C/157** R32C/116** R32C/117**
512K+12K							R32C/121**		R32C/133** R32C/134** R32C/156** R32C/157**
512K+24K							M16C/64**		
640K+8K							R32C/116** R32C/117** R32C/118**		R32C/116** R32C/117** R32C/118**
768K+4K							M32C/87		M32C/87
768K+8K							R32C/116** R32C/117** R32C/118**		R32C/116** R32C/117** R32C/118** R32C/151** R32C/152** R32C/153**
768K+16K									R32C/151** R32C/152** R32C/153**
1MB+4K							M32C/87		M32C/87
1MB+8K							R32C/116** R32C/117** R32C/118**		R32C/116** R32C/117** R32C/118** R32C/151** R32C/152** R32C/153**
1MB+16K									R32C/151** R32C/152** R32C/153**

★: New Product ★★: Under Development

Mask Versions

Memory Options (ROM/RAM)

RAM size (bytes)

ROM size (bytes)	1K	2K	3K	4K	5K	6K	8K	10K	12K	16K	18K	20K	24K	31K	32K
ROM Less			M16C/62P			M16C/30P	M32C/80	M16C/80 M16C/62P M32C/84	M32C/8A			M16C/62P	M16C/80	M16C/62P	M32C/8B**
24K	M16C/26A														
32K	M16C/1N		M16C/62A												
48K		M16C/26A		M16C/62P											
64K		M16C/26A	M16C/1N	M16C/28 M16C/29 M16C/62A M16C/62P				M16C/62A							
96K					M16C/30P M16C/62A M16C/62P		M16C/28 M16C/29	M16C/62A							
128K					M16C/30P M16C/39P M16C/62A M16C/6N			M16C/62A M16C/62N M16C/62P M16C/80 M32C/81 M32C/84	M16C/28 M16C/29 M16C/62N M32C/81						
160K						M16C/30P									
192K						M16C/30P M16C/39P			M16C/62P	M16C/6N					
256K								M16C/6N	M16C/62P			M16C/62A M16C/62N M16C/62P M16C/6N M16C/80 M32C/84 M32C/85			
320K										M16C/62P			M16C/62P M32C/82 M32C/84 M32C/85	M16C/62P	
384K										M16C/62P			M16C/62P M32C/82 M32C/84 M32C/85 M32C/87	M16C/62P M32C/82	
512K														M32C/87	

★★: Under Development

Memory Options (Pin count)

ROM size (bytes)	Pin count						
	42	48	64	80	100	128	144
ROM Less					M16C/62P M16C/80 M32C/8A M32C/80 M32C/84 M32C/8B★★		M16C/80 M32C/84 M32C/8B★★
24K	M16C/26A	M16C/26A					
32K		M16C/1N		M16C/62N	M16C/62A		
48K	M16C/26A	M16C/26A		M16C/62P	M16C/62P		
64K	M16C/26A	M16C/26A M16C/1N	M16C/28 M16C/29	M16C/28 M16C/29 M16C/62A M16C/62P	M16C/62A M16C/62P		
96K			M16C/28 M16C/29	M16C/28 M16C/29 M16C/62A M16C/62P	M16C/30P M16C/62A M16C/62P		
128K			M16C/28 M16C/29	M16C/28 M16C/29 M16C/62A M16C/62P	M16C/30P M16C/39P M16C/62A M16C/62N M16C/62P M16C/6N M16C/80 M32C/81 M32C/84		M32C/81 M32C/84
160K					M16C/30P		
192K					M16C/30P M16C/39P M16C/62P M16C/62N	M16C/62P M16C/62N	
256K				M16C/62A M16C/62N	M16C/62A M16C/62N M16C/62P M16C/6N M16C/80	M16C/62P M16C/62N	M16C/80
320K					M16C/62P M32C/82 M32C/84 M32C/85	M16C/62P	M32C/82 M32C/84 M32C/85
384K					M16C/62P M32C/82 M32C/87	M16C/62P	M32C/82 M32C/87
512K					M32C/87		M32C/87

★★: Under Development

Products Lineup

• Specifications (R32C/100 Series)

Group		R32C/111						R32C/116					
Memory	ROM (Bytes)	256K+8K		384K+8K		512K+8K			640K+8K	768K+8K	1024K+8K		
	RAM (Bytes)	40K	63K	40K	63K	40K	63K	40K	48K	63K			
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)						8K (Data Flash: program /erase 1000times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	20 (@50MHz)											
	Multiplier	32×32 → 64											
	Multiply-Accumulate Instruction	32×32+64 → 64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMAC II	DMAC II (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	Support for insertion of wait states, Outputs 4 chip-select signals											
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit)						Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16/32-bit)					
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes						Yes (Low speed: 125kHz)					
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n = 2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage)											
A/D Converter	Resolution×Channels	10-bit×26						10-bit×34			10-bit×26		10-bit×34
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	8-bit×2											
Timer	8-bit	—											
	16-bit	11 (Timer A, Timer B)											
	Input Capture	16 (Intelligent I/O)											
	Output Compare	19 (Intelligent I/O)						24 (Intelligent I/O)			19 (Intelligent I/O)		24 (Intelligent I/O)
	PWM Output	24 (Timer A, Intelligent I/O)						29 (Timer A, Intelligent I/O)			24 (Timer A, Intelligent I/O)		29 (Timer A, Intelligent I/O)
	Real-Time Port	3 (Intelligent I/O)											
	Event Counter	11 (Timer A, Timer B)											
	2-Phase Encoder Input	3 (Timer A)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	9 (UART)											
	Clock Sync. Only	1 (Intelligent I/O)											
	Clock Async. Only	—											
I^2C-bus		7 (UART)						8 (UART, Multi master I^2C)					
IEBus		8 (UART, Intelligent I/O)											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		7 (UART)											
CAN	Channels	—											
	Message Box (Numbers)	—											
IrDA		—											
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	82				84		120			84		120
	N-Channel Open Drain Port (Numbers)	2				36 (programmable)		56 (programmable)			36 (programmable)		56 (programmable)
	High Current Drive Port	—											
	Pull-Up Resistor	85				53		89			53		89
External Interrupts Pins		11						14			11		14
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	3V, 5V interface						5V torelant input					
Operating Frequency/Supply Voltage		50MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85											
Package		PLQP0100KB-A						PLQP0144KA-A			PLQP0100KB-A		PLQP0144KA-A
Part No.		R5F64114DFB**	R5F64110DFB**	R5F64115DFB**	R5F64111DFB**	R5F64116DFB**	R5F64112DFB**	R5F64166DFB**	R5F64166PFB**	R5F64166DFD**	R5F64166PFD**	R5F64167DFD**	R5F64167PFD**	R5F64168DFD**	R5F64168PFD**	R5F64169DFB**	R5F64169PFB**	R5F64169DFD**	R5F64169PFD**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R32C/100 Series)

Group		R32C/117				R32C/118			
Memory	ROM (Bytes)	512K+8K	640K+8K	768K+8K	1024K+8K	640K+8K	768K+8K	1024K+8K	
	RAM (Bytes)	40K	48K	63K		48K	63K		
	ROM Type*1	F							
	Data Flash/E2 Data Flash	8K (Data Flash: program /erase 1000times)							
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)							
CPU	CPU	R32C/100 core							
	Basic Instructions	108							
	Minimum Instruction Execution Time (ns)	20 (@50MHz)							
	Multiplier	32×32 → 64							
	Multiply-Accumulate Instruction	32×32+64 → 64							
	Barrel Shifter	Yes							
DMA	DMAC (Channels)	4							
	DTC/DMAC Ⅱ	DMAC Ⅱ (Starts by all peripheral interrupt factors)							
External Bus Expansion	Address Space (Bytes)	64M							
	External Bus Interface	Support for insertion of wait states, Outputs 4 chip-select signals							
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16/32-bit)							
	DRAM Controller	—							
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock, on-chip oscillator)							
	PLL	Yes							
	Subclock	Yes							
	RTC	—							
	On-Chip Oscillator	Yes (Low speed: 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n = 2 to 24)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	—							
	Low Voltage Detection/LVD	Yes (Low voltage)							
A/D Converter	Resolution × Channels	10-bit×26	10-bit×34		10-bit×26	10-bit×34		10-bit×26	10-bit×34
	Sample and Hold	Yes							
	Multi-Channel Sample and Hold	—							
D/A Converter	Resolution × Channels	8-bit×2							
Timer	8-bit	—							
	16-bit	11 (Timer A, Timer B)							
	Input Capture	16 (Intelligent I/O)							
	Output Compare	19 (Intelligent I/O)	24 (Intelligent I/O)		19 (Intelligent I/O)	24 (Intelligent I/O)		19 (Intelligent I/O)	24 (Intelligent I/O)
	PWM Output	24 (Timer A, Intelligent I/O)	29 (Timer A, Intelligent I/O)		24 (Timer A, Intelligent I/O)	29 (Timer A, Intelligent I/O)		24 (Timer A, Intelligent I/O)	29 (Timer A, Intelligent I/O)
	Real-Time Port	3 (Intelligent I/O)							
	Event Counter	11 (Timer A, Timer B)							
	2-Phase Encoder Input	3 (Timer A)+2 (Intelligent I/O)							
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time Timer)							
Watchdog Timer		1							
Serial Interface	Clock Sync./ Clock Async.	9 (UART)							
	Clock Sync. Only	1 (Intelligent I/O)							
	Clock Async. Only	—							
I²C-bus		8 (UART, Multi master I²C)							
IEBus		8 (UART, Intelligent I/O)							
Smart Card/SIM		—							
Synchronous Serial Communication Unit/Special Serial I/O		7 (UART)							
CAN	Channels	1				2			
	Message Box (Numbers)	32							
IrDA		—							
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))							
X/Y Converter		Yes							
I/O Ports	Input Only (Numbers)	2							
	CMOS I/O (Numbers)	84	120		84	120		84	120
	N-Channel Open Drain Port (Numbers)	36 (programmable)	56 (programmable)		36 (programmable)	56 (programmable)		36 (programmable)	56 (programmable)
	High Current Drive Port	—							
	Pull-Up Resistor	53	89		53	89		53	89
External Interrupts Pins		11	14		11	14		11	14
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	5V torelant input							
Operating Frequency/Supply Voltage		50MHz/3.0 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 85							
Package		PLQP0100KB-A	PLQP0144KA-A		PLQP0100KB-A	PLQP0144KA-A		PLQP0100KB-A	PLQP0144KA-A
Part No.		R5F64176DFB**	R5F64176PFB**	R5F64176DFD**	R5F64176PFD**	R5F64177DFD**	R5F64177PFD**	R5F64178DFD**	R5F64178PFD**
		R5F64179DFB**	R5F64179PFB**	R5F64179DFD**	R5F64179PFD**	R5F64187DFD**	R5F64187PFD**	R5F64188DFD**	R5F64188PFD**
		R5F64189DFB**	R5F64189PFB**	R5F64189DFD**	R5F64189PFD**				

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M32C/80 Series)

Group		M32C/8A	M32C/8B			M32C/80	M32C/83	
Memory	ROM (Bytes)	—		256K+8K		—	512K	
	RAM (Bytes)	12K	32K			8K	31K	
	ROM Type*1	L		F		L	F	
	Data Flash/E2 Data Flash	—		8K (Data Flash)		—		
	Program Security	—		Yes (ID Code Check Function , ROM Code Protect Function)		—	Yes (ID Code Check Function , ROM Code Protect Function)	
CPU	CPU	M32C/80 Core						
	Basic Instructions	108						
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)						
	Multiplier	16×16→32						
	Multiply-Accumulate Instruction	16×16+48→48						
	Barrel Shifter	Yes						
DMA	DMAC (Channels)	4						
	DTC/DMAC II	DMAC II (Starts by all peripheral interrupt factors)						
External Bus Expansion	Address Space (Bytes)	16M						
	External Bus Interface	Support for insertion of 1 to 6 wait states, Outputs 4 chip-select signals, Page mode support	Support for insertion of 1 to 7 wait states, Outputs 4 chip-select signals, Page mode support			Support for insertion of 1 to 6 wait states, Outputs 4 chip-select signals	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals	
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)						
	DRAM Controller	—					Yes	
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock and On-chip oscillator)						
	PLL	Yes						
	Subclock	Yes						
	RTC	—						
	On-Chip Oscillator	Yes						
	Oscillation Stop Detection	Yes						
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)						
	Power Save	Wait/Stop						
Power Supply Voltage Detection	Power-On Reset/POR	—						
	Low Voltage Detection/LVD	Yes (Low voltage)					—	
A/D Converter	Resolution×Channels	10-bit×10	10-bit×18	10-bit×26	10-bit×34	10-bit×10	10-bit×26 (2 circuits)	10-bit×34 (2 circuits)
	Sample and Hold	Yes						
	Multi-Channel Sample and Hold	—					Yes	
D/A Converter	Resolution×Channels	8-bit×2						
Timer	8-bit	—						
	16-bit	11 (Timer A, Timer B)						
	Input Capture	—					5 (Intelligent I/O)	12 (Intelligent I/O)
	Output Compare	—					10 (Intelligent I/O)	28 (Intelligent I/O)
	PWM Output	5 (Timer A)					15 (Timer A, Intelligent I/O)	33 (Timer A, Intelligent I/O)
	Real-Time Port	—					4 (Intelligent I/O)	16 (Intelligent I/O)
	Event Counter	11 (Timer A, Timer B)						
	2-Phase Encoder Input	3 (Timer A)					3 (Timer A) + 2 (Intelligent I/O)	
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)						
Watchdog Timer		1						
Serial Interface	Clock Sync./ Clock Async.	5 (UART)					7 (UART, Intelligent I/O)	
	Clock Sync. Only	—				2 (Intelligent I/O)		
	Clock Async. Only	—						
I²C-bus		5 (UART)						
IEBus		5 (UART)					6 (UART, Intelligent I/O)	
Smart Card/SIM		5 (UART)						
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)						
CAN	Channels	—					1	
	Message Box (Numbers)	—					16	
IrDA		—						
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))						
X/Y Converter		Yes						
I/O Ports	Input Only (Numbers)	1						
	CMOS I/O (Numbers)	45	81	85	121	45	85	121
	N-Channel Open Drain Port (Numbers)	2						
	High Current Drive Port	—						
	Pull-Up Resistor	45	81	85	121	45	85	121
External Interrupts Pins		11						
Debugging Function	On-Chip Debug	—		Yes		—	Yes	
	On-Board Flash Program	—		Yes		—	Yes	
Other Functions	ROM Correction Function	—						
	Others	3V, 5V Interface					—	
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V, 24MHz/3.0 to 5.5V	32MHz/4.2 to 5.5V			32MHz/4.2 to 5.5V, 24MHz/3.0 to 5.5V	32MHz/4.2 to 5.5V, 20MHz/3.0 to 5.5V	
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85						
Package		PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A / PLQP0100KB-A / PLQP0144KA-A
Part No.		M308A0SGP*	M308B6SGP**	M308B8SGP**	M308B6FGP**	M308B8FGP**	M30800SAFP / M30800SAFP-BL[Note1]	M30800SAGP / M30800SAGP-BL[Note1]	M30833FJFP	M30833FJGP	M30835FJGP

[1] Built-in boot loader function ROM-less version

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M32C/80 Series)

Group		M32C/84																			
Memory	ROM (Bytes)	—		128K		320K		320K + 4K		384K		384K + 4K		512K + 4K							
	RAM (Bytes)	10K						24K													
	ROM Type*1	L		M				F		M		F									
	Data Flash/E2 Data Flash	—						4K (Data Flash)		—		4K (Data Flash)									
	Program Security	—						Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)									
CPU	CPU	M32C/80 Core																			
	Basic Instructions	108																			
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)																			
	Multiplier	16×16→32																			
	Multiply-Accumulate Instruction	16×16+48→48																			
	Barrel Shifter	Yes																			
DMA	DMAC (Channels)	4																			
	DTC/DMAC II	DMAC II (Starts by all peripheral interrupt factors)																			
External Bus Expansion	Address Space (Bytes)	16M																			
	External Bus Interface	Support for insertion of 1 to 6 wait states, Outputs 4 chip-select signals, Page mode support	Support for insertion of 1 to 6 wait states, Outputs 4 chip-select signals																		
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)																			
	DRAM Controller	—																			
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock and On-chip oscillator)																			
	PLL	Yes																			
	Subclock	Yes																			
	RTC	—																			
	On-Chip Oscillator	Yes																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	—																			
	Low Voltage Detection/LVD	Yes (Low voltage)																			
A/D Converter	Resolution×Channels	10-bit×10	10-bit×18	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26		10-bit×34		10-bit×26		10-bit×34			
	Sample and Hold	Yes																			
	Multi-Channel Sample and Hold	—																			
D/A Converter	Resolution×Channels	8-bit×2																			
Timer	8-bit	—																			
	16-bit	11 (Timer A, Timer B)																			
	Input Capture	8 (Intelligent I/O)																			
	Output Compare	8 (Intelligent I/O)																			
	PWM Output	13 (Timer A, Intelligent I/O)																			
	Real-Time Port	—																			
	Event Counter	11 (Timer A, Timer B)																			
	2-Phase Encoder Input	3 (Timer A)+1 (Intelligent I/O)																			
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																			
Watchdog Timer		1																			
Serial Interface	Clock Sync./ Clock Async.	6 (UART, Intelligent I/O)																			
	Clock Sync. Only	1 (Intelligent I/O)																			
	Clock Async. Only	—																			
I²C-bus		5 (UART)																			
IEBus		5 (UART)																			
Smart Card/SIM		5 (UART)																			
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)																			
CAN	Channels	1																			
	Message Box (Numbers)	16																			
IrDA		—																			
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																			
X/Y Converter		Yes																			
I/O Ports	Input Only (Numbers)	1																			
	CMOS I/O (Numbers)	45	81	85	121	85	121	85	121	85	121	85		121		85		121			
	N-Channel Open Drain Port (Numbers)	2																			
	High Current Drive Port	—																			
	Pull-Up Resistor	45	81	85	121	85	121	85	121	85	121	85		121		85		121			
External Interrupts Pins		11																			
Debugging Function	On-Chip Debug	—						Yes		—		Yes									
	On-Board Flash Program	—						Yes		—		Yes									
Other Functions	ROM Correction Function	—		Yes				—		Yes		—									
	Others	3V, 5V Interface																			
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V, 24MHz/3.0 to 5.5V																			
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																			
Package		PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	
Part No.		M30840SFP	M30840SGP	M30842SGP	M30840MC-XXXFP*	M30840MC-XXXGP*	M30842MC-XXXGP*	M30843MW-XXXFP	M30843MW-XXXGP	M30845MW-XXXGP	M30843FWGP	M30845FWGP	M30843MH-XXXGP**	M30845MH-XXXGP**	M30843FHFP	M30843FHGP	M30845FHGP	M30843FJFP	M30843FJGP	M30845FJGP	

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M32C/80 Series)

Group		M32C/85									
Memory	ROM (Bytes)	320K		320K+4K		384K		384K+4K		512K+4K	
	RAM (Bytes)	24K									
	ROM Type*1	M		F		M		F			
	Data Flash/E2 Data Flash	—		4K (Data Flash)		—		4K (Data Flash)			
	Program Security	—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)			
CPU	CPU	M32C/80 Core									
	Basic Instructions	108									
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)									
	Multiplier	16×16→32									
	Multiply-Accumulate Instruction	16×16+48→48									
	Barrel Shifter	Yes									
DMA	DMAC (Channels)	4									
	DTC/DMAC II	DMAC II (Starts by all peripheral interrupt factors)									
External Bus Expansion	Address Space (Bytes)	16M									
	External Bus Interface	Support for insertion of 1 to 6 wait states, Outputs 4 chip-select signals									
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)									
	DRAM Controller	—									
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock and On-chip oscillator)									
	PLL	Yes									
	Subclock	Yes									
	RTC	—									
	On-Chip Oscillator	Yes									
	Oscillation Stop Detection	Yes									
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)									
	Power Save	Wait/Stop									
Power Supply Voltage Detection	Power-On Reset/POR	—									
	Low Voltage Detection/LVD	Yes (Low voltage)									
A/D Converter	Resolution×Channels	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34
	Sample and Hold	Yes									
	Multi-Channel Sample and Hold	—									
D/A Converter	Resolution×Channels	8-bit×2									
Timer	8-bit	—									
	16-bit	11 (Timer A, Timer B)									
	Input Capture	8 (Intelligent I/O)									
	Output Compare	8 (Intelligent I/O)									
	PWM Output	13 (Timer A, Intelligent I/O)									
	Real-Time Port	—									
	Event Counter	11 (Timer A, Timer B)									
	2-Phase Encoder Input	3 (Timer A)+1 (Intelligent I/O)									
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)									
Watchdog Timer		1									
Serial Interface	Clock Sync./ Clock Async.	6 (UART, Intelligent I/O)									
	Clock Sync. Only	1 (Intelligent I/O)									
	Clock Async. Only	—									
I²C-bus		5 (UART)									
IEBus		5 (UART)									
Smart Card/SIM		5 (UART)									
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)									
CAN	Channels	2									
	Message Box (Numbers)	16× 2									
IrDA		—									
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))									
X/Y Converter		Yes									
I/O Ports	Input Only (Numbers)	1									
	CMOS I/O (Numbers)	85	121	85	121	85	121	85	121	85	121
	N-Channel Open Drain Port (Numbers)	2									
	High Current Drive Port	—									
	Pull-Up Resistor	85	121	85	121	85	121	85	121	85	121
External Interrupts Pins		11									
Debugging Function	On-Chip Debug	—		Yes		—		Yes			
	On-Board Flash Program	—		Yes		—		Yes			
Other Functions	ROM Correction Function	Yes		—		Yes		—			
	Others	3V, 5V Interface									
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V, 24MHz/3.0 to 5.5V									
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85									
Package		PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A
Part No.		M30853MW-XXXFP	M30853MW-XXXGP	M30855MW-XXXGP	M30853FWFP	M30853FWGP	M30855FWGP	M30853MH-XXXGP**	M30855MH-XXXGP**	M30853FHFP	M30853FHGP	M30855FHGP	M30853FJFP	M30853FJGP	M30855FJGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M32C/80 Series)

Group		M32C/87 (M32C/87)														M32C/87 (M32C/87A)						
Memory	ROM (Bytes)	384K		384K+4K		512K			512K+4K		768K+4K		1M+4K			384K		384K+4K		512K		
	RAM (Bytes)	24K				31K					48K					24K				31K		
	ROM Type*1	M		F		M			F							M		F		M		
	Data Flash/E2 Data Flash	—		4K (Data Flash)		—			4K (Data Flash)							—		4K (Data Flash)		—		
	Program Security	—		Yes (ID Code Check Function, ROM Code Protect Function)		—			Yes (ID Code Check Function, ROM Code Protect Function)							—		Yes (ID Code Check Function, ROM Code Protect Function)		—		
CPU	CPU	M32C/80 Core																				
	Basic Instructions	108																				
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)																				
	Multiplier	16×16→32																				
	Multiply-Accumulate Instruction	16×16+48→48																				
	Barrel Shifter	Yes																				
DMA	DMAC (Channels)	4																				
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)																				
External Bus Expansion	Address Space (Bytes)	16M																				
	External Bus Interface	Support for insertion of 1 to 7 wait states, Outputs 4 chip-select signals																				
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)																				
	DRAM Controller	—																				
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock and On-chip oscillator)																				
	PLL	Yes																				
	Subclock	Yes																				
	RTC	—																				
	On-Chip Oscillator	Yes																				
	Oscillation Stop Detection	Yes																				
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)																				
	Power Save	Wait/Stop																				
Power Supply Voltage Detection	Power-On Reset/POR	—																				
	Low Voltage Detection/LVD	Yes (Low voltage)																				
A/D Converter	Resolution×Channels	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit×26		10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit×26		10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit×26		10-bit ×34
	Sample and Hold	Yes																				
	Multi-Channel Sample and Hold	—																				
D/A Converter	Resolution×Channels	8-bit×2																				
Timer	8-bit	—																				
	16-bit	11 (Timer A, Timer B)																				
	Input Capture	8 (Intelligent I/O)																				
	Output Compare	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)		16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)		16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)		16 (Intelligent I/O)
	PWM Output	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)		21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)		21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)		21 (Timer A, Intelligent I/O)
	Real-Time Port	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)		8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)		8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)		8 (Intelligent I/O)
	Event Counter	11 (Timer A, Timer B)																				
	2-Phase Encoder Input	3 (Timer A) + 1 (Intelligent I/O)																				
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																				
Watchdog Timer		1																				
Serial Interface	Clock Sync./ Clock Async.	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)		8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)		8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)		8 (UART, Intelligent I/O)
	Clock Sync. Only	2 (Intelligent I/O)																				
	Clock Async. Only	—																				
I^2C-bus		5 (UART)																				
IEBus		6 (UART, Intelligent I/O)																				
Smart Card/SIM		5 (UART)																				
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)																				
CAN	Channels	2														1						
	Message Box (Numbers)	16x 2														16						
IrDA		Yes (UART)																				
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																				
X/Y Converter		Yes																				
I/O Ports	Input Only (Numbers)	1																				
	CMOS I/O (Numbers)	85	121	85	121	85		121	85	121	85	121	85		121	85	121	85	121	85		121
	N-Channel Open Drain Port (Numbers)	2																				
	High Current Drive Port	—																				
	Pull-Up Resistor	85	121	85	121	85		121	85	121	85	121	85		121	85	121	85	121	85		121
External Interrupts Pins		11	14	11	14	11		14	11	14	11	14	11		14	11	14	11	14	11		14
Debugging Function	On-Chip Debug	—		Yes		—			Yes							—		Yes		—		
	On-Board Flash Program	—		Yes		—			Yes							—		Yes		—		
Other Functions	ROM Correction Function	Yes		—		Yes			—							Yes		—		Yes		
	Others	3V, 5V Interface																				
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V, 24MHz/3.0 to 5.5V																				
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																				
Package		PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A
Part No.		M30873MH-XXXGP	M30875MH-XXXGP	M30873FHGP	M30875FHGP	M30876MJ-XXXFP	M30876MJ-XXXGP	M30878MJ-XXXGP	M30876FJGP	M30878FJGP	M30879FKGP	M3087BFKGP	M30879FLFP	M30879FLGP	M3087BFLGP	M30873MHA-XXXGP	M30875MHA-XXXGP	M30873FHAGP	M30875FHAGP	M30876MJA-XXXFP	M30876MJA-XXXGP	M30878MJA-XXXGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M32C/80 Series)

Group		M32C/87 (M32C/87A)							M32C/87 (M32C/87B)													
Memory	ROM (Bytes)	512K+4K		768K+4K		1M+4K			384K		384K+4K		512K			512K+4K		768K+4K		1M+4K		
	RAM (Bytes)	31K		48K					24K				31K					48K				
	ROM Type*1	F							M		F		M			F						
	Data Flash/E2 Data Flash	4K (Data Flash)							—		4K (Data Flash)		—			4K (Data Flash)						
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)							—		Yes (ID Code Check Function, ROM Code Protect Function)		—			Yes (ID Code Check Function, ROM Code Protect Function)						
CPU	CPU	M32C/80 Core																				
	Basic Instructions	108																				
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)																				
	Multiplier	16×16→32																				
	Multiply-Accumulate Instruction	16×16+48→48																				
	Barrel Shifter	Yes																				
DMA	DMAC (Channels)	4																				
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)																				
External Bus Expansion	Address Space (Bytes)	16M																				
	External Bus Interface	Support for insertion of 1 to 7 wait states, Outputs 4 chip-select signals																				
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)																				
	DRAM Controller	—																				
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub-clock and On-chip oscillator)																				
	PLL	Yes																				
	Subclock	Yes																				
	RTC	—																				
	On-Chip Oscillator	Yes																				
	Oscillation Stop Detection	Yes																				
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)																				
	Power Save	Wait/Stop																				
Power Supply Voltage Detection	Power-On Reset/POR	—																				
	Low Voltage Detection/LVD	Yes (Low voltage)																				
A/D Converter	Resolution×Channels	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26		10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26		10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26		10-bit×34
	Sample and Hold	Yes																				
	Multi-Channel Sample and Hold	—																				
D/A Converter	Resolution×Channels	8-bit×2																				
Timer	8-bit	—																				
	16-bit	11 (Timer A, Timer B)																				
	Input Capture	8 (Intelligent I/O)																				
	Output Compare	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)		16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)		16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)	16 (Intelligent I/O)	10 (Intelligent I/O)		16 (Intelligent I/O)
	PWM Output	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)		21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)		21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)	21 (Timer A, Intelligent I/O)	15 (Timer A, Intelligent I/O)		21 (Timer A, Intelligent I/O)
	Real-Time Port	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)		8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)		8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)	8 (Intelligent I/O)	3 (Intelligent I/O)		8 (Intelligent I/O)
	Event Counter	11 (Timer A, Timer B)																				
	2-Phase Encoder Input	3 (Timer A)+1 (Intelligent I/O)																				
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																				
Watchdog Timer		1																				
Serial Interface	Clock Sync./ Clock Async.	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)		8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)		8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)	8 (UART, Intelligent I/O)	7 (UART, Intelligent I/O)		8 (UART, Intelligent I/O)
	Clock Sync. Only	2 (Intelligent I/O)																				
	Clock Async. Only	—																				
I^2C-bus		5 (UART)																				
IEBus		6 (UART, Intelligent I/O)																				
Smart Card/SIM		5 (UART)																				
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)																				
CAN	Channels	1							—													
	Message Box (Numbers)	16							—													
IrDA		Yes (UART)																				
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																				
X/Y Converter		Yes																				
I/O Ports	Input Only (Numbers)	1																				
	CMOS I/O (Numbers)	85	121	85	121	85		121	85	121	85	121	85		121	85	121	85	121	85		121
	N-Channel Open Drain Port (Numbers)	2																				
	High Current Drive Port	—																				
	Pull-Up Resistor	85	121	85	121	85		121	85	121	85	121	85		121	85	121	85	121	85		121
External Interrupts Pins		11	14	11	14	11		14	11	14	11	14	11		14	11	14	11	14	11		14
Debugging Function	On-Chip Debug	Yes							—		Yes		—			Yes						
	On-Board Flash Program	Yes							—		Yes		—			Yes						
Other Functions	ROM Correction Function	—							Yes		—		Yes			—						
	Others	3V, 5V Interface																				
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V, 24MHz/3.0 to 5.5V																				
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																				
Package		PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0144KA-A
Part No.		M30876FJAGP	M30878FJAGP	M30879FKAGP	M3087BFKAGP	M30879FLAFP	M30879FLAGP	M3087BFLAGP	M30873MHB-XXXGP	M30875MHB-XXXGP	M30873FHBGP	M30875FHBGP	M30876MJB-XXXFP	M30876MJB-XXXGP	M30878MJB-XXXGP	M30876FJBGP	M30878FJBGP	M30879FKBGP	M3087BFKBGP	M30879FLBFP	M30879FLBGP	M3087BFLBGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/80 Series)

