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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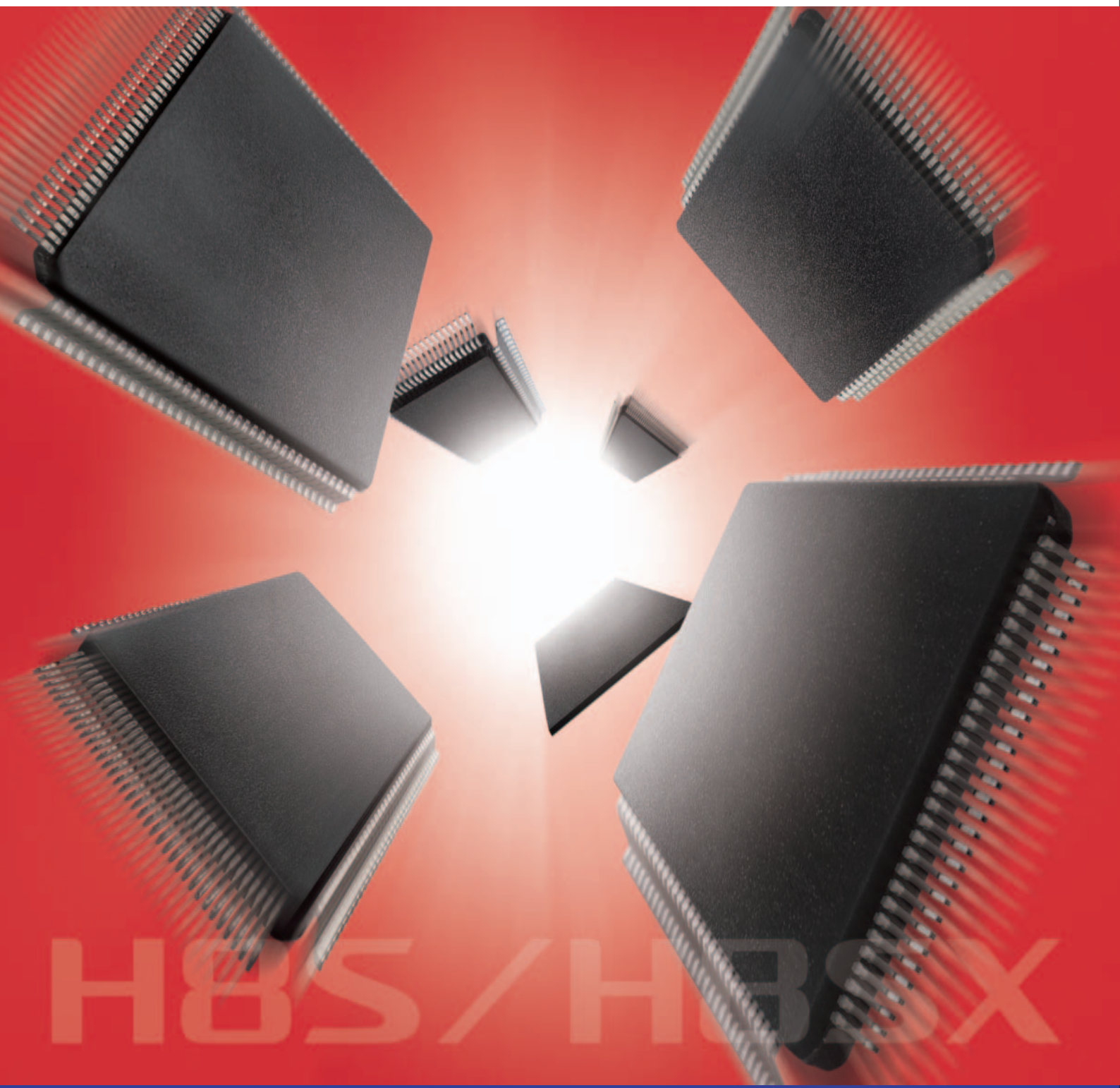
RENESAS

Renesas MCUs

H8S Family H8SX Family



Renesas Electronics
www.renesas.com

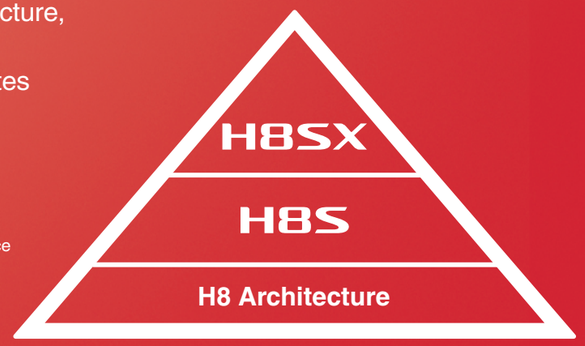
2008.03

Learn why Renesas MCUs are preferred.

Speedy + Standard + Special + Select + Safety

Inheriting the world-renowned H8 architecture, and evolving it even further. This 16-bit/32-bit CISC architecture creates a new standard for MCUs.

The Renesas MCU H8S Family and H8SX Family products are high-performance MCUs that evolve the world standard H8 CISC architecture even further. These are becoming the de facto standard MCUs and are chosen by our customers due to their high performance and leading edge functionality, extensive product line, rich set of peripheral functions, and other features. Renesas provides a MCU product line that responds to customer needs based on the “5S” concept: Speedy, Standard, Special, Select, and Safety.



The H8S/H8SX Family meet our customer’s need with the “5S” concept.

Speedy	The Speedy CISC architecture achieves the world’s fastest access of 1 cycle. The H8SX achieves the high performance of 50 MHz, and the H8S achieves 35 MHz.
Standard	These MCUs inherit the world Standard H8 architecture. The H8SX adds high-speed multiply and divide instruction, and the H8S adds multiply/multiply and accumulate instructions.
Special	These MCUs provide Special peripheral functions to support all our users’ needs. The basic functions, such as the timer, SCI, and A/D converter units are common to both the H8S and H8SX products.
Select	Users can Select a MCU optimal for their application from the extensive variations available. On-chip flash memory MCUs are available in every group, and diverse peripheral functions are available.
Safety	Renesas MCUs provide the Safety of knowing that a cumulative total of over one billion units have been shipped. A protection function, that prevents important programs from being read out illegally is also available.

Here is where you will find MCUs that perfectly match specific needs: the H8S/H8SX lineup.

★ : Under development

RENESAS H8SX

The 32-bit H8SX Family features high performance provided by the CISC architecture.
These MCUs take the maximum possible advantage of the merits of the CISC architecture: good code efficiency, low power, ability to make the most effective use of flash memory performance. These MCUs achieve outstanding benchmark performance in automotive, digital home electronics, PC peripherals, and other application areas.
• Internal bus width: 32 bits • Basic instruction execution states: 1 state
• Number of instructions: 87 • Maximum operating frequency: 50 MHz

RENESAS H8S

The 16-bit H8S Family features high performance provided by the CISC architecture.
The H8S Family of 16-bit CISC MCUs boasts superlative generality and superb ease of use. Along with a diverse set of functions, these MCUs include a variety of interfaces to match application needs. Renesas provides a product series lineup that is optimal for customers and responds to diverse needs.
• Internal bus width: 16 bits • Basic instruction execution states: 1 state
• Number of instructions: 65 or 69* • Maximum operating frequency: 35 MHz
*: H8S/2600 and 2400 Series

• Internal bus width: 16 bits • Basic instruction execution states: 2 states
• Number of instructions: 62 • Maximum operating frequency: 25 MHz

RENESAS H8

The H8 Family is the standard for CISC architecture MCUs

• Internal bus width: 8 bits • Basic instruction execution states: 2 states
• Number of instructions: 57 • Maximum operating frequency: 20 MHz

H8SX/1700★
Internal 32-bit multiplier/divider unit
5.0V@60MHz | CAN
Featuring 80 MHz operation at 5V, these MCUs provide high reliability for automotive and industrial applications.
Built-in special communication functions (CAN bus)

H8SX/1600
Internal 32-bit multiplier/divider unit
3.3V@50MHz | Low Power | ΔΣA/D | USB | High-speed SCI
Featuring 50 MHz operation at 3.3V, these MCUs cover a wide range of applications from ASSP to general-purpose areas. They provide a rich set of basic peripheral functions.
Built-in special communication functions
(including USB and high-speed UART)

H8SX/1500
Internal 32-bit multiplier/divider unit
5.0V@40MHz | High-speed A/D converter | CAN | Sound Generator
Featuring 40 MHz operation at 5V, these MCUs provide high reliability for automotive and industrial applications.
Built-in special communication functions
(CAN bus and synchronous serial communications units)
Improved peripheral functions
(including timer, A/D converter, and sound generator units)

CPU upwards compatibility.

High performance
High functionality

H8S/2600
Internal 16-bit multiplier
5.0V@20MHz | I²C-Bus | 3.3V@33MHz | CAN
Lineup of high-reliability products for automotive applications.
Built-in special communication functions
(CAN bus and I²C bus units)
Extensive set of built-in peripheral functions
(including 14-bit PWM timer and LCDC units)

H8S/2500
Built-in 32 kHz oscillator, low power
5.0V@26MHz | Multi-voltage power supply | IEBus | 3.3V@26MHz | CAN
Extensive set of low-power modes. Support for both 3V and 5V interfaces.
Built-in special communication functions
(including IEBus and CAN Bus)
IEBus is a trademark of NEC Corporation.

H8S/2400
Internal 16-bit multiplier
5.0V@33MHz | 5V tolerant | I²C-Bus | 3.3V@34MHz* | USB*
Enhanced I/F, USB, Ether
PC/General

H8S/2300
Standard group in the H8S series
5.0V@20MHz | SDRAM-I/F | I²C-Bus | 3.3V@35MHz | EXDMAC
Provides a rich set of built-in basic peripheral functions.
Extensive set of variations (from 100 to 144 pins).
High-speed operation (Maximum operating frequency: 35 MHz)

H8S/2200
Built-in 32 kHz oscillator, low-voltage operation
5.0V@20MHz | IEBus | I²C-Bus | 3.3V@35MHz | USB
Low-voltage operation. Rich set of low-power modes.
Special communication functions
(USB, IEBus, I²C bus, and high-speed UART)
IEBus is a trademark of NEC Corporation.

H8S/2100
Inherits the peripheral IP of the H8/300 Series.
5.0V@20MHz | ISA-Bus | LPC-Bus | 3.0V@33MHz | USB
Provides the standard PC interfaces
(including I²C bus, LPC bus, ISA bus, and USB)
Inherits the peripheral functionality of the H8/300 Series.

H8S/Tiny★
Single chip and low pin count versions of the H8S.
5.0V@20MHz | 3.0V@20MHz
Lineup of 64 and 80-pin products.
Rich set of peripheral functions
(multifunction timers, I²C bus, and SCI)

Slimmed-down functionality
Lower pin counts

H8/300H
Standard model in the H8 Series

H8/Tiny
Single chip and low pin count H8

H8/300
The standard for 8-bit CPUs

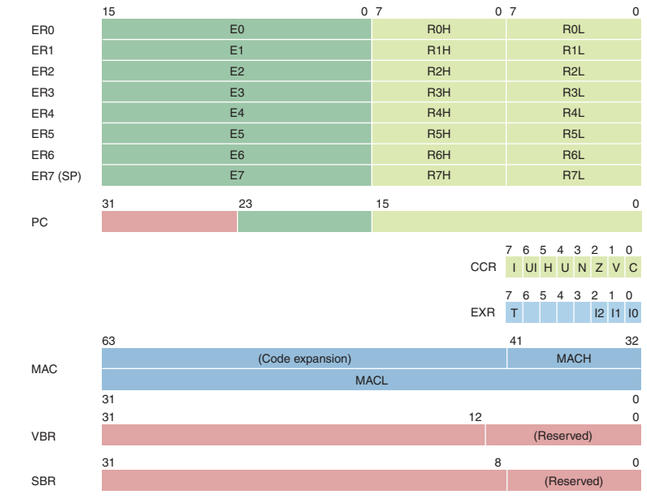
H8/300L
Built-in 32 kHz oscillator and LCD controller/driver units

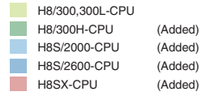
Inheriting the respected H8 architecture and improving processing ability and speed.

High-performance CISC architecture

Based on core development focused on compatibility, the H8S Family and H8SX Family also feature upward compatibility in register layout and functionality. This makes reuse of software resources easy. Furthermore, functions that improve ease of use are added to each family.