Group		M16C/80																					
Memory	ROM (Bytes)	—						128K						256K									
	RAM (Bytes)	10K		24K				10K						20K									
	ROM Type*1	L						F		M				F		M							
	Data Flash/E2 Data Flash	—																					
	Program Security	—						Yes (ID Code Check Function, ROM Code Protect Function)		—				Yes (ID Code Check Function, ROM Code Protect Function)		—							
CPU	CPU	M16C/80 Core																					
	Basic Instructions	106																					
	Minimum Instruction Execution Time (ns)	50 (@20MHz)																					
	Multiplier	16×16→32																					
	Multiply-Accumulate Instruction	16×16+48→48																					
	Barrel Shifter	—																					
DMA	DMAC (Channels)	4																					
	DTC/DMAC II	—																					
External Bus Expansion	Address Space (Bytes)	16M																					
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals																					
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data bus width can be selected (8/16-bit), The number of output address buses can be selected (16/20)																					
	DRAM Controller	Yes																					
Clock	Clock Generation Circuit	2 circuits (Main clock, Sub-clock)																					
	PLL	—																					
	Subclock	Yes																					
	RTC	—																					
	On-Chip Oscillator	—																					
	Oscillation Stop Detection	—																					
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)																					
	Power Save	Wait/Stop																					
Power Supply Voltage Detection	Power-On Reset/POR	—																					
	Low Voltage Detection/LVD	—																					
A/D Converter	Resolution×Channels	10-bit×10																					
	Sample and Hold	Yes																					
	Multi-Channel Sample and Hold	—																					
D/A Converter	Resolution×Channels	8-bit×2																					
Timer	8-bit	—																					
	16-bit	11 (Timer A, Timer B)																					
	Input Capture	—																					
	Output Compare	—																					
	PWM Output	5 (Timer A)																					
	Real-Time Port	—																					
	Event Counter	11 (Timer A, Timer B)																					
	2-Phase Encoder Input	3 (Timer A)																					
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																					
Watchdog Timer		1																					
Serial Interface	Clock Sync./ Clock Async.	5 (UART)																					
	Clock Sync. Only	—																					
	Clock Async. Only	—																					
I²C-bus		3 (UART)																					
IEBus		3 (UART)																					
Smart Card/SIM		3 (UART)																					
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)																					
CAN	Channels	—																					
	Message Box (Numbers)	—																					
IrDA		—																					
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																					
X/Y Converter		Yes																					
I/O Ports	Input Only (Numbers)	1																					
	CMOS I/O (Numbers)	45		81		45		81		85		121		85		121		85		121		85	121
	N-Channel Open Drain Port (Numbers)	2																					
	High Current Drive Port	—																					
	Pull-Up Resistor	45		81		45		81		85		121		85		121		85		121		85	121
External Interrupts Pins		11																					
Debugging Function	On-Chip Debug	—								Yes				—				Yes				—	
	On-Board Flash Program	—								Yes				—				Yes				—	
Other Functions	ROM Correction Function	—												Yes				—				Yes	
	Others	—																					
Operating Frequency/Supply Voltage		20MHz/4.2 to 5.5V, 10MHz/2.7 to 5.5V																					
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																					
Package		PRQP0100JB-A		PLQP0100KB-A		PLQP0144KA-A		PRQP0100JB-A		PLQP0100KB-A		PLQP0144KA-A		PRQP0100JB-A		PLQP0100KB-A		PLQP0144KA-A		PRQP0100JB-A		PLQP0100KB-A		PLQP0144KA-A		PRQP0100JB-A		PLQP0100KB-A		PLQP0144KA-A	
Part No.		M30800SFP	M30800SFP-BL Note1	M30800SGP	M30800SGP-BL Note1	M30802SGP	M30802SGP-BL Note1	M30803SFP	M30803SFP-BL Note1	M30803SGP	M30803SGP-BL Note1	M30805SGP	M30805SGP-BL Note1	M30800FCFP		M30800FCGP		M30802FCGP		M30800MC-XXXFP		M30800MC-XXXGP		M30802MC-XXXGP		M30803FGFP		M30803FGGP		M30805FGGP		M30803MG-XXXFP		M30803MG-XXXGP		M30805MG-XXXGP	

[1] Built-in boot loader function ROM-less version

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/60 Series : M16C/63, M16C/64, M16C/65 Group)

Group		M16C/63		M16C/64				M16C/65	
Memory	ROM (Bytes)	256K+24K		256K+24K		512K+24K		256K+24K	
	RAM (Bytes)	20K		16K		31K		20K	
	ROM Type*1	F							
	Data Flash/E2 Data Flash	8K (Data Flash:Program/Erase 10k times)		8K (Data Flash)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)							
CPU	CPU	M16C/60 Core							
	Basic Instructions	91							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)		40.0 (@25MHz)				31.25 (@32MHz)	
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
	Barrel Shifter	—							
DMA	DMAC (Channels)	4							
	DTC/DMAC II	—							
External Bus Expansion	Address Space (Bytes)	1M							
	External Bus Interface	Support for insertion of 0 to 8 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function	—	Support for insertion of 0 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function				Support for insertion of 0 to 5 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function	
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)	—	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)					
	DRAM Controller	—							
Clock	Clock Generation Circuit	4 circuits (Main clock, Sub clock, High speed on-chip oscillator, Low- speed on-chip oscillator)		4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)				5 circuits (Main clock, PLL, Sub clock, High speed on-chip oscillator, Low- speed on-chip oscillator)	
	PLL	—		Yes					
	Subclock	Yes (32.768kHz)							
	RTC	Yes		—				Yes	
	On-Chip Oscillator	2 circuits (High speed:40MHz, Low speed:125kHz)		Yes (Low speed:125kHz)				2 circuits (High speed:40MHz, Low speed:125kHz)	
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	—						Yes	
	Low Voltage Detection/LVD	Yes (Voltage detection 3)		Yes (Low voltage)				Yes (Voltage detection 3)	
A/D Converter	Resolution×Channels	10-bit×26							
	Sample and Hold	Yes							
	Multi-Channel Sample and Hold	—							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	—							
	16-bit	11 (Timer A, Timer B)							
	Input Capture	—							
	Output Compare	—							
	PWM Output	7 (TimerA, PWM function)	5 (Timer A, PWM function)	5 (Timer A)				7 (Timer A, PWM Function)	
	Real-Time Port	—							
	Event Counter	11 (Timer A, Timer B)							
	2-Phase Encoder Input	3 (Timer A)							
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)	—	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)					
Watchdog Timer		1							
Serial Interface	Clock Sync./ Clock Async.	6 (UART)	3 (UART)	6 (UART)					
	Clock Sync. Only	2 (SI/O)							
	Clock Async. Only	—	1 (UART)	—					
I²C-bus		7 (Multi master I²C, UART)	5 (Multi master I²C, UART)	6 (UART)				7 (Multi master I²C, UART)	
IEBus		6 (UART)	3 (UART)	6 (UART)					
Smart Card/SIM		1 (UART)							
Synchronous Serial Communication Unit/Special Serial I/O		6 (UART)	3 (UART)	6 (UART)					
CAN	Channels	—							
	Message Box (Numbers)	—							
IrDA		—							
CRC Calculation Circuit		1 (CRC-CCITT($X^{16}+X^{12}+X^5+1$) /CRC-16 ($X^{16}+X^{15}+X^2+1$))		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))				1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$)/CRC-16 ($X^{16}+X^{15}+X^2+1$))	
X/Y Converter		—							
I/O Ports	Input Only (Numbers)	—							
	CMOS I/O (Numbers)	85	68	85					
	N-Channel Open Drain Port (Numbers)	3							
	High Current Drive Port	—							
	Pull-Up Resistor	85	68	85					
External Interrupts Pins		17		13					
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	3V, 5V interface Remote control signal reception function, CEC function	Remote control signal reception function, CEC function	3V, 5V interface				3V, 5V Interface Pattern Matching Input	
Operating Frequency/Supply Voltage		20MHz/2.7 to 5.5V, 5MHz/1.8 to 5.5V		25MHz/2.7 to 5.5V				32MHz/2.7 to 5.5V	
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PRQP0100JD-B	PLQP0100KB-A	PRQP0100JD-B	PLQP0100KB-A	PLQP0080KB-A		PRQP0100JD-B	PLQP0100KB-A	PRQP0100JD-B	PLQP0100KB-A	PRQP0100JD-B	PLQP0100KB-A	PRQP0100JD-B	PLQP0100KB-A	PRQP0100JD-B	PLQP0100KB-A
Part No.		R5F3630EDFA**	R5F3630EDFB**	R5F3630ENFA**	R5F3630ENFB**	R5F3632EDFE**	R5F3632ENFE**	R5F3640DDFA**	R5F3640DDFB**	R5F3640DNFA**	R5F3640DNFB**	R5F3640MDFA**	R5F3640MDFB**	R5F3640MNFA**	R5F3640MNFB**	R5F3650EDFA**	R5F3650EDFB**	R5F3650ENFA**	R5F3650ENFB**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Oz : OzROM version

★ : New product ★★ : Under development

• Specifications (M16C/60 Series : M16C/62P Group)

Group		M16C/62P																			
Memory	ROM (Bytes)	—				48K		64K		64K+4K		96K									
	RAM (Bytes)	4K		10K		20K		31K		4K										5K	
	ROM Type*1	L								M				F		M					
	Data Flash/E2 Data Flash	—												4K (Data Flash)		—					
	Program Security	—												Yes (ID Code Check Function, ROM Code Protect Function)		—					
CPU	CPU	M16C/60 Core																			
	Basic Instructions	91																			
	Minimum Instruction Execution Time (ns)	41.7 (@24MHz)																			
	Multiplier	16×16→32																			
	Multiply-Accumulate Instruction	16×16+32→32																			
	Barrel Shifter	—																			
DMA	DMAC (Channels)	2																			
	DTC/DMAC II	—																			
External Bus Expansion	Address Space (Bytes)	1M											—	1M		—	1M		—		
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function											—	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function		—	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function		—		
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)											—	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)		—	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)		—		
	DRAM Controller	—																			
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																			
	PLL	Yes																			
	Subclock	Yes																			
	RTC	—																			
	On-Chip Oscillator	Yes																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	—																			
	Low Voltage Detection/LVD	Yes (Low voltage)																			
A/D Converter	Resolution×Channels	10-bit×26																			
	Sample and Hold	Yes																			
	Multi-Channel Sample and Hold	—																			
D/A Converter	Resolution×Channels	8-bit×2																			
Timer	8-bit	—																			
	16-bit	11 (Timer A, Timer B)																			
	Input Capture	—																			
	Output Compare	—																			
	PWM Output	5 (Timer A)											3 (Timer A)	5 (Timer A)		3 (Timer A)	5 (Timer A)		3 (Timer A)		
	Real-Time Port	—																			
	Event Counter	11 (Timer A, Timer B)																			
	2-Phase Encoder Input	3 (Timer A)											2 (Timer A)	3 (Timer A)		2 (Timer A)	3 (Timer A)		2 (Timer A)		
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)											—	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)		—	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)		—		
Watchdog Timer		1																			
Serial Interface	Clock Sync./ Clock Async.	3 (UART)											2 (UART)	3 (UART)		2 (UART)	3 (UART)		2 (UART)		
	Clock Sync. Only	2 (SI/O)																			
	Clock Async. Only	—											1 (UART)	—		1 (UART)	—		1 (UART)		
I²C-bus		3 (UART)																			
IEBus		3 (UART)																			
Smart Card/SIM		1 (UART)																			
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)																			
CAN	Channels	—																			
	Message Box (Numbers)	—																			
IrDA		—																			
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																			
X/Y Converter		—																			
I/O Ports	Input Only (Numbers)	1																			
	CMOS I/O (Numbers)	50								85			68	85		68	85		68		
	N-Channel Open Drain Port (Numbers)	2																			
	High Current Drive Port	—																			
	Pull-Up Resistor	50								85			68	85		68	85		68		
External Interrupts Pins		11											8	11		8	11		8		
Debugging Function	On-Chip Debug	—												Yes			—				
	On-Board Flash Program	—												Yes			—				
Other Functions	ROM Correction Function	Yes												—			Yes				
	Others	3V, 5V interface																			
Operating Frequency/Supply Voltage		24MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V																			
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																			
Package		PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0080JA-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0080JA-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0080JA-A	
Part No.		M30622SPFP	M30622SPGP	M30620SPFP	M30620SPGP	M30624SPFP	M30624SPGP	M30626SPFP	M30626SPGP	M30622M6P-XXXFP	M30622M6P-XXXGP	M30622M8P-XXXFP	M30622M8P-XXXGP	M30623M8P-XXXGP	M30622F8PFP	M30622F8PGP	M30623F8PGP	M30622MAP-XXXFP	M30622MAP-XXXGP	M30623MAP-XXXGP	

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/60 Series : M16C/62P Group)

Group		M16C/62P																					
Memory	ROM (Bytes)	128K		128K+4K		192K		256K				256K+4K				320K							
	RAM (Bytes)	10K				12K				20K						16K							
	ROM Type*1	M		F		M						F				M							
	Data Flash/E2 Data Flash	—		4K (Data Flash)		—						4K (Data Flash)				—							
	Program Security	—		Yes (ID Code Check Function, ROM Code Protect Function)		—						Yes (ID Code Check Function, ROM Code Protect Function)				—							
CPU	CPU	M16C/60 Core																					
	Basic Instructions	91																					
	Minimum Instruction Execution Time (ns)	41.7 (@24MHz)																					
	Multiplier	16×16→32																					
	Multiply-Accumulate Instruction	16×16+32→32																					
	Barrel Shifter	—																					
DMA	DMAC (Channels)	2																					
	DTC/DMAC II	—																					
External Bus Expansion	Address Space (Bytes)	1M	—	1M	—	1M																	
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function	—	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function	—	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function																	
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)	—	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)	—	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)																
	DRAM Controller	—																					
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																					
	PLL	Yes																					
	Subclock	Yes																					
	RTC	—																					
	On-Chip Oscillator	Yes																					
	Oscillation Stop Detection	Yes																					
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																					
	Power Save	Wait/Stop																					
Power Supply Voltage Detection	Power-On Reset/POR	—																					
	Low Voltage Detection/LVD	Yes (Low voltage)																					
A/D Converter	Resolution×Channels	10-bit×26																					
	Sample and Hold	Yes																					
	Multi-Channel Sample and Hold	—																					
D/A Converter	Resolution×Channels	8-bit×2																					
Timer	8-bit	—																					
	16-bit	11 (Timer A, Timer B)																					
	Input Capture	—																					
	Output Compare	—																					
	PWM Output	5 (Timer A)	3 (Timer A)	5 (Timer A)	3 (Timer A)	5 (Timer A)																	
	Real-Time Port	—																					
	Event Counter	11 (Timer A, Timer B)																					
	2-Phase Encoder Input	3 (Timer A)	2 (Timer A)	3 (Timer A)	2 (Timer A)	3 (Timer A)																	
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)	—	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)	—	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																	
Watchdog Timer		1																					
Serial Interface	Clock Sync./ Clock Async.	3 (UART)	2 (UART)	3 (UART)	2 (UART)	3 (UART)																	
	Clock Sync. Only	2 (SI/O)																					
	Clock Async. Only	—	1 (UART)	—	1 (UART)	—																	
I²C-bus		3 (UART)																					
IEBus		3 (UART)																					
Smart Card/SIM		1 (UART)																					
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)																					
CAN	Channels	—																					
	Message Box (Numbers)	—																					
IrDA		—																					
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																					
X/Y Converter		—																					
I/O Ports	Input Only (Numbers)	1																					
	CMOS I/O (Numbers)	85	68	85	68	85	111	85	111	85	111	85	111	85	111	85	111						
	N-Channel Open Drain Port (Numbers)	2																					
	High Current Drive Port	-																					
	Pull-Up Resistor	85	68	85	68	85	111	85	111	85	111	85	111	85	111	85	111						
External Interrupts Pins		11	8	11	8	11																	
Debugging Function	On-Chip Debug	—		Yes		—						Yes				—							
	On-Board Flash Program	—		Yes		—						Yes				—							
Other Functions	ROM Correction Function	Yes		—		Yes						—				Yes							
	Others	3V, 5V interface																					
Operating Frequency/Supply Voltage		24MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V																					
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																					
Package		PRQP0100JB-A	PLQP0100KB-A	PRQP0080JA-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0080JA-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A
Part No.		M30620MCP-XXXFP	M30620MCP-XXXGP	M30621MCP-XXXGP	M30620FCPFP	M30620FCPGP	M30621FCPGP	M30622MEP-XXXFP	M30622MEP-XXXGP	M30623MEP-XXXGP	M30622MGP-XXXFP	M30622MGP-XXXGP	M30623MGP-XXXGP	M30624MGP-XXXFP	M30624MGP-XXXGP	M30625MGP-XXXGP	M30624FGPFP	M30624FGPGP	M30625FGPGP	M3062LFGPFP	M3062LFGPGP	M30622MWP-XXXFP	M30622MWP-XXXGP	M30623MWP-XXXGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Oz : OzROM version

★ : New product ★★ : Under development

• Specifications (M16C/60 Series : M16C/62P Group)

Group		M16C/62P																			
Memory	ROM (Bytes)	320K				384K								384K+4K		512K		512K+4K			
	RAM (Bytes)	24K		31K		16K		24K		31K											
	ROM Type*1	M												F		M		F			
	Data Flash/E2 Data Flash	—												4K (Data Flash)		—		4K (Data Flash)			
	Program Security	—												Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)			
CPU	CPU	M16C/60 Core																			
	Basic Instructions	91																			
	Minimum Instruction Execution Time (ns)	41.7 (@24MHz)																			
	Multiplier	16×16→32																			
	Multiply-Accumulate Instruction	16×16+32→32																			
	Barrel Shifter	—																			
DMA	DMAC (Channels)	2																			
	DTC/DMAC II	—																			
External Bus Expansion	Address Space (Bytes)	1M																			
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals, Available to 4M bytes by address space expansion function																			
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)																			
	DRAM Controller	—																			
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																			
	PLL	Yes																			
	Subclock	Yes																			
	RTC	—																			
	On-Chip Oscillator	Yes																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	—																			
	Low Voltage Detection/LVD	Yes (Low voltage)																			
A/D Converter	Resolution×Channels	10-bit×26																			
	Sample and Hold	Yes																			
	Multi-Channel Sample and Hold	—																			
D/A Converter	Resolution×Channels	8-bit×2																			
Timer	8-bit	—																			
	16-bit	11 (Timer A, Timer B)																			
	Input Capture	—																			
	Output Compare	—																			
	PWM Output	5 (Timer A)																			
	Real-Time Port	—																			
	Event Counter	11 (Timer A, Timer B)																			
	2-Phase Encoder Input	3 (Timer A)																			
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																			
Watchdog Timer		1																			
Serial Interface	Clock Sync./ Clock Async.	3 (UART)																			
	Clock Sync. Only	2 (SI/O)																			
	Clock Async. Only	—																			
I²C-bus		3 (UART)																			
IEBus		3 (UART)																			
Smart Card/SIM		1 (UART)																			
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)																			
CAN	Channels	—																			
	Message Box (Numbers)	—																			
IrDA		—																			
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																			
X/Y Converter		—																			
I/O Ports	Input Only (Numbers)	1																			
	CMOS I/O (Numbers)	85	111	85	111	85	111	85	111	85	111	85	111	85	111	85	111	85	111		
	N-Channel Open Drain Port (Numbers)	2																			
	High Current Drive Port	—																			
	Pull-Up Resistor	85	111	85	111	85	111	85	111	85	111	85	111	85	111	85	111	85	111		
External Interrupts Pins		11																			
Debugging Function	On-Chip Debug	—												Yes		—		Yes			
	On-Board Flash Program	—												Yes		—		Yes			
Other Functions	ROM Correction Function	Yes												—		Yes		—			
	Others	3V, 5V interface																			
Operating Frequency/Supply Voltage		24MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V																			
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																			
Package		PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A	PRQP0100JB-A	PLQP0100KB-A	PLQP0128KB-A
Part No.		M30624MWP-XXXFP	M30624MWP-XXXGP	M30625MWP-XXXGP	M30626MWP-XXXFP	M30626MWP-XXXGP	M30627MWP-XXXGP	M30622MHP-XXXFP	M30622MHP-XXXGP	M30623MHP-XXXGP	M30624MHP-XXXFP	M30624MHP-XXXGP	M30625MHP-XXXGP	M30626MHP-XXXFP	M30626MHP-XXXGP	M30627MHP-XXXGP	M30626FHPFP	M30626FHPGP	M30627FHPGP	M30626MJP-XXXFP	M30626MJP-XXXGP	M30627MJP-XXXGP	M30626FJPFP	M30626FJPGP	M30627FJPGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/60 Series : M16C/6N Group)

Group		M16C/6N4				M16C/6N5	
Memory	ROM (Bytes)	128K	128K + 4K	256K	256K + 4K	128K	128K + 4K
	RAM (Bytes)	5K		10K		5K	
	ROM Type*1	M	F	M	F	M	F
	Data Flash/E2 Data Flash	—	4K (Data Flash)	—	4K (Data Flash)	—	4K (Data Flash)
	Program Security	—	Yes (ID Code Check Function, ROM Code Protect Function)	—	Yes (ID Code Check Function, ROM Code Protect Function)	—	Yes (ID Code Check Function, ROM Code Protect Function)
CPU	CPU	M16C/60 Core					
	Basic Instructions	91					
	Minimum Instruction Execution Time (ns)	41.7 (@24MHz)					
	Multiplier	16 × 16 → 32					
	Multiply-Accumulate Instruction	16 × 16 + 32 → 32					
	Barrel Shifter	—					
DMA	DMAC (Channels)	2					
	DTC/DMAC II	—					
External Bus Expansion	Address Space (Bytes)	1M					
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals					
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)					
	DRAM Controller	—					
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)					
	PLL	Yes					
	Subclock	Yes					
	RTC	—					
	On-Chip Oscillator	Yes					
	Oscillation Stop Detection	Yes					
	Frequency Divider	1/n (n = 1, 2, 4, 8, 16)					
	Power Save	Wait/Stop					
Power Supply Voltage Detection	Power-On Reset/POR	—					
	Low Voltage Detection/LVD	—					
A/D Converter	Resolution × Channels	10-bit × 26					
	Sample and Hold	Yes					
	Multi-Channel Sample and Hold	—					
D/A Converter	Resolution × Channels	8-bit × 2					
Timer	8-bit	—					
	16-bit	11 (Timer A, Timer B)					
	Input Capture	—					
	Output Compare	—					
	PWM Output	5 (Timer A)					
	Real-Time Port	—					
	Event Counter	11 (Timer A, Timer B)					
	2-Phase Encoder Input	3 (Timer A)					
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)					
Watchdog Timer		1					
Serial Interface	Clock Sync./ Clock Async.	3 (UART)					
	Clock Sync. Only	1 (SI/O)					
	Clock Async. Only	—					
I²C-bus		3 (UART)					
IEBus		3 (UART)					
Smart Card/SIM		1 (UART)					
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)					
CAN	Channels	2				1	
	Message Box (Numbers)	16 + 16				16	
IrDA		—					
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16} + X^{12} + X^5 + 1$))					
X/Y Converter		—					
I/O Ports	Input Only (Numbers)	1					
	CMOS I/O (Numbers)	85					
	N-Channel Open Drain Port (Numbers)	2					
	High Current Drive Port	—					
	Pull-Up Resistor	85					
External Interrupts Pins		11					
Debugging Function	On-Chip Debug	—	Yes	—	Yes	—	Yes
	On-Board Flash Program	—	Yes	—	Yes	—	Yes
Other Functions	ROM Correction Function	Yes	—	Yes	—	Yes	—
	Others	—					
Operating Frequency/Supply Voltage		24MHz/3.0 to 5.5V					
Operating Ambient Temperature (°C)		−40 to 85					
Package		PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A
Part No.		M306N4MC-XXXGP	M306N4FCFP	M306N4FCGP	M306N4MG-XXXGP	M306N4FGFP	M306N4FGGP	M306N5MC-XXXGP	M306N5FCFP	M306N5FCGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/60 Series : M16C/6N Group)

Group		M16C/6NK				M16C/6NL				M16C/6NM				M16C/6NN			
Memory	ROM (Bytes)	192K	256K	384K+4K	512K+4K	192K	256K	384K+4K	512K+4K	192K	256K	384K+4K	512K+4K	192K	256K	384K+4K	512K+4K
	RAM (Bytes)	16K	20K	31K		16K	20K	31K		16K	20K	31K		16K	20K	31K	
	ROM Type*1	M		F		M		F		M		F		M		F	
	Data Flash/E2 Data Flash	—		4K (Data Flash)		—		4K (Data Flash)		—		4K (Data Flash)		—		4K (Data Flash)	
	Program Security	—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)	
CPU	CPU	M16C/60 Core															
	Basic Instructions	91															
	Minimum Instruction Execution Time (ns)	41.7 (@24MHz)															
	Multiplier	16×16→32															
	Multiply-Accumulate Instruction	16×16+32→32															
	Barrel Shifter	—															
DMA	DMAC (Channels)	2															
	DTC/DMAC II	—															
External Bus Expansion	Address Space (Bytes)	1M															
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals															
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)															
	DRAM Controller	—															
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)															
	PLL	Yes															
	Subclock	Yes															
	RTC	—															
	On-Chip Oscillator	Yes															
	Oscillation Stop Detection	Yes															
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)															
	Power Save	Wait/Stop															
Power Supply Voltage Detection	Power-On Reset/POR	—															
	Low Voltage Detection/LVD	—															
A/D Converter	Resolution×Channels	10-bit×26															
	Sample and Hold	Yes															
	Multi-Channel Sample and Hold	—															
D/A Converter	Resolution×Channels	8-bit×2															
Timer	8-bit	—															
	16-bit	11 (Timer A, Timer B)															
	Input Capture	—															
	Output Compare	—															
	PWM Output	5 (Timer A)															
	Real-Time Port	—															
	Event Counter	11 (Timer A, Timer B)															
	2-Phase Encoder Input	3 (Timer A)															
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)															
Watchdog Timer		1															
Serial Interface	Clock Sync./ Clock Async.	3 (UART)															
	Clock Sync. Only	2 (SI/O)								4 (SI/O)							
	Clock Async. Only	—															
I²C-bus		3 (UART)															
IEBus		3 (UART)															
Smart Card/SIM		1 (UART)															
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)															
CAN	Channels	2				1				2				1			
	Message Box (Numbers)	16+16				16				16+16				16			
IrDA		—															
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))															
X/Y Converter		—															
I/O Ports	Input Only (Numbers)	1															
	CMOS I/O (Numbers)	85								111							
	N-Channel Open Drain Port (Numbers)	2															
	High Current Drive Port	—															
	Pull-Up Resistor	85								111							
External Interrupts Pins		11								14							
Debugging Function	On-Chip Debug	—		Yes		—		Yes		—		Yes		—		Yes	
	On-Board Flash Program	—		Yes		—		Yes		—		Yes		—		Yes	
Other Functions	ROM Correction Function	Yes		—		Yes		—		Yes		—		Yes		—	
	Others	—															
Operating Frequency/Supply Voltage		24MHz/3.0 to 5.5V															
Operating Ambient Temperature (°C)		−40 to 85															
Package		PLQP0100KB-A								PLQP0128KB-A							
Part No.		M306NKME-XXXGP	M306NKMG-XXXGP	M306NKFHGP	M306NKFJGP	M306NLME-XXXGP	M306NLMG-XXXGP	M306NLFHGP	M306NLFJGP	M306NMME-XXXGP	M306NMMG-XXXGP	M306NMFHGP	M306NMFJGP	M306NNME-XXXGP	M306NNMG-XXXGP	M306NNFHGP	M306NNFJGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/30 Series)

Group		M16C/30P											
Memory	ROM (Bytes)	—	96K			96K+4K		128K					
	RAM (Bytes)	6K	5K										
	ROM Type*1	L	F		M	F							M
	Data Flash/E2 Data Flash	—				4K (Data Flash)		—					
	Program Security	—	Yes (ID Code Check Function)		—	Yes (ID Code Check Function, ROM Code Protect Function)		Yes (ID Code Check Function)					—
CPU	CPU	M16C/60 Core											
	Basic Instructions	91											
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)											
	Multiplier	16×16→32											
	Multiply-Accumulate Instruction	16×16+32→32											
	Barrel Shifter	—											
DMA	DMAC (Channels)	2											
	DTC/DMAC II	—											
External Bus Expansion	Address Space (Bytes)	1M											
	External Bus Interface	Support for insertion of 1 wait states, Outputs 4 chip-select signals											
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)											
	DRAM Controller	—											
Clock	Clock Generation Circuit	2 circuits (Main clock, Sub-clock)											
	PLL	—											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	—											
	Oscillation Stop Detection	—											
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	—											
A/D Converter	Resolution×Channels	10-bit×18											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	—											
Timer	8-bit	—											
	16-bit	6 (Timer A, Timer B)											
	Input Capture	—											
	Output Compare	—											
	PWM Output	3 (Timer A)											
	Real-Time Port	—											
	Event Counter	6 (Timer A, Timer B)											
	2-Phase Encoder Input	1 (Timer A)											
	3-Phase Inverter Control	—											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	3 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		1 (UART)											
Smart Card/SIM		1 (UART)											
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)											
CAN	Channels	—											
	Message Box (Numbers)	—											
IrDA		—											
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))											
X/Y Converter		—											
I/O Ports	Input Only (Numbers)	1											
	CMOS I/O (Numbers)	85											
	N-Channel Open Drain Port (Numbers)	2											
	High Current Drive Port	—											
	Pull-Up Resistor	85											
External Interrupts Pins		10											
Debugging Function	On-Chip Debug	—				Yes		—					
	On-Board Flash Program	—	Yes (Only Rewriting is possible)		—	Yes		Yes (Only Rewriting is possible)					—
Other Functions	ROM Correction Function	Yes				—		Yes					
	Others	—											
Operating Frequency/Supply Voltage		16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V											
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85											
Package		PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A
Part No.		M30302SPFP	M30302SPGP	M30302GAPFP*Note1	M30302GAPGP*Note1	M30302MAP-XXXFP	M30302MAP-XXXGP	M30302FAPFP	M30302FAPGP	M30302GCPFP*Note1	M30302GCPGP*Note1	M30302MCP-XXXFP	M30302MCP-XXXGP

[1] Data can only be written once and cannot be erased.

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/30 Series)

Group		M16C/30P																	
Memory	ROM (Bytes)	128K+4K	160K					192K								192K+4K		256K	
	RAM (Bytes)	5K	6K			12K		6K				12K				6K		12K	
	ROM Type*1	F			M	F				M		F				F			
	Data Flash/E2 Data Flash	4K (Data Flash)	—													4K (Data Flash)		—	
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)	Yes (ID Code Check Function)		—	Yes (ID Code Check Function)				—		Yes (ID Code Check Function)				Yes (ID Code Check Function, ROM Code Protect Function)		Yes (ID Code Check Function)	
CPU	CPU	M16C/60 Core																	
	Basic Instructions	91																	
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)																	
	Multiplier	16×16→32																	
	Multiply-Accumulate Instruction	16×16+32→32																	
	Barrel Shifter	—																	
DMA	DMAC (Channels)	2																	
	DTC/DMAC II	—																	
External Bus Expansion	Address Space (Bytes)	1M																	
	External Bus Interface	Support for insertion of 1 wait states, Outputs 4 chip-select signals																	
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)																	
	DRAM Controller	—																	
Clock	Clock Generation Circuit	2 circuits (Main clock, Sub-clock)																	
	PLL	—																	
	Subclock	Yes																	
	RTC	—																	
	On-Chip Oscillator	—																	
	Oscillation Stop Detection	—																	
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																	
	Power Save	Wait/Stop																	
Power Supply Voltage Detection	Power-On Reset/POR	—																	
	Low Voltage Detection/LVD	—																	
A/D Converter	Resolution×Channels	10-bit×18																	
	Sample and Hold	Yes																	
	Multi-Channel Sample and Hold	—																	
D/A Converter	Resolution×Channels	—																	
Timer	8-bit	—																	
	16-bit	6 (Timer A, Timer B)																	
	Input Capture	—																	
	Output Compare	—																	
	PWM Output	3 (Timer A)																	
	Real-Time Port	—																	
	Event Counter	6 (Timer A, Timer B)																	
	2-Phase Encoder Input	1 (Timer A)																	
	3-Phase Inverter Control	—																	
Watchdog Timer		1																	
Serial Interface	Clock Sync./ Clock Async.	3 (UART)																	
	Clock Sync. Only	—																	
	Clock Async. Only	—																	
I²C-bus		3 (UART)																	
IEBus		1 (UART)																	
Smart Card/SIM		1 (UART)																	
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)																	
CAN	Channels	—																	
	Message Box (Numbers)	—																	
IrDA		—																	
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))																	
X/Y Converter		—																	
I/O Ports	Input Only (Numbers)	1																	
	CMOS I/O (Numbers)	85																	
	N-Channel Open Drain Port (Numbers)	2																	
	High Current Drive Port	—																	
	Pull-Up Resistor	85																	
External Interrupts Pins		10																	
Debugging Function	On-Chip Debug	Yes	—													Yes		—	
	On-Board Flash Program	Yes	Yes (Only Rewriting is possible)		—	Yes (Only Rewriting is possible)				—		Yes (Only Rewriting is possible)				Yes		Yes (Only Rewriting is possible)	
Other Functions	ROM Correction Function	—	Yes													—		Yes	
	Others	—																	
Operating Frequency/Supply Voltage		16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V																	
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85																	
Package		PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A	PRQP0100JB-A	PLQP0100KB-A
Part No.		M30302FCPFP	M30302FCPGP	M30302GDPFP*Note1	M30302GDPGP*Note1	M30302MDP-XXXFP	M30302MDP-XXXGP	M30304GDPFP*Note1	M30304GDPGP*Note1	M30302GEPFP*Note1	M30302GEPGP*Note1	M30302MEP-XXXFP	M30302MEP-XXXGP	M30304GEPFP*Note1	M30304GEPGP*Note1	M30302FEPFP	M30302FEPGP	M30302GGPFP*Note1	M30302GGPGP*Note1

[1] Data can only be written once and cannot be erased.

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/1N Group)

Group		M16C/1N
Memory	ROM (Bytes)	64K + 4K
	RAM (Bytes)	3K
	ROM Type*1	F
	Data Flash	Yes (4K)
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)
CPU	CPU	M16C/60 core
	Basic Instructions	91
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)
	Multiplier	16×16→32
	Multiply-Accumulate Instruction	16×16+32→32
	Barrel Shifter	—
DMA	DMAC (Channels)	—
	DTC/DMAC II	—
External Bus Expansion	Address Space (Bytes)	—
	External Bus Interface	—
	Bus Structure	—
	DRAM Controller	—
Clock	Clock Generation Circuit	3 circuits (Main clock, Sub clock, On-chip oscillator)
	PLL	—
	Subclock	Yes
	On-Chip Oscillator	Yes
	Oscillation Stop Detection	Yes
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)
	Power Save	Wait/Stop
Power Supply Voltage Detection	Power-On Reset/POR	—
	Low Voltage Detection/LVD	—
A/D Converter	Resolution×Channels	10-bit×14
	Sample and Hold	Yes
	Multi-Channel Sample and Hold	—
D/A Converter	Resolution×Channels	8-bit×1
Timer	8-bit	4 (Timer 1, Timer X, Timer Y, Timer Z)
	16-bit	1 (Timer C)
	Input Capture	1 (Timer C)
	Output Compare	—
	PWM Output	2 (Timer Y, Timer Z)
	Real-Time Port	—
	Event Counter	1 (Timer X)
	2-Phase Encoder Input	—
	3-Phase Inverter Control	—
Watchdog Timer		—
Serial Interface	Clock Sync./ Clock Async.	2 (UART)
	Clock Sync. Only	—
	Clock Async. Only	—
I^2C-bus		—
IEBus		—
Smart Card/SIM		—
Synchronous Serial Communication Unit/Special Serial I/O		—
CAN	Channels	1
	Message Box (Numbers)	16
IrDA		—
CRC Calculation Circuit		—
X/Y Converter		—
I/O Ports	Input Only (Numbers)	—
	CMOS I/O (Numbers)	37
	N-Channel Open Drain Port (Numbers)	—
	High Current Drive Port	8
	Pull-Up Resistor	37
External Interrupts Pins		8
Debugging Function	On-Chip Debug	Yes
	On-Board Flash Program	Yes
Other Functions	ROM Correction Function	—
	Others	—
Operating Frequency/Supply Voltage		16MHz/4.2 to 5.5V
Operating Ambient Temperature (°C)		−40 to 85
Package		PLQP0048KB-A
Part No.		M301N2F8FP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/Tiny Series)

Group		M16C/26A (M16C/26A)												M16C/26A (M16C/26B)	
Memory	ROM (Bytes)	24K		24K+4K		48K		48K+4K		64K		64K+4K			
	RAM (Bytes)	1K				2K									
	ROM Type*1	M		F		M		F		M		F			
	Data Flash/E2 Data Flash	—		4K (Data Flash)		—		4K (Data Flash)		—		4K (Data Flash)			
	Program Security	—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)			
CPU	CPU	M16C/60 Core													
	Basic Instructions	91													
	Minimum Instruction Execution Time (ns)	50 (@20MHz)												41.7 (@24MHz)	
	Multiplier	16×16→32													
	Multiply-Accumulate Instruction	16×16+32→32													
	Barrel Shifter	—													
DMA	DMAC (Channels)	2													
	DTC/DMAC II	—													
External Bus Expansion	Address Space (Bytes)	—													
	External Bus Interface	—													
	Bus Structure	—													
	DRAM Controller	—													
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)													
	PLL	Yes													
	Subclock	Yes													
	RTC	—													
	On-Chip Oscillator	Yes													
	Oscillation Stop Detection	Yes													
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)													
	Power Save	Wait/Stop													
Power Supply Voltage Detection	Power-On Reset/POR	—													
	Low Voltage Detection/LVD	Yes (Low voltage)													
A/D Converter	Resolution×Channels	10-bit×12	10-bit×10	10-bit×12	10-bit×10	10-bit×12	10-bit×10	10-bit×12	10-bit×10	10-bit×12	10-bit×10	10-bit×12	10-bit×10	10-bit×12	10-bit×10
	Sample and Hold	Yes													
	Multi-Channel Sample and Hold	Yes													
D/A Converter	Resolution×Channels	—													
Timer	8-bit	—													
	16-bit	8 (Timer A, Timer B)													
	Input Capture	—													
	Output Compare	—													
	PWM Output	5 (Timer A)													
	Real-Time Port	—													
	Event Counter	8 (Timer A, Timer B)													
	2-Phase Encoder Input	3 (Timer A)													
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)													
Watchdog Timer		1													
Serial Interface	Clock Sync./ Clock Async.	3 (UART)	2 (UART)	3 (UART)	2 (UART)	3 (UART)	2 (UART)	3 (UART)	2 (UART)	3 (UART)	2 (UART)	3 (UART)	2 (UART)	3 (UART)	2 (UART)
	Clock Sync. Only	—													
	Clock Async. Only	—													
I²C-bus		1 (UART)													
IEBus		1 (UART)													
Smart Card/SIM		1 (UART)													
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)													
CAN	Channels	—													
	Message Box (Numbers)	—													
IrDA		—													
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$)/CRC-16 ($X^{16}+X^{15}+X^2+1$))													
X/Y Converter		—													
I/O Ports	Input Only (Numbers)	—													
	CMOS I/O (Numbers)	39	33	39	33	39	33	39	33	39	33	39	33	39	33
	N-Channel Open Drain Port (Numbers)	—													
	High Current Drive Port	—													
	Pull-Up Resistor	39	33	39	33	39	33	39	33	39	33	39	33	39	33
External Interrupts Pins		11													
Debugging Function	On-Chip Debug	—		Yes		—		Yes		—		Yes			
	On-Board Flash Program	—		Yes		—		Yes		—		Yes			
Other Functions	ROM Correction Function	Yes (Address match×2)		—		Yes (Address match×2)		—		Yes (Address match×2)		—			
	Others	—													
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V												24MHz/4.2 to 5.5V, 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85												−40 to 85	−40 to 85
Package		PLQP0048KB-A	PRSP0042GA-B	PLQP0048KB-A	PRSP0042GA-B	PLQP0048KB-A	PRSP0042GA-B	PLQP0048KB-A	PRSP0042GA-B	PLQP0048KB-A	PRSP0042GA-B	PLQP0048KB-A	PRSP0042GA-B	PLQP0048KB-A	PRSP0042GA-B
Part No.		M30260M3A-XXXGP	M30263M3A-XXXFP	M30260F3AGP	M30263F3AFP	M30260M6A-XXXGP	M30263M6A-XXXFP	M30260F6AGP	M30263F6AFP	M30260M8A-XXXGP	M30263M8A-XXXFP	M30260F8AGP	M30263F8AFP	M30260F8BGP*	M30263F8BFP*

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/Tiny Series)

Group		M16C/28																M16C/28 (M16C/28B)	
Memory	ROM (Bytes)	48K+4K		64K		64K+4K		96K		96K+4K		128K		128K+4K					
	RAM (Bytes)	4K						8K				12K							
	ROM Type*1	F		M		F		M		F		M		F					
	Data Flash/E2 Data Flash	4K (Data Flash)		—		4K (Data Flash)		—		4K (Data Flash)		—		4K (Data Flash)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)					
CPU	CPU	M16C/60 Core																	
	Basic Instructions	91																	
	Minimum Instruction Execution Time (ns)	50 (@20MHz)																41.7 (@24MHz)	
	Multiplier	16×16→32																	
	Multiply-Accumulate Instruction	16×16+32→32																	
	Barrel Shifter	—																	
DMA	DMAC (Channels)	2																	
	DTC/DMAC II	—																	
External Bus Expansion	Address Space (Bytes)	—																	
	External Bus Interface	—																	
	Bus Structure	—																	
	DRAM Controller	—																	
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																	
	PLL	Yes																	
	Subclock	Yes																	
	RTC	—																	
	On-Chip Oscillator	Yes																	
	Oscillation Stop Detection	Yes																	
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																	
	Power Save	Wait/Stop																	
Power Supply Voltage Detection	Power-On Reset/POR	—																	
	Low Voltage Detection/LVD	Yes (Low voltage)																	
A/D Converter	Resolution×Channels	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13	10-bit×24	10-bit×13
	Sample and Hold	Yes																	
	Multi-Channel Sample and Hold	Yes																	
D/A Converter	Resolution×Channels	—																	
Timer	8-bit	—																	
	16-bit	8 (Timer A, Timer B)																	
	Input Capture	8 (Timer S)																	
	Output Compare	8 (Timer S)																	
	PWM Output	13 (Timer A, Timer S)																	
	Real-Time Port	—																	
	Event Counter	8 (Timer A, Timer B)																	
	2-Phase Encoder Input	3 (Timer A)+1 (Timer S)																	
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)																	
Watchdog Timer		1																	
Serial Interface	Clock Sync./ Clock Async.	3 (UART)																	
	Clock Sync. Only	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)
	Clock Async. Only	—																	
I²C-bus		2 (Multi master I²C, UART)																	
IEBus		1 (UART)																	
Smart Card/SIM		1 (UART)																	
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)																	
CAN	Channels	—																	
	Message Box (Numbers)	—																	
IrDA		—																	
CRC Calculation Circuit		—																	
X/Y Converter		—																	
I/O Ports	Input Only (Numbers)	—																	
	CMOS I/O (Numbers)	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55
	N-Channel Open Drain Port (Numbers)	—																	
	High Current Drive Port	—																	
	Pull-Up Resistor	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55
External Interrupts Pins		11																	
Debugging Function	On-Chip Debug	Yes		—		Yes		—		Yes		—		Yes					
	On-Board Flash Program	Yes		—		Yes		—		Yes		—		Yes					
Other Functions	ROM Correction Function	—		Yes (Address match×2)		—		Yes (Address match×2)		—		Yes (Address match×2)		—					
	Others	—																	
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V																24MHz/4.2 to 5.5V, 20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85	−20 to 85	−20 to 85, −40 to 85				−20 to 85	−20 to 85, −40 to 85			−20 to 85	−20 to 85, −40 to 85					−40 to 85	
Package		PLQP0080KB-A	PTLG0085JB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PTLG0085JB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PTLG0085JB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A
Part No.		M30280F6HP	M30280F6WG	M30281F6HP	M30280M8-XXXHP	M30281M8-XXXHP	M30280F8HP	M30280F8WG	M30281F8HP	M30280MA-XXXHP	M30281MA-XXXHP	M30280FAHP	M30280FAWG	M30281FAHP	M30280MC-XXXHP	M30281MC-XXXHP	M30280FCHP	M30281FCHP	M30280FCBHP*	M30281FCBHP*

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/Tiny Series)

Group		M16C/29									
Memory	ROM (Bytes)	64K		96K		96K + 4K		128K		128K + 4K	
	RAM (Bytes)	4K		8K				12K			
	ROM Type*1	M				F		M		F	
	Data Flash/E2 Data Flash	—				4K (Data Flash)		—		4K (Data Flash)	
	Program Security	—				Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)	
CPU	CPU	M16C/60 Core									
	Basic Instructions	91									
	Minimum Instruction Execution Time (ns)	50 (@20MHz)									
	Multiplier	16 × 16 → 32									
	Multiply-Accumulate Instruction	16 × 16 + 32 → 32									
	Barrel Shifter	—									
DMA	DMAC (Channels)	2									
	DTC/DMAC II	—									
External Bus Expansion	Address Space (Bytes)	—									
	External Bus Interface	—									
	Bus Structure	—									
	DRAM Controller	—									
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)									
	PLL	Yes									
	Subclock	Yes									
	RTC	—									
	On-Chip Oscillator	Yes									
	Oscillation Stop Detection	Yes									
	Frequency Divider	1/n (n = 1, 2, 4, 8, 16)									
	Power Save	Wait/Stop									
Power Supply Voltage Detection	Power-On Reset/POR	—									
	Low Voltage Detection/LVD	Yes (Low voltage)									
A/D Converter	Resolution × Channels	10-bit × 27	10-bit × 16	10-bit × 27	10-bit × 16	10-bit × 27	10-bit × 16	10-bit × 27	10-bit × 16	10-bit × 27	10-bit × 16
	Sample and Hold	Yes									
	Multi-Channel Sample and Hold	Yes									
D/A Converter	Resolution × Channels	—									
Timer	8-bit	—									
	16-bit	8 (Timer A, Timer B)									
	Input Capture	8 (Timer S)									
	Output Compare	8 (Timer S)									
	PWM Output	13 (Timer A, Timer S)									
	Real-Time Port	—									
	Event Counter	8 (Timer A, Timer B)									
	2-Phase Encoder Input	3 (Timer A) + 1 (Timer S)									
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead time timer)									
Watchdog Timer		1									
Serial Interface	Clock Sync./ Clock Async.	3 (UART)									
	Clock Sync. Only	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)
	Clock Async. Only	—									
I²C-bus		2 (Multi master I²C, UART)									
IEBus		1 (UART)									
Smart Card/SIM		1 (UART)									
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)									
CAN	Channels	1									
	Message Box (Numbers)	16									
IrDA		—									
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$)/CRC-16 ($X^{16}+X^{15}+X^2+1$))									
X/Y Converter		—									
I/O Ports	Input Only (Numbers)	—									
	CMOS I/O (Numbers)	71	55	71	55	71	55	71	55	71	55
	N-Channel Open Drain Port (Numbers)	—									
	High Current Drive Port	—									
	Pull-Up Resistor	71	55	71	55	71	55	71	55	71	55
External Interrupts Pins		11									
Debugging Function	On-Chip Debug	—				Yes		—		Yes	
	On-Board Flash Program	—				Yes		—		Yes	
Other Functions	ROM Correction Function	Yes (Address match × 2)				—		Yes (Address match × 2)		—	
	Others	—									
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V									
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85									
Package		PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A
Part No.		M30290M8-XXXHP	M30291M8-XXXHP	M30290MA-XXXHP	M30291MA-XXXHP	M30290FAHP	M30291FAHP	M30290MC-XXXHP	M30291MC-XXXHP	M30290FCHP	M30291FCHP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/6H Group)

Group		M16C/6H		
Memory	ROM (Bytes)	128K	256K	
	RAM (Bytes)	5K	8K	
	ROM Type*1	M		F
	Data Flash	—		
	Program Security	—		Yes (ID code check function, ROM code protect function)
CPU	CPU	M16C/60 Core		
	Basic Instructions	91		
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)		
	Multiplier	16×16→32		
	Multiply-Accumulate Instruction	16×16+32→32		
DMA	DMAC (Channels)	2		
Clock	Clock Generation Circuit	2 circuits (Main clock, Sub-clock)		
	PLL	—		
	Subclock	Yes		
	RTC	Yes		
	On-Chip Oscillator	—		
	Frequency Divider	1/n (n = 1, 2, 4, 8, 16)		
	Power Save	Normal operation (High-speed, Medium-speed, Low-speed, Low-power consumption)/Wait/Stop		
A/D Converter	Resolution×Channels	8-bit×(8+2)		
D/A Converter	Sample and Hold	—		
Timer	16-bit	11 (Timer A, Timer B)		
Watchdog Timer		1		
Serial Interface	Clock Sync./ Clock Async.	3 (UART0 to UART2)		
	Clock Sync. Only	2 (SI/O3, SI/O4)		
	Clock Async. Only	—		
I^2C-bus		4 (UART0 to UART2+Multi master I^2C)		
IEBus		1 (UART2)		
Smart Card/SIM		1 (UART2)		
Synchronous Serial Communication Unit/Special Serial I/O		—		
CAN	Channels	—		
	Message Box (Numbers)	—		
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))		
I/O Ports	Input Only (Numbers)	1		
	CMOS Output Only (Numbers)	—	1	
	CMOS I/O (Numbers)	79		
	N-Channel Open Drain Port (Numbers)	4		
External Interrupts Pins		8		
Debugging Function	On-Board Flash Program	—		Yes
Other Functions	ROM Correction Function	Yes (Adress match×4)		—
	Others	VBI Data slicer (PDC, VPS, WSS, EPG-J, CCD, CC2X, ID-1)		
Operating Frequency/Supply Voltage		16MHz/4.5 to 5.5V		
Operating Ambient Temperature (°C)		−20 to 70		
Package		PRQP0100JB-A		
Part No.		M306H7MC-XXXFP	M306H7MG-XXXFP	M306H7FGFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/6S Group)

Group		M16C/6S
Memory	ROM (Bytes)	96K
	RAM (Bytes)	24K
	ROM Type*1	F
	Data Flash	—
	Program Security	Yes (ID code check function, ROM code protect function)
CPU	CPU	M16C/60 Core
	Basic Instructions	91
	Minimum Instruction Execution Time (ns)	65.1 (@15.36MHz)
	Multiplier	16×16→32
	Multiply-Accumulate Instruction	16×16+32→32
	Barrel Shifter	—
DMA	DMAC (Channels)	2
	DTC/DMAC II	—
External Bus Expansion	Address Space (Bytes)	—
	External Bus Interface	—
	Bus Structure	—
	DRAM Controller	—
Clock	Clock Generation Circuit	2 circuits (Main clock, On-chip oscillator)
	PLL	—
	Subclock	—
	Real Time clock	—
	On-Chip Oscillator	Yes
	Oscillation Stop Detection	—
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)
	Power Save	Normal operation (High-speed, Medium-speed)/Wait/Stop
Power Supply Voltage Detection	Power-On Reset/POR	—
	Low Voltage Detection/LVD	—
A/D Converter	Resolution×Channels	—
	Sample and Hold	—
	Multi-Channel Sample and Hold	—
D/A Converter	Resolution×Channels	—
Timer	8-bit	—
	16-bit	5 (Timer A)
	Input Capture	—
	Output Compare	—
	PWM Output	—
	Real-Time Port	—
	Event Counter	—
	2-Phase Encoder Input	—
	3-Phase Inverter Control	—
Watchdog Timer		—
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART1)
	Clock Sync. Only	2 (SI/O4 is internally connected to IT800)
	Clock Async. Only	1 (UART2)
I²C-bus		3 (UART0 to UART2)
IEBus		—
Smart Card/SIM		—
Synchronous Serial Communication Unit/Special Serial I/O		—
CAN	Channels	—
	Message Box (Numbers)	—
IrDA		—
CRC Calculation Circuit		—
X/Y Converter		—
I/O Ports	Input Only (Numbers)	1
	CMOS I/O (Numbers)	20
	N-Channel Open Drain Port (Numbers)	1 (P7_0)
	High Current Drive Port	—
	Pull-Up Resistor	20 (Pull-up resistor can be set every four ports)
External Interrupts Pins		3 (INT1-INT3)
Debugging Function	On-Chip Debug	Yes
	On-Board Flash Program	Yes
Other Functions	ROM Correction Function	—
	Others	Power line communication function
Operating Frequency/Supply Voltage		15.36MHz/3.0 to 3.6V
Operating Ambient Temperature (°C)		−20 to 85, −40 to 85
Package		PLQP0064KB-A
Part No.		M306S0FAGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (M16C/39P Group)

Group		M16C/39P	
Memory	ROM (Bytes)	128K	192K
	RAM (Bytes)	5K	6K
	ROM Type*1	M	
	Data Flash	—	
	Program Security	—	
CPU	CPU	M16C/60 Core	
	Basic Instructions	91	
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)	
	Multiplier	16×16→32	
	Multiply-Accumulate Instruction	16×16+32→32	
DMA	DMAC (Channels)	2	
Clock	Clock Generation Circuit	2 circuits (Main clock, Sub clock)	
	PLL	—	
	Subclock	Yes (32.768kHz)	
	On-Chip Oscillator	—	
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)	
	Power Save	Normal operation (High-speed, Medium-speed, Low-speed, Low-power consumption)/Wait/Stop	
A/D Converter	Resolution×Channels	10-bit×18	
D/A Converter	Resolution×Channels	—	
Timer	16-bit	6 (Timer A, Timer B)	
	PWM Output	3 (shared with Timer A)	
	Event Counter	6 (shared with Timer A, Timer B)	
	2-Phase Encoder Input	1 (shared with Timer A2)	
Watchdog Timer		1	
Serial Interface	Clock Sync./ Clock Async.	2 (UART1, UART2)	
	Clock Sync. Only	1 (used in UART0, VFD Controller)	
I^2C-bus		2 (shared with UART1, UART2)	
IEBus		1 (shared with UART2)	
Smart Card/SIM		1 (shared with UART2)	
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART2 : Special mode 2)	
VFD		High Current Drive Port 34 (Segment (Numbers) ≦ 32, 2 ≦ Digit (Numbers) ≦ 16)	
CRC Calculation Circuit		1 (CRC-CCITT ($X^{16}+X^{12}+X^5+1$))	
I/O Ports	Input Only (Numbers)	1	
	CMOS I/O (Numbers)	51	
	High Current Drive Port	34	
	N-Channel Open Drain Port (Numbers)	2 (P7_0, P7_1)	
	Pull-Up Resistor	51 (Pull-up resistor can be set every four ports)	
External Interrupts Pins		7	
Other Functions	ROM Correction Function	Yes (Address match×2)	
	Others	—	
Operating Frequency/Supply Voltage		When using VFD:16MHz/4.5 to 5.5V, 10MHz/3.0 to 3.6V, When not using VFD:16MHz/4.2 to 5.5V, 10MHz/2.7 to 5.5V	
Operating Ambient Temperature (°C)		−20 to 75	
Package		PRQP0100JB-A	
Part No.		M30392MCP-XXXFP	M30392MEP-XXXFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/18				R8C/19			
Memory	ROM (Bytes)	4K	8K	12K	16K	4K+2K	8K+2K	12K+2K	16K+2K
	RAM (Bytes)	384	512	768	1K	384	512	768	1K
	ROM Type*1	F							
	Data Flash / E2 Data Flash	—				2K (Data Flash : program/erase 10k times)			
	Program Security	Yes (ID code check function, ROM code protect function)							
CPU	CPU	R8C Core							
	Basic Instructions	89							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
Clock	Clock Generation Circuit	3 circuits (Main clock, High speed on-chip oscillator, Low speed on-chip oscillator)							
	PLL	—							
	Subclock	—							
	Real Time clock	—							
	On-Chip Oscillator	2 circuits (High precision, High speed : 8MHz, Low speed : 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	Yes							
	Low Voltage Detection/LVD	Yes (Voltage detection 2)							
A/D Converter	Resolution×Channels	—							
	Sample and Hold	—							
D/A Converter	Resolution×Channels	—							
Timer	8-bit	2 (Timer X, Timer Z)							
	16-bit	1 (Timer C)							
	Input Capture	1 (shaed with Timer C)							
	Output Compare	1 (shaed with Timer C)							
	PWM Output	1 (shaed with Timer Z)							
	Real-Time Port	—							
	Event Counter	1 (shaed with Timer X)							
	2-Phase Encoder Input	—							
	3-Phase Inverter Control	—							
Watchdog Timer		1 (with automatic starting function and clock source protection function)							
Serial Interface	Clock Sync./ Clock Async.	1 (UART0)							
	Clock Sync. Only	—							
	Clock Async. Only	1 (UART1)							
I²C-bus		—							
Synchronous Serial Communication Unit/Special Serial I/O		—							
CAN	Channels	—							
	Message Box (Numbers)	—							
I/O Ports	Input Only (Numbers)	3							
	CMOS Output Only (Numbers)	—							
	CMOS I/O (Numbers)	13							
	N-Channel Open Drain Port (Numbers)	—							
	High Current Drive Port	4							
	Pull-Up Resistor	13							
External Interrupts Pins		7							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	comparator							
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V							
Operating Ambient Temperature (°C)		−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85
Package		PRDP0020BA-A	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A
Part No.		R5F21181DD	R5F21181DSP	R5F21181SP	R5F21182DD	R5F21182DSP	R5F21182NP	R5F21182SP	R5F21183DD

Group		−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A
Part No.		R5F21183DSP	R5F21183NP	R5F21183SP	R5F21184DD	R5F21184DSP	R5F21184NP	R5F21184SP	R5F21191DD	R5F21191DSP	R5F21191SP	R5F21192DD	R5F21192DSP	R5F21192NP	R5F21192SP	R5F21193DD	R5F21193DSP	R5F21193NP	R5F21193SP	R5F21194DD	R5F21194DSP	R5F21194NP	R5F21194SP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (R8C/Tiny Series)

Group		R8C/1A				R8C/1B			
Memory	ROM (Bytes)	4K	8K	12K	16K	4K + 2K	8K + 2K	12K + 2K	16K + 2K
	RAM (Bytes)	384	512	768	1K	384	512	768	1K
	ROM Type*[1]	F							
	Data Flash / E2 Data Flash	–				2K (Data Flash : program/erase 10k times)			
	Program Security	Yes (ID code check function, ROM code protect function)							
CPU	CPU	R8C Core							
	Basic Instructions	89							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
Clock	Clock Generation Circuit	3 circuits (Main clock, High speed on-chip oscillator, Low speed on-chip oscillator)							
	PLL	–							
	Subclock	–							
	Real Time clock	–							
	On-Chip Oscillator	2 circuits (High precision, High speed : 8MHz, Low speed : 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	Yes							
	Low Voltage Detection/LVD	Yes (Voltage detection 2)							
A/D Converter	Resolution×Channels	10-bit×4							
	Sample and Hold	Yes							
D/A Converter	Resolution×Channels	–							
Timer	8-bit	2 (Timer X, Timer Z)							
	16-bit	1 (Timer C)							
	Input Capture	1 (shared with Timer C)							
	Output Compare	1 (shared with Timer C)							
	PWM Output	1 (shared with Timer Z)							
	Real-Time Port	–							
	Event Counter	1 (shared with Timer X)							
	2-Phase Encoder Input	–							
	3-Phase Inverter Control	–							
Watchdog Timer		1 (with automatic starting function and clock source protection function)							
Serial Interface	Clock Sync./ Clock Async.	1 (UART0)							
	Clock Sync. Only	–							
	Clock Async. Only	1 (UART1)							
I²C-bus		1 (shared with Synchronous Serial Communication Unit)							
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)							
CAN	Channels	–							
	Message Box (Numbers)	–							
I/O Ports	Input Only (Numbers)	3							
	CMOS Output Only (Numbers)	–							
	CMOS I/O (Numbers)	13							
	N-Channel Open Drain Port (Numbers)	–							
	High Current Drive Port	4							
	Pull-Up Resistor	13							
External Interrupts Pins		7							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	–							
	Others	–							
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V							

Operating Ambient Temperature (°C)	–20 to 85	–40 to 85	–20 to 85		–40 to 85	–20 to 85			–40 to 85	–20 to 85			–40 to 85	–20 to 85			–40 to 85	–20 to 85		–40 to 85	–20 to 85			–40 to 85	–20 to 85			–40 to 85	–20 to 85	
Package	PRDP0020BA-A	PLSP0020JB-A		PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A		PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A	PRDP0020BA-A	PLSP0020JB-A	PWQN0028KA-B	PLSP0020JB-A
Part No.	R5F211A1DD	R5F211A1DSP	R5F211A1SP	R5F211A2DD	R5F211A2DSP	R5F211A2NP	R5F211A2SP	R5F211A3DD	R5F211A3DSP	R5F211A3NP	R5F211A3SP	R5F211A4DD	R5F211A4DSP	R5F211A4NP	R5F211A4SP	R5F211B1DD	R5F211B1DSP	R5F211B1SP	R5F211B2DD	R5F211B2DSP	R5F211B2NP	R5F211B2SP	R5F211B3DD	R5F211B3DSP	R5F211B3NP	R5F211B3SP	R5F211B4DD	R5F211B4DSP	R5F211B4NP	R5F211B4SP

*[1] F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/22			R8C/23		
Memory	ROM (Bytes)	32K	48K	64K	32K+2K	48K+2K	64K+2K
	RAM (Bytes)	2K	2.5K	3K	2K	2.5K	3K
	ROM Type*1	F					
	Data Flash / E2 Data Flash	—			2K (Data Flash : program/erase 10k times)		
	Program Security	Yes (ID code check function, ROM code protect function)					
CPU	CPU	R8C Core					
	Basic Instructions	89					
	Minimum Instruction Execution Time (ns)	50 (@20MHz)					
	Multiplier	16×16→32					
	Multiply-Accumulate Instruction	16×16+32→32					
Clock	Clock Generation Circuit	3 circuits (Main clock, High speed on-chip oscillator, Low speed on-chip oscillator)					
	PLL	—					
	Subclock	—					
	Real Time clock	—					
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)					
	Oscillation Stop Detection	Yes					
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)					
	Power Save	Wait/Stop					
Power Supply Voltage Detection	Power-On Reset/POR	Yes					
	Low Voltage Detection/LVD	Yes (Voltage detection 2)					
A/D Converter	Resolution×Channels	10-bit×12					
	Sample and Hold	Yes					
D/A Converter	Resolution×Channels	—					
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)					
	16-bit	2 (Timer RD)					
	Input Capture	8 (shared with Timer RD)					
	Output Compare	9 (shared with Timer RD, Timer RE)					
	PWM Output	7 (shared with Timer RB, Timer RD)					
	Real-Time Port	—					
	Event Counter	1 (shared with Timer RA)					
	2-Phase Encoder Input	—					
	3-Phase Inverter Control	1 (shared with Timer RD)					
Watchdog Timer		1 (with automatic starting function and clock source protection function)					
Serial Interface	Clock Sync./ Clock Async.	1 (UART0)					
	Clock Sync. Only	—					
	Clock Async. Only	1 (UART1)					
I²C-bus		1 (shared with Synchronous Serial Communication Unit)					
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)					
CAN	Channels	1					
	Message Box (Numbers)	16					
I/O Ports	Input Only (Numbers)	3					
	CMOS Output Only (Numbers)	—					
	CMOS I/O (Numbers)	41					
	N-Channel Open Drain Port (Numbers)	—					
	High Current Drive Port	—					
	Pull-Up Resistor	41					
External Interrupts Pins		8					
Debugging Function	On-Chip Debug	Yes					
	On-Board Flash Program	Yes					
Other Functions	ROM Correction Function	—					
	Others	—					
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V					
Operating Ambient Temperature (°C)		−40 to 85					
Package		PLQP0048KB-A					
Part No.		R5F21226DFP	R5F21227DFP	R5F21228DFP	R5F21236DFP	R5F21237DFP	R5F21238DFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (R8C/Tiny Series)

Group		R8C/24					R8C/25				
Memory	ROM (Bytes)	16K	24K	32K	48K	64K	16K+2K	24K+2K	32K+2K	48K+2K	64K+2K
	RAM (Bytes)	1K	2K		2.5K	3K	1K	2K		2.5K	3K
	ROM Type*1	F									
	Data Flash / E2 Data Flash	—					2K (Data Flash : program/erase 10k times)				
	Program Security	Yes (ID code check function, ROM code protect function)									
CPU	CPU	R8C Core									
	Basic Instructions	89									
	Minimum Instruction Execution Time (ns)	50 (@20MHz)									
	Multiplier	16×16→32									
	Multiply-Accumulate Instruction	16×16+32→32									
Clock	Clock Generation Circuit	4 circuits (Main clock, Sub clock, High speed on-chip oscillator, Low speed on-chip oscillator)									
	PLL	—									
	Subclock	Yes (32.768kHz)									
	Real Time clock	Yes (Timer RE)									
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)									
	Oscillation Stop Detection	Yes									
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)									
	Power Save	Wait/Stop									
Power Supply Voltage Detection	Power-On Reset/POR	Yes									
	Low Voltage Detection/LVD	Yes (Voltage detection 3)									
A/D Converter	Resolution×Channels	10-bit×12									
	Sample and Hold	Yes									
D/A Converter	Resolution×Channels	—									
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)									
	16-bit	2 (Timer RD)									
	Input Capture	8 (shared with Timer RD)									
	Output Compare	9 (shared with Timer RD, Timer RE)									
	PWM Output	7 (shared with Timer RB, Timer RD)									
	Real-Time Port	—									
	Event Counter	1 (shared with Timer RA)									
	2-Phase Encoder Input	—									
	3-Phase Inverter Control	1 (shared with Timer RD)									
Watchdog Timer		1 (with automatic starting function and clock source protection function)									
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART1)									
	Clock Sync. Only	—									
	Clock Async. Only	—									
I²C-bus		1 (shared with Synchronous Serial Communication Unit)									
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)									
CAN	Channels	—									
	Message Box (Numbers)	—									
I/O Ports	Input Only (Numbers)	3									
	CMOS Output Only (Numbers)	—									
	CMOS I/O (Numbers)	41									
	N-Channel Open Drain Port (Numbers)	—									
	High Current Drive Port	8									
	Pull-Up Resistor	41									
External Interrupts Pins		8									
Debugging Function	On-Chip Debug	Yes									
	On-Board Flash Program	Yes									
Other Functions	ROM Correction Function	—									
	Others	—									
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V, 5MHz/2.2 to 5.5V									
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0052JA-A	PTLG0064JA-A	PLQP0052JA-A	PTLG0064JA-A	PLQP0052JA-A	PTLG0064JA-A	PLQP0052JA-A	PTLG0064JA-A	PLQP0052JA-A	
Part No.		R5F21244SDFP	R5F21244SNFP	R5F21244SNLG	R5F21245SDFP	R5F21245SNFP	R5F21246SDFP	R5F21246SNFP	R5F21246SNLG	R5F21247SDFP	R5F21247SNFP
		R5F21248SDFP	R5F21248SNFP	R5F21254SDFP	R5F21254SNFP	R5F21254SNLG	R5F21255SDFP	R5F21255SNFP	R5F21256SDFP	R5F21256SNFP	R5F21256SNLG
		R5F21257SDFP	R5F21257SNFP	R5F21258SDFP	R5F21258SNFP						