CPU register structure

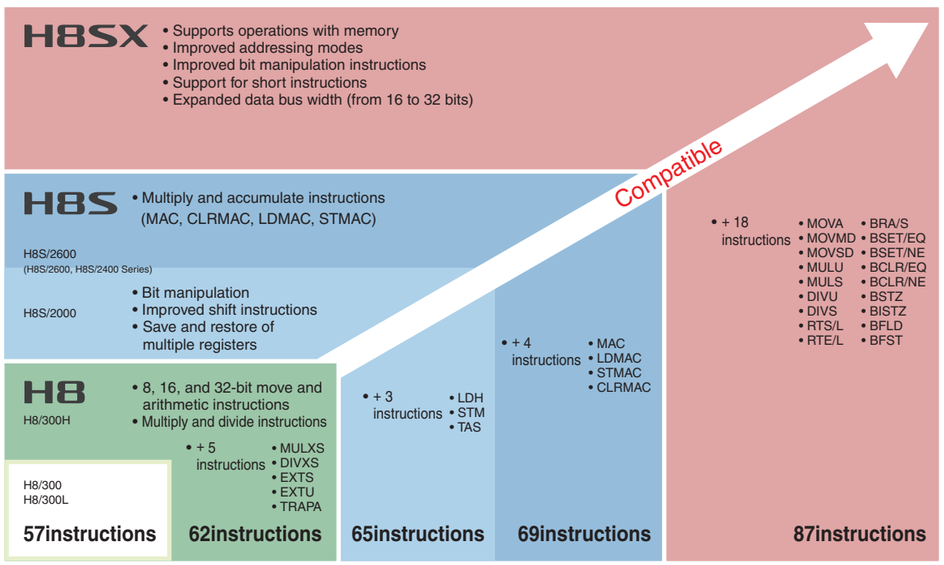




SP : Stack pointer
PC : Program counter
CCR : Condition code register
I : Interrupt mask bit
UI : User bit/interrupt mask bit
H : Half carry flag
U : User bit
N : Negative flag
Z : Zero flag
V : Overflow flag
C : Carry flag
EXR : Extend register
T : Trace bit
I2 to I0 : Interrupt mask bits
MAC : Multiply register
VBR : Vector base register
SBR : Short address base register

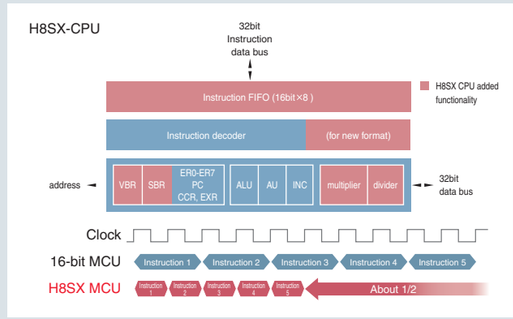
Assuring compatibility at the object level

Firmware developed for the H8 CPU can be used on the 16-bit H8S CPU and the 32-bit H8SX CPU as well.



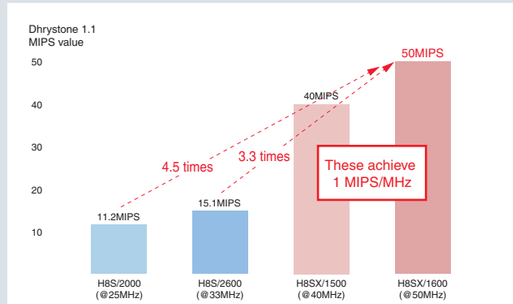
High-speed 32-bit processing for high performance

These CPUS use a 2-stage pipelined processing plus instruction FIFO structure to achieve high-speed processing at one instruction per clock cycle. Furthermore, by making the internal CPU bus 32 bits wide, the instruction fetch time is reduced significantly from earlier 16-bit MCUs.



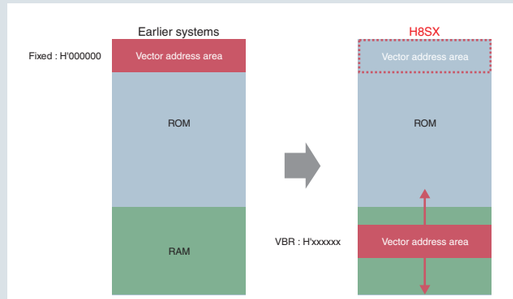
The H8SX inherits the whole H8S instruction set.

In addition to inheriting the whole H8S instruction set, which is ideal for embedded applications, the H8SX adds new instructions and new addressing modes to improve ease of use even further. Arithmetic performance is improved greatly by the provision of 32-bit multiply and divide instructions.



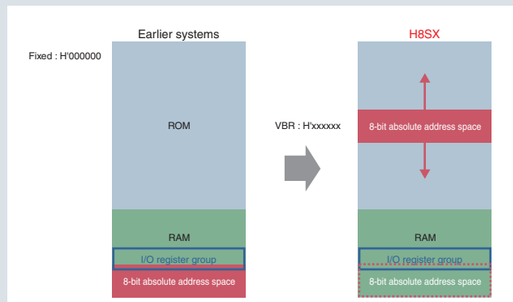
VBR reduces the interrupt response time significantly.

These MCUs feature a VBR (vector base register) function that can set up an arbitrary address in a vector table. By allocating the vector in RAM, even ROM-less versions can perform interrupt handling quickly.



SBR creates faster programs.

The SBR (short address base register) function makes it possible to set up a start address for an 8-bit absolute address space at an arbitrary location. Fast and efficient programs can be created by changing the start address of the 8-bit absolute address space.

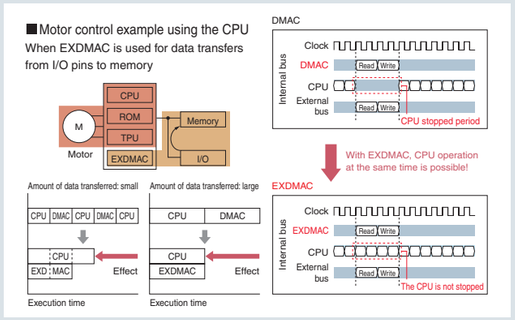


A rich set of advanced functions that can completely support a wide range of applications.

Feature

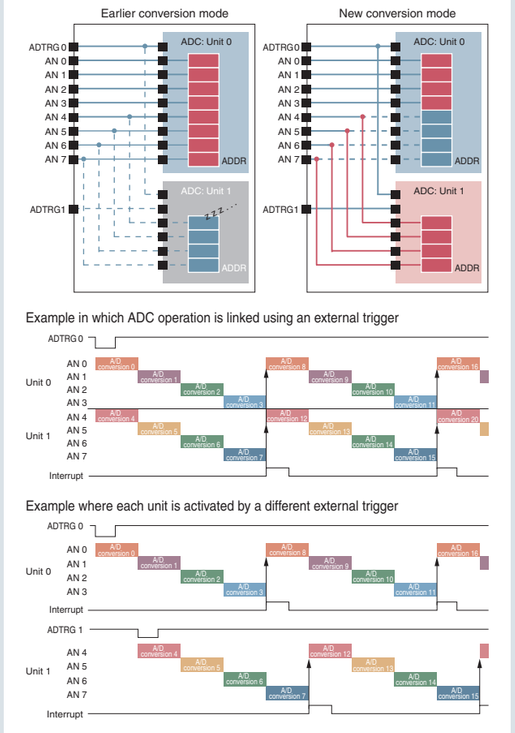
EXDMAC makes high-speed data transfers possible.

These MCUs include the EXDMAC direct memory access controller that proves its worth in high-speed transfers of data between two external data busses. System performance increases significantly since data is transferred without stopping CPU operation.



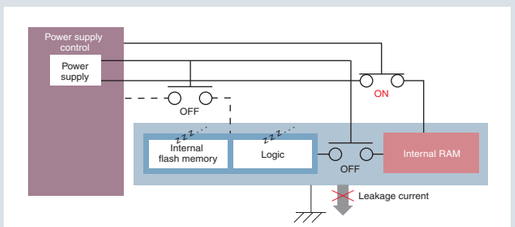
New A/D conversion mode that doubles conversion speed.

Conversion speed is effectively doubled since the units can convert at the same time, making high-speed conversion possible. (Units 0 and 1 can operate independently from the same external trigger (ADTRG0).) It is also possible to activate the units independently from different external triggers.



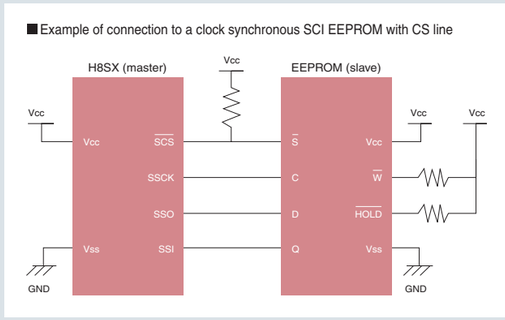
Deep software standby mode

These MCUs provide deep software standby mode, which can suppress standby mode power consumption even further. Power to unneeded modules can be cut with register settings and leakage current can be reduced greatly.



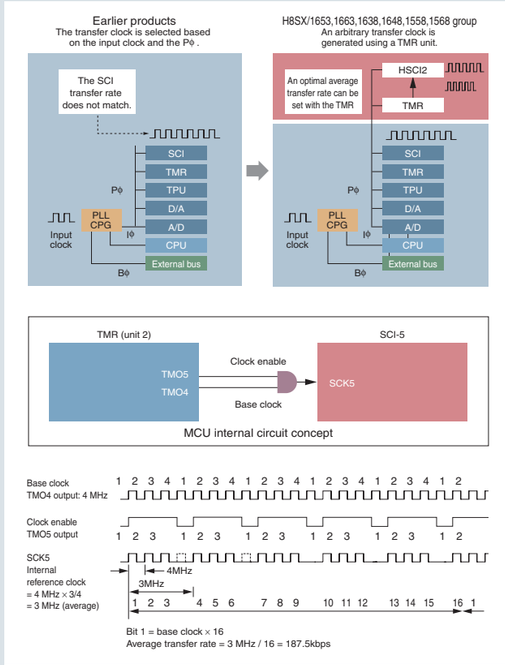
Synchronous serial communications unit that provides high-speed synchronous serial communications

These MCU provide a synchronous serial communications unit that supports both a clock synchronous communications mode and a 4-wire bus communications mode. This unit supports communications with a wide range of devices that have a clock synchronous CSI unit with CS signal by providing clock polarity reversal, LSB/MSB first selection, conflict error detection and other functions.



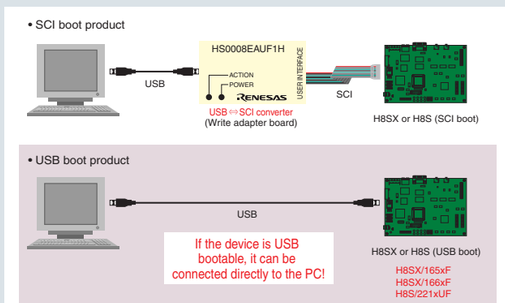
HSCI2 allows selection of an optimal transfer clock.

HSCI2 (high-speed serial communications interface 2) allows the selection of an optimal SCI transfer clock without depending on the frequency of an oscillator element. It generates the optimal average transfer rate clock source required for the SCI from the MCU's internal 8-bit timer (TMR unit). This obviates the need to select an oscillator element constrained by the SCI transfer clock, and allows an oscillator element optimal for the system to be selected.



USB boot function that can write to a connected flash memory.

The MCU's internal flash memory can be written directly from a PC using the USB boot function. Since this is a direct USB connection, high-speed writing is possible. Furthermore, on-site maintenance and other operations are quite and easy since no USB/SCI converter or other external circuits are required.



H8SX /1600

3V series that features a built-in 32-bit multiplier/divider.

Extensive lineup with operating frequencies up to 50 MHz and internal flash memory capacities from 256 KB to 1024 KB.

ROMless products support onboard writing to external flash ROM.*

Built-in functions include a high-precision 16-bit ΔΣA/D converter and a high-speed 10-bit successive approximation A/D converter.

*: The user must provide write and erase programs for the specifications of the flash ROM actually used.

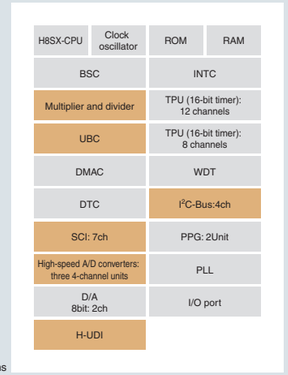
Application Areas

PC peripherals and OA equipment (PC, storage devices, printers, and scanners), consumer equipment (digital home electronics), and industrial equipment (FA equipment, POS peripherals, meters, test equipment, and games).

Features of the H8SX/1600 Series

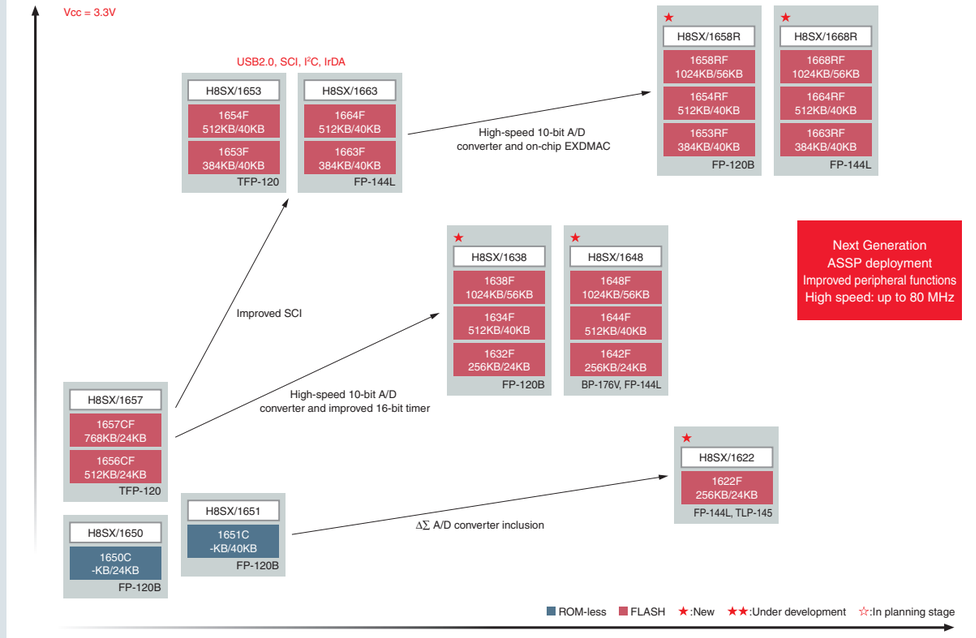
- Flash/ROM capacities from 256/24 KB to 1024/56 KB
- Improved peripheral functions, including dual TPU/PPG units, and high-speed SCI/I²C bus units
- Up to three high-speed 10-bit A/D converter units support simultaneous, independent, and continuous conversion.
- Built-in high-precision 16-bit ΔΣ A/D converter
- Support for a wide variety of communication formats including USB 2.0 (full speed) and I²C bus.
- Built-in EXDMAC can operate the internal and external busses independently.
- New standby mode added. Supports even finer-grained control of the power supply and provides standby mode operation with low power consumption.
- Available in a variety of miniature packages including BP-176V (13 × 13 mm) and TLP-145V (9 × 9 mm).

H8SX/1648F Block Diagram

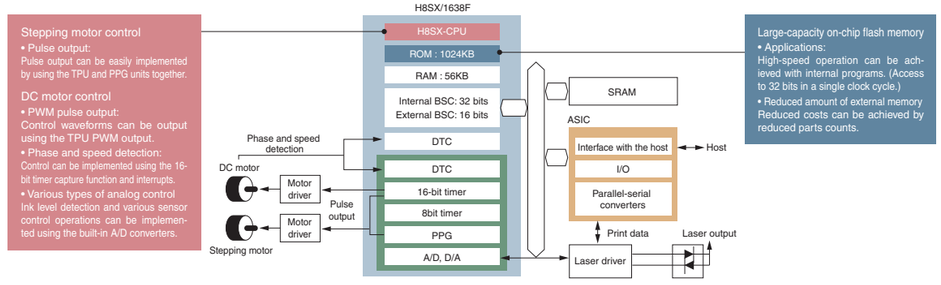


: Special functions

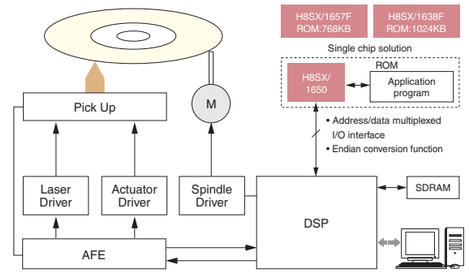
H8SX/1600 Series Product Development Chart



Laser Printer/Plain Paper Copier Engine System Structure Example



Optical Disc Drive System Structure Example



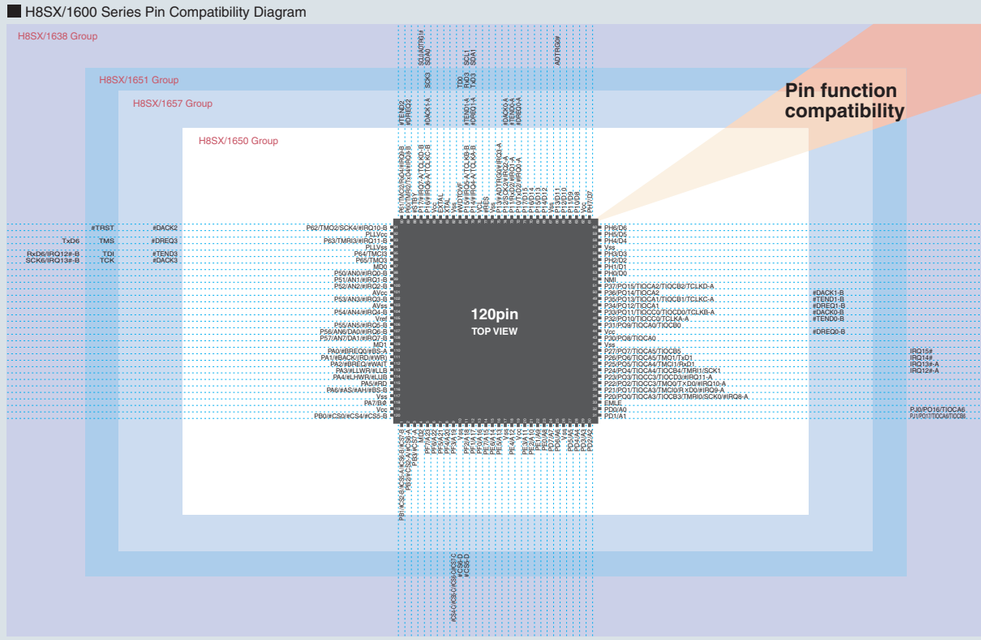
CPU performance improvements
- Operating frequency improvements: To 50 MHz and higher
- New instruction set additions for improved code efficiency (83% improvement over earlier CPUs)
- On-chip multiplier/divider unit for improved calculation speeds
- An 8-bit absolute address space that the user can set freely ⇒SBR
- Vector table can be freely located by the user ⇒VBR
- Single clock cycle memory access achieved by on-chip RAM (24 KB)

Bus controller performance improvements
- Support for a data/address multiplexed I/O interface makes direct interface with a DSP possible.
- Little/big endian conversion function
- All registers and internal busses have been made 32 bits wide.

Large capacity built-in flash memory
- The inclusion of a large capacity (up to 1 MB) flash memory on chip allows large application programs to be loaded onto the MCU chip itself.

⇒This means that external memory can be reduced.

H8SX/1600 Series Pin Compatibility Diagram



H8SX /1500

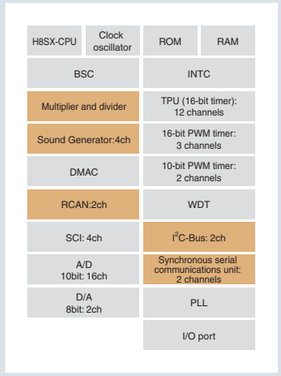
5V series that features a built-in 32-bit multiplier/divider.

Lineup features operating frequencies up to 48 MHz and ASSP products for automotive applications.
This is an extensive line with, in addition to a lineup of models with 256 KB to 1024 KB of on-chip flash memory, high quality grade versions for dashboard and airbag systems.

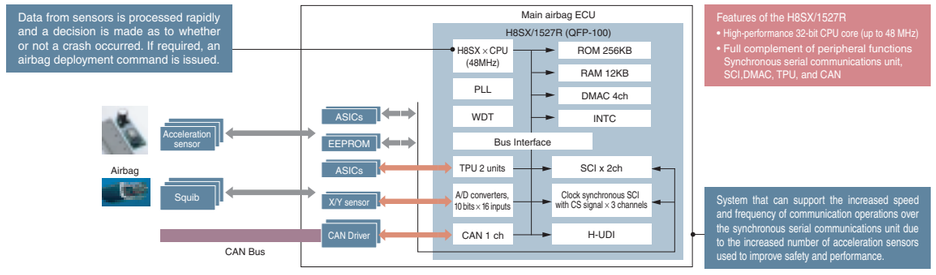
Application Areas
Industrial equipment (FA control, HVAC, and vending machines) and automotive applications (dashboard and airbag systems).

Features of the H8SX/1500 Series
- Built-in PWM modules that provide 16 10-bit channels and 12 16-bit channels
- Extensive set of built-in communications functions, including synchronous serial communications unit, I²C bus, and CAN Bus.
- Sound generator function can produce sine waves in the range 31 Hz to 20 kHz with an accuracy of within 1%.
- Multi-signal pulse control can be implemented using up to two 16-bit PPG units and up to two 16-bit TPU units.
- Up to three high-speed 10-bit A/D converter units support simultaneous, independent, and continuous conversion.
- New standby mode added. Supports even finer-grained control of the power supply and provides standby mode operation with low power consumption.

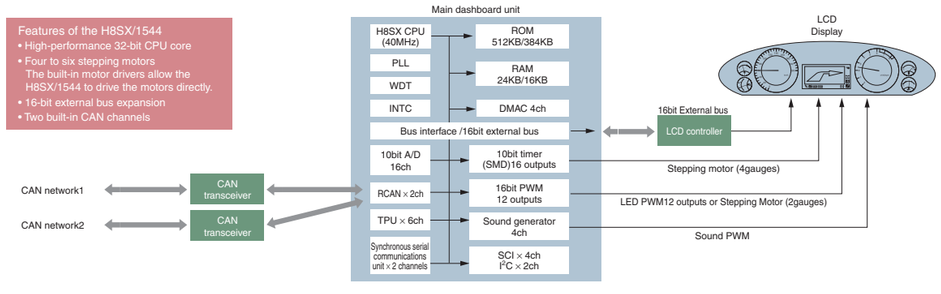
■ H8SX/1544F Block Diagram



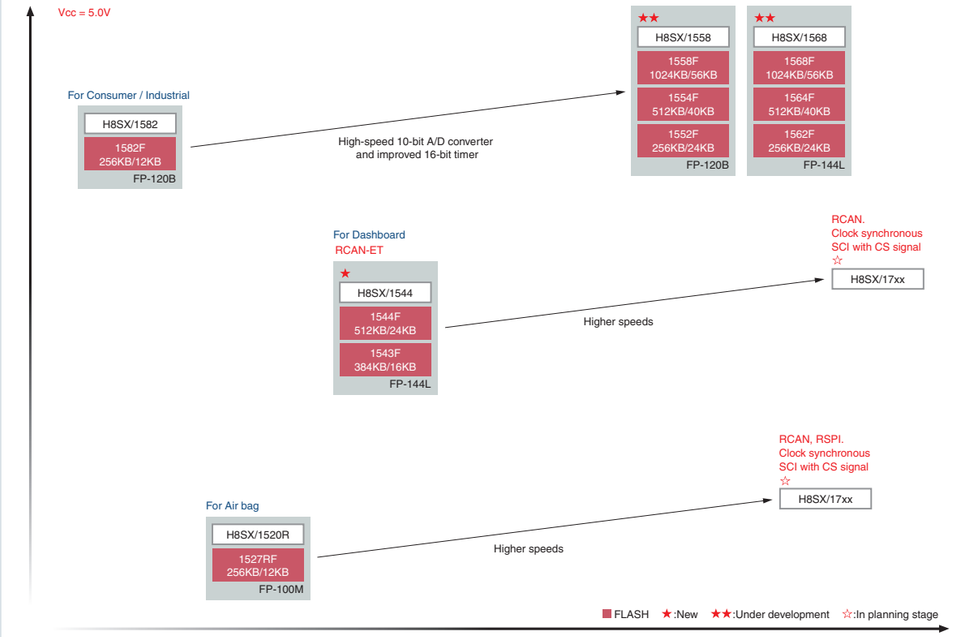
■ Airbag System Structure Example



■ Dashboard System Structure Example

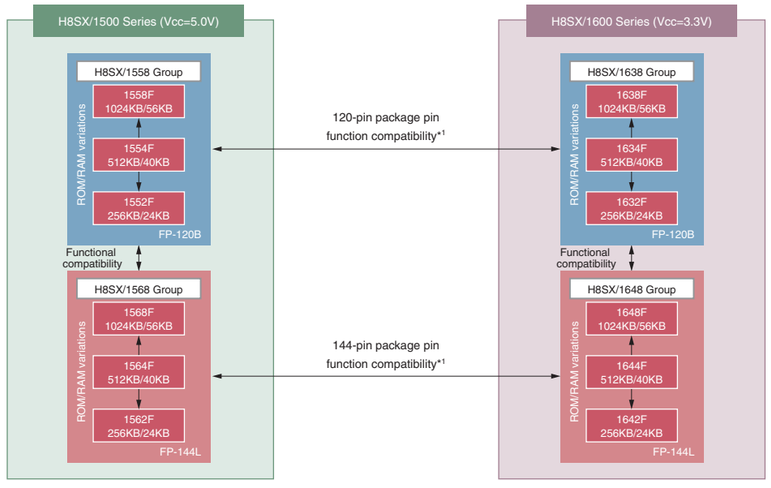


■ H8SX/1500 Series Product Development Chart



■ Compatibility with the Vcc = 3.3V H8SX/1600 Series

Even though the operating voltages differ between the H8SX/1500 Series and the H8SX/1600 Series, Renesas has emphasized pin compatibility when developing the product lines.
Both the H8SX/1558 group and the H8SX/1638 group, and the H8SX/1568 group and the group, are pin function compatible*1 products.
If, in the future, a Renesas customer changes from a Vcc = 5.0 V to a Vcc = 3.3V power supply system, Renesas provides a product lineup that allows the switch to the H8SX/1638 group or H8SX/1668 group to be made with confidence.



*1: The H8SX/1558 group and the H8SX/1568 group do not support external expansion. Also, their operating frequency range is 8 to 40 MHz.

H8S/2600

High-end H8S Family series that features a built-in 16-bit multiplier.

Product lineup includes wide temperature range high-reliability products (-40 to +105°C, -40 to +125°C) for automotive applications.

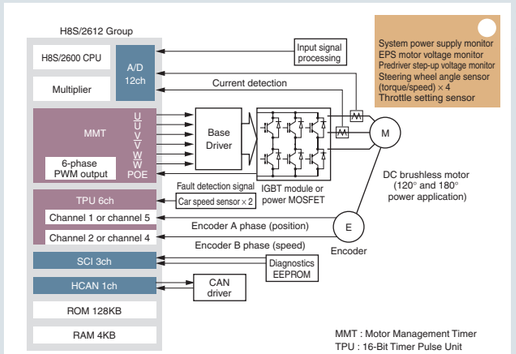
This series features not only special communications functions (I²C bus, CAN Bus, and synchronous serial communications units)

but also special peripheral functions (including motor control PWM output and LCD controller units).