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/26				R8C/27				R8C/28		R8C/29	
Memory	ROM (Bytes)	8K	16K	24K	32K	8K+2K	16K+2K	24K+2K	32K+2K	8K	16K	8K+2K	16K+2K
	RAM (Bytes)	512	1K	1.5K		512	1K	1.5K		512	1K	512	1K
	ROM Type*1	F											
	Data Flash / E2 Data Flash	—				2K (Data Flash : program/erase 10k times)				—		2K (Data Flash : program/erase 10k times)	
	Program Security	Yes (ID code check function, ROM code protect function)											
CPU	CPU	R8C Core											
	Basic Instructions	89											
	Minimum Instruction Execution Time (ns)	50 (@20MHz)											
	Multiplier	16×16→32											
	Multiply-Accumulate Instruction	16×16+32→32											
Clock	Clock Generation Circuit	4 circuits (Main clock, Sub clock, High speed on-chip oscillator, Low speed on-chip oscillator)											
	PLL	—											
	Subclock	Yes (32.768kHz)											
	Real Time clock	Yes (Timer RE)											
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	Yes											
	Low Voltage Detection/LVD	Yes (Voltage detection 3)											
A/D Converter	Resolution×Channels	10-bit×12								10-bit×4			
	Sample and Hold	Yes											
D/A Converter	Resolution×Channels	—											
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)											
	16-bit	1 (Timer RC)											
	Input Capture	4 (shared with Timer RC)											
	Output Compare	5 (shared with Timer RC, Timer RE)											
	PWM Output	4 (shared with Timer RB, Timer RC)											
	Real-Time Port	—											
	Event Counter	1 (shared with Timer RA)											
	2-Phase Encoder Input	—											
	3-Phase Inverter Control	—											
Watchdog Timer		1 (with automatic starting function and clock source protection function)											
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART1)								1 (UART0)			
	Clock Sync. Only	—											
	Clock Async. Only	—								1 (UART1)			
I²C-bus		1 (shared with Synchronous Serial Communication Unit)											
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)											
CAN	Channels	—											
	Message Box (Numbers)	—											
I/O Ports	Input Only (Numbers)	3											
	CMOS Output Only (Numbers)	—											
	CMOS I/O (Numbers)	25								13			
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	8											
	Pull-Up Resistor	25								13			
External Interrupts Pins		7											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	—											
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V, 5MHz/2.2 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0032GB-A								PLSP0020JB-A			
Part No.		R5F21262SDFP	R5F21262SNFP	R5F21264SDFP	R5F21264SNFP	R5F21265SDFP	R5F21265SNFP	R5F21266SDFP	R5F21266SNFP	R5F21272SDFP	R5F21272SNFP	R5F21274SDFP	R5F21274SNFP	R5F21275SDFP	R5F21275SNFP	R5F21276SDFP	R5F21276SNFP	R5F21282SDSP	R5F21282SNSP	R5F21284SDSP	R5F21284SNSP	R5F21292SDSP	R5F21292SNSP	R5F21294SDSP	R5F21294SNSP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (R8C/Tiny Series)

Group		R8C/2A				R8C/2B			
Memory	ROM (Bytes)	48K	64K	96K	128K	48K+2K	64K+2K	96K+2K	128K+2K
	RAM (Bytes)	2.5K	3K	7K	7.5K	2.5K	3K	7K	7.5K
	ROM Type*1	F							
	Data Flash / E2 Data Flash	—				2K (Data Flash : program/erase 10k times)			
	Program Security	Yes (ID code check function, ROM code protect function)							
CPU	CPU	R8C Core							
	Basic Instructions	89							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
Clock	Clock Generation Circuit	4 circuits (Main clock, Sub clock, High speed on-chip oscillator, Low speed on-chip oscillator)							
	PLL	—							
	Subclock	Yes (32.768kHz)							
	Real Time clock	Yes (Timer RE)							
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	Yes							
	Low Voltage Detection/LVD	Yes (Voltage detection 3)							
A/D Converter	Resolution×Channels	10-bit×12							
	Sample and Hold	Yes							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)							
	16-bit	4 (Timer RC, Timer RD, Timer RF)							
	Input Capture	13 (shared with Timer RC, Timer RD, Timer RF)							
	Output Compare	14 (shared with Timer RC, Timer RD, Timer RE, Timer RF)							
	PWM Output	10 (shared with Timer RB, Timer RC, Timer RD)							
	Real-Time Port	—							
	Event Counter	1 (shared with Timer RA)							
	2-Phase Encoder Input	—							
	3-Phase Inverter Control	1 (shared with Timer RD)							
Watchdog Timer		1 (with automatic starting function and clock source protection function)							
Serial Interface	Clock Sync./ Clock Async.	3 (UART0 to UART2)							
	Clock Sync. Only	—							
	Clock Async. Only	—							
I²C-bus		1 (shared with Synchronous Serial Communication Unit)							
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)							
CAN	Channels	—							
	Message Box (Numbers)	—							
I/O Ports	Input Only (Numbers)	2							
	CMOS Output Only (Numbers)	—							
	CMOS I/O (Numbers)	55							
	N-Channel Open Drain Port (Numbers)	—							
	High Current Drive Port	8							
	Pull-Up Resistor	55							
External Interrupts Pins		8							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	—							
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V, 5MHz/2.2 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A
Part No.		R5F212A7SDFA	R5F212A7SDFP	R5F212A7SNFA	R5F212A7SNFP	R5F212A7SNLG*	R5F212A8SDFA	R5F212A8SDFP	R5F212A8SNFA

Group		R8C/2A																			
Memory	ROM (Bytes)	48K																			
	RAM (Bytes)	2.5K																			
	ROM Type*1																				
	Data Flash / E2 Data Flash																				
	Program Security																				
CPU	CPU																				
	Basic Instructions																				
	Minimum Instruction Execution Time (ns)																				
	Multiplier																				
	Multiply-Accumulate Instruction																				
Clock	Clock Generation Circuit																				
	PLL																				
	Subclock																				
	Real Time clock																				
	On-Chip Oscillator																				
	Oscillation Stop Detection																				
	Frequency Divider																				
	Power Save																				
Power Supply Voltage Detection	Power-On Reset/POR																				
	Low Voltage Detection/LVD																				
A/D Converter	Resolution×Channels																				
	Sample and Hold																				
D/A Converter	Resolution×Channels																				
Timer	8-bit																				
	16-bit																				
	Input Capture																				
	Output Compare																				
	PWM Output																				
	Real-Time Port																				
	Event Counter																				
	2-Phase Encoder Input																				
	3-Phase Inverter Control																				
Watchdog Timer																					
Serial Interface	Clock Sync./ Clock Async.																				
	Clock Sync. Only																				
	Clock Async. Only																				
I²C-bus																					
Synchronous Serial Communication Unit/Special Serial I/O																					
CAN	Channels																				
	Message Box (Numbers)																				
I/O Ports	Input Only (Numbers)																				
	CMOS Output Only (Numbers)																				
	CMOS I/O (Numbers)																				
	N-Channel Open Drain Port (Numbers)																				
	High Current Drive Port																				
	Pull-Up Resistor																				
External Interrupts Pins																					
Debugging Function	On-Chip Debug																				
	On-Board Flash Program																				
Other Functions	ROM Correction Function																				
	Others																				
Operating Frequency/Supply Voltage																					
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	
Part No.		R5F212A8SNFP	R5F212A8SNLG*	R5F212AASDFA	R5F212AASDFP	R5F212AASNFA	R5F212AASNFP	R5F212AASNLG*	R5F212ACSDFA	R5F212ACSDFP	R5F212ACSNFA	R5F212ACSNFP	R5F212ACSNLG*	R5F212B7SDFA	R5F212B7SDFP	R5F212B7SNFA	R5F212B7SNFP	R5F212B7SNLG*	R5F212B8SDFA	R5F212B8SDFP	

Group		R8C/2B																			
Memory	ROM (Bytes)	48K+2K																			
	RAM (Bytes)	2.5K																			
	ROM Type*1																				
	Data Flash / E2 Data Flash																				
	Program Security																				
CPU	CPU																				
	Basic Instructions																				
	Minimum Instruction Execution Time (ns)																				
	Multiplier																				
	Multiply-Accumulate Instruction																				
Clock	Clock Generation Circuit																				
	PLL																				
	Subclock																				
	Real Time clock																				
	On-Chip Oscillator																				
	Oscillation Stop Detection																				
	Frequency Divider																				
	Power Save																				
Power Supply Voltage Detection	Power-On Reset/POR																				
	Low Voltage Detection/LVD																				
A/D Converter	Resolution×Channels																				
	Sample and Hold																				
D/A Converter	Resolution×Channels																				
Timer	8-bit																				
	16-bit																				
	Input Capture																				
	Output Compare																				
	PWM Output																				
	Real-Time Port																				
	Event Counter																				
	2-Phase Encoder Input																				
	3-Phase Inverter Control																				
Watchdog Timer																					
Serial Interface	Clock Sync./ Clock Async.																				
	Clock Sync. Only																				
	Clock Async. Only																				
I²C-bus																					
Synchronous Serial Communication Unit/Special Serial I/O																					
CAN	Channels																				
	Message Box (Numbers)																				
I/O Ports	Input Only (Numbers)																				
	CMOS Output Only (Numbers)																				
	CMOS I/O (Numbers)																				
	N-Channel Open Drain Port (Numbers)																				
	High Current Drive Port																				
	Pull-Up Resistor																				
External Interrupts Pins																					
Debugging Function	On-Chip Debug																				
	On-Board Flash Program																				
Other Functions	ROM Correction Function																				
	Others																				
Operating Frequency/Supply Voltage																					
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A	PLQP0064GA-A	PLQP0064KB-A	PLQP0064GA-A	PLQP0064KB-A	PTLG0064JA-A
Part No.		R5F212B8SNFA	R5F212B8SNFP	R5F212B8SNLG*	R5F212BASDFA	R5F212BASDFP	R5F212BASNFA	R5F212BASNFP	R5F212BASNLG*	R5F212BCSDFA	R5F212BCSDFP	R5F212BCSNFA	R5F212BCSNFP	R5F212BCSNLG*							

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/2C				R8C/2D			
Memory	ROM (Bytes)	48K	64K	96K	128K	48K+2K	64K+2K	96K+2K	128K+2K
	RAM (Bytes)	2.5K	3K	7K	7.5K	2.5K	3K	7K	7.5K
	ROM Type*1	F							
	Data Flash / E2 Data Flash	—				2K (Data Flash : program/erase 10k times)			
	Program Security	Yes (ID code check function, ROM code protect function)							
CPU	CPU	R8C Core							
	Basic Instructions	89							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
Clock	Clock Generation Circuit	4 circuits (Main clock, Sub clock, High speed on-chip oscillator, Low speed on-chip oscillator)							
	PLL	—							
	Subclock	Yes (32.768kHz)							
	Real Time clock	Yes (Timer RE)							
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	Yes							
	Low Voltage Detection/LVD	Yes (Voltage detection 3)							
A/D Converter	Resolution×Channels	10-bit×20							
	Sample and Hold	Yes							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)							
	16-bit	4 (Timer RC, Timer RD, Timer RF)							
	Input Capture	13 (shared with Timer RC, Timer RD, Timer RF)							
	Output Compare	14 (shared with Timer RC, Timer RD, Timer RE, Timer RF)							
	PWM Output	10 (shared with Timer RB, Timer RC, Timer RD)							
	Real-Time Port	—							
	Event Counter	1 (shared with Timer RA)							
	2-Phase Encoder Input	—							
	3-Phase Inverter Control	1 (shared with Timer RD)							
Watchdog Timer		1 (with automatic starting function and clock source protection function)							
Serial Interface	Clock Sync./ Clock Async.	3 (UART0 to UART2)							
	Clock Sync. Only	—							
	Clock Async. Only	—							
I²C-bus		1 (shared with Synchronous Serial Communication Unit)							
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)							
CAN	Channels	—							
	Message Box (Numbers)	—							
I/O Ports	Input Only (Numbers)	2							
	CMOS Output Only (Numbers)	—							
	CMOS I/O (Numbers)	71							
	N-Channel Open Drain Port (Numbers)	—							
	High Current Drive Port	8							
	Pull-Up Resistor	71							
External Interrupts Pins		8							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	—							
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V, 5MHz/2.2 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0080KB-A							
Part No.		R5F212C7SDFP	R5F212C7SNFP	R5F212C8SDFP	R5F212C8SNFP	R5F212CASDFP	R5F212CASNFP	R5F212CCSDFP	R5F212CCSNFP	R5F212D7SDFP	R5F212D7SNFP	R5F212D8SDFP	R5F212D8SNFP	R5F212DASDFP	R5F212DASNFP	R5F212DCSDFP	R5F212DCSNFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (R8C/Tiny Series)

Group		R8C/2E				R8C/2F			
Memory	ROM (Bytes)	8K		16K		8K+2K		16K+2K	
	RAM (Bytes)	512		1K		512		1K	
	ROM Type*1	F							
	Data Flash / E2 Data Flash	—				2K (Data Flash : program/erase 10k times)			
	Program Security	Yes (ID code check function, ROM code protect function)							
CPU	CPU	R8C Core							
	Basic Instructions	89							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
Clock	Clock Generation Circuit	3 circuits (Main clock, High speed on-chip oscillator, Low speed on-chip oscillator)							
	PLL	—							
	Subclock	—							
	Real Time clock	—							
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	Yes							
	Low Voltage Detection/LVD	Yes (Voltage detection 2)							
A/D Converter	Resolution×Channels	10-bit×12							
	Sample and Hold	Yes							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)							
	16-bit	1 (Timer RC)							
	Input Capture	4 (shared with Timer RC)							
	Output Compare	5 (shared with Timer RC, Timer RE)							
	PWM Output	4 (shared with Timer RB, Timer RC)							
	Real-Time Port	—							
	Event Counter	1 (shared with Timer RA)							
	2-Phase Encoder Input	—							
	3-Phase Inverter Control	—							
Watchdog Timer		1 (with automatic starting function and clock source protection function)							
Serial Interface	Clock Sync./ Clock Async.	1 (UART0)							
	Clock Sync. Only	—							
	Clock Async. Only	—							
I²C-bus		—							
Synchronous Serial Communication Unit/Special Serial I/O		—							
CAN	Channels	—							
	Message Box (Numbers)	—							
I/O Ports	Input Only (Numbers)	3							
	CMOS Output Only (Numbers)	—							
	CMOS I/O (Numbers)	25							
	N-Channel Open Drain Port (Numbers)	—							
	High Current Drive Port	8							
	Pull-Up Resistor	25							
External Interrupts Pins		7							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	comparator×2							
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0032GB-A							
Part No.		R5F212E2DFP*	R5F212E2NFP*	R5F212E4DFP*	R5F212E4NFP*	R5F212F2DFP*	R5F212F2NFP*	R5F212F4DFP*	R5F212F4NFP*

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Oz : OzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/2G						R8C/2H				R8C/2J			
Memory	ROM (Bytes)	16K		24K		32K		4K		8K		2K		4K	
	RAM (Bytes)	512		1K				256		384		256		384	
	ROM Type*1	F													
	Data Flash / E2 Data Flash	—													
	Program Security	Yes (ID code check function, ROM code protect function)													
CPU	CPU	R8C Core													
	Basic Instructions	89													
	Minimum Instruction Execution Time (ns)	125 (@8MHz)													
	Multiplier	16×16→32													
	Multiply-Accumulate Instruction	16×16+32→32													
Clock	Clock Generation Circuit	3 circuits (Main clock, High speed on-chip oscillator, Low speed on-chip oscillator)										2 circuits (High speed on-chip oscillator, Low speed on-chip oscillator)			
	PLL	—													
	Subclock	Yes (32.768KHz)										—			
	Real Time clock	Yes (Timer RE)										—			
	On-Chip Oscillator	2 circuits (High precision, High speed : 8MHz, Low speed : 125kHz)													
	Oscillation Stop Detection	—													
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)													
	Power Save	Wait/Stop													
Power Supply Voltage Detection	Power-On Reset/POR	Yes													
	Low Voltage Detection/LVD	Yes (Voltage detection 3)													
A/D Converter	Resolution×Channels	—													
	Sample and Hold	—													
D/A Converter	Resolution×Channels	—													
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)										2 (Timer RA, Timer RB)			
	16-bit	1 (Timer RF)													
	Input Capture	1 (shared with Timer RF)													
	Output Compare	2 (shared with Timer RE, Timer RF)										1 (shared with Timer RF)			
	PWM Output	1 (shared with Timer RB)													
	Real-Time Port	—													
	Event Counter	1 (shared with Timer RA)													
	2-Phase Encoder Input	—													
	3-Phase Inverter Control	—													
Watchdog Timer		1 (with automatic starting function and clock source protection function)													
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART2)										1 (UART0)			
	Clock Sync. Only	—													
	Clock Async. Only	—													
I²C-bus		—													
Synchronous Serial Communication Unit/Special Serial I/O		—													
CAN	Channels	—													
	Message Box (Numbers)	—													
I/O Ports	Input Only (Numbers)	—													
	CMOS Output Only (Numbers)	1										—			
	CMOS I/O (Numbers)	27						15				12			
	N-Channel Open Drain Port (Numbers)	—													
	High Current Drive Port	—													
	Pull-Up Resistor	27						15				12			
External Interrupts Pins		8						6							
Debugging Function	On-Chip Debug	Yes													
	On-Board Flash Program	Yes													
Other Functions	ROM Correction Function	—													
	Others	comparator×2 (shared with voltage monitor 1 and 2)													
Operating Frequency/Supply Voltage		8MHz/2.7 to 5.5V, 4MHz/2.2 to 5.5V													
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0032GB-A						PLSP0020JB-A							
Part No.		R5F212G4SDFP*	R5F212G4SNFP*	R5F212G5SDFP*	R5F212G5SNFP*	R5F212G6SDFP*	R5F212G6SNFP*	R5F212H1SDSP*	R5F212H1SNSP*	R5F212H2SDSP*	R5F212H2SNSP*	R5F212J0SDSP*	R5F212J0SNSP*	R5F212J1SDSP*	R5F212J1SNSP*

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

• Specifications (R8C/Tiny Series)

Group		R8C/2K				R8C/2L			
Memory	ROM (Bytes)	8K		16K		8K+2K		16K+2K	
	RAM (Bytes)	1K		1.5K		1K		1.5K	
	ROM Type*1	F							
	Data Flash / E2 Data Flash	—				2K (Data Flash : program/erase 10k times)			
	Program Security	Yes (ID code check function, ROM code protect function)							
CPU	CPU	R8C Core							
	Basic Instructions	89							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
Clock	Clock Generation Circuit	3 circuits (Main clock, High speed on-chip oscillator, Low speed on-chip oscillator)							
	PLL	—							
	Subclock	—							
	Real Time clock	—							
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	Yes							
	Low Voltage Detection/LVD	Yes (Voltage detection 3)							
A/D Converter	Resolution×Channels	10-bit×9							
	Sample and Hold	Yes							
D/A Converter	Resolution×Channels	—							
Timer	8-bit	2 (Timer RA, Timer RB)							
	16-bit	3 (Timer RC, Timer RD)							
	Input Capture	12 (shared with Timer RC, Timer RD)							
	Output Compare	12 (shared with Timer RC, Timer RD)							
	PWM Output	10 (shared with Timer RB, Timer RC, Timer RD)							
	Real-Time Port	—							
	Event Counter	1 (shared with Timer RA)							
	2-Phase Encoder Input	—							
	3-Phase Inverter Control	1 (shared with Timer RD)							
Watchdog Timer		1 (with automatic starting function and clock source protection function)							
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART2)							
	Clock Sync. Only	—							
	Clock Async. Only	—							
I²C-bus		—							
Synchronous Serial Communication Unit/Special Serial I/O		—							
CAN	Channels	—							
	Message Box (Numbers)	—							
I/O Ports	Input Only (Numbers)	3							
	CMOS Output Only (Numbers)	—							
	CMOS I/O (Numbers)	25							
	N-Channel Open Drain Port (Numbers)	—							
	High Current Drive Port	8							
	Pull-Up Resistor	25							
External Interrupts Pins		7							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	—							
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V, 5MHz/2.2 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85	−40 to 85	−20 to 85
Package		PLQP0032GB-A							
Part No.		R5F212K2SDFP*	R5F212K2SNFP*	R5F212K4SDFP*	R5F212K4SNFP*	R5F212L2SDFP*	R5F212L2SNFP*	R5F212L4SDFP*	R5F212L4SNFP*

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Oz : OzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/32A			R8C/33A					R8C/35A		
Memory	ROM (Bytes)	4K+4K	8K+4K	16K+4K	4K+4K	8K+4K	16K+4K	24K+4K	32K+4K	16K+4K	24K+4K	32K+4K
	RAM (Bytes)	512	1K	1.5K	512	1K	1.5K	2K	2.5K	1.5K	2K	2.5K
	ROM Type*1	F										
	Data Flash / E2 Data Flash	4K (Data Flash : program/erase 10k times)										
	Program Security	Yes (ID code check function, ROM code protect function)										
CPU	CPU	R8C Core										
	Basic Instructions	89										
	Minimum Instruction Execution Time (ns)	50 (@20MHz)										
	Multiplier	16×16→32										
	Multiply-Accumulate Instruction	16×16+32→32										
Clock	Clock Generation Circuit	4 circuits (Main clock, Sub clock, High speed on-chip oscillator, Low speed on-chip oscillator)										
	PLL	—										
	Subclock	Yes (32.768kHz)										
	Real Time clock	Yes (Timer RE)										
	On-Chip Oscillator	2 circuits (High precision, High speed : 40MHz, Low speed : 125kHz)										
	Oscillation Stop Detection	Yes										
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)										
	Power Save	Wait/Stop										
Power Supply Voltage Detection	Power-On Reset/POR	Yes										
	Low Voltage Detection/LVD	Yes (Voltage detection 3)										
A/D Converter	Resolution×Channels	10-bit×4			10-bit×12							
	Sample and Hold	Yes										
D/A Converter	Resolution×Channels	—			8-bit×2							
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)										
	16-bit	1 (Timer RC)								3 (Timer RC, Timer RD)		
	Input Capture	4 (shared with Timer RC)								12 (shared with Timer RC, Timer RD)		
	Output Compare	5 (shared with Timer RC, Timer RE)								13 (shared with Timer RC, Timer RD, Timer RE)		
	PWM Output	4 (shared with Timer RB, Timer RC)								10 (shared with Timer RB, Timer RC, Timer RD)		
	Real-Time Port	—										
	Event Counter	1 (shared with Timer RA)										
	2-Phase Encoder Input	—										
	3-Phase Inverter Control	—								1 (shared with Timer RD)		
Watchdog Timer		1 (with automatic start function, clock source protection function, low-speed on-chip oscillator for watchdog timer)										
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART2)			3 (UART0 to UART2)							
	Clock Sync. Only	—										
	Clock Async. Only	—										
I²C-bus		1 (shared with Synchronous Serial Communication Unit)+1 (UART2)										
Synchronous Serial Communication Unit/Special Serial I/O		1 (shared with I²C)										
CAN	Channels	—										
	Message Box (Numbers)	—										
I/O Ports	Input Only (Numbers)	1										
	CMOS Output Only (Numbers)	—										
	CMOS I/O (Numbers)	15			27					47		
	N-Channel Open Drain Port (Numbers)	—										
	High Current Drive Port	15			27					47		
	Pull-Up Resistor	15			27					47		
External Interrupts Pins		7								9		
Debugging Function	On-Chip Debug	Yes										
	On-Board Flash Program	Yes										
Other Functions	ROM Correction Function	—										
	Others	comparator A×2 (shared with voltage monitor 1 and 2)+comparator B×2										
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V, 5MHz/2.2 to 5.5V, 2MHz/1.8 to 5.5V										
Operating Ambient Temperature (°C)		–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85	–40 to 85	–20 to 85
Package		PLSP0020JB-A						PLQP0032GB-A										PLQP0052JA-A						
Part No.		R5F21321ADSP**	R5F21321ANSP**	R5F21322ADSP**	R5F21322ANSP**	R5F21324ADSP**	R5F21324ANSP**	R5F21331ADFP**	R5F21331ANFP**	R5F21332ADFP**	R5F21332ANFP**	R5F21334ADFP**	R5F21334ANFP**	R5F21335ADFP**	R5F21335ANFP**	R5F21336ADFP**	R5F21336ANFP**	R5F21354ADFP**	R5F21354ANFP**	R5F21355ADFP**	R5F21355ANFP**	R5F21356ADFP**	R5F21356ANFP**	

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R32C/100 Series)

Group		R32C/120											
Memory	ROM (Bytes)	128K+8K		128K+12K		256K+8K		256K+12K					
	RAM (Bytes)	12K				20K							
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)											
	Multiplier	32×32→64											
	Multiply-Accumulate Instruction	32×32+64→64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage detection)											
A/D Converter	Resolution×Channels	10-bit×26											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	8-bit×2											
Timer	8-bit	—											
	16-bit	11 (TimerA, TimerB)											
	Input Capture	16 (Intelligent I/O)											
	Output Compare	16 (Intelligent I/O)											
	PWM Output	21 (TimerA, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (TimerA, TimerB)											
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	5 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		—											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		1											
CAN	Channels	1											
	Message Box (Numbers)	32											
FlexRay		—											
IrDA		—											
CRC Calculation Circuit		1 (CRC−CCITT (X16+X12+X5+1))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	84											
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	—											
	Pull-Up Resistor	85											
External Interrupts Pins		11											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	LIN:2 channels											
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP0100KB-A											
Part No.		R5F6420EJFB**	R5F6420ELFB**	R5F6420EKFB**	R5F64200JFB**	R5F64200LFB**	R5F64200KFB**	R5F6420FJFB**	R5F6420FLFB**	R5F6420FKFB**	R5F64201JFB**	R5F64201LFB**	R5F64201KFB**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R32C/100 Series)

Group		R32C/121							
Memory	ROM (Bytes)	128K+8K	128K+12K	256K+8K	256K+12K	384K+8K	384K+12K	512K+8K	512K+12K
	RAM (Bytes)	12K		20K		24K		32K	
	ROM Type*1	F							
	Data Flash/E2 Data Flash	8K (Data Flash)	8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)	8K (Data Flash)	8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)	8K (Data Flash)	8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)	8K (Data Flash)	8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)							
CPU	CPU	R32C/100 Core							
	Basic Instructions	108							
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)							
	Multiplier	32×32→64							
	Multiply-Accumulate Instruction	32×32+64→64							
	Barrel Shifter	Yes							
DMA	DMAC (Channels)	4							
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)							
External Bus Expansion	Address Space (Bytes)	64M							
	External Bus Interface	—							
	Bus Structure	—							
	DRAM Controller	—							
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)							
	PLL	Yes							
	Subclock	Yes							
	RTC	—							
	On-Chip Oscillator	Yes							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=2 to 24)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	—							
	Low Voltage Detection/LVD	Yes (Low voltage detection)							
A/D Converter	Resolution×Channels	10-bit×26							
	Sample and Hold	Yes							
	Multi-Channel Sample and Hold	—							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	—							
	16-bit	11 (TimerA, TimerB)							
	Input Capture	16 (Intelligent I/O)							
	Output Compare	16 (Intelligent I/O)							
	PWM Output	21 (TimerA, Intelligent I/O)							
	Real-Time Port	—							
	Event Counter	11 (TimerA, TimerB)							
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)							
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)							
Watchdog Timer		1							
Serial Interface	Clock Sync./ Clock Async.	5 (UART)							
	Clock Sync. Only	—							
	Clock Async. Only	—							
I²C-bus		3 (UART)							
IEBus		—							
Smart Card/SIM		—							
Synchronous Serial Communication Unit/Special Serial I/O		3							
CAN	Channels	2							
	Message Box (Numbers)	32							
FlexRay		—							
IrDA		—							
CRC Calculation Circuit		1 (CRC−CCITT (X16+X12+X5+1))							
X/Y Converter		Yes							
I/O Ports	Input Only (Numbers)	2							
	CMOS I/O (Numbers)	84							
	N-Channel Open Drain Port (Numbers)	—							
	High Current Drive Port	—							
	Pull-Up Resistor	85							
External Interrupts Pins		11							
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	LIN:2 channels							
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP0100KB-A																									
Part No.		R5F6421EJFB**	R5F6421ELFB**	R5F6421EKFB**	R5F6421JFB**	R5F6421JLFB**	R5F6421JKFB**	R5F6421FJFB**	R5F6421FLFB**	R5F6421FKFB**	R5F6421JFB**	R5F6421LFB**	R5F6421KFB**	R5F6421GJFB**	R5F6421GLFB**	R5F6421GKFB**	R5F6421JFB**	R5F6421LFB**	R5F6421KFB**	R5F6421HJFB**	R5F6421HLFB**	R5F6421HKFB**	R5F6421JFB**	R5F6421LFB**	R5F6421KFB**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R32C/100 Series)

Group		R32C/133			R32C/134		
Memory	ROM (Bytes)	256K + 12K	384K + 12K	512K + 12K	256K + 12K	384K + 12K	512K + 12K
	RAM (Bytes)	20K	24K	32K	20K	24K	32K
	ROM Type*1	F					
	Data Flash/E2 Data Flash	8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)					
CPU	CPU	R32C/100 Core					
	Basic Instructions	108					
	Minimum Instruction Execution Time (ns)	16.67 (@60MHz)					
	Multiplier	32 × 32 → 64					
	Multiply-Accumulate Instruction	32 × 32 + 64 → 64					
	Barrel Shifter	Yes					
DMA	DMAC (Channels)	4					
	DTC/DMAC Ⅱ	DMAC Ⅱ (Starts by all peripheral interrupt factors)					
External Bus Expansion	Address Space (Bytes)	64M					
	External Bus Interface	—					
	Bus Structure	—					
	DRAM Controller	—					
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)					
	PLL	Yes					
	Subclock	Yes					
	RTC	—					
	On-Chip Oscillator	Yes					
	Oscillation Stop Detection	Yes					
	Frequency Divider	1/n (n = 2 to 24)					
	Power Save	Wait/Stop					
Power Supply Voltage Detection	Power-On Reset/POR	—					
	Low Voltage Detection/LVD	—					
A/D Converter	Resolution × Channels	10-bit × 34					
	Sample and Hold	Yes					
	Multi-Channel Sample and Hold	—					
D/A Converter	Resolution × Channels	8-bit × 2					
Timer	8-bit	—					
	16-bit	11 (TimerA, TimerB)					
	Input Capture	16 (Intelligent I/O)					
	Output Compare	16 (Intelligent I/O)					
	PWM Output	21 (TimerA, Intelligent I/O)					
	Real-Time Port	—					
	Event Counter	11 (TimerA, TimerB)					
	2-Phase Encoder Input	3 (TimerA) + 2 (Intelligent I/O)					
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)					
Watchdog Timer		1					
Serial Interface	Clock Sync./ Clock Async.	5 (UART)					
	Clock Sync. Only	—					
	Clock Async. Only	—					
I²C-bus		3 (UART)					
IEBus		—					
Smart Card/SIM		—					
Synchronous Serial Communication Unit/Special Serial I/O		2					
CAN	Channels	2			3		
	Message Box (Numbers)	32					
FlexRay		2					
IrDA		—					
CRC Calculation Circuit		1 (CRC−CCITT (X16 + X12 + X5 + 1))					
X/Y Converter		Yes					
I/O Ports	Input Only (Numbers)	2					
	CMOS I/O (Numbers)	120					
	N-Channel Open Drain Port (Numbers)	—					
	High Current Drive Port	—					
	Pull-Up Resistor	121					
External Interrupts Pins		14					
Debugging Function	On-Chip Debug	Yes					
	On-Board Flash Program	Yes					
Other Functions	ROM Correction Function	—					
	Others	—					
Operating Frequency/Supply Voltage		60MHz/3.0 to 5.5V					
Operating Ambient Temperature (°C)		−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125
Package		PLQP0144KA-A					
Part No.		R5F64331JFD**	R5F64331KFD**	R5F64332JFD**	R5F64332KFD**	R5F64333JFD**	R5F64333KFD**	R5F64341JFD**	R5F64341KFD**	R5F64342JFD**	R5F64342KFD**	R5F64343JFD**	R5F64343KFD**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R32C/100 Series)

Group		R32C/151											
Memory	ROM (Bytes)	768K+8K			768K+16K			1024K+8K			1024K+16K		
	RAM (Bytes)	48K											
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)			8K (Data Flash), 8K (E2dateFlash:program/erase 100k times)			8K (Data Flash)			8K (Data Flash), 8K (E2dateFlash:program/erase 100k times)		
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)											
	Multiplier	32×32→64											
	Multiply-Accumulate Instruction	32×32+64→64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage detection)											
A/D Converter	Resolution×Channels	10-bit×34											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	8-bit×2											
Timer	8-bit	—											
	16-bit	11 (TimerA, TimerB)											
	Input Capture	32 (Intelligent I/O)											
	Output Compare	32 (Intelligent I/O)											
	PWM Output	37 (TimerA, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (TimerA, TimerB)											
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	5 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		—											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		3											
CAN	Channels	2											
	Message Box (Numbers)	32											
FlexRay		—											
IrDA		—											
CRC Calculation Circuit		1 (CRC—CCITT (X16+X12+X5+1))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	120											
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	—											
	Pull-Up Resistor	121											
External Interrupts Pins		14											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	LIN:8 channels											
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP0144KA-A											
Part No.		R5F6451MJFD**	R5F6451MLFD**	R5F6451MKFD**	R5F64514JFD**	R5F64514LFD**	R5F64514KFD**	R5F6451NJFD**	R5F6451NLFD**	R5F6451NKFD**	R5F64515JFD**	R5F64515LFD**	R5F64515KFD**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R32C/100 Series)

Group		R32C/152											
Memory	ROM (Bytes)	768K+8K		768K+16K		1024K+8K		1024K+16K					
	RAM (Bytes)	48K											
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 8K (E2dateFlash:program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 8K (E2dateFlash:program/erase 100k times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)											
	Multiplier	32×32→64											
	Multiply-Accumulate Instruction	32×32+64→64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage detection)											
A/D Converter	Resolution×Channels	10-bit×34											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	8-bit×2											
Timer	8-bit	—											
	16-bit	11 (TimerA, TimerB)											
	Input Capture	32 (Intelligent I/O)											
	Output Compare	32 (Intelligent I/O)											
	PWM Output	37 (TimerA, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (TimerA, TimerB)											
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	5 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		—											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		3											
CAN	Channels	3											
	Message Box (Numbers)	32											
FlexRay		—											
IrDA		—											
CRC Calculation Circuit		1 (CRC−CCITT (X16+X12+X5+1))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	120											
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	—											
	Pull-Up Resistor	121											
External Interrupts Pins		14											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	LIN:8 channels											
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP0144KA-A											
Part No.		R5F6452MJFD**	R5F6452MLFD**	R5F6452MKFD**	R5F64524JFD**	R5F64524LFD**	R5F64524KFD**	R5F6452NJFD**	R5F6452NLFD**	R5F6452NKFD**	R5F64525JFD**	R5F64525LFD**	R5F64525KFD**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R32C/100 Series)

Group		R32C/153											
Memory	ROM (Bytes)	768K+8K		768K+16K		1024K+8K		1024K+16K					
	RAM (Bytes)	48K											
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 8K (E2dateFlash:program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 8K (E2dateFlash:program/erase 100k times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)											
	Multiplier	32×32→64											
	Multiply-Accumulate Instruction	32×32+64→64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage detection)											
A/D Converter	Resolution×Channels	10-bit×34											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	8-bit×2											
Timer	8-bit	—											
	16-bit	11 (TimerA, TimerB)											
	Input Capture	32 (Intelligent I/O)											
	Output Compare	32 (Intelligent I/O)											
	PWM Output	37 (TimerA, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (TimerA, TimerB)											
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	5 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		—											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		3											
CAN	Channels	4											
	Message Box (Numbers)	32											
FlexRay		—											
IrDA		—											
CRC Calculation Circuit		1 (CRC—CCITT (X16+X12+X5+1))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	120											
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	—											
	Pull-Up Resistor	121											
External Interrupts Pins		14											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	LIN:8 channels											
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP0144KA-A											
Part No.		R5F6453MJFD**	R5F6453MLFD**	R5F6453MKFD**	R5F64534JFD**	R5F64534LFD**	R5F64534KFD**	R5F6453NJFD**	R5F6453NLFD**	R5F6453NKFD**	R5F64535JFD**	R5F64535LFD**	R5F64535KFD**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R32C/100 Series)

Group		R32C/156																			
Memory	ROM (Bytes)	256K+8K		256K+12K		384K+8K		384K+12K		512K+8K		512K+12K									
	RAM (Bytes)	20K				24K				32K											
	ROM Type*1	F																			
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)									
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)																			
CPU	CPU	R32C/100 Core																			
	Basic Instructions	108																			
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)																			
	Multiplier	32×32→64																			
	Multiply-Accumulate Instruction	32×32+64→64																			
	Barrel Shifter	Yes																			
DMA	DMAC (Channels)	4																			
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)																			
External Bus Expansion	Address Space (Bytes)	64M																			
	External Bus Interface	—																			
	Bus Structure	—																			
	DRAM Controller	—																			
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)																			
	PLL	Yes																			
	Subclock	Yes																			
	RTC	—																			
	On-Chip Oscillator	Yes																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=2 to 24)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	—																			
	Low Voltage Detection/LVD	Yes (Low voltage detection)																			
A/D Converter	Resolution×Channels	10-bit×34																			
	Sample and Hold	Yes																			
	Multi-Channel Sample and Hold	—																			
D/A Converter	Resolution×Channels	8-bit×2																			
Timer	8-bit	—																			
	16-bit	11 (TimerA, TimerB)																			
	Input Capture	32 (Intelligent I/O)																			
	Output Compare	32 (Intelligent I/O)																			
	PWM Output	37 (TimerA, Intelligent I/O)																			
	Real-Time Port	—																			
	Event Counter	11 (TimerA, TimerB)																			
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)																			
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)																			
Watchdog Timer		1																			
Serial Interface	Clock Sync./ Clock Async.	5 (UART)																			
	Clock Sync. Only	—																			
	Clock Async. Only	—																			
I²C-bus		3 (UART)																			
IEBus		—																			
Smart Card/SIM		—																			
Synchronous Serial Communication Unit/Special Serial I/O		3																			
CAN	Channels	2																			
	Message Box (Numbers)	32																			
FlexRay		—																			
IrDA		—																			
CRC Calculation Circuit		1 (CRC−CCITT (X16+X12+X5+1))																			
X/Y Converter		Yes																			
I/O Ports	Input Only (Numbers)	2																			
	CMOS I/O (Numbers)	120																			
	N-Channel Open Drain Port (Numbers)	—																			
	High Current Drive Port	—																			
	Pull-Up Resistor	121																			
External Interrupts Pins		14																			
Debugging Function	On-Chip Debug	Yes																			
	On-Board Flash Program	Yes																			
Other Functions	ROM Correction Function	—																			
	Others	LIN:4 channels																			
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V																			
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP0144KA-A																			
Part No.		R5F6456FJFD**	R5F6456FLFD**	R5F6456FKFD**	R5F64561JFD**	R5F64561LFD**	R5F64561KFD**	R5F6456GJFD**	R5F6456GLFD**	R5F6456GKFD**	R5F64562JFD**	R5F64562LFD**	R5F64562KFD**	R5F6456HJFD**	R5F6456HLFD**	R5F6456HKFD**	R5F64563JFD**	R5F64563LFD**	R5F64563KFD**		

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R32C/100 Series)

Group		R32C/157																			
Memory	ROM (Bytes)	256K+8K		256K+12K		384K+8K		384K+12K		512K+8K		512K+12K									
	RAM (Bytes)	20K				24K				32K											
	ROM Type*1	F																			
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)									
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)																			
CPU	CPU	R32C/100 Core																			
	Basic Instructions	108																			
	Minimum Instruction Execution Time (ns)	15.625 (@64MHz)																			
	Multiplier	32×32→64																			
	Multiply-Accumulate Instruction	32×32+64→64																			
	Barrel Shifter	Yes																			
DMA	DMAC (Channels)	4																			
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)																			
External Bus Expansion	Address Space (Bytes)	64M																			
	External Bus Interface	—																			
	Bus Structure	—																			
	DRAM Controller	—																			
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)																			
	PLL	Yes																			
	Subclock	Yes																			
	RTC	—																			
	On-Chip Oscillator	Yes																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=2 to 24)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	—																			
	Low Voltage Detection/LVD	Yes (Low voltage detection)																			
A/D Converter	Resolution×Channels	10-bit×34																			
	Sample and Hold	Yes																			
	Multi-Channel Sample and Hold	—																			
D/A Converter	Resolution×Channels	8-bit×2																			
Timer	8-bit	—																			
	16-bit	11 (TimerA, TimerB)																			
	Input Capture	32 (Intelligent I/O)																			
	Output Compare	32 (Intelligent I/O)																			
	PWM Output	37 (TimerA, Intelligent I/O)																			
	Real-Time Port	—																			
	Event Counter	11 (TimerA, TimerB)																			
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)																			
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)																			
Watchdog Timer		1																			
Serial Interface	Clock Sync./ Clock Async.	5 (UART)																			
	Clock Sync. Only	—																			
	Clock Async. Only	—																			
I²C-bus		3 (UART)																			
IEBus		—																			
Smart Card/SIM		—																			
Synchronous Serial Communication Unit/Special Serial I/O		3																			
CAN	Channels	3																			
	Message Box (Numbers)	32																			
FlexRay		—																			
IrDA		—																			
CRC Calculation Circuit		1 (CRC−CCITT (X16+X12+X5+1))																			
X/Y Converter		Yes																			
I/O Ports	Input Only (Numbers)	2																			
	CMOS I/O (Numbers)	120																			
	N-Channel Open Drain Port (Numbers)	—																			
	High Current Drive Port	—																			
	Pull-Up Resistor	121																			
External Interrupts Pins		14																			
Debugging Function	On-Chip Debug	Yes																			
	On-Board Flash Program	Yes																			
Other Functions	ROM Correction Function	—																			
	Others	LIN:4 channels																			
Operating Frequency/Supply Voltage		64MHz/3.0 to 5.5V																			
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125		
Package		PLQP0144KA-A																			
Part No.		R5F6457FJFD**	R5F6457FLFD**	R5F6457FKFD**	R5F64571JFD**	R5F64571LFD**	R5F64571KFD**	R5F6457GJFD**	R5F6457GLFD**	R5F6457GKFD**	R5F64572JFD**	R5F64572LFD**	R5F64572KFD**	R5F6457HJFD**	R5F6457HLFD**	R5F6457HKFD**	R5F64573JFD**	R5F64573LFD**	R5F64573KFD**		

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R32C/100 Series)

Group		R32C/160											
Memory	ROM (Bytes)	128K+8K		128K+12K		256K+8K		256K+12K					
	RAM (Bytes)	12K				20K							
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash: program/erase 100k times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	20.8 (@48MHz)											
	Multiplier	32×32→64											
	Multiply-Accumulate Instruction	32×32+64→64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage detection)											
A/D Converter	Resolution×Channels	10-bit×23											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	—											
Timer	8-bit	—											
	16-bit	11 (TimerA, TimerB)											
	Input Capture	8 (Intelligent I/O)											
	Output Compare	8 (Intelligent I/O)											
	PWM Output	13 (TimerA, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (TimerA, TimerB)											
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	5 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		—											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		1											
CAN	Channels	1											
	Message Box (Numbers)	32											
FlexRay		—											
IrDA		—											
CRC Calculation Circuit		1 (CRC−CCITT (X16+X12+X5+1))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	64											
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	—											
	Pull-Up Resistor	65											
External Interrupts Pins		7											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	LIN:1 channel											
Operating Frequency/Supply Voltage		48MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP080KB-A											
Part No.		R5F64600EJFP**	R5F64600ELFP**	R5F64600EKFP**	R5F64600JFP**	R5F64600LFP**	R5F64600KFP**	R5F64600FJFP**	R5F64600FLFP**	R5F64600FKFP**	R5F64601JFP**	R5F64601LFP**	R5F64601KFP**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R32C/100 Series)

Group		R32C/161											
Memory	ROM (Bytes)	128K+8K		128K+12K		256K+8K		256K+12K					
	RAM (Bytes)	12K				20K							
	ROM Type*1	F											
	Data Flash/E2 Data Flash	8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)		8K (Data Flash)		8K (Data Flash), 4K (E2dateFlash:program/erase 100k times)					
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	R32C/100 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	20.8 (@48MHz)											
	Multiplier	32×32→64											
	Multiply-Accumulate Instruction	32×32+64→64											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMACⅡ	DMACⅡ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	64M											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, on-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n=2 to 24)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	Yes (Low voltage detection)											
A/D Converter	Resolution×Channels	10-bit×23											
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	—											
Timer	8-bit	—											
	16-bit	11 (TimerA, TimerB)											
	Input Capture	8 (Intelligent I/O)											
	Output Compare	8 (Intelligent I/O)											
	PWM Output	13 (TimerA, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (TimerA, TimerB)											
	2-Phase Encoder Input	3 (TimerA)+2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with TimerA4, TimerA1, TimerA2, TimerB2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	5 (UART)											
	Clock Sync. Only	—											
	Clock Async. Only	—											
I²C-bus		3 (UART)											
IEBus		—											
Smart Card/SIM		—											
Synchronous Serial Communication Unit/Special Serial I/O		1											
CAN	Channels	2											
	Message Box (Numbers)	32											
FlexRay		—											
IrDA		—											
CRC Calculation Circuit		1 (CRC—CCITT (X16+X12+X5+1))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	2											
	CMOS I/O (Numbers)	64											
	N-Channel Open Drain Port (Numbers)	—											
	High Current Drive Port	—											
	Pull-Up Resistor	65											
External Interrupts Pins		7											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	LIN:1 channel											
Operating Frequency/Supply Voltage		48MHz/3.0 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125	−40 to 85	−40 to 105	−40 to 125
Package		PLQP080KB-A											
Part No.		R5F6461EJFP**	R5F6461ELFP**	R5F6461EKFP**	R5F64610JFP**	R5F64610LFP**	R5F64610KFP**	R5F6461FJFP**	R5F6461FLFP**	R5F6461FKFP**	R5F64611JFP**	R5F64611LFP**	R5F64611KFP**

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (M32C/80 Series)

Group		M32C/84 (M32C/84T)																							
Memory	ROM (Bytes)	128K		256K		320K		384K		384K+4K		512K+4K													
	RAM (Bytes)	10K		20K		24K																			
	ROM Type*1	M								F															
	Data Flash/E2 Data Flash	—								4K (Data Flash)															
	Program Security	—								Yes (ID Code Check Function, ROM Code Protect Function)															
CPU	CPU	M32C/80 Core																							
	Basic Instructions	108																							
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)																							
	Multiplier	16×16→32																							
	Multiply-Accumulate Instruction	16×16+48→48																							
	Barrel Shifter	Yes																							
DMA	DMAC (Channels)	4																							
	DTC/DMAC II	DMAC II (Starts by all peripheral interrupt factors)																							
External Bus Expansion	Address Space (Bytes)	—																							
	External Bus Interface	—																							
	Bus Structure	—																							
	DRAM Controller	—																							
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																							
	PLL	Yes																							
	Subclock	Yes																							
	RTC	—																							
	On-Chip Oscillator	Yes																							
	Oscillation Stop Detection	Yes																							
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)																							
	Power Save	Wait/Stop																							
Power Supply Voltage Detection	Power-On Reset/POR	—																							
	Low Voltage Detection/LVD	—																							
A/D Converter	Resolution×Channels	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34
	Sample and Hold	Yes																							
	Multi-Channel Sample and Hold	—																							
D/A Converter	Resolution×Channels	8-bit×2																							
Timer	8-bit	—																							
	16-bit	11 (Timer A, Timer B)																							
	Input Capture	8 (Intelligent I/O)																							
	Output Compare	8 (Intelligent I/O)																							
	PWM Output	13 (Timer A, Intelligent I/O)																							
	Real-Time Port	—																							
	Event Counter	11 (Timer A, Timer B)																							
	2-Phase Encoder Input	3 (Timer A)+1 (Intelligent I/O)																							
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)																							
Watchdog Timer		1																							
Serial Interface	Clock Sync./ Clock Async.	6 (UART, Intelligent I/O)																							
	Clock Sync. Only	1 (Intelligent I/O)																							
	Clock Async. Only	—																							
I^2C-bus		5 (UART)																							
IEBus		5 (UART)																							
Smart Card/SIM		5 (UART)																							
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)																							
CAN	Channels	1																							
	Message Box (Numbers)	16																							
IrDA		—																							
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$))																							
X/Y Converter		Yes																							
I/O Ports	Input Only (Numbers)	1																							
	CMOS I/O (Numbers)	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121
	N-Channel Open Drain Port (Numbers)	2																							
	High Current Drive Port	—																							
	Pull-Up Resistor	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121
External Interrupts Pins		11																							
Debugging Function	On-Chip Debug	—								Yes															
	On-Board Flash Program	—								Yes															
Other Functions	ROM Correction Function	Yes								—															
	Others	—																							
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V																							
Operating Ambient Temperature (°C)		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105	
Package		PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A
Part No.		M30840MCT-XXXGP	M30842MCT-XXXGP	M30840MCU-XXXGP*	M30842MCU-XXXGP*	M30843MGT-XXXGP	M30845MGT-XXXGP	M30843MGU-XXXGP*	M30845MGU-XXXGP*	M30843MWT-XXXGP	M30845MWT-XXXGP	M30843MWU-XXXGP*	M30845MWU-XXXGP*	M30843MHT-XXXGP	M30845MHT-XXXGP	M30843MHU-XXXGP*	M30845MHU-XXXGP*	M30843FHTGP	M30845FHTGP	M30843FHUGP	M30845FHUGP	M30843FJTGP	M30845FJTGP	M30843FJUGP	M30845FJUGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M32C/80 Series)

Group		M32C/85 (M32C/85T)																									
Memory	ROM (Bytes)	256K		320K		320K+4K		384K		384K+4K		512K+4K															
	RAM (Bytes)	20K		24K																							
	ROM Type*1	M				F		M		F																	
	Data Flash/E2 Data Flash	—				4K (Data Flash)		—		4K (Data Flash)																	
	Program Security	—				Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)																	
CPU	CPU	M32C/80 Core																									
	Basic Instructions	108																									
	Minimum Instruction Execution Time (ns)	31,3 (@32MHz)																									
	Multiplier	16×16→32																									
	Multiply-Accumulate Instruction	16×16+48→48																									
	Barrel Shifter	Yes																									
DMA	DMAC (Channels)	4																									
	DTC/DMAC II	DMAC II (Starts by all peripheral interrupt factors)																									
External Bus Expansion	Address Space (Bytes)	—																									
	External Bus Interface	—																									
	Bus Structure	—																									
	DRAM Controller	—																									
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																									
	PLL	Yes																									
	Subclock	Yes																									
	RTC	—																									
	On-Chip Oscillator	Yes																									
	Oscillation Stop Detection	Yes																									
	Frequency Divider	1/n (n=1, 2, 3, 4, 6, 8, 10, 12, 14, 16)																									
	Power Save	Wait/Stop																									
Power Supply Voltage Detection	Power-On Reset/POR	—																									
	Low Voltage Detection/LVD	—																									
A/D Converter	Resolution×Channels	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34	10-bit ×26	10-bit ×34
	Sample and Hold	Yes																									
	Multi-Channel Sample and Hold	—																									
D/A Converter	Resolution×Channels	8-bit×2																									
Timer	8-bit	—																									
	16-bit	11 (Timer A, Timer B)																									
	Input Capture	8 (Intelligent I/O)																									
	Output Compare	8 (Intelligent I/O)																									
	PWM Output	13 (Timer A, Intelligent I/O)																									
	Real-Time Port	—																									
	Event Counter	11 (Timer A, Timer B)																									
	2-Phase Encoder Input	3 (Timer A)+1 (Intelligent I/O)																									
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)																									
Watchdog Timer		1																									
Serial Interface	Clock Sync./ Clock Async.	6 (UART, Intelligent I/O)																									
	Clock Sync. Only	1 (Intelligent I/O)																									
	Clock Async. Only	—																									
I²C-bus		5 (UART)																									
IEBus		5 (UART)																									
Smart Card/SIM		5 (UART)																									
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)																									
CAN	Channels	2																									
	Message Box (Numbers)	16×2																									
IrDA		—																									
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$))																									
X/Y Converter		Yes																									
I/O Ports	Input Only (Numbers)	1																									
	CMOS I/O (Numbers)	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121
	N-Channel Open Drain Port (Numbers)	2																									
	High Current Drive Port	—																									
	Pull-Up Resistor	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121	85	121
External Interrupts Pins		11																									
Debugging Function	On-Chip Debug	—				Yes		—		Yes																	
	On-Board Flash Program	—				Yes		—		Yes																	
Other Functions	ROM Correction Function	Yes				—		Yes		—																	
	Others	—																									
Operating Frequency/Supply Voltage		32MHz/4,2 to 5,5V																									
Operating Ambient Temperature (°C)		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105			
Package		PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A
Part No.		M30853MGT-XXXGP	M30855MGT-XXXGP	M30853MGU-XXXGP*	M30855MGU-XXXGP*	M30853MWT-XXXGP	M30855MWT-XXXGP	M30853MWU-XXXGP*	M30855MWU-XXXGP*	M30853FWTGP	M30855FWTGP	M30853FWUGP	M30855FWUGP	M30853MHT-XXXGP	M30855MHT-XXXGP	M30853MHU-XXXGP*	M30855MHU-XXXGP*	M30853FHTGP	M30855FHTGP	M30853FHUGP	M30855FHUGP	M30853FJTGP	M30855FJTGP	M30853FJUGP	M30855FJUGP		

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (M32C/80 Series)

Group		M32C/88 (M32C/88T)											
Memory	ROM (Bytes)	320K + 4K				384K + 4K				512K + 4K			
	RAM (Bytes)	18K											
	ROM Type*1	F											
	Data Flash/E2 Data Flash	4K (Data Flash)											
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	M32C/80 Core											
	Basic Instructions	108											
	Minimum Instruction Execution Time (ns)	31.3 (@32MHz)											
	Multiplier	16×16→32											
	Multiply-Accumulate Instruction	16×16+48→48											
	Barrel Shifter	Yes											
DMA	DMAC (Channels)	4											
	DTC/DMAC Ⅱ	DMAC Ⅱ (Starts by all peripheral interrupt factors)											
External Bus Expansion	Address Space (Bytes)	—											
	External Bus Interface	—											
	Bus Structure	—											
	DRAM Controller	—											
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)											
	PLL	Yes											
	Subclock	Yes											
	RTC	—											
	On-Chip Oscillator	Yes											
	Oscillation Stop Detection	Yes											
	Frequency Divider	1/n (n = 1, 2, 3, 4, 6, 8, 10, 12, 14, 16)											
	Power Save	Wait/Stop											
Power Supply Voltage Detection	Power-On Reset/POR	—											
	Low Voltage Detection/LVD	—											
A/D Converter	Resolution×Channels	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34	10-bit×26	10-bit×34
	Sample and Hold	Yes											
	Multi-Channel Sample and Hold	—											
D/A Converter	Resolution×Channels	8-bit×2											
Timer	8-bit	—											
	16-bit	11 (Timer A, Timer B)											
	Input Capture	8 (Intelligent I/O)											
	Output Compare	8 (Intelligent I/O)											
	PWM Output	13 (Timer A, Intelligent I/O)											
	Real-Time Port	—											
	Event Counter	11 (Timer A, Timer B)											
	2-Phase Encoder Input	3 (Timer A) + 2 (Intelligent I/O)											
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)											
Watchdog Timer		1											
Serial Interface	Clock Sync./ Clock Async.	6 (UART, Intelligent I/O)											
	Clock Sync. Only	1 (Intelligent I/O)											
	Clock Async. Only	—											
I^2C-bus		5 (UART)											
IEBus		5 (UART)											
Smart Card/SIM		5 (UART)											
Synchronous Serial Communication Unit/Special Serial I/O		5 (UART)											
CAN	Channels	3											
	Message Box (Numbers)	16×3											
IrDA		—											
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$))											
X/Y Converter		Yes											
I/O Ports	Input Only (Numbers)	1											
	CMOS I/O (Numbers)	85	121	85	121	85	121	85	121	85	121	85	121
	N-Channel Open Drain Port (Numbers)	2											
	High Current Drive Port	—											
	Pull-Up Resistor	85	121	85	121	85	121	85	121	85	121	85	121
External Interrupts Pins		11											
Debugging Function	On-Chip Debug	Yes											
	On-Board Flash Program	Yes											
Other Functions	ROM Correction Function	—											
	Others	—											
Operating Frequency/Supply Voltage		32MHz/4.2 to 5.5V											
Operating Ambient Temperature (°C)		−40 to 85		−40 to 105		−40 to 85		−40 to 105		−40 to 85		−40 to 105	
Package		PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A	PLQP0100KB-A	PLQP0144KA-A
Part No.		M30880FWTGP	M30882FWTGP	M30880FWUGP	M30882FWUGP	M30880FHTGP	M30882FHTGP	M30880FHUGP	M30882FHUGP	M30880FJTGP	M30882FJTGP	M30880FJUGP	M30882FJUGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/60 Series)

Group		M16C/62P (M16C/62PT)						
Memory	ROM (Bytes)	48K	64K	64K+4K	96K	128K	128K+4K	384K+4K
	RAM (Bytes)	4K			5K	10K		31K
	ROM Type*1	M		F	M		F	
	Data Flash	—		Yes (4K)	—		Yes (4K)	
	Program Security	—		Yes (ID Code Check Function, ROM Code Protect Function)	—		Yes (ID Code Check Function, ROM Code Protect Function)	
CPU	CPU	M16C/60 Core						
	Basic Instructions	91						
	Minimum Instruction Execution Time (ns)	41.7 (@24MHz)						
	Multiplier	16×16→32						
	Multiply-Accumulate Instruction	16×16+32→32						
	Barrel Shifter	—						
DMA	DMAC (Channels)	2						
	DTC/DMAC II	—						
External Bus Expansion	Address Space (Bytes)	—						
	External Bus Interface	—						
	Bus Structure	—						
	DRAM Controller	—						
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)						
	PLL	Yes						
	Subclock	Yes						
	RTC	—						
	On-Chip Oscillator	Yes						
	Oscillation Stop Detection	Yes						
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)						
	Power Save	Wait/Stop						
Power Supply Voltage Detection	Power-On Reset/POR	—						
	Low Voltage Detection/LVD	—						
A/D Converter	Resolution×Channels	10-bit×26						
	Sample and Hold	Yes						
	Multi-Channel Sample and Hold	—						
D/A Converter	Resolution×Channels	8-bit×2						
Timer	8-bit	—						
	16-bit	11 (Timer A, Timer B)						
	Input Capture	—						
	Output Compare	—						
	PWM Output	5 (Timer A)						
	Real-Time Port	—						
	Event Counter	11 (Timer A, Timer B)						
	2-Phase Encoder Input	3 (Timer A)						
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)						
Watchdog Timer		1						
Serial Interface	Clock Sync./ Clock Async.	3 (UART)						
	Clock Sync. Only	2 (SI/O)						
	Clock Async. Only	—						
I^2C-bus		3 (UART)						
IEBus		3 (UART)						
Smart Card/SIM		1 (UART)						
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)						
CAN	Channels	—						
	Message Box (Numbers)	—						
IrDA		—						
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$))						
X/Y Converter		—						
I/O Ports	Input Only (Numbers)	1						
	CMOS I/O (Numbers)	85						
	N-Channel Open Drain Port (Numbers)	2						
	High Current Drive Port	—						
	Pull-Up Resistor	85						
External Interrupts Pins		11						
Debugging Function	On-Chip Debug	—		Yes	—		Yes	
	On-Board Flash Program	—		Yes	—		Yes	
Other Functions	ROM Correction Function	Yes		—	Yes		—	
	Others	—						
Operating Frequency/Supply Voltage		24MHz/4.0 to 5.5V						
Operating Ambient Temperature (°C)		−40 to 85						
Package		PLQP0100KB-A					PRQP0100JB-A	PLQP0100KB-A
Part No.		M3062CM6T-XXXGP	M3062CM8T-XXXGP	M3062CF8TGP	M3062CMAT-XXXGP	M3062AMCT-XXXGP	M3062AFCTGP	M3062JFHTFP	M3062JFHTGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (M16C/60 Series)