Application Areas

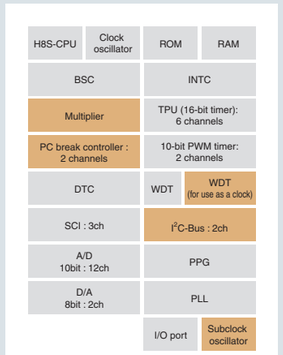
PC peripherals and OA equipment (printers), industrial equipment (FA control and inverter control), and automotive applications (dashboard, car air conditioning, gateways, EPS, ABS, and body control).

■ EPS System Structure Example



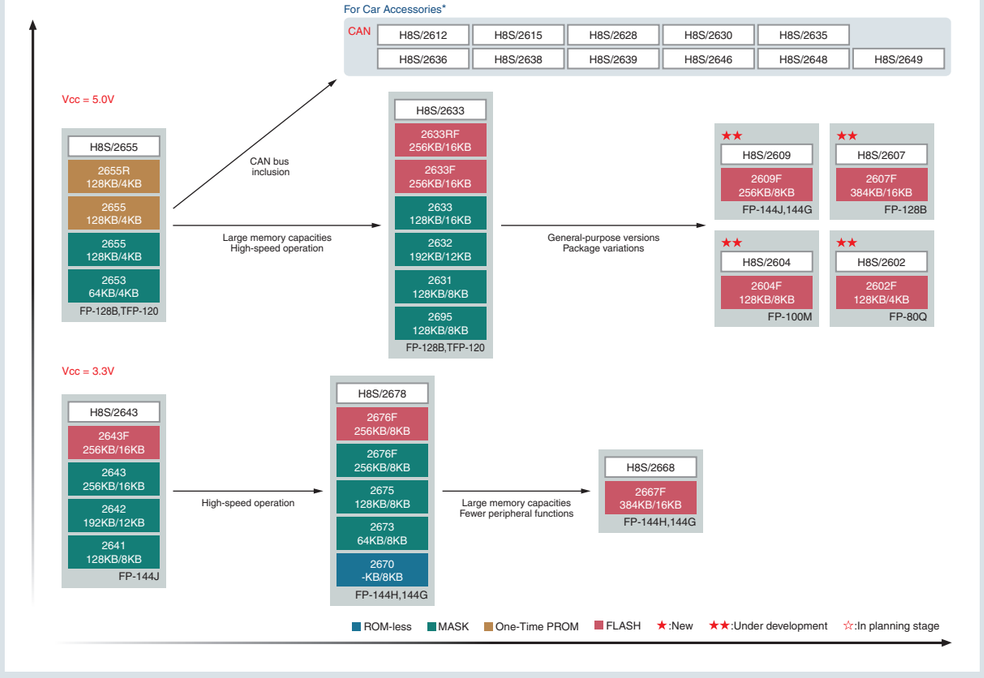
- 20 MHz, 5V operation
- Built-in multiplier
- Versions with 80, 100, 120, and 144 pins available.

■ H8S/2607 Group Block Diagram (under development)



: Special functions

■ H8S/2600 Series Product Development Chart



*: See the Renesas Microcomputer Automotive LAN Microcomputer Catalog for details.

H8S/2500

Low-power 5V series that features a 32 kHz oscillator inherited from the H8S/2200 series.

These MCUs include special communications functions (I²C bus, IEBus, and CAN bus)

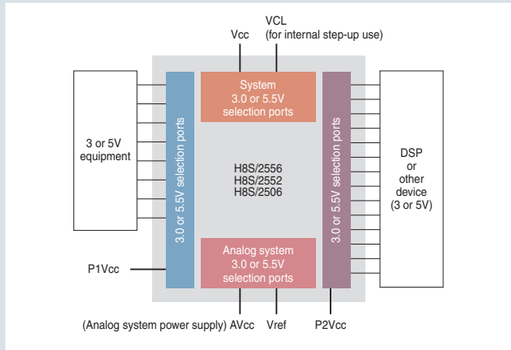
and support both 5V interface and 3V interface systems with a port pin power supply.

This series can also support 5V/3V mixed systems by supplying different port pin power supply voltages.

Application Areas

Industrial equipment (FA control and inverter control) and automotive applications (car audio).

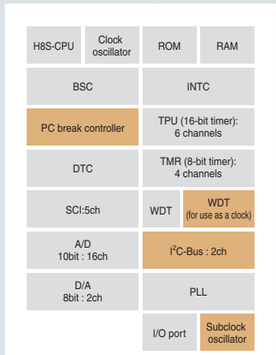
■ Pin Voltage Selection



*: ICE (E6000) is supported with the HS2556EP162H.

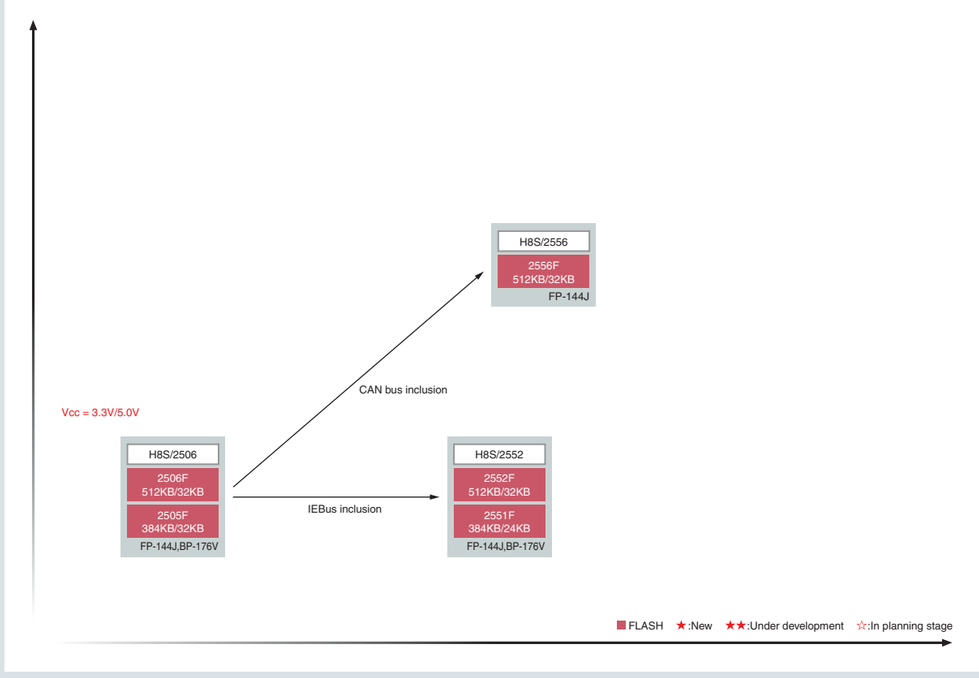
- Built-in 512 KB flash memory
- Built-in I²C bus interface
- A pin voltage of 3.0 or 5.5V can be selected.

■ H8S/2506F Block Diagram



: Special functions

■ H8S/2500 Series Product Development Chart



H8S /2400

New H8S series that provides an extensive set of peripheral functions and a 16-bit multiplier.

Adopts the CPU from the H8S/2600 H8S Family high-end model for powerful arithmetic processing.

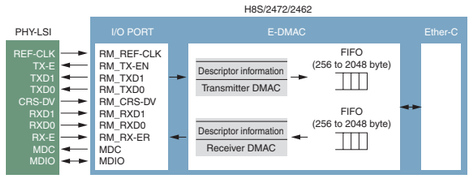
New models with built-in USB and Ethernet functions are under development.

This new series features low-voltage operation (3.3V@34 MHz) and a rich set of low-power modes.

Application Areas

PC peripherals and OA equipment (POS terminals, printers, and USB equipment) and industrial equipment (card readers and wireless equipment)

■ PHY LSI Connection Example



- Conforms to the Ethernet/IEEE 802.3 MAC layer (Media Access Control) standards.
- Supports both 10 Mbps and 100 Mbps transfers.
- Supports both full and half-duplex modes.
- Supports the IEEE 802.3u standard RMII (Reduced Media Independent Interface).
- Magic packet detection and Wake-On-LAN (WOL) signal output
- Connection to a physical layer LSI (PHY LSI) makes Ethernet/IEEE 802.3 transmission/reception possible.

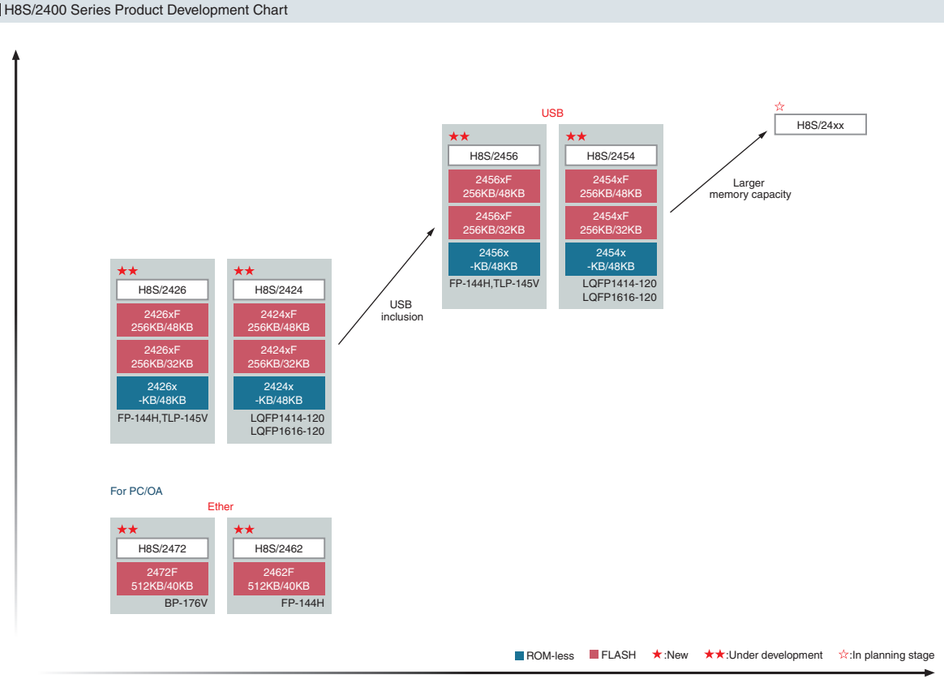
- Built-in multiplier
- Built-in CRC circuit
- Improved communications functions
  - USB
  - EtherC
  - I^2C bus: 6 channels
  - Synchronous serial communications unit: 1 channel
  - SCI with FIFO: 1 channel
- Miniature package
  - BP-176V (13mm□)

■ H8S/2472 Group Block Diagram (under development)

H8S-CPU	Clock oscillator	ROM	RAM
BSC		INTC	
Multiplier		TPU (16-bit timer): 12 channels	
CRC calculation circuit		TMR (8-bit timer): 2 channels	
DTC		14-bit PWM timer: 4 channels	
SCI : 2ch		WDT : 2ch	
SCI with FIFO: 1 channel		I^2C-Bus : 6ch	
Synchronous serial communications unit: 1 channel		EtherC	
A/D 10bit : 8ch		LPC	
Boundary scan		USB	
		PLL	
PLL		I/O port	

: Special functions

■ H8S/2400 Series Product Development Chart



H8S /2300

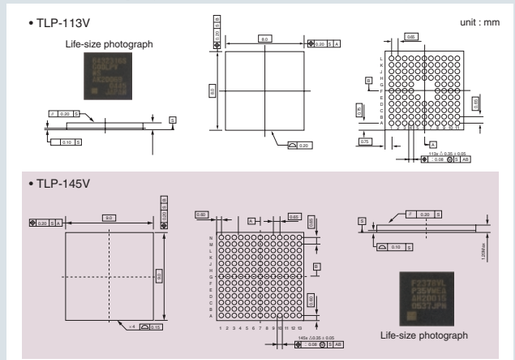
H8S Family standard series that provides optimal support for a wide range of application areas.

This general-purpose series features the world's highest level of 16-bit CPU performance (H8S/2378 group: 28.6 ns at 35 MHz), the smallest package in the H8S Family (TLP-112: 8 × 8 mm□), and an extensive memory lineup, from 32 KB/2 KB to 512 KB/32 KG, and is optimal for a wide range of application areas.

Application Areas

PC peripherals and OA equipment (printers and POS terminals), industrial equipment (card readers and FA control), and consumer products (LCD TVs and electronic musical instruments).

■ Miniature Packages (8mm□:TLP-113V / 9mm□:TLP-145V)



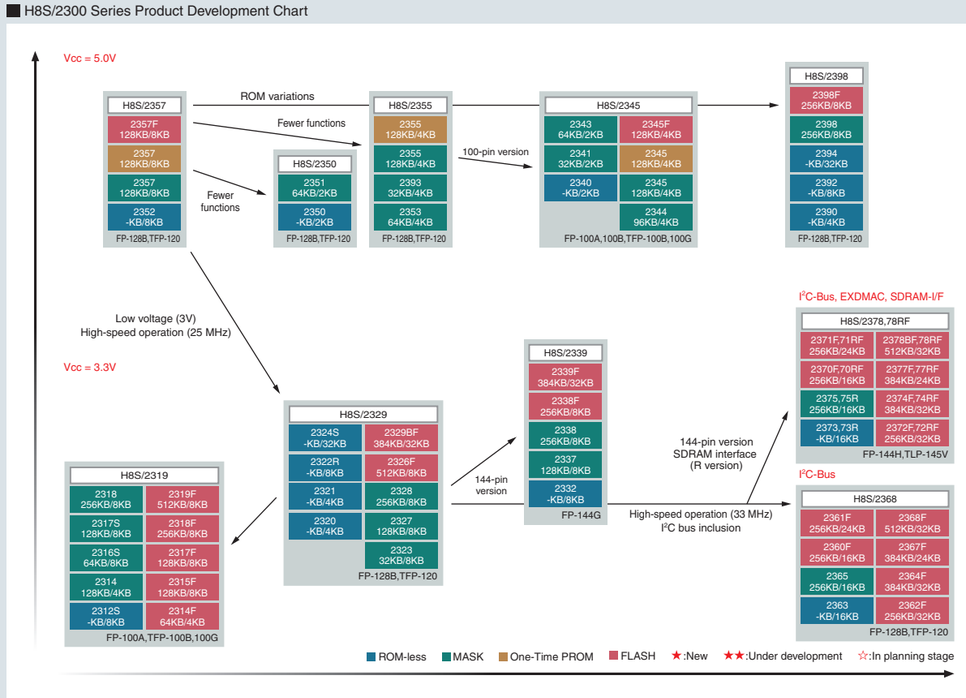
- 3.3V single power supply
  - Built-in 384 KB flash memory
- Low-voltage/high-speed operation (35 MHz/3.3V)
- Improved peripheral functions
  - Serial interfaces: 5 channels (I^2C bus: 2 channels)
  - A/D converters: 16 channels, and other units
- Built-in SDRAM interface*1 (H8S/2378R group)
- On-chip debugging functions (with E10A-USB support)
- Miniature package:
  - TLP-145V(9mm□)

: Special functions

■ H8S/2378,78R Group Block Diagram

H8S-CPU	Clock oscillator	ROM	RAM
BSC (SDRAM-I/F *1)		INTC	
EXDMAC		TPU (16-bit timer): 6 channels	
DMAC		10-bit PWM timer: 2 channels	
DTC		WDT	
SCI : 5ch		I^2C-Bus : 2ch	
A/D 10bit : 16ch		PPG	
D/A 8bit : 6ch		PLL	
H-UDI *2		I/O port	

■ H8S/2300 Series Product Development Chart



H8S /2200

H8S series that aims for low power consumption by including a 32 kHz oscillator.

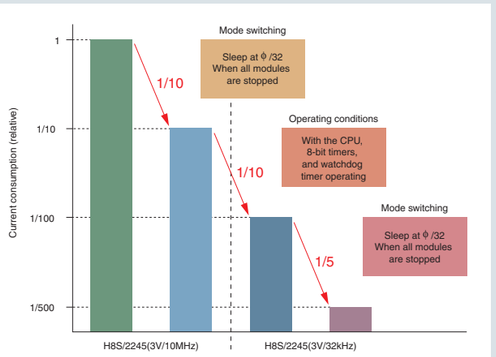
In addition to versions with a lowest guaranteed operating voltage of 2.2V, this series also features powerful communications functions (SCI: 4 channels, I²C bus: 2 channels, IEBus, high-speed SCI, and USB 2.0).

This is a microcomputer series that aims for low power consumption by providing a 32 kHz oscillator.

Application Areas

PC peripherals and OA equipment (POS terminals, printers, and USB equipment), industrial equipment (card readers and wireless equipment), and consumer products (electronic health-related product)

■ H8S/2200 Series Low Power Modes



- Built-in high-speed SCI, DMAC, and DTC
- Built-in USB interface
- Flash memory can be programmed over a USB connection.
- On-chip debugging functions (with E10A USB support)
- Miniature packages

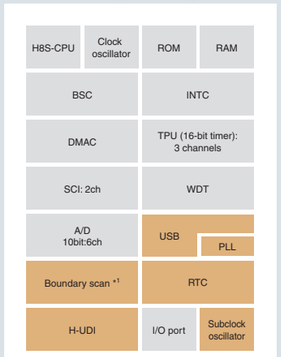
BP-112 (10mm□)

TBP-112A (10mm□)

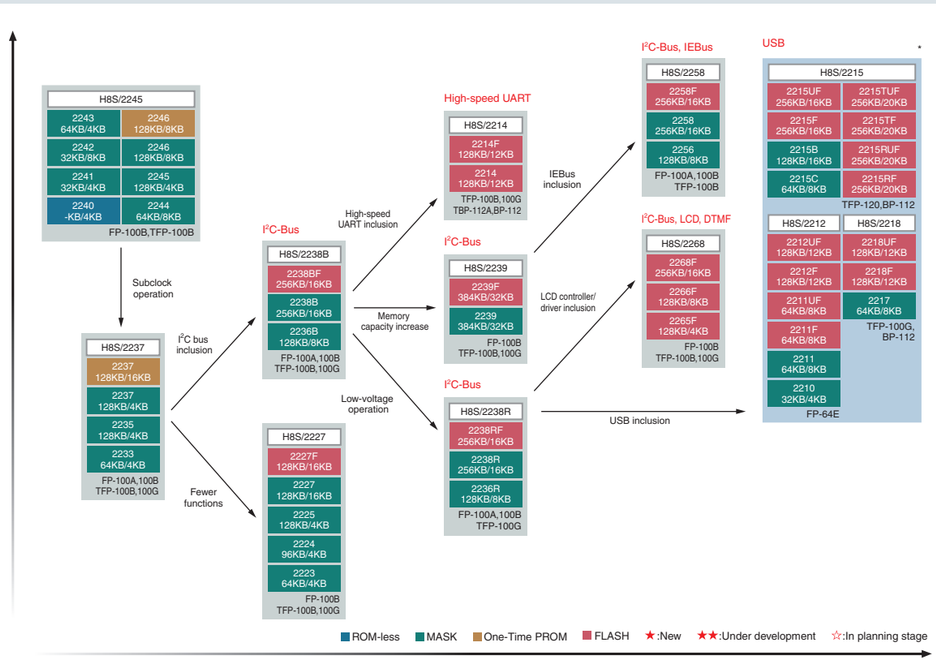
*1: Flash memory versions only

: Special functions

■ H8S/2218 Group Block Diagram



■ H8S/2200 Series Product Development Chart



*: See the Renesas USB Device Catalog for details.

H8S /2100

16-bit MCU series that inherits the peripheral functions of the H8/300 8-bit microcomputers.

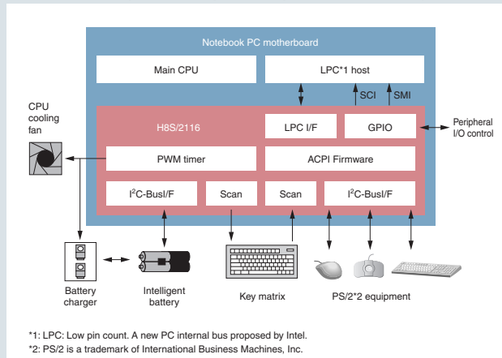
These devices maintain the same pin arrangements as the H8/300 Series to allow smooth replacement and include a wide range of PC-related peripheral functions, such as I²C bus, keyboard buffer controller, ISA bus, and LPC units.

This series also features an extensive set of memory options (ROM: 32 KB to 1 MB, RAM: 2 KB to 40 KB).

Application Areas

PC peripherals and OA equipment (PC servers, keyboard controllers, and battery control) and industrial equipment (card readers and meters).

■ Notebook PC Keyboard/Battery Control System Structure Example



*1: LPC: Low pin count. A new PC internal bus proposed by Intel.
*2: PS/2 is a trademark of International Business Machines, Inc.

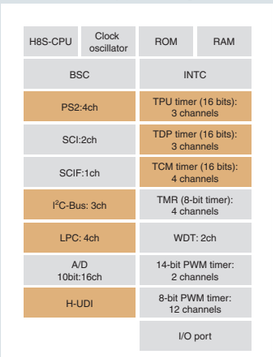
- 3.3V single power supply

On-chip flash memory: 160 KB

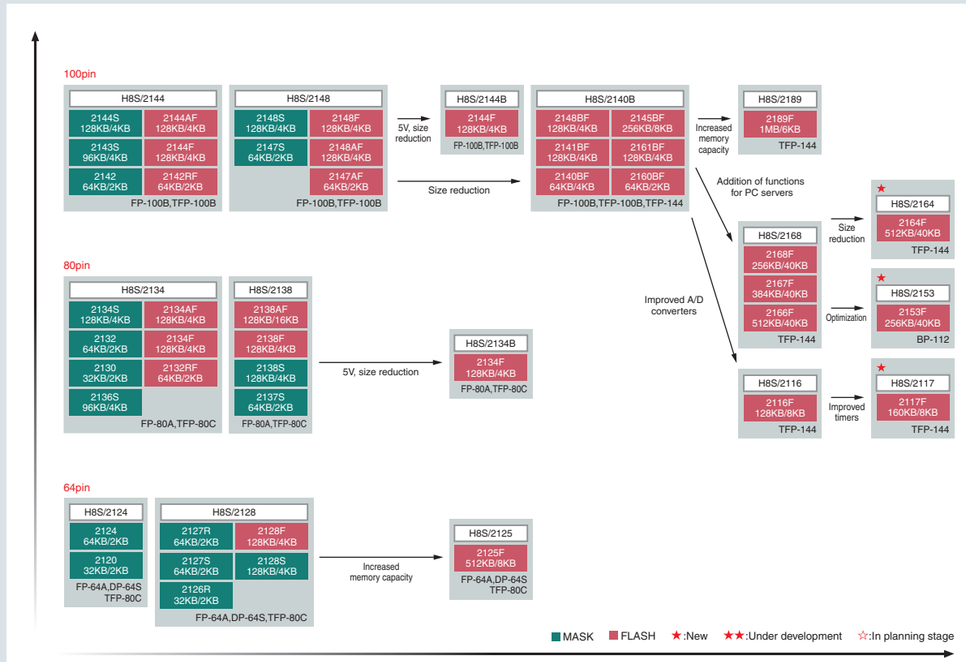
- Built-in LPC interface
- Built-in I²C bus interface
- Built-in PS/2 interface
- Improved timer functions
- On-chip debugging functions (with E10A USB support)

: Special functions

■ H8S/2117 Group Block Diagram



■ H8S/2100 Series Product Development Chart



Function Overview

H8SX Family

Series	Group	CPU, memory, and bus functions																								Clock and power supply functions												Peripheral functions				
		Internal memory										CPU					DMA *2		External bus expansion							Clocks						Voltage detection		Operating voltage				A/D converters				
		ROM																																								
		Flash memory	Mask ROM	One-time PROM	EEPROM	QzROM	ROM-less	RAM	Data flash memory	Cache memory	Program security	Multiplier	Multiply-and-accumulate instruction	Barrel shifter	FPU	MMU	DMAC	DTC/DMA II	Separate address/data busses	Multiplexed address/data busses	DRAM controller	SDRAM controller	PCI controller	Endian conversion	Host interface	PLL	Subclock/RTC	On-chip oscillator	Oscillator stop detection	Frequency divider	Low-power structure	Power on reset	Low-voltage detection/LVD	5V system	3V system	2V system	Under 2V	8-bit unit	10-bit unit	14-bit ΔΣ converter *3	Sample and hold	Multi-channel sample and hold
H8SX/1600	H8SX/1668R★★	●						●			●	●	●				●	●	●	●	●	●		●		●	●			●	●				●				●		●	●
	H8SX/1663	●						●			●	●	●				●	●	●	●	●	●		●		●	●			●	●				●				●		●	
	H8SX/1658R★★	●						●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	●
	H8SX/1657	●						●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	
	H8SX/1653	●						●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	
	H8SX/1651						●	●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	
	H8SX/1650						●	●			●	●	●					●	●	●				●		●				●	●				●				●		●	
	H8SX/1648★	●						●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	●
	H8SX/1638★	●						●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	●
	H8SX/1622★	●						●			●	●	●				●	●	●	●				●		●				●	●				●				●		●	
H8SX/1500	H8SX/1580	●						●			●	●	●				●	●								●				●	●			●					●		●	●
	H8SX/1568★★	●						●			●	●	●				●	●								●				●	●			●					●		●	●
	H8SX/1558★★	●						●			●	●	●				●	●								●				●	●			●					●		●	●
	H8SX/1544★	●						●			●	●	●				●		●	●						●				●	●			●					●		●	●
	H8SX/1520R	●						●			●	●	●				●									●				●	●			●					●		●	●

Peripheral functions																																									Other functions		Group	Series
	Timers													Serial interfaces		High-functionality communication units											Display functions			Calculation functions			I/O ports					Debugging functions						
			Timer length				Function																																					
8-bit D/A converters	Input capture	Output compare	8 bits	16 bits	32 or more bits	Other bit lengths	PWM output	Real-time port	Programmable pulse generator	Event counter	2-phase encoder input	3-phase inverter control	Watchdog timer	Clock asynchronous serial interface	Clock synchronous serial interface	I²C bus	IEBus	Smart card/SIM	Synchronous serial communications unit/special serial I/O	CAN	Ethernet	HDLC	USB HOST	USB Function	LPC/ISA	IrDA	LCD	VFD	OSD	CRC	X/Y conversion	DTMF	Large current drive ports	High breakdown voltage ports	N-channel open drain ports	Pull-up resistors	NMOS push-pull ports	Boundary scan/JTAG	On-chip debugger	Onboard flash writing	ROM correction function	Other items		
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●						●		●				●					●	●		●	●	●			H8SX/1668R★★	H8SX/1600
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●						●		●				●					●	●			●	●			H8SX/1663	
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●						●		●									●	●		●	●	●			H8SX/1658R★★	
●	●	●	●	●	●		●		●	●	●		●	●	●			●																	●	●			●	●			H8SX/1657	
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●						●		●				●					●	●			●	●			H8SX/1653	
●	●	●	●	●	●		●		●	●	●		●	●	●			●																	●	●			●	●			H8SX/1651	
●	●	●	●	●	●		●		●	●	●		●	●	●			●																	●	●			●	●			H8SX/1650	
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●								●									●	●		●	●	●			H8SX/1648★	
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●								●									●	●		●	●	●			H8SX/1638★	
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●																	●	●		●	●	●			H8SX/1622★	
	●	●		●	●		●		●	●	●		●	●	●			●	●																●	●			●	●			H8SX/1580	H8SX/1500
●	●	●	●	●	●		●		●	●	●		●	●	●	●	●	●								●				●					●	●		●	●	●			H8SX/1568★★	
●	●	●	●	●	●		●		●	●	●		●	●	●	●	●	●								●				●					●	●		●	●	●			H8SX/1558★★	
●	●	●	●	●	●		●		●	●	●		●	●	●	●		●	●	●															●	●		●	●	●			H8SX/1544★	
	●	●		●	●		●		●	●	●		●	●	●			●	●	●															●	●			●	●			H8SX/1520R	