<table>
<tr><th colspan="2">Group</th><th colspan="26">M16C/62A (M16C/62T)</th></tr>
<tr><td rowspan="5">Memory</td><td>ROM (Bytes)</td><td>32K</td><td colspan="4">64K</td><td colspan="17">128K</td><td colspan="4">256K</td></tr>
<tr><td>RAM (Bytes)</td><td>3K</td><td colspan="4">4K</td><td colspan="12">5K</td><td colspan="5">10K</td><td colspan="4">20K</td></tr>
<tr><td>ROM Type*1</td><td colspan="9">M</td><td colspan="8">O</td><td colspan="9">F</td></tr>
<tr><td>Data Flash</td><td colspan="26">—</td></tr>
<tr><td>Program Security</td><td colspan="17">—</td><td colspan="9">Yes (ID Code Check Function, ROM Code Protect Function)</td></tr>
<tr><td rowspan="6">CPU</td><td>CPU</td><td colspan="26">M16C/60 Core</td></tr>
<tr><td>Basic Instructions</td><td colspan="26">91</td></tr>
<tr><td>Minimum Instruction Execution Time (ns)</td><td colspan="26">62.5 (@16MHz)</td></tr>
<tr><td>Multiplier</td><td colspan="26">16×16→32</td></tr>
<tr><td>Multiply-Accumulate Instruction</td><td colspan="26">16×16+32→32</td></tr>
<tr><td>Barrel Shifter</td><td colspan="26">—</td></tr>
<tr><td rowspan="2">DMA</td><td>DMAC (Channels)</td><td colspan="26">2</td></tr>
<tr><td>DTC/DMACⅡ</td><td colspan="26">—</td></tr>
<tr><td rowspan="4">External Bus Expansion</td><td>Address Space (Bytes)</td><td colspan="26">—</td></tr>
<tr><td>External Bus Interface</td><td colspan="26">—</td></tr>
<tr><td>Bus Structure</td><td colspan="26">—</td></tr>
<tr><td>DRAM Controller</td><td colspan="26">—</td></tr>
<tr><td rowspan="8">Clock</td><td>Clock Generation Circuit</td><td colspan="26">2 circuits (Main clock, Sub clock)</td></tr>
<tr><td>PLL</td><td colspan="26">—</td></tr>
<tr><td>Subclock</td><td colspan="26">Yes</td></tr>
<tr><td>RTC</td><td colspan="26">—</td></tr>
<tr><td>On-Chip Oscillator</td><td colspan="26">—</td></tr>
<tr><td>Oscillation Stop Detection</td><td colspan="26">—</td></tr>
<tr><td>Frequency Divider</td><td colspan="26">1/n (n=1, 2, 4, 8, 16)</td></tr>
<tr><td>Power Save</td><td colspan="26">Wait/Stop</td></tr>
<tr><td rowspan="2">Power Supply Voltage Detection</td><td>Power-On Reset/POR</td><td colspan="26">—</td></tr>
<tr><td>Low Voltage Detection/LVD</td><td colspan="26">—</td></tr>
<tr><td rowspan="3">A/D Converter</td><td>Resolution×Channels</td><td colspan="26">10-bit×26</td></tr>
<tr><td>Sample and Hold</td><td colspan="26">Yes</td></tr>
<tr><td>Multi-Channel Sample and Hold</td><td colspan="26">—</td></tr>
<tr><td>D/A Converter</td><td>Resolution×Channels</td><td colspan="26">8-bit×2</td></tr>
<tr><td rowspan="9">Timer</td><td>8-bit</td><td colspan="26">—</td></tr>
<tr><td>16-bit</td><td colspan="26">11 (Timer A, Timer B)</td></tr>
<tr><td>Input Capture</td><td colspan="26">—</td></tr>
<tr><td>Output Compare</td><td colspan="26">—</td></tr>
<tr><td>PWM Output</td><td>3 (Timer A)</td><td colspan="2">5 (Timer A)</td><td colspan="2">3 (Timer A)</td><td colspan="2">5 (Timer A)</td><td colspan="3">3 (Timer A)</td><td>5 (Timer A)</td><td colspan="2">3 (Timer A)</td><td>5 (Timer A)</td><td>3 (Timer A)</td><td colspan="3">5 (Timer A)</td><td colspan="2">3 (Timer A)</td><td colspan="6">5 (Timer A)</td></tr>
<tr><td>Real-Time Port</td><td colspan="26">—</td></tr>
<tr><td>Event Counter</td><td colspan="26">11 (Timer A, Timer B)</td></tr>
<tr><td>2-Phase Encoder Input</td><td>2 (Timer A)</td><td colspan="2">3 (Timer A)</td><td colspan="2">2 (Timer A)</td><td colspan="2">3 (Timer A)</td><td colspan="3">2 (Timer A)</td><td>3 (Timer A)</td><td colspan="2">2 (Timer A)</td><td>3 (Timer A)</td><td>2 (Timer A)</td><td colspan="3">3 (Timer A)</td><td colspan="2">2 (Timer A)</td><td colspan="6">3 (Timer A)</td></tr>
<tr><td>3-Phase Inverter Control</td><td>—</td><td colspan="2">1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)</td><td colspan="2">—</td><td colspan="2">1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)</td><td colspan="3">—</td><td>1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)</td><td colspan="2">—</td><td>1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)</td><td>—</td><td colspan="3">1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)</td><td colspan="2">—</td><td colspan="6">1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)</td></tr>
<tr><td colspan="2">Watchdog Timer</td><td colspan="26">1</td></tr>
<tr><td rowspan="3">Serial Interface</td><td>Clock Sync./ Clock Async.</td><td>2 (UART)</td><td colspan="2">3 (UART)</td><td colspan="2">2 (UART)</td><td colspan="2">3 (UART)</td><td colspan="3">2 (UART)</td><td>3 (UART)</td><td colspan="2">2 (UART)</td><td>3 (UART)</td><td>2 (UART)</td><td colspan="3">3 (UART)</td><td colspan="2">2 (UART)</td><td colspan="6">3 (UART)</td></tr>
<tr><td>Clock Sync. Only</td><td colspan="26">2 (SI/O)</td></tr>
<tr><td>Clock Async. Only</td><td>1 (UART)</td><td colspan="2">—</td><td colspan="2">1 (UART)</td><td colspan="2">—</td><td colspan="3">1 (UART)</td><td>—</td><td colspan="2">1 (UART)</td><td>—</td><td>1 (UART)</td><td colspan="3">—</td><td colspan="2">1 (UART)</td><td colspan="6">—</td></tr>
<tr><td colspan="2">I²C-bus</td><td colspan="26">1 (UART)</td></tr>
<tr><td colspan="2">IEBus</td><td colspan="26">1 (UART)</td></tr>
<tr><td colspan="2">Smart Card/SIM</td><td colspan="26">1 (UART)</td></tr>
<tr><td colspan="2">Synchronous Serial Communication Unit/Special Serial I/O</td><td colspan="26">—</td></tr>
<tr><td rowspan="2">CAN</td><td>Channels</td><td colspan="26">—</td></tr>
<tr><td>Message Box (Numbers)</td><td colspan="26">—</td></tr>
<tr><td colspan="2">IrDA</td><td colspan="26">—</td></tr>
<tr><td colspan="2">CRC Calculation Circuit</td><td colspan="26">1 (CRC–CCITT ($X^{16}+X^{12}+X^{5}+1$))</td></tr>
<tr><td colspan="2">X/Y Converter</td><td colspan="26">—</td></tr>
<tr><td rowspan="5">I/O Ports</td><td>Input Only (Numbers)</td><td colspan="26">1</td></tr>
<tr><td>CMOS I/O (Numbers)</td><td>68</td><td colspan="2">85</td><td colspan="2">68</td><td colspan="2">85</td><td colspan="3">68</td><td>85</td><td colspan="2">68</td><td>85</td><td>68</td><td colspan="3">85</td><td colspan="2">68</td><td colspan="6">85</td></tr>
<tr><td>N-Channel Open Drain Port (Numbers)</td><td colspan="26">2</td></tr>
<tr><td>High Current Drive Port</td><td colspan="26">—</td></tr>
<tr><td>Pull-Up Resistor</td><td>68</td><td colspan="2">85</td><td colspan="2">68</td><td colspan="2">85</td><td colspan="3">68</td><td>85</td><td colspan="2">68</td><td>85</td><td>68</td><td colspan="3">85</td><td colspan="2">68</td><td colspan="6">85</td></tr>
<tr><td colspan="2">External Interrupts Pins</td><td>8</td><td colspan="2">11</td><td colspan="2">8</td><td colspan="2">11</td><td colspan="3">8</td><td>11</td><td colspan="2">8</td><td>11</td><td>8</td><td colspan="3">11</td><td colspan="2">8</td><td colspan="6">11</td></tr>
<tr><td rowspan="2">Debugging Function</td><td>On-Chip Debug</td><td colspan="17">—</td><td colspan="9">Yes</td></tr>
<tr><td>On-Board Flash Program</td><td colspan="17">—</td><td colspan="9">Yes</td></tr>
<tr><td rowspan="2">Other Functions</td><td>ROM Correction Function</td><td colspan="17">Yes</td><td colspan="9">—</td></tr>
<tr><td>Others</td><td colspan="26">—</td></tr>
<tr><td colspan="2">Operating Frequency/Supply Voltage</td><td colspan="9">16MHz/4.2 to 5.5V</td><td colspan="8">16MHz/4.5 to 5.5V</td><td colspan="9">16MHz/4.2 to 5.5V</td></tr>
<tr><td colspan="2">Operating Ambient Temperature (°C)</td><td>−40 to 85</td><td>−40 to 125</td><td colspan="2">−40 to 85</td><td colspan="2">−40 to 125</td><td colspan="2">−40 to 85</td><td colspan="3">−40 to 125</td><td>−40 to 85</td><td>−40 to 125</td><td colspan="2">−40 to 85</td><td>−40 to 125</td><td colspan="3">−40 to 85</td><td colspan="2">−40 to 105</td><td colspan="2">-40 to 85</td><td>−40 to 105</td><td>−40 to 85</td><td>−40 to 105</td></tr>
<tr><td colspan="2">Package</td><td>PRQP0080JA-A</td><td colspan="2">PRQP0100JB-A</td><td colspan="2">PRQP0080JA-A</td><td colspan="2">PRQP0100JB-A</td><td colspan="3">PRQP0080JA-A</td><td>PRQP0100JB-A</td><td colspan="2">PRQP0080JA-A</td><td>PRQP0100JB-A</td><td>PRQP0080JA-A</td><td colspan="3">PRQP0100JB-A</td><td colspan="2">PRQP0080JA-A</td><td colspan="2">PRQP0100JB-A</td><td>PLQP0100KB-A</td><td>PRQP0100JB-A</td><td>PLQP0100KB-A</td><td>PRQP0100JB-A</td></tr>
<tr><td colspan="2">Part No.</td><td>M30623M4T-XXXGP</td><td>M30622M8V-XXXFP</td><td>M30622M8T-XXXFP</td><td>M30623M8T-XXXGP</td><td>M30623M8V-XXXGP</td><td>M30622MCV-XXXFP</td><td>M30622MCT-XXXFP</td><td>M30623MCT-XXXGP</td><td>M30623MCV-XXXGP</td><td>M30623ECVGP</td><td>M30622ECVFP</td><td>M30623ECT-XXXGP</td><td>M30623ECV-XXXGP</td><td>M30622ECTFP</td><td>M30623ECTGP</td><td>M30622ECV-XXXFP</td><td>M30622ECT-XXXFP</td><td>M30620FCT-XXXFP</td><td>M30621FCTGP</td><td>M30621FCUGP</td><td>M30620FCUFP</td><td>M30620FCTFP</td><td>M30624FGT-XXXGP</td><td>M30624FGUFP</td><td>M30624FGTGP</td><td>M30624FGU-XXXFP</td></tr>
</table>

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/60 Series)

Group		M16C/6N4				M16C/6N5	
Memory	ROM (Bytes)	128K	128K + 4K	256K	256K + 4K	128K	128K + 4K
	RAM (Bytes)	5K		10K		5K	
	ROM Type*1	M	F	M	F	M	F
	Data Flash	–	Yes (4K)	–	Yes (4K)	–	Yes (4K)
	Program Security	–	Yes (ID Code Check Function, ROM Code Protect Function)	–	Yes (ID Code Check Function, ROM Code Protect Function)	–	Yes (ID Code Check Function, ROM Code Protect Function)
CPU	CPU	M16C/60 Core					
	Basic Instructions	91					
	Minimum Instruction Execution Time (ns)	50 (@20MHz)					
	Multiplier	16 × 16 → 32					
	Multiply-Accumulate Instruction	16 × 16 + 32 → 32					
	Barrel Shifter	–					
DMA	DMAC (Channels)	2					
	DTC/DMAC II	–					
External Bus Expansion	Address Space (Bytes)	1M					
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals					
	Bus Structure	Selectable from Separate bus, Multiplex bus, Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (12/16/20)					
	DRAM Controller	–					
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)					
	PLL	Yes					
	Subclock	Yes					
	RTC	–					
	On-Chip Oscillator	Yes					
	Oscillation Stop Detection	Yes					
	Frequency Divider	1/n (n = 1, 2, 4, 8, 16)					
	Power Save	Wait/Stop					
Power Supply Voltage Detection	Power-On Reset/POR	–					
	Low Voltage Detection/LVD	–					
A/D Converter	Resolution × Channels	10-bit × 26					
	Sample and Hold	Yes					
	Multi-Channel Sample and Hold	–					
D/A Converter	Resolution × Channels	8-bit × 2					
Timer	8-bit	–					
	16-bit	11 (Timer A, Timer B)					
	Input Capture	–					
	Output Compare	–					
	PWM Output	5 (Timer A)					
	Real-Time Port	–					
	Event Counter	11 (Timer A, Timer B)					
	2-Phase Encoder Input	3 (Timer A)					
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)					
Watchdog Timer		1					
Serial Interface	Clock Sync./ Clock Async.	3 (UART)					
	Clock Sync. Only	1 (SI/O)					
	Clock Async. Only	–					
I^2C-bus		3 (UART)					
IEBus		3 (UART)					
Smart Card/SIM		1 (UART)					
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)					
CAN	Channels	2				1	
	Message Box (Numbers)	16 + 16				16	
IrDA		–					
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16} + X^{12} + X^5 + 1$))					
X/Y Converter		–					
I/O Ports	Input Only (Numbers)	1					
	CMOS I/O (Numbers)	85					
	N-Channel Open Drain Port (Numbers)	2					
	High Current Drive Port	–					
	Pull-Up Resistor	85					
External Interrupts Pins		11					
Debugging Function	On-Chip Debug	–	Yes	–	Yes	–	Yes
	On-Board Flash Program	–	Yes	–	Yes	–	Yes
Other Functions	ROM Correction Function	Yes	–	Yes	–	Yes	–
	Others	–					
Operating Frequency/Supply Voltage		20MHz/4.2 to 5.5V					

Part No.	Operating Ambient Temperature (°C)	Package
M306N4MCT-XXXGP	–40 to 85	PLQP0100KB-A
M306N4MCT-XXXFP	–40 to 85	PRQP0100JB-A
M306N4MCV-XXXGP	–40 to 125	PLQP0100KB-A
M306N4MCV-XXXFP	–40 to 125	PRQP0100JB-A
M306N4FCTGP	–40 to 85	PLQP0100KB-A
M306N4FCVFP	–40 to 125	PRQP0100JB-A
M306N4FCVGP	–40 to 125	PLQP0100KB-A
M306N4FCTFP	–40 to 85	PRQP0100JB-A
M306N4MGT-XXXGP	–40 to 85	PLQP0100KB-A
M306N4MGT-XXXFP	–40 to 85	PRQP0100JB-A
M306N4MGV-XXXFP	–40 to 125	PRQP0100JB-A
M306N4MGV-XXXGP	–40 to 125	PLQP0100KB-A
M306N4FGTFP	–40 to 85	PRQP0100JB-A
M306N4FGTGP	–40 to 85	PLQP0100KB-A
M306N4FGVFP	–40 to 125	PRQP0100JB-A
M306N4FGVGP	–40 to 125	PLQP0100KB-A
M306N5MCT-XXXGP	–40 to 85	PLQP0100KB-A
M306N5MCV-XXXGP	–40 to 125	PLQP0100KB-A
M306N5MCV-XXXFP	–40 to 125	PRQP0100JB-A
M306N5MCT-XXXFP	–40 to 85	PRQP0100JB-A
M306N5FCVFP	–40 to 125	PRQP0100JB-A
M306N5FCVGP	–40 to 125	PLQP0100KB-A
M306N5FCTGP	–40 to 85	PLQP0100KB-A
M306N5FCTFP	–40 to 85	PRQP0100JB-A

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (M16C/60 Series)

Group		M16C/6NK				M16C/6NM			
Memory	ROM (Bytes)	384K+4K		512K+4K		384K+4K		512K+4K	
	RAM (Bytes)	31K							
	ROM Type*1	F							
	Data Flash	Yes (4K)							
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)							
CPU	CPU	M16C/60 Core							
	Basic Instructions	91							
	Minimum Instruction Execution Time (ns)	50 (@20MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
	Barrel Shifter	—							
DMA	DMAC (Channels)	2							
	DTC/DMAC II	—							
External Bus Expansion	Address Space (Bytes)	—							
	External Bus Interface	—							
	Bus Structure	—							
	DRAM Controller	—							
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)							
	PLL	Yes							
	Subclock	Yes							
	RTC	—							
	On-Chip Oscillator	Yes							
	Oscillation Stop Detection	Yes							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	—							
	Low Voltage Detection/LVD	—							
A/D Converter	Resolution×Channels	10-bit×26							
	Sample and Hold	Yes							
	Multi-Channel Sample and Hold	—							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	—							
	16-bit	11 (Timer A, Timer B)							
	Input Capture	—							
	Output Compare	—							
	PWM Output	5 (Timer A)							
	Real-Time Port	—							
	Event Counter	11 (Timer A, Timer B)							
	2-Phase Encoder Input	3 (Timer A)							
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)							
Watchdog Timer		1							
Serial Interface	Clock Sync./ Clock Async.	3 (UART)							
	Clock Sync. Only	2 (SI/O)				4 (SI/O)			
	Clock Async. Only	—							
I^2C-bus		3 (UART)							
IEBus		3 (UART)							
Smart Card/SIM		1 (UART)							
Synchronous Serial Communication Unit/Special Serial I/O		3 (UART)							
CAN	Channels	2							
	Message Box (Numbers)	16+16							
IrDA		—							
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$))							
X/Y Converter		—							
I/O Ports	Input Only (Numbers)	1							
	CMOS I/O (Numbers)	85				111			
	N-Channel Open Drain Port (Numbers)	2							
	High Current Drive Port	—							
	Pull-Up Resistor	85				111			
External Interrupts Pins		11				14			
Debugging Function	On-Chip Debug	Yes							
	On-Board Flash Program	Yes							
Other Functions	ROM Correction Function	—							
	Others	—							
Operating Frequency/Supply Voltage		20MHz/4.2 to 5.5V							
Operating Ambient Temperature (°C)		−40 to 125	−40 to 85		−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125
Package		PLQP0100KB-A				PLQP0128KB-A			
Part No.		M306NKFHVGP	M306NKFHTGP	M306NKFJTGP	M306NKFJVGP	M306NMFHTGP	M306NMFHVGP	M306NMFJTGP	M306NMFJVGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/Tiny Series)

Group		M16C/26A (M16C/26T)				M16C/28											
Memory	ROM (Bytes)	24K+4K	48K+4K	64K+4K		64K		96K		96K+4K							
	RAM (Bytes)	1K	2K			4K		8K									
	ROM Type*1	F				M				F							
	Data Flash/E2 Data Flash	4K (Data Flash)				—				4K (Data Flash)							
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)				—				Yes (ID Code Check Function, ROM Code Protect Function)							
CPU	CPU	M16C/60 Core															
	Basic Instructions	91															
	Minimum Instruction Execution Time (ns)	50 (@20MHz)			62.5 (@16MHz)	50 (@20MHz)		62.5 (@16MHz)		50 (@20MHz)		62.5 (@16MHz)		50 (@20MHz)		62.5 (@16MHz)	
	Multiplier	16×16→32															
	Multiply-Accumulate Instruction	16×16+32→32															
	Barrel Shifter	—															
DMA	DMAC (Channels)	2															
	DTC/DMAC II	—															
External Bus Expansion	Address Space (Bytes)	—															
	External Bus Interface	—															
	Bus Structure	—															
	DRAM Controller	—															
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)															
	PLL	Yes															
	Subclock	Yes															
	RTC	—															
	On-Chip Oscillator	Yes															
	Oscillation Stop Detection	Yes															
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)															
	Power Save	Wait/Stop															
Power Supply Voltage Detection	Power-On Reset/POR	—															
	Low Voltage Detection/LVD	—															
A/D Converter	Resolution×Channels	10-bit×12				10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16
	Sample and Hold	Yes															
	Multi-Channel Sample and Hold	Yes															
D/A Converter	Resolution×Channels	—															
Timer	8-bit	—															
	16-bit	8 (Timer A, Timer B)															
	Input Capture	—				8 (Timer S)											
	Output Compare	—				8 (Timer S)											
	PWM Output	5 (Timer A)				13 (Timer A, Timer S)											
	Real-Time Port	—															
	Event Counter	8 (Timer A, Timer B)															
	2-Phase Encoder Input	3 (Timer A)				3 (Timer A)+1 (Timer S)											
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)															
Watchdog Timer		1															
Serial Interface	Clock Sync./ Clock Async.	3 (UART)															
	Clock Sync. Only	—				2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)
	Clock Async. Only	—															
I²C-bus		1 (UART)				2 (Multi master I²C, UART)											
IEBus		1 (UART)															
Smart Card/SIM		1 (UART)															
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)															
CAN	Channels	—															
	Message Box (Numbers)	—															
IrDA		—															
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$)/CRC–16 ($X^{16}+X^{15}+X^2+1$))															
X/Y Converter		—															
I/O Ports	Input Only (Numbers)	—															
	CMOS I/O (Numbers)	39				71	55	71	55	71	55	71	55	71	55	71	55
	N-Channel Open Drain Port (Numbers)	—															
	High Current Drive Port	—															
	Pull-Up Resistor	39				71	55	71	55	71	55	71	55	71	55	71	55
External Interrupts Pins		11															
Debugging Function	On-Chip Debug	Yes				—				Yes							
	On-Board Flash Program	Yes				—				Yes							
Other Functions	ROM Correction Function	—				Yes (Address match×2)				—							
	Others	—															
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V			16MHz/4.2 to 5.5V	20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V	
Operating Ambient Temperature (°C)		−40 to 85			−40 to 125	−40 to 85		−40 to 125		−40 to 85		−40 to 125		−40 to 85		−40 to 125	
Package		PLQP0048KB-A				PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A
Part No.		M30260F3TGP	M30260F6TGP	M30260F8TGP	M30260F8VGP	M30280M8T-XXXHP	M30281M8T-XXXHP	M30280M8V-XXXHP	M30281M8V-XXXHP	M30280MAT-XXXHP	M30281MAT-XXXHP	M30280MAV-XXXHP	M30281MAV-XXXHP	M30280FATHP	M30281FATHP	M30280FAVHP	M30281FAVHP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (M16C/Tiny Series)

Group		M16C/29																			
Memory	ROM (Bytes)	64K		96K		96K+4K		128K		128K+4K											
	RAM (Bytes)	4K		8K				12K													
	ROM Type*1	M				F		M		F											
	Data Flash/E2 Data Flash	—				4K (Data Flash)		—		4K (Data Flash)											
	Program Security	—				Yes (ID Code Check Function, ROM Code Protect Function)		—		Yes (ID Code Check Function, ROM Code Protect Function)											
CPU	CPU	M16C/60 Core																			
	Basic Instructions	91																			
	Minimum Instruction Execution Time (ns)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)										
	Multiplier	16×16→32																			
	Multiply-Accumulate Instruction	16×16+32→32																			
	Barrel Shifter	—																			
DMA	DMAC (Channels)	2																			
	DTC/DMAC II	—																			
External Bus Expansion	Address Space (Bytes)	—																			
	External Bus Interface	—																			
	Bus Structure	—																			
	DRAM Controller	—																			
Clock	Clock Generation Circuit	4 circuits (Main clock, PLL, Sub clock, On-chip oscillator)																			
	PLL	Yes																			
	Subclock	Yes																			
	RTC	—																			
	On-Chip Oscillator	Yes																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	—																			
	Low Voltage Detection/LVD	—																			
A/D Converter	Resolution×Channels	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16	10-bit×27	10-bit×16
	Sample and Hold	Yes																			
	Multi-Channel Sample and Hold	Yes																			
D/A Converter	Resolution×Channels	—																			
Timer	8-bit	—																			
	16-bit	8 (Timer A, Timer B)																			
	Input Capture	8 (Timer S)																			
	Output Compare	8 (Timer S)																			
	PWM Output	13 (Timer A, Timer S)																			
	Real-Time Port	—																			
	Event Counter	8 (Timer A, Timer B)																			
	2-Phase Encoder Input	3 (Timer A)+1 (Timer S)																			
	3-Phase Inverter Control	1 (shared with Timer A4, Timer A1, Timer A2, Timer B2, Dead Time Timer)																			
Watchdog Timer		1																			
Serial Interface	Clock Sync./ Clock Async.	3 (UART)																			
	Clock Sync. Only	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)	2 (SI/O)	1 (SI/O)
	Clock Async. Only	—																			
I²C-bus		2 (Multi master I²C, UART)																			
IEBus		1 (UART)																			
Smart Card/SIM		1 (UART)																			
Synchronous Serial Communication Unit/Special Serial I/O		1 (UART)																			
CAN	Channels	1																			
	Message Box (Numbers)	16																			
IrDA		—																			
CRC Calculation Circuit		1 (CRC–CCITT ($X^{16}+X^{12}+X^5+1$)/CRC–16 ($X^{16}+X^{15}+X^2+1$))																			
X/Y Converter		—																			
I/O Ports	Input Only (Numbers)	—																			
	CMOS I/O (Numbers)	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55
	N-Channel Open Drain Port (Numbers)	—																			
	High Current Drive Port	—																			
	Pull-Up Resistor	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55	71	55
External Interrupts Pins		11																			
Debugging Function	On-Chip Debug	—				Yes		—		Yes											
	On-Board Flash Program	—				Yes		—		Yes											
Other Functions	ROM Correction Function	Yes (Address match×2)				—		Yes (Address match×2)		—											
	Others	—																			
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V		20MHz/3.0 to 5.5V		16MHz/4.2 to 5.5V	
Operating Ambient Temperature (°C)		−40 to 85		−40 to 125		−40 to 85		−40 to 125		−40 to 85		−40 to 125		−40 to 85		−40 to 125		−40 to 85		−40 to 125	
Package		PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A	PLQP0080KB-A	PLQP0064KB-A
Part No.		M30290M8T-XXXHP	M30291M8T-XXXHP	M30290M8V-XXXHP	M30291M8V-XXXHP	M30290MAT-XXXHP	M30291MAT-XXXHP	M30290MAV-XXXHP	M30291MAV-XXXHP	M30290FATHP	M30291FATHP	M30290FAVHP	M30291FAVHP	M30290MCT-XXXHP	M30291MCT-XXXHP	M30290MCV-XXXHP	M30291MCV-XXXHP	M30290FCTHP	M30291FCTHP	M30290FCVHP	M30291FCVHP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (M16C/10 Series)

Group		M16C/1N					
Memory	ROM (Bytes)	32K	64K			64K+4K	
	RAM (Bytes)	1K	3K				
	ROM Type*1	M				F	
	Data Flash	—				Yes (4K)	
	Program Security	—				Yes (ID Code Check Function, ROM Code Protect Function)	
CPU	CPU	M16C/60 Core					
	Basic Instructions	91					
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)					
	Multiplier	16×16→32					
	Multiply-Accumulate Instruction	16×16+32→32					
	Barrel Shifter	—					
DMA	DMAC (Channels)	—					
	DTC/DMAC II	—					
External Bus Expansion	Address Space (Bytes)	—					
	External Bus Interface	—					
	Bus Structure	—					
	DRAM Controller	—					
Clock	Clock Generation Circuit	3 circuits (Main clock, Sub clock, On-chip oscillator)					
	PLL	—					
	Subclock	Yes					
	RTC	—					
	On-Chip Oscillator	Yes					
	Oscillation Stop Detection	Yes					
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)					
	Power Save	Wait/Stop					
Power Supply Voltage Detection	Power-On Reset/POR	—					
	Low Voltage Detection/LVD	—					
A/D Converter	Resolution×Channels	10-bit×14					
	Sample and Hold	Yes					
	Multi-Channel Sample and Hold	—					
D/A Converter	Resolution×Channels	8-bit×1					
Timer	8-bit	4 (Timer 1, Timer X, Timer Y, Timer Z)					
	16-bit	1 (Timer C)					
	Input Capture	1 (Timer C)					
	Output Compare	—					
	PWM Output	2 (Timer Y, Timer Z)					
	Real-Time Port	—					
	Event Counter	1 (Timer X)					
	2-Phase Encoder Input	—					
	3-Phase Inverter Control	—					
Watchdog Timer		—					
Serial Interface	Clock Sync./ Clock Async.	2 (UART)					
	Clock Sync. Only	—					
	Clock Async. Only	—					
I^2C-bus		—					
IEBus		—					
Smart Card/SIM		—					
Synchronous Serial Communication Unit/Special Serial I/O		—					
CAN	Channels	1					
	Message Box (Numbers)	16					
IrDA		—					
CRC Calculation Circuit		—					
X/Y Converter		—					
I/O Ports	Input Only (Numbers)	—					
	CMOS I/O (Numbers)	37					
	N-Channel Open Drain Port (Numbers)	—					
	High Current Drive Port	8					
	Pull-Up Resistor	37					
External Interrupts Pins		8					
Debugging Function	On-Chip Debug	—				Yes	
	On-Board Flash Program	—				Yes	
Other Functions	ROM Correction Function	Yes				—	
	Others	—					
Operating Frequency/Supply Voltage		16MHz/4.2 to 5.5V					
Operating Ambient Temperature (°C)		−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85
Package		PLQP0048KB-A					
Part No.		M301N2M4V-XXXFP	M301N2M4T-XXXFP	M301N2M8V-XXXFP	M301N2M8T-XXXFP	M301N2F8VFP	M301N2F8TFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R8C/Tiny Series)

Group		R8C/20										R8C/21									
Memory	ROM (Bytes)	32K		48K		64K		96K		128K		32K+2K		48K+2K		64K+2K		96K+2K		128K+2K	
	RAM (Bytes)	2K		2.5K		3K		5K		6K		2K		2.5K		3K		5K		6K	
	ROM Type*1	F																			
	Data Flash/E2 Data Flash	—										2K (Data Flash)									
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)																			
CPU	CPU	R8C Core																			
	Basic Instructions	89																			
	Minimum Instruction Execution Time (ns)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)
	Multiplier	16×16→32																			
	Multiply-Accumulate Instruction	16×16+32→32																			
Clock	Clock Generation Circuit	2 circuits (Main clock, On-chip oscillator)																			
	PLL	—																			
	Subclock	—																			
	RTC	—																			
	On-Chip Oscillator	Yes (High precision, High speed : 40MHz, Low speed : 125kHz)																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	Yes																			
	Low Voltage Detection/LVD	Yes (Voltage detection 2)																			
A/D Converter	Resolution×Channels	10-bit×12																			
	Sample and Hold	Yes																			
D/A Converter	Resolution×Channels	—																			
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)																			
	16-bit	2 (Timer RD)																			
	Input Capture	8 (shared with Timer RD)																			
	Output Compare	9 (shared with Timer RD, Timer RE)																			
	PWM Output	7 (shared with Timer RB, Timer RD)																			
	Real-Time Port	—																			
	Event Counter	1 (shared with Timer RA)																			
	2-Phase Encoder Input	—																			
	3-Phase Inverter Control	1 (shared with Timer RD)																			
Watchdog Timer		1 (with automatic start, clock source protection function)																			
Serial Interface	Clock Sync./ Clock Async.	1 (UART0)																			
	Clock Sync. Only	—																			
	Clock Async. Only	1 (UART1)																			
I^2C-bus		1 (Share with Synchronous Serial Communication Unit)																			
Synchronous Serial Communication Unit/Special Serial I/O		1 (Share with I^2C)																			
CAN	Channels	—																			
	Message Box (Numbers)	—																			
I/O Ports	Input Only (Numbers)	3																			
	CMOS I/O (Numbers)	41																			
	N-Channel Open Drain Port (Numbers)	—																			
	High Current Drive Port	—																			
	Pull-Up Resistor	41																			
External Interrupts Pins		8																			
Debugging Function	On-Chip Debug	Yes																			
	On-Board Flash Program	Yes																			
Other Functions	ROM Correction Function	—																			
	Others	—																			
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V
Operating Ambient Temperature (°C)		−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125
Package		PLQP0048KB-A																			
Part No.		R5F21206JFP	R5F21206KFP	R5F21207JFP	R5F21207KFP	R5F21208JFP	R5F21208KFP	R5F2120AJFP	R5F2120AKFP	R5F2120CJFP	R5F2120CKFP	R5F21216JFP	R5F21216KFP	R5F21217JFP	R5F21217KFP	R5F21218JFP	R5F21218KFP	R5F2121AJFP	R5F2121AKFP	R5F2121CJFP	R5F2121CKFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

• Specifications (R8C/Tiny Series)

Group		R8C/22										R8C/23									
Memory	ROM (Bytes)	32K		48K		64K		96K		128K		32K+2K		48K+2K		64K+2K		96K+2K		128K+2K	
	RAM (Bytes)	2K		2.5K		3K		5K		6K		2K		2.5K		3K		5K		6K	
	ROM Type*1	F																			
	Data Flash/E2 Data Flash	—										2K (Data Flash)									
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)																			
CPU	CPU	R8C Core																			
	Basic Instructions	89																			
	Minimum Instruction Execution Time (ns)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)
	Multiplier	16×16→32																			
	Multiply-Accumulate Instruction	16×16+32→32																			
Clock	Clock Generation Circuit	2 circuits (Main clock, On-chip oscillator)																			
	PLL	—																			
	Subclock	—																			
	RTC	—																			
	On-Chip Oscillator	Yes (High precision, High speed : 40MHz, Low speed : 125kHz)																			
	Oscillation Stop Detection	Yes																			
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)																			
	Power Save	Wait/Stop																			
Power Supply Voltage Detection	Power-On Reset/POR	Yes																			
	Low Voltage Detection/LVD	Yes (Voltage detection 2)																			
A/D Converter	Resolution×Channels	10-bit×12																			
	Sample and Hold	Yes																			
D/A Converter	Resolution×Channels	—																			
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)																			
	16-bit	2 (Timer RD)																			
	Input Capture	8 (shared with Timer RD)																			
	Output Compare	9 (shared with Timer RD, Timer RE)																			
	PWM Output	7 (shared with Timer RB, Timer RD)																			
	Real-Time Port	—																			
	Event Counter	1 (shared with Timer RA)																			
	2-Phase Encoder Input	—																			
	3-Phase Inverter Control	1 (shared with Timer RD)																			
Watchdog Timer		1 (with automatic start, clock source protection function)																			
Serial Interface	Clock Sync./ Clock Async.	1 (UART0)																			
	Clock Sync. Only	—																			
	Clock Async. Only	1 (UART1)																			
I^2C-bus		1 (Share with Synchronous Serial Communication Unit)																			
Synchronous Serial Communication Unit/Special Serial I/O		1 (Share with I^2C)																			
CAN	Channels	16																			
	Message Box (Numbers)	—																			
I/O Ports	Input Only (Numbers)	3																			
	CMOS I/O (Numbers)	41																			
	N-Channel Open Drain Port (Numbers)	—																			
	High Current Drive Port	—																			
	Pull-Up Resistor	41																			
External Interrupts Pins		8																			
Debugging Function	On-Chip Debug	Yes																			
	On-Board Flash Program	Yes																			
Other Functions	ROM Correction Function	—																			
	Others	—																			
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V
Operating Ambient Temperature (°C)		−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125	−40 to 85	−40 to 125
Package		PLQP0048KB-A																			
Part No.		R5F21226JFP	R5F21226KFP	R5F21227JFP	R5F21227KFP	R5F21228JFP	R5F21228KFP	R5F2122AJFP	R5F2122AKFP	R5F2122CJFP	R5F2122CKFP	R5F21236JFP	R5F21236KFP	R5F21237JFP	R5F21237KFP	R5F21238JFP	R5F21238KFP	R5F2123AJFP	R5F2123AKFP	R5F2123CJFP	R5F2123CKFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

Automotive MCUs

• Specifications (R8C/Tiny Series)