*1: Function that A/D converts two or more analog values at the same time.   *2: EXDMAC: Present in the H8SX/1668R and H8SX/1648R   *3: The H8SX/1622 has a 16-bit ΔΣ converter

★: New product   ★★: Under development

H8S Family

Series	Group	CPU, memory, and bus functions																								Clock and power supply functions												Peripheral functions				
		Internal memory										CPU					DMA		External bus expansion							Clocks						Voltage detection		Operating voltage				A/D converters				
		ROM																																								
		Flash memory	Mask ROM	One-time PROM	EEPROM	QzROM	ROM-less	RAM	Data flash memory	Cache memory	Program security	Multiplier	Multiply-and-accumulate instruction	Barrel shifter	FPU	MMU	DMAC	DTC/DMA II	Separate address/data busses	Multiplexed address/data busses	DRAM controller	SDRAM controller	PCI controller	Endian conversion	Host interface	PLL	Subclock/RTC	On-chip oscillator	Oscillator stop detection	Frequency divider	Low-power structure	Power on reset	Low-voltage detection/LVD	5V system	3V system	2V system	Under 2V	8-bit unit	10-bit unit	14-bit ΔΣ converter	Sample and hold	Multi-channel sample and hold
H8S/2600	H8S/2678R						●	●				●	●				●	●	●		●	●				●				●	●				●				●		●	
	H8S/2678	●	●				●	●			●	●	●				●	●	●		●					●				●	●				●				●		●	
	H8S/2668	●						●			●	●	●					●	●							●				●	●				●				●		●	
	H8S/2655		●	●				●				●	●				●	●	●		●									●	●			●					●		●	
	H8S/2649	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2648	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2646	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2643	●	●					●			●	●					●	●	●		●					●	●			●	●			●	●				●		●	
	H8S/2639	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2638	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2636	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2635	●	●					●			●	●							●							●	●			●	●			●					●		●	
	H8S/2633	●	●					●			●	●					●	●	●		●					●	●			●	●			●	●			●	●		●	
	H8S/2630	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2628	●	●					●			●	●	●					●								●				●	●			●					●		●	
	H8S/2615	●	●					●			●	●	●													●	●			●	●			●					●		●	
	H8S/2612	●	●					●			●	●	●					●								●	*2			●	●			●					●		●	
	H8S/2609★★	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2607★★	●	●					●			●	●	●					●	●	●						●	●			●	●			●					●		●	
	H8S/2604★★	●	●					●			●	●	●					●								●				●	●			●					●		●	
	H8S/2602★★	●	●					●			●	●	●					●								●				●	●			●					●		●	
H8S/2500	H8S/2556	●						●			●							●	●	●						●	●			●	●			●	●				●		●	
	H8S/2552	●						●			●							●	●	●						●	●			●	●			●	●				●		●	
	H8S/2506	●						●			●							●	●	●						●	●			●	●			●	●				●		●	
H8S/2400	H8S/2472★★	●						●			●	●	●					●	●	●						●				●	●				●				●		●	
	H8S/2462★★	●						●			●	●	●					●	●	●						●				●	●				●				●		●	
H8S/2300	H8S/2398	●	●				●	●			●						●	●	●		●									●	●			●					●			
	H8S/2378R	●	●				●	●			●						●	●	●		●	●				●				●	●				●				●		●	
	H8S/2378	●	●				●	●			●						●	●	●		●	●				●				●	●				●				●		●	
	H8S/2368	●	●				●	●			●						●	●	●		●					●				●	●				●				●			
	H8S/2357	●	●	●			●	●			●						●	●	●		●									●	●			●					●			
	H8S/2355		●	●				●										●	●											●	●			●					●			
	H8S/2350		●				●	●									●	●	●		●									●	●			●					●			
	H8S/2345	●	●	●			●	●			●							●	●	●										●	●			●	●				●			
	H8S/2339	●	●				●	●			●						●	●	●		●									●	●				●				●			
	H8S/2329	●	●				●	●			●						●	●	●		●									●	●				●				●			
	H8S/2319	●	●				●	●			●							●	●											●	●				●				●			
H8S/2200	H8S/2282	●	●					●			●															●				●	●			●					●			
	H8S/2280★	●	●					●			●															●				●	●			●					●			
	H8S/2268	●						●			●							●									●			●	●			●	●				●			
	H8S/2258	●	●					●			●							●	●	●							●			●	●			●					●			
	H8S/2245		●	●			●	●										●	●	●										●	●			●	●				●			
	H8S/2239	●	●					●			●						●	●	●	●							●			●	●				●				●			
	H8S/2238R	●	●					●			●							●	●	●							●			●	●				●	●			●			
	H8S/2238B	●	●					●			●							●	●	●							●			●	●			●		●			●			
	H8S/2237		●	●				●										●	●	●							●			●	●				●				●			
	H8S/2227	●	●					●			●							●	●	●						●	●			●	●				●	●			●			
	H8S/2218	●	●					●			●						●		●	●						●	●			●	●				●	●			●			
	H8S/2215	●	●					●			●						●	●	●	●										●	●				●				●			
	H8S/2214	●	●					●			●						●	●	●	●						●				●	●				●							
	H8S/2212	●	●					●			●						●										●			●	●				●				●		●	
H8S/2100	H8S/2199	●	●					●											●								●			●	●			●					●		●	
	H8S/2194	●	●					●											●								●			●	●			●					●		●	
	H8S/2189	●						●			●							●	●							●	●			●	●				●				●		●	
	H8S/2172	●						●									●		●		●					●				●	●				●							
	H8S/2168	●						●			●							●	●	●					●					●	●				●				●		●	
	H8S/2148	●	●					●			●							●	●						●					●	●			●	●				●		●	
	H8S/2144B	●						●			●								●											●	●			●					●		●	
	H8S/2144	●	●					●			●								●											●	●			●	●				●		●	
	H8S/2140B	●						●			●							●	●						●					●	●			●	●				●		●	
	H8S/2138	●	●					●			●							●	●						●					●	●			●	●				●		●	
	H8S/2134B	●						●			●								●											●	●			●					●		●	
	H8S/2134	●	●					●			●								●											●	●			●	●				●		●	
	H8S/2128	●	●					●			●							●	●											●	●			●	●				●		●	
	H8S/2125	●	●					●			●								●											●	●				●				●		●	
	H8S/2124	●	●					●											●											●	●			●	●				●		●	
	H8S/2117	●						●																	●		●			●	●				●				●		●	
	H8S/2116	●						●																	●		●			●	●				●				●		●	
	H8S/2114	●						●										●							●		●			●	●				●				●		●	
	H8S/2111B	●						●																	●					●	●				●						●	
	H8S/2110B	●						●																	●					●	●				●							
H8S Super Low Power	H8S/2264		●					●																			●			●	●			●	●				●			

Peripheral functions																																									Other functions		Group	Series
	Timers													Serial interfaces		High-functionality communication units											Display functions			Calculation functions			I/O ports					Debugging functions						
			Timer length				Function																																					
8-bit D/A converters	Input capture	Output compare	8 bits	16 bits	32 or more bits	Other bit lengths	PWM output	Real-time port	Programmable pulse generator	Event counter	2-phase encoder input	3-phase inverter control	Watchdog timer	Clock asynchronous serial interface	Clock synchronous serial interface	I²C bus	IEBus	Smart card/SIM	Synchronous serial communications unit/special serial I/O	CAN	Ethernet	HDLC	USB HOST	USB Function	LPC/ISA	IrDA	LCD	VFD	OSD	CRC	X/Y conversion	DTMF	Large current drive ports	High breakdown voltage ports	N-channel open drain ports	Pull-up resistors	NMOS push-pull ports	Boundary scan/JTAG	On-chip debugger	Onboard flash writing	ROM correction function	Other items		
●	●	●	●	●			●		●		●		●	●	●			●									●									●	●							H8S/2678R	H8S/2600
●	●	●	●	●			●		●		●		●	●	●			●									●									●	●				●			H8S/2678	
●	●	●	●	●			●		●		●		●	●	●			●									●									●	●				●			H8S/2668	
●	●	●	●	●			●		●		●		●	●	●			●																		●	●							H8S/2655	
	●	●		●			●		●		●		●	●	●			●		●							●						●		●	●				●	●		H8S/2649	
	●	●		●			●		●		●		●	●	●			●		●							●						●		●	●				●	●		H8S/2648	
	●	●		●			●		●		●		●	●	●			●		●							●						●		●	●				●	●		H8S/2646	
●	●	●	●	●			●		●	●	●		●	●	●	●		●								●							●		●	●				●			H8S/2643	
●	●	●		●			●		●		●		●	●	●	●		●		●													●		●	●	●			●	●		H8S/2639	
●	●	●		●			●		●		●		●	●	●	●		●		●													●		●	●	●			●	●		H8S/2638	
●	●	●		●			●		●		●		●	●	●	●		●		●													●		●	●				●	●		H8S/2636	
	●	●		●			●		●		●		●	●	●			●																						●			H8S/2635	
●	●	●	●	●			●		●	●	●		●	●	●	●		●								●							●		●	●							H8S/2633	
●	●	●		●			●		●		●		●	●	●	●		●		●													●		●	●	●			●	●		H8S/2630	
	●	●	●	●			●		●		●		●	●	●			●	●	●															●	●				●	●		H8S/2628	
	●	●		●			●				●		●	●	●			●		●															●	●				●			H8S/2615	
	●	●		●			●		●		●		●	●	●			●		●															●	●				●	●		H8S/2612	
	●	●		●			●		●		●		●	●	●			●															●		●	●				●	●		H8S/2609★★	
●	●	●		●			●		●		●		●	●	●	●		●															●		●	●	●			●	●		H8S/2607★★	
	●	●	●	●			●		●		●		●	●	●			●	●																●	●				●	●		H8S/2604★★	
	●	●		●			●		●		●		●	●	●			●																	●	●				●	●		H8S/2602★★	
●	●	●	●	●			●				●		●	●	●	●		●		●															●	●	●			●	●		H8S/2556	H8S/2500
●	●	●	●	●			●				●		●	●	●	●	●	●																	●	●	●			●	●		H8S/2552	
●	●	●	●	●			●				●		●	●	●	●		●																	●	●	●			●	●		H8S/2506	
			●	●			●						●	●	●	●		●	●		●			●	●					●			●		●	●		●	●	●			H8S/2472★★	H8S/2400
			●	●			●						●	●	●	●		●	●		●				●					●			●		●	●		●	●	●			H8S/2462★★	
●	●	●	●	●			●	●			●		●	●	●			●																	●	●				●			H8S/2398	H8S/2300
●	●	●	●	●			●	●		●	●		●	●	●	●		●								●							●		●	●			●	●			H8S/2378R	
●	●	●	●	●			●	●		●	●		●	●	●	●		●								●							●		●	●			●	●			H8S/2378	
●	●	●	●	●			●	●		●	●		●	●	●	●		●								●							●		●	●			●	●			H8S/2368	
●	●	●	●	●			●	●			●		●	●	●			●																	●	●				●			H8S/2357	
●	●	●	●	●			●				●		●	●	●			●																	●	●							H8S/2355	
●	●	●	●	●			●	●			●		●	●	●			●																	●	●							H8S/2350	
●	●	●	●	●			●				●		●	●	●			●															●		●	●				●			H8S/2345	
●	●	●	●	●			●	●			●		●	●	●			●																	●	●			●	●			H8S/2339	
●	●	●	●	●			●	●			●		●	●	●			●																	●	●			●	●			H8S/2329	
●	●	●	●	●			●				●		●	●	●			●																	●	●			●	●			H8S/2319	
	●	●		●			●				●		●	●	●			●		●							●								●					●			H8S/2282	H8S/2200
	●	●		●			●				●		●	●	●			●		●							●								●					●			H8S/2280★	
●	●	●	●	●			●				●		●	●	●	●	●	●									●					●			●	●	●			●	●		H8S/2268	
●	●	●	●	●			●				●		●	●	●	●		●																	●	●	●			●	●		H8S/2258	
●	●	●		●			●				●		●	●	●			●															●		●	●							H8S/2245	
●	●	●	●	●			●				●		●	●	●	●		●																	●	●	●			●	●		H8S/2239	
●	●	●	●	●			●				●		●	●	●	●		●																	●	●	●			●	●		H8S/2238R	
●	●	●	●	●			●				●		●	●	●	●		●																	●	●	●			●	●		H8S/2238B	
●	●	●	●	●			●				●		●	●	●			●																	●	●					●		H8S/2237	
	●	●	●	●			●				●		●	●	●			●																	●	●				●	●		H8S/2227	
	●	●		●			●				●		●	●	●			●						●														●	●	●			H8S/2218	
●	●	●	●	●			●				●		●	●	●			●						●														●	●	●			H8S/2215	
●	●	●		●			●				●		●	●	●																									●			H8S/2214	
	●	●		●			●				●		●	●	●			●						●															●	●			H8S/2212	
	●	●	●	●			●						●	●	●	●													●				●		●	●				●			H8S/2199	H8S/2100
	●	●	●	●			●						●	●	●	●																	●		●	●				●			H8S/2194	
	●	●	●	●			●				●	●	●	●	●	●		●								●							●			●	●		●	●			H8S/2189	
		●	●	●									●											●															●	●			H8S/2172	
●	●	●	●	●			●						●	●	●	●		●							●	●				●						●	●	●	●	●			H8S/2168	
●	●	●	●	●			●						●	●	●	●									●	●							●		●	●	●			●			H8S/2148	
●	●	●	●	●			●						●	●	●																		●			●	●			●			H8S/2144B	
●	●	●	●	●			●						●	●	●																		●			●	●			●			H8S/2144	
●	●	●	●	●			●						●	●	●	●									●	●							●			●	●			●			H8S/2140B	
●	●	●	●	●			●						●	●	●	●									●	●							●		●	●	●			●			H8S/2138	
●	●	●	●	●			●						●	●	●											●							●			●	●			●			H8S/2134B	
●	●	●	●	●			●						●	●	●											●							●			●	●			●			H8S/2134	
	●	●	●	●			●						●	●	●	●																	●		●	●	●			●			H8S/2128	
	●	●	●	●			●						●	●	●	●																	●		●	●	●		●	●			H8S/2125	
	●	●	●	●			●						●	●	●																		●			●							H8S/2124	
	●	●	●	●			●				●		●	●	●	●		●							●	●									●	●		●	●			H8S/2117	
	●	●	●	●			●				●		●	●	●	●		●							●	●									●	●		●	●			H8S/2116	
	●	●	●	●			●				●		●	●	●	●		●							●	●									●	●	●	●	●			H8S/2114	
	●	●	●	●			●						●	●	●	●									●								●			●	●			●			H8S/2111B	
	●	●	●	●			●						●	●	●	●									●											●	●			●			H8S/2110B	
	●	●	●	●			●				●		●	●	●	●		●									●						●		●	●	●						H8S/2264	H8S Super Low Power