Group		R8C/26				R8C/27				R8C/28				R8C/29			
Memory	ROM (Bytes)	16K		32K		16K+2K		32K+2K		16K		32K		16K+2K		32K+2K	
	RAM (Bytes)	1K		1.5K		1K		1.5K		1K							
	ROM Type*1	F															
	Data Flash/E2 Data Flash	–				2K (Data Flash)				–				2K (Data Flash)			
	Program Security	Yes (ID Code Check Function, ROM Code Protect Function)															
CPU	CPU	R8C Core															
	Basic Instructions	89															
	Minimum Instruction Execution Time (ns)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)	50 (@20MHz)	62.5 (@16MHz)
	Multiplier	16×16→32															
	Multiply-Accumulate Instruction	16×16+32→32															
Clock	Clock Generation Circuit	2 circuits (Main clock, On-chip oscillator)															
	PLL	–															
	Subclock	–															
	RTC	–															
	On-Chip Oscillator	Yes (High precision, High speed : 40MHz, Low speed : 125kHz)															
	Oscillation Stop Detection	Yes															
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)															
	Power Save	Wait/Stop															
Power Supply Voltage Detection	Power-On Reset/POR	Yes															
	Low Voltage Detection/LVD	Yes (Voltage detection 2)															
A/D Converter	Resolution×Channels	10-bit×12								10-bit×4							
	Sample and Hold	Yes															
D/A Converter	Resolution×Channels	–															
Timer	8-bit	3 (Timer RA, Timer RB, Timer RE)															
	16-bit	1 (Timer RC)															
	Input Capture	4 (shared with Timer RC)															
	Output Compare	5 (shared with Timer RC, Timer RE)															
	PWM Output	4 (shared with Timer RB, Timer RC)															
	Real-Time Port	–															
	Event Counter	1 (shared with Timer RA)															
	2-Phase Encoder Input	–															
	3-Phase Inverter Control	–															
Watchdog Timer		1 (with automatic start, clock source protection function)															
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART1)								1 (UART0)							
	Clock Sync. Only	–															
	Clock Async. Only	–								1 (UART1)							
I^2C-bus		1 (Share with Synchronous Serial Communication Unit)															
Synchronous Serial Communication Unit/Special Serial I/O		1 (Share with I^2C)															
CAN	Channels	–															
	Message Box (Numbers)	–															
I/O Ports	Input Only (Numbers)	3															
	CMOS I/O (Numbers)	25								13							
	N-Channel Open Drain Port (Numbers)	–															
	High Current Drive Port	–															
	Pull-Up Resistor	25								13							
External Interrupts Pins		7															
Debugging Function	On-Chip Debug	Yes															
	On-Board Flash Program	Yes															
Other Functions	ROM Correction Function	–															
	Others	–															
Operating Frequency/Supply Voltage		20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	20MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V	16MHz/3.0 to 5.5V, 10MHz/2.7 to 5.5V
Operating Ambient Temperature (°C)		–40 to 85	–40 to 125	–40 to 85	–40 to 125	–40 to 85	–40 to 125	–40 to 85	–40 to 125	–40 to 85	–40 to 125	–40 to 85	–40 to 125	–40 to 85	–40 to 125	–40 to 85	–40 to 125
Package		PLQP0032GB-A								PLSP0020JB-A							
Part No.		R5F21264JFP	R5F21264KFP	R5F21266JFP	R5F21266KFP	R5F21274JFP	R5F21274KFP	R5F21276JFP	R5F21276KFP	R5F21284JSP	R5F21284KSP	R5F21286JSP**	R5F21286KSP**	R5F21294JSP	R5F21294KSP	R5F21296JSP	R5F21296KSP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

MCUs for Notebook PCs / PC Servers

• Specifications (M16C/6K Group)

Group		M16C/6KA
Memory	ROM (Bytes)	128K
	RAM (Bytes)	5K
	ROM Type*1	F
	Data Flash	—
	Program Security	—
CPU	CPU	M16C/60 Core
	Basic Instructions	91
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)
	Multiplier	16×16→32
	Multiply-Accumulate Instruction	16×16+32→32
	Barrel Shifter	—
DMA	DMAC (Channels)	—
Clock	Clock Generation Circuit	2 circuits (Main clock, Sub clock)
	Subclock	—
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)
	Power Save	Normal operating (High-speed, Medium-speed) /Wait/Stop
A/D Converter	Resolution×Channels	10-bit×10
	Sample and Hold	—
D/A Converter	Resolution×Channels	—
Timer	8-bit	—
	16-bit	11
	PWM Output	6
	Event Counter	—
Watchdog Timer		1
Serial Interface	Clock Sync./ Clock Async.	1
	Clock Sync. Only	2 (SI/O3, SI/O4)
	Clock Async. Only	—
I²C-bus		3
I/O Ports	Input Only (Numbers)	1
	CMOS I/O (Numbers)	129
	N-Channel Open Drain Port (Numbers)	37
	High Current Drive Port	16
	Pull-Up Resistor	104
External Interrupts Pins		16
Other Functions	ROM Correction Function	—
	Others	PS/2 Interface×3
Operating Frequency/Supply Voltage		16MHz/3.0 to 3.6V
Operating Ambient Temperature (°C)		−20 to 85
Package		PTQP0144LA-A
Part No.		M306KAFCLRP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Products Lineup

USB MPUs and MCUs

• Specifications (M16C/20 Series)

Group		M16C/24		
Memory	ROM (Bytes)	64K	128K	
	RAM (Bytes)	5K	10K	
	ROM Type*1	M		F
	Data Flash	—		
	Program Security	—		Yes (ID code check function, ROM code protect function)
CPU	CPU	M16C/60 Core		
	Basic Instructions	91		
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)		
	Multiplier	16×16→32		
	Multiply-Accumulate Instruction	16×16+32→32		
	Barrel Shifter	—		
DMA	DMAC (Channels)	4		
	DTC/DMAC II	—		
External Bus Expansion	Address Space (Bytes)	1M		
	External Bus Interface	Support for insertion of 1 to 3 wait states, Outputs 4 chip-select signals		
	Bus Structure	Separate bus/Data Bus Width can be selected (8/16-bit), The number of output address buses can be selected (16/20)		
	DRAM Controller	—		
Clock	Clock Generation Circuit	3 circuits (Main clock, Sub-clock and On-chip oscillator)		
	PLL	Yes		
	Subclock	Yes		
	RTC	—		
	On-Chip Oscillator	Yes		
	Oscillation Stop Detection	Yes		
	Frequency Divider	1/n (n = 1, 2, 4, 8, 16)		
	Power Save	Normal operating (High-speed, Medium-speed, Low-speed, Low-power consumption) /Wait/Stop		
Power Supply Voltage Detection	Power-On Reset/POR	—		
	Low Voltage Detection/LVD	—		
A/D Converter	Resolution×Channels	10-bit×8		
	Sample and Hold	Yes		
	Multi-Channel Sample and Hold	—		
D/A Converter	Resolution×Channels	—		
Timer	8-bit	—		
	16-bit	5 (Timer A0, Timer A1, Timer A2, Timer A3, Timer A4)		
	Input Capture	—		
	Output Compare	—		
	PWM Output	5 (shared with Timer A0, Timer A1, Timer A2, Timer A3, Timer A4)		
	Real-Time Port	—		
	Event Counter	5 (shared with Timer A0, Timer A1, Timer A2, Timer A3, Timer A4)		
	2-Phase Encoder Input	—		
	3-Phase Inverter Control	—		
Watchdog Timer		1		
Serial Interface	Clock Sync./ Clock Async.	4 (UART0, UART1, UART2, UART3)		
	Clock Sync. Only	—		
	Clock Async. Only	—		
I^2C-bus		4 (UART0, UART1, UART2, UART3)		
IEBus		4 (UART0, UART1, UART2, UART3)		
Smart Card/SIM		4 (UART0, UART1, UART2, UART3)		
Synchronous Serial Communication Unit/Special Serial I/O		2 (UART0, UART1, Serial sound interface)		
CAN	Channels	—		
	Message Box (Numbers)	—		
USB Function		Yes (Full-Speed)		
IrDA		—		
CRC Calculation Circuit		2 (CRC-CCITT, CRC16)		
X/Y Converter		—		
I/O Ports	Input Only (Numbers)	1		
	CMOS I/O (Numbers)	80		
	N-Channel Open Drain Port (Numbers)	2		
	High Current Drive Port	8 (20mA)		
	Pull-Up Resistor	80 (Possible to Set Each of 4 Ports)		
External Interrupts Pins		12 (INT×3, NMI×1, Key Input ×8)		
Debugging Function	On-Chip Debug	—		
	On-Board Flash Program	—		
Other Functions	ROM Correction Function	Yes (Address match)		—
	Others	Serial Sound Interface : 2, AND Flash Controller		
Operating Frequency/Supply Voltage		16MHz/3.0 to 3.6		
Operating Ambient Temperature (°C)		−20 to 85		
Package		PLQP0100KB−A		
Part No.		M30245M8-XXXGP	M30245MC-XXXGP	M30245FCGP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Oz : OzROM version

★ : New product ★★ : Under development

Products Lineup

TV MCUs

• Specifications (M16C/6V Group)

Group		M16C/6V							
Memory	ROM (Bytes)	256K		384K		512K			
	RAM (Bytes)	10K						16K	
	ROM Type*1	M	F	M	F	M	F	M	F
	Data Flash	—							
	Program Security	—	Yes (ID code check function)	—	Yes (ID code check function)	—	Yes (ID code check function)	—	Yes (ID code check function)
CPU	CPU	M16C/60 Core							
	Basic Instructions	91							
	Minimum Instruction Execution Time (ns)	62.5 (@16MHz)							
	Multiplier	16×16→32							
	Multiply-Accumulate Instruction	16×16+32→32							
	Barrel Shifter	—							
DMA	DMAC (Channels)	2							
	DTC/DMAC II	—							
External Bus Expansion	Address Space (Bytes)	1M							
	External Bus Interface	Support for insertion of 1 wait states, Outputs 4 chip-select signals (CS0, CS1, CS2, CS3)							
	Bus Structure	Separate bus, Data bus width can be selected (8-bit/16-bit), The number of output address buses can be selected (16/20)							
	DRAM Controller	—							
Clock	Clock Generation Circuit	3 circuits (Main clock, Sub-clock OSD clock)							
	PLL	—							
	Subclock	Yes							
	Real Time clock	—							
	On-Chip Oscillator	—							
	Oscillation Stop Detection	—							
	Frequency Divider	1/n (n=1, 2, 4, 8, 16)							
	Power Save	Normal operation (High-speed, Medium-speed, Low-speed, Low-power consumption)/Wait/Stop							
Power Supply Voltage Detection	Power-On Reset/POR	—							
	Low Voltage Detection/LVD	—							
A/D Converter	Resolution×Channels	8-bit×6							
	Sample and Hold	Yes							
	Multi-Channel Sample and Hold	—							
D/A Converter	Resolution×Channels	8-bit×2							
Timer	8-bit	—							
	16-bit	8 (Timer A, Timer B)							
	Input Capture	—							
	Output Compare	—							
	PWM Output	2 (Timer A)							
	Real-Time Port	—							
	Event Counter	8 (Timer A, Timer B)							
	2-Phase Encoder Input	—							
	3-Phase Inverter Control	—							
Watchdog Timer		1							
Serial Interface	Clock Sync./ Clock Async.	2 (UART0, UART2)							
	Clock Sync. Only	—							
	Clock Async. Only	—							
I^2C-bus		2 (Multi master I^2C)							
IEBus		—							
Smart Card/SIM		—							
Synchronous Serial Communication Unit/Special Serial I/O		—							
CAN	Channels	—							
	Message Box (Numbers)	—							
IrDA		—							
CRC Calculation Circuit		—							
X/Y Converter		—							
I/O Ports	Input Only (Numbers)	—							
	CMOS I/O (Numbers)	74							
	N-Channel Open Drain Port (Numbers)	2							
	High Current Drive Port	—							
	Pull-Up Resistor	74 (Pull-up resistor can be set every four ports)							
External Interrupts Pins		3							
Debugging Function	On-Chip Debug	—	Yes	—	Yes	—	Yes	—	Yes
	On-Board Flash Program	—	Yes	—	Yes	—	Yes	—	Yes
Other Functions	ROM Correction Function	Yes (Address match×2)	—	Yes (Address match×2)	—	Yes (Address match×2)	—	Yes (Address match×2)	—
	Others	CCD, ID1 : 2 circuits, Triple-layer, 512-color OSD							
Operating Frequency/Supply Voltage		16MHz/3.15 to 3.45V							
Operating Ambient Temperature (°C)		−20 to 70							
Package		PRQP0100JB-A							
Part No.		M306V7MG-XXXFP	M306V7FGFP	M306V7MH-XXXFP	M306V7FHFP	M306V7MJ-XXXFP	M306V7FJFP	M306V7MJA-XXXFP	M306V7FJAFP

*1 F : Flash memory version, L : ROM-less version, M : Mask ROM version, O : One time PROM version, Qz : QzROM version

★ : New product ★★ : Under development

Development Tools List

Development Tools for R32C/100 Series

MCU		Software tools			On-chip debugging emulator*5		Programming tool
Series	Group	RTOS	C compiler package*2	IDE	Low-price version	High-function version	
R32C/100★★	R32C/111★★ R32C/116★★ R32C/117★★ R32C/118★★	M3T-MR100/4*1 *6	R32C Series C Compiler package (MISRA C*3)	High-performance Embedded Workshop *4	E8a★★	E30A	Flash Development Toolkit (R0C00000FDW04R)*7 ★★ (E8a emulator is necessary at programming)★★
	R32C/120★★ R32C/121★★ R32C/133★★ R32C/134★★ R32C/151★★ R32C/152★★ R32C/153★★ R32C/156★★ R32C/157★★ R32C/160★★ R32C/161★★				–		–

*1. M3T-MR100/4 is a general term referring to the real-time OS development kit (M3T-MR100K/4) and the mass production contract (M3T-MR100S/4).
*2. C compiler package includes integrated development environment (High-performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. MISRA C rule checking functionality may be added by installing the optional SQMlint (Part No.: R0C00000SCW01R) MISRA C rule checker.
*4. High-performance Embedded Workshop is included with C compiler package and Emulator software.
*5. E30A emulator bundles emulator software.
*6. Please refer to the following URL for the target MCU group (http://www.renesas.com/r32c100)
*7. Flash Development Toolkit is available in a product version (with technical support) and an evaluation version (without technical support).
Visit the Renesas Technology Web site (http://www.renesas.com/fdt) to confirm support details for specific MCU product numbers.
★★: Under development or evaluation: product name may be changed.

Operating Environment for R32C/100 Series Software Tools

Product type	Product name	Host machine (OS)*8
RTOS	M3T-MR100/4*1	IBM PC/AT Compatibles (Windows® XP, 2000)
C compiler package	C compiler package for R32C Series*2	IBM PC/AT Compatibles (Windows® XP, 2000)
MISRA C rule checker	SQMlint*3	IBM PC/AT Compatibles (Windows® XP, 2000)
IDE	High-performance Embedded Workshop*4	IBM PC/AT Compatibles (Windows® XP, 2000)
Simulator debugger	Simulator Debugger for R32C Series*5	IBM PC/AT Compatibles (Windows® XP, 2000)
Emulator software	Emulator Software for E8a *7★★ Emulator Software for E30A*7	IBM PC/AT Compatibles (Windows® XP, 2000)
Flash Development ToolKit	Flash Development Toolkit *8	IBM PC/AT Compatibles (Windows® XP, 2000)

*1. M3T-MR100/4 is a general term referring to the real-time OS development kit (M3T-MR100K/4) and the mass production contract (M3T-MR100S/4).
*2. The C compiler package for R32C/100 Series includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R) is sold as the optional product of Renesas C compiler.
*4. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5. Simulator debugger is included with C compiler package.
*6. Please refer to the following URL for Windows Vista.
http://www.renesas.com/tool_env
*7. Emulator software is included in Emulators.
*8. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support).
The E8a emulator (Part No.: R0E00008AKCE00) is necessary for programming.

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools for M32C/80 Series

MCU		Introductory tools	Software tools			Emulator (included emulator software*7)				Programming tool	
Series	Group	Starter kit	RTOS	C compiler package	IDE	Onchip debugging emulator	Compact emulator	In-circuit emulator: Emulator	In-circuit emulator: Emulation probe	Flash programmer*10	IC socket board*13
M32C/80	M32C/80	—	M3T-MR308/4*2	M3T-NC308WA*3 (MISRA C*4)	High-performance Embedded Workshop*5	—	M30850T3-CPE *8	PC7501	M30850T2-EPB	—	—
	M32C/82						—		M30830T-EPB *9		
	M32C/84 (M32C/84, M32C/84T)	Renesas Starter Kit for M32C/87 (R0K330879S001BE) *1				E8a*6	M30850T3-CPE *8		M30850T2-EPB	Flash Development Toolkit*11 (E8a emulator is necessary at programming) or M3A-0806*12	R0K3100PSZ000BR (for PRQP0100JB-A [Previous code: 100P6S-A]) R0K3100PQZ000BR (for PLQP0100KB-A [Previous code: 100P6Q-A]) R0K3144PSZ000BR (for PLQP0144KA-A [Previous code: 144P6Q-A])
	M32C/85 (M32C/85, M32C/85T)										
	M32C/87 (M32C/87, M32C/87A, M32C/87B)						M30870T2-CPE		M30870T-EPB		
	M32C/88 (M32C/88T)						—		M30880T-EPB	Flash Development Toolkit*11 (E8a emulator is necessary at programming)	R0K3100PQZ000BR (for PLQP0100KB-A [Previous code: 100P6Q-A]) R0K3144PSZ000BR (for PLQP0144KA-A [Previous code: 144P6Q-A])
	M32C/8A	—				—	M30850T3-CPE *8		M30850T2-EPB	—	—
	M32C/8B★★					E8a*6 ★★	—		★★★	Flash Development Toolkit*11 ★★ (E8a emulator is necessary at programming)	

*1. CPU board, E8a on-chip debugging emulator, software (High-Performance Embedded Workshop integrated development environment, M3T-NC308WA C compiler package evaluation version, E8a emulator software, Flash Development Toolkit evaluation version), etc., are included.
Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*2. M3T-MR308/4 is a general term referring to the real-time OS development kit (M3T-MR308K/4) and the mass production contract (M3T-MR308S/4).
*3. The M3T-NC308WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*4. MISRA C rule checking functionality may be added by installing the optional SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R).
*5. High-performance Embedded Workshop is included with C compiler package and Emulator software.
*6. The E8a emulator (Part No.: R0E00008AKCE00) includes emulator software (High-Performance Embedded Workshop integrated development environment, E8a emulator software, compiler evaluation version, Flash Development Toolkit evaluation version). Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*7. Each emulator includes an emulator debugger. Depending on the shipping date, the bundled emulator debugger may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*8. The M30850T3-CPE is the successor to the M30850T2-CPE. The M30850T3-CPE supports allocation of emulation memory to an external area and microprocessor mode using the optional R0E330850MSRC0 emulation memory board.
*9. The M32C/82 Group can be used with the combination of an emulator debugger, the PC4701U emulator and the M30830T-RPD-E emulation pod only when the MCU operating frequency is 20MHz or less.
*10. A variety of compatible programmers are available from our partner vendors. Contact the manufacturer regarding programmer details, supported MCUs and suitability for installation in a mass production or factory environment.
*11. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support). The E8a emulator is necessary for programming. Visit the Renesas Technology Web site (http://www.renesas.com/fdt) to confirm support details for specific MCU product numbers.
*12. The data flash areas of the M32C/84 and M32C/85 Groups cannot be reprogrammed.
*13. The IC socket board is a programming adapter that supports a specific programmer.
★★: Under Development ★★★: In Planning

Accessories for M32C/80 Series

MCU		Accessories			
Series	Group	Package type	Package name	Previous code	Recommended accessories*1
M32C/80	M32C/80	100 pin 0.5mm pitch LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)
		100 pin 0.65mm pitch QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)
	M32C/82 M32C/84 (M32C/84, M32C/84T) M32C/85 (M32C/85, M32C/85T) M32C/87 (M32C/87, M32C/87A, M32C/87B)	100 pin 0.5mm pitch LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)
		100 pin 0.65mm pitch QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)
		144 pin 0.5mm pitch LQFP	PLQP0144KA-A	144P6Q-A	M3T-FLX-144NSD (optional)
	M32C/88 (M32C/88T)	100 pin 0.5mm pitch LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)
		144 pin 0.5mm pitch LQFP	PLQP0144KA-A	144P6Q-A	M3T-FLX-144NSD (optional)
	M32C/8A	100 pin 0.5mm pitch LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)
	M32C/8B★★	100 pin 0.5mm pitch LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)
		144 pin 0.5mm pitch LQFP	PLQP0144KA-A	144P6Q-A	M3T-FLX-144NSD (optional)

*1. A variety of other accessories are available. Visit the Renesas Technology Web site (http://www.renesas.com/accessory) for details.
(optional): Not included with compact emulator or emulation probe. Purchase it separately.
★★: Under Development

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools List

Development Tools for M16C/80 Series

MCU		Software tools			Emulator (bundled Emulator software*5)			Programming tool	
Series	Group	RTOS	C compiler package	IDE	Compact emulator	In-circuit emulator		Flash programmer	IC socket board*7
						Emulator	Emulation pod or Probe		
M16C/80	**M16C/80**	M3T-MR308/4*1	M3T-NC308WA*2 (MISRA C*3)	High-performance Embedded Workshop*4	M30800T-CPE (RAM 10K)	PC4701U	M30803T-RPD-E (RAM 24K)*6	M3A-0806	R0K3100PSZ000BR (for PRQP0100JB-A [Previous code: 100P6S-A]) R0K3100PQZ000BR (for PLQP0100KB-A [Previous code: 100P6Q-A]) R0K3144PSZ000BR (for PLQP0144KA-A [Previous code: 144P6Q-A])

*1. M3T-MR308/4 is a general term referring to the real-time OS development kit (M3T-MR308K/4) and the mass production contract (M3T-MR308S/4).
*2. The M3T-NC308WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. MISRA C rule checking functionality may be added by installing the optional SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R).
*4. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5. Each emulator includes an emulator debugger. Depending on the shipping date, the bundled emulator debugger may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*6. Please contact us when you use this for the M16C/80T Group for automotive applications.
*7. The IC socket board is a programming adapter that supports a specific programmer.

Accessories for M16C/80 Series

MCU		Accessories			
Series	Group	Package type	Package name	Previous code	Recommended accessories*1
M16C/80	**M16C/80**	100 pin 0.5mm pitch LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)
		100 pin 0.65mm pitch QFP	PRQP0100JB-A	100P6S-A	M30800T-PTC (included) + M3T-100LCC-DMS (optional) + M3T-FLX-100NRB (optional)
		144 pin 0.5mm pitch LQFP	PLQP0144KA-A	144P6Q-A	M3T-FLX-144NSD (optional)

*1. A variety of other accessories are available. Visit the Renesas Technology Web site (http://www.renesas.com/accessory) for details.
(optional): Not included with emulation pod or probe. Purchase it separately.
(included): Included with emulation pod or probe.

Operating Environment for M32C/80 and M16C/80 Series Software Tools

Product type	Product type	Host machine (OS)*8
RTOS	M3T-MR308/4*1	IBM PC/AT Compatibles (Windows® XP, 2000)
C compiler package	M3T-NC308WA*2	IBM PC/AT Compatibles (Windows® XP, 2000)
MISRA C rule checker	SQMlint*3	IBM PC/AT Compatibles (Windows® XP, 2000)
IDE	High-performance Embedded Workshop*4	IBM PC/AT Compatibles (Windows® XP, 2000)
Simulator debugger	Simulator Debugger for M32C Series*5	IBM PC/AT Compatibles (Windows® XP, 2000)
Emulator debugger	PC7501 Emulator Debugger for M32C Series*6 PC4701 Emulator Debugger for M32C Series*6 Compact Emulator Debugger for M32C Series*6 FoUSB/UART Debugger for M32C Series*6 E8a Emulator Software*6	IBM PC/AT Compatibles (Windows® XP, 2000)
Flash Development Toolkit	Flash Development Toolkit*7	IBM PC/AT Compatibles (Windows® XP, 2000)

*1. M3T-MR308/4 is a general term referring to the real-time OS development kit (M3T-MR308K/4) and the mass production contract (M3T-MR308S/4).
*2. The M3T-NC308WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R) is sold as the optional product of Renesas C compiler.
*4. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5. Simulator debugger is included with C compiler package.
*6. Emulator debugger is bundled with emulators.
*7. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support).
The E8a emulator (Part No.: R0E00008AKCE00) is necessary for programming.
*8. Please refer to the following URL for Windows Vista. http://www.renesas.com/tool_env

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools for M16C/60, 30, 20 and 10 Series

MCU			Introductory tools	Software tools			Emulator (included Emulator software*7)				Programming tool	
									In-circuit emulator			
Series	Group	MCU	Starter kit	RTOS	C compiler package	IDE	Onchip debugging emulator	Compact emulator	Emulator	Emulation probe, pod or MCU unit	Flash programmer *16	IC socket board*20
M16C/60	M16C/63★★		—	M3T-MR30/4*2	M3T-NC30WA *3 (MISRA C*4)	High-performance Embedded Workshop*5	E8a*6 ★★	—	—	—	Flash Development Toolkit *19★★ (E8a emulator is necessary at programming)	—
	M16C/64★★		—				E8a*6	—	E100*21 (R0E001000EMU00)	R0E530640MCU00	Flash Development Toolkit *19 (E8a emulator is necessary at programming)	—
	M16C/65★★		★★				E8a*6 ★★		E100*21 (R0E001000EMU00)	★★	Flash Development Toolkit *19★★ (E8a emulator is necessary at programming)	
	M16C/62A		—				—	M30620T-CPE	PC4701U	M30620T2-RPD-E	M3A-0806*17 *18	R0K3100PSZ000BR (for PRQP0100JB-A [Previous code: 100P6S-A]) R0K3100PQZ000BR (for PLQP0100KB-A [Previous code: 100P6Q-A])
	M16C/62M							—		M30620TL-RPD-E		
	M16C/62N									M3062NT3-RPD-E	M3A-0806*17	
	M16C/62P		Renesas Starter Kit for M16C/62P (R0K33062PS001BE) *1				E8a*6	M3062PT3-CPE*8	PC7501	M3062PT2-EPB*10	Flash Development Toolkit*19 (E8a emulator is necessary at programming) or M3A-0806*17	
	M16C/6V	M306V7	—				—	—	PC4701U	M306V7T-RPD-E	—	—
	M16C/6N	M306N4 M306N5					E8a*6	—	PC7501	M306NKT-EPB*11	Flash Development Toolkit*19 (E8a emulator is necessary at programming) or M3A-0806*17	R0K3100PSZ000BR (for PRQP0100JB-A [Previous code: 100P6S-A]) R0K3100PQZ000BR (for PLQP0100KB-A [Previous code: 100P6Q-A])
		M306NK M306NL M306NM M306NN	Renesas Starter Kit for M16C/6NK (R0K3306NKS001BE) *1									
	M16C/6H	M306H7	—				—	—	PC4701U	M306H7T3-RPD-E	—	—
	M16C/6S	M306S0					E8a*6	M3062PT3-CPE + M306S0T-PRB*9	PC7501	M3062PT2-EPB*12 + M306S0T-PRB*9	Flash Development Toolkit*19 (E8a emulator is necessary at programming) or M3A-0806*17	
M16C/30	M16C/30P	M30302 M30304	Renesas Starter Kit for M16C/62P (R0K33062PS001BE) *1					M3062PT3-CPE*8		M3062PT2-EPB*10		
	M16C/39P	M30392	—				—	—		M3062PT2-EPB*13 + M30396T-PRB*14	—	
M16C/20	M16C/24	M30245							PC4701U	M30245T3-RPD-E	*16	
M16C/10	M16C/1N	M301N2								M30100T3-RPD-E + M301N2T-PRB*15	M3A-0806*17	

*1. CPU board, E8a on-chip debugging emulator, software (High-Performance Embedded Workshop integrated development environment, M3T-NC30WA C compiler package evaluation version, E8a emulator software, Flash Development Toolkit evaluation version), etc., are included. Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*2. M3T-MR30/4 is a general term referring to the real-time OS development kit (M3T-MR30K/4) and the mass production contract (M3T-MR30S/4).
*3. The M3T-NC30WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*4. MISRA C rule checking functionality may be added by installing the optional SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R).
*5. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*6. The E8a emulator (Part No.: R0E00008AKCE00) includes emulator software (High-Performance Embedded Workshop integrated development environment, E8a emulator software, compiler evaluation version, Flash Development Toolkit evaluation version). Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*7. Each emulator or MCU unit includes an emulator debugger. Depending on the shipping date, the bundled emulator debugger may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*8. Allocation of emulation memory to an external area and microprocessor mode are supported using the optional R0E33062PMSRC0 emulation memory board.
*9. Signal converter board for the M16C/6S0 in the M16C/6S Group.
*10. May be used with the combination of the PC4701U emulator, M3062PT3-RPD-E emulation pod only when the MCU operating frequency is 16MHz or less.
*11. The M306N4 and M306NK in the M16C/6N Group can be used with the combination of the PC4701U emulator and M306NKT3-RPD-E emulation pod only when the MCU operating frequency is 16MHz or less.
*12. May be used with the combination of the PC4701U emulator, M3062PT3-RPD-E and M306S0T-PRB emulation pod only when the MCU operating frequency is 16MHz or less.
*13. May be used with the combination of the PC4701U emulator, M3062PT3-RPD-E emulation and M30396T-PRB only when the MCU operating frequency is 16MHz or less.
*14. Signal converter board for the M16C/39P Group.
*15. Pod probe for the M16C/1N Group.
*16. A variety of compatible programmers are available from our partner vendors. Contact the manufacturer regarding programmer details, supported MCUs and suitability for installation in a mass production or factory environment.
*17. The data flash area cannot be reprogrammed.
*18. Advantest Corporation's R4945 or R4945A programmer and PCA7413F-80 program writer adapter for the PRQP0080JA-A (formerly 80P6S-A) package or PCA7412F-100 program writer adapter for the PRQP0100JB-A (formerly 100P6S-A) package may be used to program the M16C/62A one-time PROM.
*19. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support). The E8a emulator is necessary for programming. Visit the Renesas Technology Web site (http://www.renesas.com/fdt) to confirm support details for specific MCU product numbers.
*20. The IC socket board is a programming adapter that supports a specific programmer.
*21. MCU unit(optional) and a converter board for connecting to target MCU are needed. Please refer to the list "Converter Board for M16C/64 Group and M16C/65 Group in M16C/60 Series" for details.

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools List

Converter Board for M16C/64 Group and M16C/65 Group in M16C/60 Series

Series	Group	Target MCU			Converter board
		Package type	Package name	Previous code	
M16C/60	M16C/64★★ M16C/65★★	100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	R0E0100TNPFK00
		100 pin 0.65mm pich QFP	PRQP0100JD-B	100P6F-A	R0E0100TNPFJ00

★★ : Under Develpment

Set Package of Compact Emulators for M16C/62P and M16C/30P Group

Series	Group	Target MCU			Product Type name	Components*1
		Package type	Package name	Previous code		
M16C/60 M16C/30	M16C/62P M16C/30P	80 pin 0.65mm pich QFP	PRQP0080JA-A	80P6S-A	M3062PT3-CPE-1	Compact emulator M3062PT3-CPE*2 Converter board M3062PT-80FPB
		100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3062PT3-CPE-2	Compact emulator M3062PT3-CPE *2 Converter board M30800T-PTC IC socket IC61-1004-051
					M3062PT3-CPE-5	Compact emulator M3062PT3-CPE*2 Converter board M3T-F160-100NRB
		100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3062PT3-CPE-3	Compact emulator M3062PT3-CPE*2 Converter board M3T-F160-100NSD
		128 pin 0.5mm pich LQFP	PLQP0128KB-A	128P6Q-A	M3062PT3-CPE-4	Compact emulator M3062PT3-CPE*2 Converter board M3T-FLX-128NRD

*1. For debugging, the combination of a compact emulator and a converter board supporting the target MCU are used to connect to the user's system.
Compact emulators and converter boards can be purchased individually.
*2. With the optional emulation memory board R0E33062PMSRC0, emulation memory allocation function and microprocessor mode are available.

Accessories for M16C/60, 30, 20 and 10 Series

MCU			Accessories				Emulator
Series	Group	MCU	Package type	Package name	Previous code	Recommended accessories*1	
M16C/60	M16C/62A M16C/62M		80 pin 0.65mm pich QFP	PRQP0080JA-A	80P6S-A	M3T-FLX-100LCC (included) + M3T-100LCC-80QSB (optional)	PC4701U
			100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-FLX-100NSD (optional)	
			100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-FLX-100NRB (optional)	
	M16C/62N		80 pin 0.65mm pich QFP	PRQP0080JA-A	80P6S-A	M3062PT-80FPB (optional)	PC4701U
			100 pin 0.4mm pich TQFP	PTQP0100LB-A	100PFB-A	M3T-F160-100NSE (optional)	
			100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)	
			100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)	
	M16C/62P		80 pin 0.65mm pich QFP	PRQP0080JA-A	80P6S-A	M3062PT-80FPB (optional)	PC7501
			100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)	
			100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)	
			128 pin 0.5mm pich LQFP	PLQP0128KB-A	128P6Q-A	M3T-F160-128NRD (optional)	
	M16C/6V	M306V7	100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)	PC4701U
	M16C/6N	M306N4	100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)	PC7501
		M306N5	100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)	
		M306NK M306NL	100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)	
		M306NM M306NN	128 pin 0.5mm pich LQFP	PLQP0128KB-A	128P6Q-A	M3T-F160-128NRD (optional)	
	M16C/6H	M306H7	100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M30800T-PTC (included) + LCC Socket (included)	PC4701U
	M16C/6S	M306S0	64 pin 0.5mm pich LQFP	PLQP0064KB-A	64P6Q-A	*2	PC7501
M16C/30	M16C/30P	M30302	100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-F160-100NSD (optional)	PC7501
		M30304	100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)	
	M16C/39P	M30392	100 pin 0.65mm pich QFP	PRQP0100JB-A	100P6S-A	M3T-F160-100NRB (optional)	
M16C/20	M16C/24	M30245	100 pin 0.5mm pich LQFP	PLQP0100KB-A	100P6Q-A	M3T-FLX-100NSD (included)	PC4701U
M16C/10	M16C/1N	M301N2	48 pin 0.5mm pich LQFP	PLQP0048KB-A	48P6Q-A	M30102T-PTC (optional)	

*1. A variety of other accessories are available. Visit the Renesas Technology Web site (http://www.renesas.com/accessory) for details.
*2. Accessories are attached to signal converter board M306S0T-PRB.
(included): Included with compact emulator, emulation pod or probe.
(optional): Not included with compact emulator, emulation pod or probe. Purchase it separately.

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Operating Environment for M16C/60, 30, 20 and 10 Series Software Tools

Product type	Product name	Host machine (OS)*8
RTOS	M3T-MR30/4*1	IBM PC/AT Compatibles (Windows® XP, 2000)
C compiler package	M3T-NC30WA*2	IBM PC/AT Compatibles (Windows® XP, 2000)
MISRA C rule checker	SQMlint*3	IBM PC/AT Compatibles (Windows® XP, 2000)
IDE	High-performance Embedded Workshop*4	IBM PC/AT Compatibles (Windows® XP, 2000)
Simulator debugger	Simulator Debugger for M16C and R8C/Tiny Series*5	IBM PC/AT Compatibles (Windows® XP, 2000)
Emulator debugger	PC7501 Emulator Debugger for M16C and R8C/Tiny Series*6 PC4701 Emulator Debugger for M16C Series*6 Compact Emulator Debugger for M16C and R8C/Tiny Series*6 FoUSB/UART Debugger for M16C and R8C/Tiny Series*6 E8a Emulator Software*6	IBM PC/AT Compatibles (Windows® XP, 2000)
Flash Development Toolkit	Flash Development Toolkit*7	IBM PC/AT Compatibles (Windows® XP, 2000)

*1. M3T-MR30/4 is a general term referring to the real-time OS development kit (M3T-MR30K/4) and the mass production contract (M3T-MR30S/4).
*2. The M3T-NC30WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R) is sold as the optional product of Renesas C compiler.
*4. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5. Simulator debugger is included with C compiler package.
*6. Emulator debugger is bundled with emulators.
*7. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support). The E8a emulator (Part No.: R0E00008AKCE00) is necessary for programming.
*8. Please refer to the following URL for Windows Vista.
http://www.renesas.com/tool_env

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools List

Development Tools for M16C/Tiny Series

MCU			Introductory tools	Software tools			Emulator (Emulator software is included.*6)				Programming tool	
Series	Group	MCU	Starter kit	RTOS	C compiler package	IDE	Onchip debugging emulator	Compact emulator	In-circuit emulator		Flash Programmer*12	IC socket board*13
									Emulator	Emulation probe		
M16C/Tiny	M16C/26A (M16C/26A, M16C/26B, M16C/26T)	M30260	Renesas Starter Kit forM16C/26A (R0K33026AS001BE)*1	M3T-MR30/4*2	M3T-NC30WA*3 (MISRA C*4)	High-performance Embedded Workshop*5	E8a*7 (R0E00008AKCE00)	M3028BT2-CPE*8	PC7501	M3028BT-EPB*9	Flash Development Toolkit*10 (R0C00000FDW04R) (E8a emulator is necessary at programming) or M3A-0806 *11	R0K3048PQZ000BR (for PLQP0048KB-A [Previous code: 48P6Q-A])
		M30263										
	M16C/28 (M16C/28, M16C/28B)	M30280	Renesas Starter Kit for M16C/29 (R0K330290S001BE)*1									R0K3064PQZ000BR (for PLQP100KB-A [Previous code: 64P6Q-A])
		M30281										
	M16C/29	M30290										R0K3080PQZ000BR (for PLQP0080KB-A [Previous code: 80P6Q-A])
		M30291										

*1. CPU board, E8a on-chip debugging emulator, software (High-Performance Embedded Workshop integrated development environment, M3T-NC30WA C compiler package evaluation version, E8a emulator software, Flash Development Toolkit evaluation version), etc., are included. Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*2. M3T-MR30/4 is a general term referring to the real-time OS development kit (M3T-MR30K/4) and the mass production contract (M3T-MR30S/4).
*3. The M3T-NC30WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*4. MISRA C rule checking functionality may be added by installing the optional SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R).
*5. High-performance Embedded Workshop is included with C compiler package and emulator debugger.
*6. Each emulator includes an emulator debugger. Depending on the shipping date, the bundled emulator debugger may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*7. The E8a emulator (Part No.: R0E00008AKCE00) includes emulator software (High-Performance Embedded Workshop integrated development environment, E8a emulator software, compiler evaluation version, Flash Development Toolkit evaluation version). Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*8. M3028BT2-CPE is the successor product of the M30290T2-CPE. It supports 24MHz operation of M16C/Tiny series MCUs. The converter board for the target connection is necessary for M3028BT2-CPE. The set sales of the emulator and the converter board are also available. For details, please refer to the lists of “Set Package of Compact Emulator for M16C/Tiny Series” and “Converter Board for M16C/Tiny Series”.
*9. M3028BT-EPB is the successor product of the M30290T-EPB. It supports 24MHz operation of M16C/Tiny series MCUs. The converter board for the target connection is necessary for M3028BT-EPB.
The set sales of the emulator and the converter board are also available. For details, please refer to the lists of "Set Package of PC7501 Emulation Probe for M16C/Tiny Series" and “Converter Board for M16C/Tiny Series”.
*10. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support). Visit the Renesas Technology Web site (http://www.renesas.com/fdt) to confirm support details for specific MCU product numbers.
*11. The data flash areas cannot be reprogrammed.
*12. A variety of compatible programmers are available from our partner vendors. Contact the manufacturer regarding programmer details, supported MCUs and suitability for installation in a mass production or factory environment.
*13. The IC socket board is a programming adapter that supports a specific programmer.

Set Package of Compact Emulators for M16C/Tiny Series

Series	Group	MCU	Target MCU			Product name	Components*1
			Package type	Package name	Previous code		
M16C/Tiny	M16C/26A (M16C/26A, M16C/26B, M16C/26T)	M30263	42 pin 0.8mm pitch SSOP	PRSP0042GA-B	42P2R-E	M3028BT2-CPE-1	Compact emulator M3028BT2-CPE Converter board M30263T-42SSB
		M30260	48 pin 0.5mm pitch LQFP	PLQP0048KB-A	48P6Q-A	M3028BT2-CPE-2	Compact emulator M3028BT2-CPE Converter board M30260T-48FPD
	M16C/28 (M16C/28, M16C/28B) M16C/29	M30281 M30291	64 pin 0.5mm pitch LQFP	PLQP0064KB-A	64P6Q-A	M3028BT2-CPE-3	Compact emulator M3028BT2-CPE Converter board M30291T-64FPD
		M30280 M30290	80 pin 0.5mm pitch LQFP	PLQP0080KB-A	80P6Q-A	M3028BT2-CPE-4	Compact emulator M3028BT2-CPE Converter board M30290T-80FPD
	M16C/28 (M16C/28, M16C/28B)	M30280	85 pin 0.65mm pitch TFLGA	PTLG0085JB-A	85F0G	M3028BT2-CPE-5	Compact emulator M3028BT2-CPE Converter board M30280T-85LGF

*1. For debugging, the combination of a compact emulator and a converter board supporting the target MCU are used to connect to the user’s system. Compact emulators and converter boards can be purchased individually.

Set Package of PC7501 Emulation Probe for M16C/Tiny Series

Series	Group	MCU	Target MCU			Product name	Components*1
			Package type	Package name	Previous code		
M16C/Tiny	M16C/26A (M16C/26A, M16C/26B, M16C/26T)	M30263	42 pin 0.8mm pitch SSOP	PRSP0042GA-B	42P2R-E	M3028BT-EPB-1	Emulation probe M3028BT-EPB Converter board M30263T-42SSB
		M30260	48 pin 0.5mm pitch LQFP	PLQP0048KB-A	48P6Q-A	M3028BT-EPB-2	Emulation probe M3028BT-EPB Converter board M30260T-48FPD
	M16C/28 (M16C/28, M16C/28B) M16C/29	M30281 M30291	64 pin 0.5mm pitch LQFP	PLQP0064KB-A	64P6Q-A	M3028BT-EPB-3	Emulation probe M3028BT-EPB Converter board M30291T-64FPD
		M30280 M30290	80 pin 0.5mm pitch LQFP	PLQP0080KB-A	80P6Q-A	M3028BT-EPB-4	Emulation probe M3028BT-EPB Converter board M30290T-80FPD
	M16C/28 (M16C/28, M16C/28B)	M30280	85 pin 0.65mm pitch TFLGA	PTLG0085JB-A	85F0G	M3028BT-EPB-5	Emulation probe M3028BT-EPB Converter board M30280T-85LGF

*1. For debugging, the combination of an emulation probe and a converter board supporting the target MCU are used to connect to the user’s system. Emulation probes and converter boards can be purchased individually.

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Converter Board for M16C/Tiny Series*1

Series	Group	MCU	Target MCU			Converter
			Package type	Package name	Previous code	
M16C/Tiny	M16C/26A (M16C/26A, M16C/26B, M16C/26T)	M30263	42 pin 0.8mm pitch SSOP	PRSP0042GA-B	42P2R-E	M30263T-42SSB
		M30260	48 pin 0.5mm pitch LQFP	PLQP0048KB-A	48P6Q-A	M30260T-48FPD
	M16C/28 (M16C/28, M16C/28B) M16C/29	M30281 M30291	64 pin 0.5mm pitch LQFP	PLQP0064KB-A	64P6Q-A	M30291T-64FPD
		M30280 M30290	80 pin 0.5mm pitch LQFP	PLQP0080KB-A	80P6Q-A	M30290T-80FPD
	M16C/28 (M16C/28, M16C/28B)	M30280	85 pin 0.65mm pitch TFLGA	PTLG0085JB-A	85F0G	M30280T-85LGF

*1. A variety of other accessories are available. Visit the Renesas Technology Web site (http://www.renesas.com/accessory) for details.

Operating Environment for M16C/Tiny Series Software Tools

Product type	Product name	Host machine (OS)*8
RTOS	M3T-MR30/4*1	IBM PC/AT Compatibles (Windows® XP, 2000)
C compiler package	M3T-NC30WA*2	IBM PC/AT Compatibles (Windows® XP, 2000)
MISRA C rule checker	SQMlint*3	IBM PC/AT Compatibles (Windows® XP, 2000)
IDE	High-performance Embedded Workshop*4	IBM PC/AT Compatibles (Windows® XP, 2000)
Simulator debugger	Simulator Debugger for M16C and R8C/Tiny Series*5	IBM PC/AT Compatibles (Windows® XP, 2000)
Emulator debugger	PC7501 Emulator Debugger for M16C and R8C/Tiny Series*6 Compact Emulator Debugger for M16C and R8C/Tiny Series*6 E8a Emulator Software*6	IBM PC/AT Compatibles (Windows® XP, 2000)
Flash Development Toolkit	Flash Development Toolkit*7	IBM PC/AT Compatibles (Windows® XP, 2000)

*1. M3T-MR30/4 is a general term referring to the real-time OS development kit (M3T-MR30K/4) and the mass production contract (M3T-MR30S/4).
*2. The M3T-NC30WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R) is sold as the optional product of Renesas C compiler.
*4. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*5. Simulator debugger is included with C compiler package.
*6. Emulator debugger is bundled with emulators.
*7. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support). The E8a emulator (Part No.: R0E00008AKCE00) is necessary for programming.
*8. Please refer to the following URL for Windows Vista.
http://www.renesas.com/tool_env

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools List

Development Tools for R8C/Tiny Series

MCU		Introductory tool	Software tools			Emulator(Emulator software is included.*6)				Programming tool	
Series	Group	Starter kit*1	RTOS	C compiler package*3	IDE	Onchip debugging emulator	Compact emulator	In-circuit emulator		Flash Programmer*12	IC socket board*13
								Emulator	Emulation probe or MCU unit		
R8C/Tiny	R8C/18	—	M3T-MR30/4 *14	M3T-NC30WA *2 (MISRA C*4)	High-performance Embedded Workshop*5	E8a (R0E00008AKCE00) *7	R0E521000CPE00 *8	PC7501	R0E521000EPB00 *9	Flash Development Toolkit*10 (E8a emulator is necessary at programming) or M16C Flash Starter M3A-0806*11	M3A-0114
	R8C/19										
	R8C/1A	Renesas Starter Kit for R8C/1B (R0K5211B4S001BE)									
	R8C/1B										
	R8C/20	Renesas Starter Kit for R8C/23 (R0K521237S001BE)									R0K521238Z000BR
	R8C/21										
	R8C/22										
	R8C/23										
	R8C/24	Renesas Starter Kit for R8C/25 (R0K521256S001BE)									R0K521258Z000BR
	R8C/25										
	R8C/26	Renesas Starter Kit for R8C/27 (R0K521276S001BE)								Flash Development Toolkit*10 (R0C00000FDW04R) (E8a emulator is necessary at programming) or M16C Flash Starter M3A-0806*11	R0K521276Z000BR
	R8C/27										
	R8C/28	—									M3A-0114
	R8C/29										
	R8C/2A										★★
	R8C/2B										
	R8C/2C	Renesas Starter Kit for R8C/2D (R0K5212D8S001BE)									R0K5212D8Z000BR
	R8C/2D										
	R8C/2E★	—				E8a (R0E00008AKCE00) *7	—	—	—	Flash Development Toolkit (R0C00000FDW04R)*10 (E8a emulator is necessary at programming)	—
	R8C/2F★										
	R8C/2G★										
	R8C/2H★										
	R8C/2J★										
	R8C/2K★						R0E521000CPE00 *8	PC7501	R0E521000EPB00 *9		
	R8C/2L★										
	R8C/32A★★	★★				E8a (R0E00008AKCE00) *7★★	—	E100 (R0E001000 EMU00) *15	—	Flash Development Toolkit (R0C00000FDW04R)*10 ★★ (E8a emulator is necessary at programming)	
	R8C/33A★★										
	R8C/35A★★										

*1. CPU board, E8a on-chip debugging emulator, software (High-Performance Embedded Workshop integrated development environment, M3T-NC30WA C compiler package evaluation version, E8a emulator software, Flash Development Toolkit evaluation version), etc., are included. Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*2. The M3T-NC30WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*3. Evaluation version of C compiler package exits.
*4. MISRA C rule checking functionality may be added by installing the optional SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R).
*5. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*6. Each emulator includes an emulator debugger. Depending on the shipping date, the bundled emulator debugger may include products or versions that are not the most recent ones available. The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*7. The E8a emulator (Part No.: R0E00008AKCE00) includes emulator software (High-Performance Embedded Workshop integrated development environment, E8a emulator software, compiler evaluation version, Flash Development Toolkit evaluation version). Depending on the shipping date, the bundled software may include products or versions that are not the most recent ones available.
The latest versions may be downloaded (free of charge) from the Renesas Technology Web site (http://www.renesas.com/download).
*8. The converter board for the target connection is necessary for R0E521000CPE00. The set sales of the emulator and the converter board are also available. For details, please refer to the lists of Set Package of Compact Emulator for R8C/Tiny Series.
*9. The converter board for the target connection is necessary for R0E521000EPB00. The set sales of the emulator and the converter board are also available. For details, please refer to the lists of “Set Package of PC7501 Emulation Probe for R8C/Tiny Series”.
*10. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support). Visit the Renesas Technology Web site (http://www.renesas.com/fdt) to confirm support details for specific MCU product numbers.
*11. Flash Programmer which supports standard serial I/O mode 2 (UART) and includes the M16C Flash Starter Software (for Windows).
*12. A variety of compatible programmers are available from our partner vendors. Contact the manufacturer regarding programmer details, supported MCUs and suitability for installation in a mass production or factory environment.
*13. The IC socket board is a programming adapter that supports a specific programmer.
*14. M3T-MR30/4 is a general term referring to the real-time OS development kit (M3T-MR30K/4) and the mass production contract (M3T-MR30S/4).
*15. MCU unit(under development) and the converter board(under development) for connecting to MCU are needed.
★★: Under development or evaluation: product name may be changed. When MCU is under development, restrictions and other limitation for tools may arise.

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Operating Environment for R8C/Tiny Series Software Tools

Product type	Product name	Host machine (OS)*7
RTOS	M3T-MR30/4*8	IBM PC/AT Compatibles (Windows® XP, 2000)
C compiler package	M3T-NC30WA*1	IBM PC/AT Compatibles (Windows® XP, 2000)
MISRA C rule checker	SQMlint*2	IBM PC/AT Compatibles (Windows® XP, 2000)
IDE	High-performance Embedded Workshop*3	IBM PC/AT Compatibles (Windows® XP, 2000)
Simulator debugger	Simulator Debugger for M16C and R8C/Tiny Series*4	IBM PC/AT Compatibles (Windows® XP, 2000)
Emulator debugger	PC7501 Emulator Debugger for M16C and R8C/Tiny Series*5 Compact Emulator Debugger for M16C and R8C/Tiny Series*5 E8a Emulator Software*5	IBM PC/AT Compatibles (Windows® XP, 2000)
Flash Development Toolkit	Flash Development Toolkit*6	IBM PC/AT Compatibles (Windows® XP, 2000)

*1. The M3T-NC30WA includes an integrated development environment (High-Performance Embedded Workshop), C compiler, assembler and simulator debugger.
*2. SQMlint MISRA C rule checker (Part No.: R0C00000SCW01R) is sold as the optional product of Renesas C compiler.
*3. High-performance Embedded Workshop is included with C compiler package and Emulator debugger.
*4. Simulator debugger is included with C compiler package.
*5. Emulator debugger is bundled with emulators.
*6. Flash Development Toolkit (Part No.: R0C00000FDW04R) is available in a product version (with technical support) and an evaluation version (without technical support).
The E8a emulator (Part No.: R0E00008AKCE00) is necessary for programming.
*7. Please refer to the following URL for Windows Vista.
http://www.renesas.com/tool_env
*8. M3T-MR30/4 is a general term referring to the real-time OS development kit (M3T-MR30K/4) and the mass production contract (M3T-MR30S/4).

Set Package of Compact Emulator for R8C/Tiny Series

Target MCU		Product name	Components (Compact emulator and converter board are also sold separately.)	
Group	Package name		Compact emulator	Converter board*1
R8C/18 R8C/19	PLSP0020JB-A *Previous code : 20P2F-A (20-pin 0.65mm-pitch LSSOP)	R0E521174CPE00	R0E521000CPE00	R0E521174CSJ00
R8C/1A R8C/1B	PRDP0020BA-A *Previous code : 20P4B (20-pin 1.778mm-pitch SDIP)	R0E521174CPE10		R0E521174CDB00
R8C/20 R8C/21 R8C/22 R8C/23	PLQP0048KB-A *Previous code : 48P6Q-A (48-pin 0.5mm-pitch LQFP)	R0E521237CPE00		R0E521237CFK00
R8C/24 R8C/25	PLQP0052JA-A *Previous code : 52P6A-A (52-pin 0.65mm-pitch LQFP)	R0E521258CPE00		R0E521258CFJ00
R8C/26 R8C/27	PLQP0032GB-A *Previous code : 32P6U-A (32-pin 0.8mm-pitch LQFP)	R0E521276CPE00		R0E521276CFG00
R8C/28 R8C/29	PLSP0020JB-A *Previous code : 20P2F-A (20-pin 0.65mm-pitch LSSOP)	R0E521174CPE00		R0E521174CSJ00
R8C/2A	PLQP0064KB-A *Previous code : 64P6Q-A (64-pin 0.5mm-pitch LQFP)	R0E5212BACPE10		R0E5212BACFK00
R8C/2B	PLQP0064GA-A *Previous code : 64P6U-A (64-pin 0.8mm-pitch LQFP)	R0E5212BACPE00		R0E5212BACFG00
R8C/2C R8C/2D	PLQP0080KB-A *Previous code : 80P6Q-A (80-pin 0.5mm-pitch LQFP)	R0E5212DACPE00		R0E5212DACFK00
R8C/2K★ R8C/2L★	PLQP0032GB-A *Previous code : 32P6U-A (32-pin 0.8mm-pitch LQFP)	R0E5212L4CPE00		R0E5212L4CFG00

*1. Converter board, socket for user system connection and user's manual are included.
★: New Product

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

Development Tools List

Set Package of PC7501 Emulation Probe for R8C/Tiny Series

Target MCU		Product name	Components (Compact emulator and converter board are also sold separately.)	
Group	Package name		Compact emulator	Converter board *1
R8C/18 R8C/19	PLSP0020JB-A *Previous code : 20P2F-A (20-pin 0.65mm-pitch LSSOP)	R0E521174EPB00	R0E521000EPB00	R0E521174CSJ00
R8C/1A R8C/1B	PRDP0020BA-A *Previous code : 20P4B (20-pin 1.778mm-pitch SDIP)	R0E521174EPB10		R0E521174CDB00
R8C/20 R8C/21 R8C/22 R8C/23	PLQP0048KB-A *Previous code : 48P6Q-A (48-pin 0.5mm-pitch LQFP)	R0E521237EPB00		R0E521237CFK00
R8C/24 R8C/25	PLQP0052JA-A *Previous code : 52P6A-A (52-pin 0.65mm-pitch LQFP)	R0E521258EPB00		R0E521258CFJ00
R8C/26 R8C/27	PLQP0032GB-A *Previous code : 32P6U-A (32-pin 0.8mm-pitch LQFP)	R0E521276EPB00		R0E521276CFG00
R8C/28 R8C/29	PLSP0020JB-A *Previous code : 20P2F-A (20-pin 0.65mm-pitch LSSOP)	R0E521174EPB00		R0E521174CSJ00
R8C/2A	PLQP0064KB-A *Previous code : 64P6Q-A (64-pin 0.5mm-pitch LQFP)	R0E5212BAEPB10		R0E5212BACFK00
R8C/2B	PLQP0064GA-A *Previous code : 64P6U-A (64-pin 0.8mm-pitch LQFP)	R0E5212BAEPB00		R0E5212BACFG00
R8C/2C R8C/2D	(PLQP0080KB-A *Previous code : 80P6Q-A (80-pin 0.5mm-pitch LQFP)	R0E5212DAEPB00		R0E5212DACFK00
R8C/2K★ R8C/2L★	PLQP0032GB-A *Previous code : 32P6U-A (32-pin 0.8mm-pitch LQFP)	R0E5212L4EPB00		R0E5212L4CFG00

*1. Converter board, socket for user system connection and user's manual are included.
★: New product

Note: Evaluation versions of software tools are free of charge.
Please refer to the following URL for details (http://www.renesas.com/tool_evaluation).

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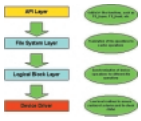

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Thesycon Systemsoftware & Consulting GmbH
USB Firmware Library - VUFIL

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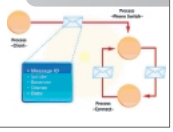

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http://www.dataio.com

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Real-time OS RTXC

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E-mail: sales@quadros.com
http://www.quadros.com/

SCIOPTA Systems AG
SCIOPTA Real-Time Operating System

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SEGGER Microcontroller Systeme GmbH
Real-time OS embOS

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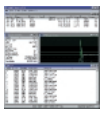
E-mail: info@segger.com
http://www.segger.com/



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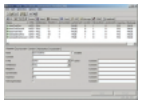

Emulation & Debugging

IAR Systems
IAR C-SPY ROM-monitor debugger
IAR C-SPY PC7501 emulator debugger
IAR C-SPY E8 emulator debugger

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FAX: +46 18 16 78 38
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http://www.iar.com

Sophia Systems Co., Ltd.
Emulator EJ-Debug, UniSTAC II, HyperSTAC

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Sunny Giken Inc.
Compact emulator S30830T-CPE,
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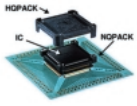

Yokogawa Digital Computer Corporation
Emulator advicePlus, Emulator advice

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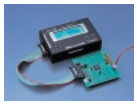

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FAX: +886 2 2999-9873
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Model 1894

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http://www.systemgeneral.com/

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SICA

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http://www.tetc.co.jp/

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Flash programming and testing system Y3000-8

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Overview of Web Site

Visit the Web site for assistance in choosing M16C Family products and for the latest technical information for use in system development.

Renesas M16C Family Web Page http://www.renesas.com/en/m16c

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Contact Us

This link can also be used for technical inquiries. Renesas Technology also accepts inquiries by e-mail.

Email: csc@renesas.com

Getting to Know the M16C

This page provides a quick overview of the M16C for customers who are not very familiar with the M16C Family of MCUs.

Application Notes

This is a link to a page where you can download information on how to use on-chip peripheral functions, application engineering, and so on, in PDF format.

Documentation

This is a link to a page where you can download documents such as manuals, datasheets, and catalogs in PDF format.

FAQs

Here you will find a list of frequently asked questions and their answers.

Technical Update

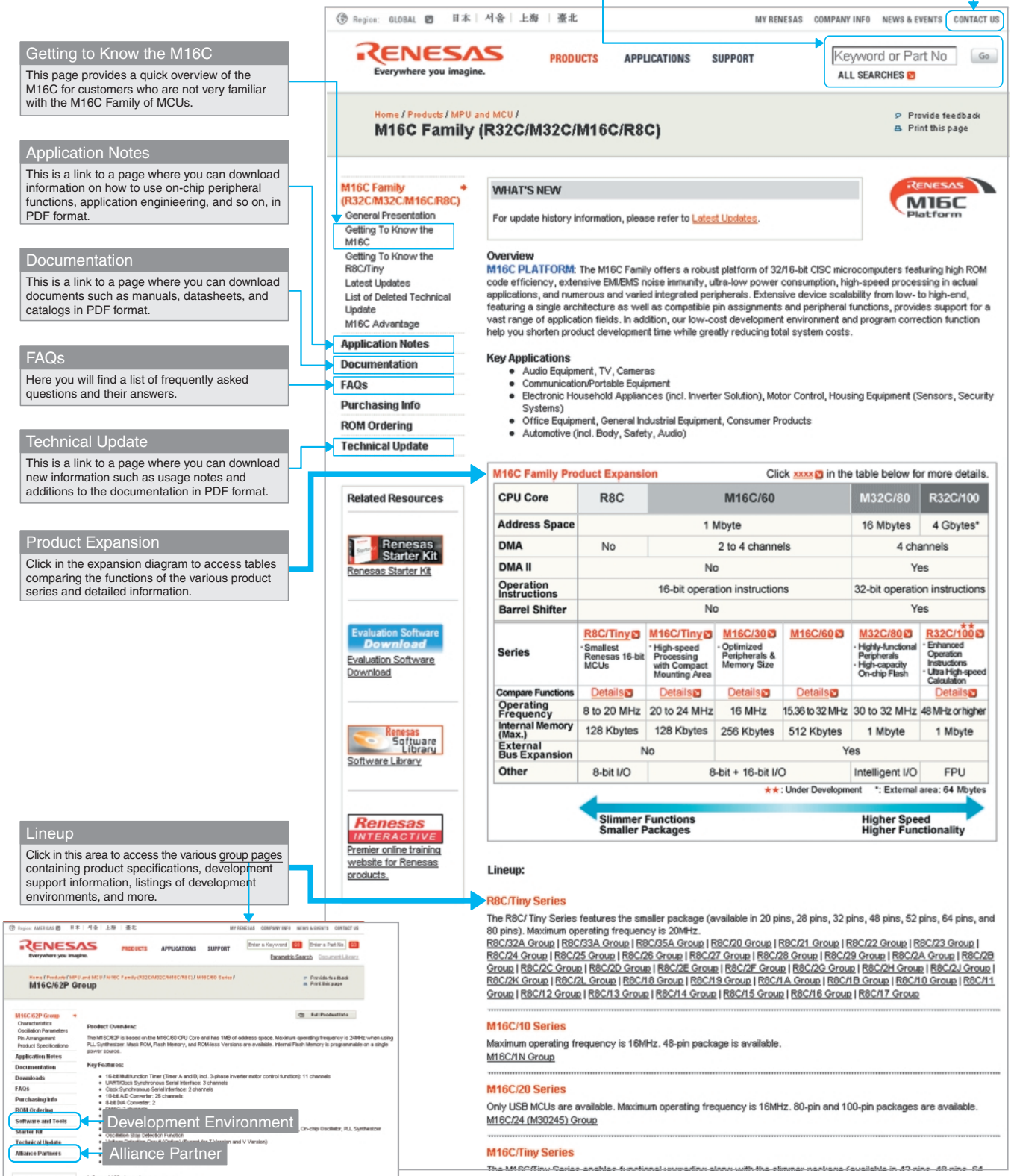
This is a link to a page where you can download new information such as usage notes and additions to the documentation in PDF format.

Product Expansion

Click in the expansion diagram to access tables comparing the functions of the various product series and detailed information.

Lineup

Click in this area to access the various group pages containing product specifications, development support information, listings of development environments, and more.



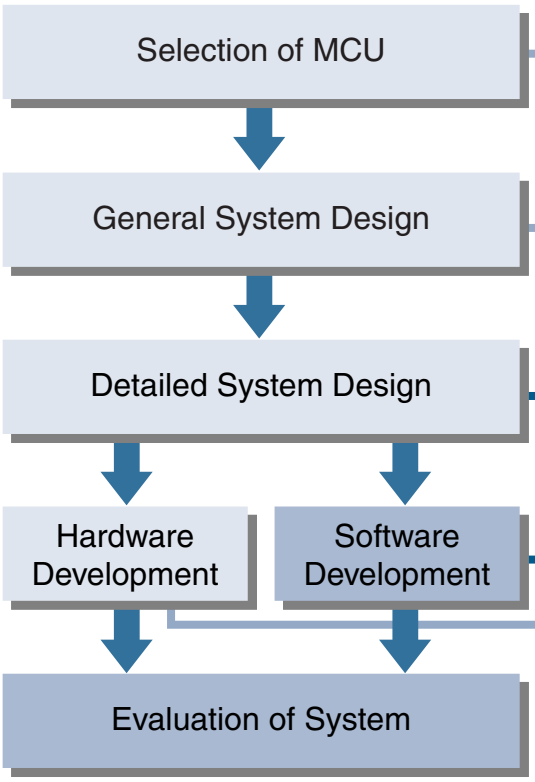
* The content of the Web site is updated frequently.

Note: The Alliance Partner program is available on the Renesas America and Renesas Europe sites (as of June 1, 2008).

Documentation

Application

MCU Development Sequence



Document Types

Hardware

Short Sheet Data Sheet
Hardware specifications (pin assignments, memory map, specifications of peripheral functions, electrical characteristics, timing)

Hardware Manual
Detailed hardware specifications, operation description, and application examples (connections with peripherals, interaction with software)

Software

Software
Detailed description of the operation of (assembly language) instructions

Application Note
Programming methods using assembly language and C, reference program listings (Available on the Renesas Web site.)

Note: All the above documents are available for download on the Renesas Web site.

Application Notes

In addition to the manuals for each product, a large number of application notes are available that customers can make immediate use of in their programs.

List of Application Note Categories

A/D Converters	D/A Converters	Flash Memory
I²C-bus	Intelligent I/O	Interrupts
Noise	CRC	Program Security
Resets	Serial Interfaces	PWM Timers for 3-Phase Motor Drive
Timers	Watchdog Timers	DMAC
CAN	USB	External Buses
Applications	Motors	Inverter
Automotive	Development Tools	

The latest versions of Renesas documents are available for download on the following Web page.

URL http://www.renesas.com/m16c

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