*1: Function that A/D converts two or more analog values at the same time.   *2: Only in the H8S/2616 and H8S/2614

★: New product   ★★: Under development

H8S Family and H8SX Family Selection by ROM/RAM Capacity

ROM-less MASK One-Time PROM FLASH

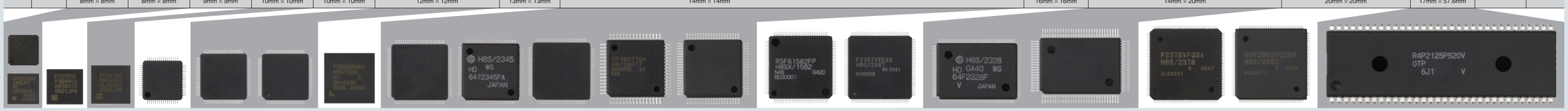
Package

ROM \ RAM	ROMless	2K	3K	4K	6K	8K	12K	16K	20K	24K	32K	40K	56K	RAM \ ROM
1M					R4F2189VTE	R4F2114VTE							R5F61668RN50FPV R5F61668RD50FPV R5F61658RN50FPV R5F61658RD50FPV R5F61648N50FPV R5F61648D50FPV R5F61638N50FPV R5F61638D50FPV R5F61568N40FPV R5F61568D40FPV R5F61558N40FPV R5F61558D40FPV	1M
768K										R5F61657CW35FTV R5F61657CN35FTV				768K
512K						R4F2125VTF20V R4F2125VPS20V R4F2125VFA20V HD64F2326VTE HD64F2326VF HD64F2319VTE HD64F2319VF HD64F2319EVTE HD64F2319EVF HD6432319XXXTE HD6432319XXXF R4F2125VPS20V		HD64F2315CVTE HD64F2319CVLP HD64F2319CVF		R5F61656C35FTV R5F61656C35FTV R5F61544FP	HD64F2556FC HD64F2552FC HD64F2552BR HD64F2506FC HD64F2506BR HD64F2378RNLP HD64F2378RVFQ HD64F2378BVLP HD64F2378BVFQ HD64F2368VTE	R5F61564N50FPV R5F61564N50FPV R5F61564RN50FPV R5F61564RD50FPV R5F61564N50FTV R5F61564RN50FTV HD64F2556FC HD64F2552FC R5F61564D50FPV R5F61564N40FPV R5F61634D50FPV R5F61564N40FTV R5F61564D40FPV R5F61554N40FPV R5F61554D40FPV R4F24312VRR R4F24652VFQ HD64F2116BTE		512K
384K		HD64F2314VTE HD64F2314VF HD6432314XXXTE HD6432314XXXF				HD64F2315VTE HD64F2315VF		R5F61543FP HD64F2667VFQ HD64F2630WF HD64F2630UF HD64F2630F HD64F2607WF HD6432630XXXF HD6432630WXXXF HD6432630UXXXF HD6432607WXXXF		HD64F2551FC HD64F2551BR HD64F2377VFQ HD64F2377RWFQ HD64F2367VTE HD64F2367VF	HD64F2505FC HD64F2505BR HD64F2374VLP HD64F2374VFQ HD64F2374RVLP HD64F2374RVFQ HD64F2364VTE HD64F2339VFC HD64F2339EVFC HD64F2329EVTE HD64F2329EVF HD64F2329BVTE	HD64F2329BVF HD64F2239TF HD64F2239TE HD64F2239FA HD64F2239BQ HD6432239XXXTF HD6432239XXXTE HD6432239XXXFA HD6432239WXXXTF HD6432239WXXXTE HD6432239WXXXFA	R5F61563N50FPV R5F61563RN50FPV R5F61563RD50FPV R5F61563N50FTV R5F61563RN50FTV R5F61563RD50FPV HD64F2167TE		384K
256K					HD64F2194CF HD6432194CXXXF	HD64F2670VFC HD64F2649FC HD64F2609FC HD64F2398TE HD64F2398F HD64F2318VFC HD64F2328BVTE HD64F2328BVF HD64F2318VTE HD64F2318VF HD64F2198RF HD64F2145BTE HD64F2145BFA HD6432676XXXXFC HD6432649XXXFC HD6432609XXXFC HD6432398XXXTE HD6432398XXXF HD6432338XXXFC HD6432328XXXTE HD6432328XXXF HD6432318XXXTE HD6432318XXXF	R5F61582FP R5F61527RFP	HD64F2640FC HD64F2639WF HD64F2639UF HD64F2638WF HD64F2638UF HD64F2638F HD64F2633TE HD64F2633RTE HD64F2633RF HD64F2633F HD64F2370VLP HD64F2370VFQ HD64F2370RVLP HD64F2370RVFQ HD64F2360VTE HD64F2268TF HD64F2268TE HD64F2268FA HD64F2258TE HD64F2258FA HD64F2258F HD64F2238RTF HD64F2238RTE HD64F2238RFA HD64F2238RBR HD64F2238RBQ HD64F2238BTF HD64F2238BTE HD64F2238BFA HD64F2238BF HD64F2215UTE HD64F2215UBR HD64F2215TE HD64F2215BR HD64F2238ROXXFA HD64F2238RWXXFA HD6432643XXXFC HD6432643WXXFC HD6432639WXXXF HD6432639UXXXF HD6432639XXXF HD6432638WXXXF HD6432638UXXXF HD6432638XXXF HD6432633XXXTE HD6432633XXXF HD6432633WXXTE HD6432633WXXXF HD6432633RXXXTF HD6432632WXXXF HD6432632UXXXF HD6432632XXXF HD6432607WXXXF HD6432375XXXFQ HD6432375RXXXFQ HD6432375WXXXFQ HD6432375RXXXFQ HD6432365XXXTE HD6432365XXXF HD6432365WXXTE HD6432365WXXXF HD6432258XXXTE HD6432258XXXFA HD6432258WXXTE HD6432258WXXXF HD6432258WXXXFA HD6432238WXXXF HD6432238WXXXTE HD6432238WXXXFA HD6432238RXXXTF HD6432238RXXXTE HD6432238RXXXFA HD6432238WXXXTF HD6432238WXXXTE HD6432238WXXXFA HD6432238RWXXXTF HD6432238RWXXXTE HD6432238RWXXXFA HD6432238BXXXTF HD6432238BXXXTE HD6432238BXXXFA HD6432238BWXXXTF HD6432238BWXXXTE HD6432238BWXXXFA HD6432238BWXXXF	HD64F2215TUTE HD64F2215TUBR HD64F2215TTE HD64F2215TBR HD64F2215RUTE HD64F2215RUBR HD64F2215RTE HD64F2215RBR	R5F61642N50FPV R5F61642D50FPV R5F61632N50FPV R5F61632D50FPV R5F61622N50LGV R5F61622N50FPV R5F61622D50FPV R5F61562N40FPV R5F61562D40FPV R5F61552N40FPV R5F61552D40FPV HD64F2371VLP HD64F2371VFQ HD64F2371RVLP HD64F2371RVFQ HD64F2361VTE	R5F61663RD50FPV R5F61653RD50FPV HD64F2372VLP HD64F2372VFQ HD64F2372RVLP HD64F2372RVFQ HD64F2362VTE HD64F2170BVTE	HD64F2168TE	256K
192K					HD64F2635UF HD64F2635F HD6432635XXXF HD6432635UXXXF HD6432194BXXXF		HD6432642XXXFC HD6432642WXXXFC HD6432632XXXTE HD6432632XXXF HD6432632WXXXTE HD6432632WXXXF							192K
160K					HD6432194AXXXF	R4F2117VTE R4F2117VLP R4F2117VBG								160K
128K		HD64F2648RFC HD64F2646RFC HD64F2636UF HD64F2636F HD64F2612FA HD64F2602FA HD64F2345TF HD64F2345TE HD64F2345FA HD64F2345F HD64F2282F HD64F2265TF HD64F2265TE HD64F2265FA HD64F2265FA HD64F2161BTE HD64F2161BTE HD64F2148TE HD64F2148FA HD64F2148BTE HD64F2148BFA HD64F2144TE HD64F2144FA HD64F2144BTE HD64F2144BFA HD64F2144ATE HD64F2144AFA HD64F2141BTE HD64F2141BFA HD64F2138TE HD64F2138FA HD64F2138ATF HD64F2134TF HD64F2134FA HD64F2134BTE HD64F2134BFA HD64F2134AFA HD64F2128TF HD64F2128TE HD64F2128PS HD64F2128FA HD64F2128FA HD6432655XXXTE HD6432655XXXF HD6432648XXXFC HD6432646XXXFC HD6432636XXXF HD6432636UXXXF HD6432638XXXTE HD6432638XXXF HD6432634XXXTE HD6432634XXXF HD6432632XXXTF HD6432632XXXTE HD6432632XXXF HD6432632XXXFA HD6432632XXXFA HD6432632WXXXFA HD6432632WXXXFA HD6432632UXXXFA HD6432632UX

H8S Family and H8SX Family Selection by Package

ROM-less MASK One-Time PROM FLASH

Family	Series	Package Options																			Series	Family
		8mm × 8mm	8mm × 8mm	9mm × 9mm	10mm × 10mm	10mm × 10mm	12mm × 12mm		13mm × 13mm	14mm × 14mm							16mm × 16mm	14mm × 20mm		20mm × 20mm		17mm × 57.6mm		
		PVQN0064LB-A	PTLG0113JA-A	PTLG0145JB-A	PLBG0112GA-A TTBG0112GA-A	PLQP0064KC-A	PTQP0080KC-A	PTQP0100LC-A	PLBG0176GA-A	PTQP0100KA-A	PRQP0100KA-A PRQP0100KB-A	PTQP0120LA-A	PRQP0064GB-A	PRQP0080JB-A PRQP0080JD-A	PLQP0120LA-A	PTQP0144LC-A	PRQP0128KB-A	PRQP0100JE-B	PLQP0144KC-A PLQP0144KA-A	PRQP0144KA-A PRQP0144KB-A	PRDP0064BB-A		
		TNP-64B	TLP-113V	TLP-145V	BP-112 TBP-112A	FP-64E	TFP-80C	TFP-100G	BP-176V	TFP-100B	FP-100B FP-100M	TFP-120	FP-64A	FP-80A FP-80Q	FP-120B	TFP-144	FP-128B	FP-100A	FP-144H FP-144L	FP-144G FP-144J	DP-64S		
H8SX Family	H8SX/1600 Series			R5F61622LG					R5F61648BG R5F61644BG R5F61642BG			R5F61653FT R5F61654FT R5F61656CFT R5F61657CFT			R5F61632FP R5F61634FP R5F61638FP R5S61650CFP R5S61651CFP R5F61653RFP R5F61654RFP R5F61658RFP					R5F61622FP R5F61642FP R5F61644FP R5F61648FP R5F61663FP R5F61664FP R5F61663RFP R5F61664RFP R5F61668RFP			H8SX/1600 Series	H8SX Family
	H8SX/1500 Series										R5F61527RF				R5F61582FP R5F61552FP R5F61554FP R5F61558FP				R5F61543FP R5F61544FP R5F61562FP R5F61564FP R5F61568FP			H8SX/1500 Series	
H8S Family	H8S/2600 Series										HD6432627xxxF HD6432628xxxF HD64F2628F	HD6432631xxxTE HD6432632xxxTE HD6432633xxxTE HD64F2633TE HD64F2633RTE HD6432653BxxxTE HD6432655xxxTE HD6472655TE HD6472655RTE		HD6432611xxxFA HD6432612xxxFA HD6472612FA HD6432614xxxFA HD6432615xxxFA HD64F2615FA HD6432616xxxFA			HD6432630xxxF HD64F2630F HD6432631xxxF HD6432632xxxF HD6432633xxxF HD64F2633F HD64F2633RF HD6432634xxxF HD6432635xxxF HD64F2635F HD6432636xxxF HD64F2636F HD6432638xxxF HD64F2638F HD6432639xxxF HD64F2639F HD6432653BxxxF HD6432655xxxF HD6472655RF HD6432695xxxF		HD6412674RVFQ	HD6432641xxxFC HD6432642xxxFC HD6432643xxxFC HD64F2643FC HD6432645xxxFC HD6432646xxxFC HD64F2646RFC HD6432647xxxFC HD6432648xxxFC HD64F2648RFC HD6432649xxxFC HD64F2649FC HD64F2667VFQ HD6412370VFC HD6432673xxxFC HD6432675xxxFC HD6432676xxxFC HD64F2676VFQ		H8S/2600 Series	
	H8S/2500 Series								HD64F2505BR HD64F2506BR HD64F2551BR HD64F2552BR											HD64F2505FC HD64F2506FC HD64F2551FC HD64F2552FC HD64F2556FC		H8S/2500 Series	
	H8S/2400 Series								R4F2472VBR										R4F2462VFQ			H8S/2400 Series	
	H8S/2300 Series		HD6432316SxxxLP HD6432317SxxxLP	HD64F2370VLP HD64F2370RVLP HD64F2371VLP HD64F2371RVLP HD64F2372VLP HD64F2372RVLP HD64F2374VLP HD64F2374RVLP HD64F2378BVLP HD64F2378RVLP					HD6432317SxxxTF HD6412340TF HD6432341xxxTF HD6432343xxxTF HD6432344xxxTF HD6432345xxxTF HD6472345TF HD64F2345TF		HD6412312SVTE HD64F2314VTE HD64F2315VTE HD6432316SxxxTE HD6432317SxxxTE HD64F2317VTE HD6432318xxxTE HD64F2318VTE HD6432319xxxTE HD64F2319VTE HD64F2319EVTE HD6412340TE HD6432341xxxTE HD6432343xxxTE HD6432344xxxTE HD6432345xxxTE HD6472345TE HD64F2345TE	HD6412340FA HD6432341xxxFA HD6432343xxxFA HD6432344xxxFA HD6432345xxxFA HD6472345FA HD64F2345FA	HD6412320VTE HD6412321VTE HD6412322RVTE HD6432323xxxTE HD6412324SVTE HD64F2326VTE HD6432327xxxTE HD6432328xxxTE HD64F2328BVTE HD64F2329BVTE HD64F2329EVTE HD6412350TE HD6432351xxxTE HD6412352TE HD6432353xxxTE HD6432355xxxTE HD6472355TE	HD6432357xxxTE HD6472357TE HD64F2357TE HD64F2357VTE HD64F2360VTE HD64F2361VTE HD64F2362VTE HD6412363TE HD64F2364VTE HD6432365xxxTE HD64F2367VTE HD64F2368VTE HD6412390TE HD6412392TE HD6432393xxxTE HD6412394TE HD6432398xxxTE HD64F2398TE			HD6412320VF HD6412321VF HD6412322RVF HD6432323xxxF HD6412324SVF HD64F2326VF HD6432327xxxF HD6432328xxxF HD64F2328BVF HD64F2329BVF HD64F2329EVF HD6412350F HD6432351xxxF HD6412352F HD6432353xxxF HD6432355xxxF HD6472355F HD6432357xxxF HD6472357F HD64F2357F HD64F2357VF HD6412363F HD6432365xxxF HD64F2367VF HD6412390F HD6412392F HD6432393xxxF HD6412394F HD6432398xxxF HD64F2398F	HD6412312SVF HD64F2314VF HD64F2315VF HD6432316SxxxF HD6432317SxxxF HD64F2317VF HD6432318xxxF HD64F2318VF HD6432319xxxF HD64F2319VF HD64F2319EVF HD6412340F HD6432341xxxF HD6432343xxxF HD6432344xxxF HD6432345xxxF HD6472345F HD64F2345F	HD64F2370VFQ HD64F2370RVFQ HD64F2371VFQ HD64F2371RVFQ HD64F2372VFQ HD64F2372RVFQ HD6412372VFQ HD6412373RVFQ HD64F2374VFQ HD64F2374RVFQ HD6432375xxxFQ HD6432375RxxxFQ HD64F2377VFQ HD64F2377RVFQ HD64F2378BVFQ HD64F2378RVFQ	HD6412332VFC HD6432337xxxFC HD6432338xxxFC HD64F2338VFC HD64F2339VFC HD64F2339EVFC	H8S/2300 Series	
	H8S/2200 Series	HD6432210NP HD6432211NP HD64F2211NP HD64F2211UNP HD64F2212NP HD64F2212UNP			HD6432214xxxBR HD6432214xxxBQ HD64F2214BR HD64F2214BQ HD6432215BxxxBR HD64F2215BR HD6432215CxxxBR HD64F2215UBR HD64F2215RBR HD64F2215RJBR HD64F2215TBR HD64F2215TUBR HD6432217xxxBR HD64F2218BR HD64F2218UBR HD64F2238RBR HD64F2238RBQ HD64F2239BR	HD6432210xxxFP HD6432211xxxFP HD64F2211FP HD64F2211UFP HD64F2212FP HD64F2212UFP		HD6432214xxxTF HD64F2214TF HD6432217xxxTF HD64F2218TF HD64F2218UTF HD6432223xxxTF HD6432224xxxTF HD6432225xxxTF HD6432227xxxTF HD64F2227TF HD6432233xxxTF HD6432235xxxTF HD6432236BxxxTF HD6432236RxxxTF HD6432237xxxTF HD6472237TF HD6432238BxxxTF HD64F2238BTF HD6432238RxxxTF HD64F2238RTF HD6432239xxxTF HD64F2239TF HD6432262xxxTF HD6432264xxxTF HD64F2265TF HD64F2266TF HD64F2268TF		HD6432214xxxTE HD64F2214TE HD6432223xxxTE HD6432224xxxTE HD6432225xxxTE HD6432227xxxTE HD64F2227TE HD6432233xxxTE HD6432235xxxTE HD6432236BxxxTE HD6432236RxxxTE HD6432237xxxTE HD6472237TE HD6432238BxxxTE HD64F2238BTE HD6432238RxxxTE HD64F2238RTE HD6432239xxxTE HD64F2239TE HD6412240TE HD6432241xxxTE HD6432242xxxTE HD6432243xxxTE HD6432244xxxTE HD6432245xxxTE HD6432246xxxTE HD6472246TE HD6432256xxxTE HD6432258xxxTE HD64F2258TE HD6432262xxxTE HD6432264xxxTE HD64F2265TE HD64F2266TE HD64F2268TE	HD6432223xxxFA HD6432224xxxFA HD6432225xxxFA HD6432227xxxFA HD64F2227TE HD6432233xxxFA HD6432235xxxFA HD6432236BxxxFA HD6432236RxxxFA HD6432237xxxFA HD6472237FA HD6432238BxxxFA HD64F2238BFA HD6432238RxxxFA HD64F2238RFA HD6432239xxxFA HD64F2239FA HD6412240FA HD6432241xxxFA HD6432242xxxFA HD6432243xxxFA HD6432244xxxFA HD6432245xxxFA HD6432246xxxFA HD6472246FA HD6432256xxxFA HD6432258xxxFA HD64F2258FA HD64F2265FA HD64F2266FA HD64F2268FA	HD6432215CxxxTE HD6432215BxxxTE HD64F2215TE HD64F2215UTE HD64F2215RTE HD64F2215RJUTE HD64F2215TTE HD64F2215TUTE					HD6432227xxxF HD6432233xxxF HD6432235xxxF HD6432236BxxxF HD6432237xxxF HD6472237F HD6432238BxxxF HD64F2238BF HD6432256xxxF HD6432258xxxF HD64F2258F HD6432281xxxF HD6432282xxxF HD64F2282F			H8S/2200 Series	H8S Family
	H8S/2100 Series			R4F2117LP			HD6432120xxxTF HD6432122xxxTF HD6432126RxxxTF HD6432127RxxxTF HD6432127SxxxTF HD6432128SxxxTF HD64F2128TF R4F2125TF HD6432130xxxTF HD6432132xxxTF HD64F2132RTF HD6432133SxxxTF HD6432134SxxxTF HD64F2134TF HD64F2134ATF HD6432137SxxxTF HD6432138SxxxTF HD64F2138ATF		R4F2116VBG R4F2117BG	HD64F2110BVTE HD64F2140BTE HD64F2141BTE HD6432142xxxTE HD64F2142RTE HD6432143SxxxTE HD64F2144TE HD64F2144ATE HD6432144SxxxTE HD64F2145BTE HD64F2147ATE HD6432147SxxxTE HD64F2148TE HD64F2148ATE HD64F2148BTE HD6432148SxxxTE HD64F2170BTE	HD64F2110BVFA HD64F2140BFA HD64F2141BFA HD6432142xxxFA HD64F2142RFA HD6432143SxxxFA HD64F2144FA HD64F2144AFA HD6432144SxxxFA HD64F2145BFA HD64F2147AFA HD6432147SxxxFA HD64F2148FA HD64F2148AFA HD64F2148BFA HD6432148SxxxFA		HD6432120xxxFA HD6432122xxxFA HD6432126RxxxFA HD6432127RxxxFA HD6432127SxxxFA HD6432128SxxxFA HD64F2128FA R4F2125FA	HD6432130xxxFA HD6432132xxxFA HD64F2132RFA HD6432133SxxxFA HD64F2134FA HD64F2134AFA HD6432134SxxxFA HD6432137SxxxFA HD6432138SxxxFA HD64F2138FA HD64F2138AFA		HD64F2111BVBTE HD64F2111BVCTE R4F2114VTE R4F2116VTE HD64F2160BTE HD64F2161BTE HD64F2166TE HD64F2167TE HD64F2168TE R4F2189VTE R4F21177E				HD6432120xxxPS HD6432122xxxPS HD6432126RxxxPS HD6432127RxxxPS HD6432127SxxxPS HD6432128SxxxPS HD64F2128PS HD64F2128PS R4F2125PS R4F2125PS	H8S/2100 Series	
Family	Series	PVQN0064LB-A	PTLG0113JA-A	PTLG0145JB-A	PLBG0112GA-A TTBG0112GA-A	PLQP0064KC-A	PTQP0080KC-A	PTQP0100LC-A	PLBG0176GA-A	PTQP0100KA-A	PRQP0100KA-A PRQP0100KB-A	PTQP0120LA-A	PRQP0064GB-A	PRQP0080JB-A PRQP0080JD-A	PLQP0120LA-A	PTQP0144LC-A	PRQP0128KB-A	PRQP0100JE-B	PLQP0144KC-A PLQP0144KA-A	PRQP0144KA-A PRQP0144KB-A	PRDP0064BB-A	Series	Family
		TNP-64B	TLP-113V	TLP-145V	BP-112 TBP-112A	FP-64E	TFP-80C	TFP-100G	BP-176V	TFP-100B	FP-100B FP-100M	TFP-120	FP-64A	FP-80A FP-80Q	FP-120B	TFP-144	FP-128B	FP-100A	FP-144H FP-144L	FP-144G FP-144J	DP-64S		
		8mm × 8mm	8mm × 8mm	9mm × 9mm	10mm × 10mm	10mm × 10mm	12mm × 12mm		13mm × 13mm	14mm × 14mm						16mm × 16mm	14mm × 20mm		20mm × 20mm		17mm × 57.6mm		



Life-size package photographs

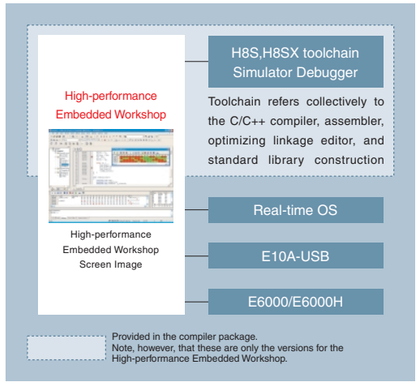
Powerful development environment makes it possible to take maximum advantage of the H8SX and H8S MCU performance.

Integrated Development Environment

High-Performance Embedded Workshop

This integrated development environment provides the tools needed for application development, including compilers and debuggers (emulator software) and implements the development process from coding through evaluation and verification in a single application.

- Automatic generation of startup programs for each MCU
- Integration and unified management of tools from editor through debugger
- Automatic execution of the compile, assemble, and link sequence
- Source file management in project units
- Windows based easy-to-use GUI
- Registration and startup of external tools
- Network environment project management
- Macro generation support functions: test support functions
- Latest information provided over the internet
  (network update function for the software tools, document update function)
- Flexible expansion functions that match the environment used
  (unique GUI environment construction using TCL/TK version 8.4.1,
  simple connection with external tools using a target server function (COM))
- Collaboration with partner vendors
  (Linking with CASE tools, linking with version control tools)



Compilers

H8SX, H8S, and H8 Family C/C++ Compiler Package

These compilers include an optimization function that generates compact code while eliciting the maximum possible performance from the MCU.

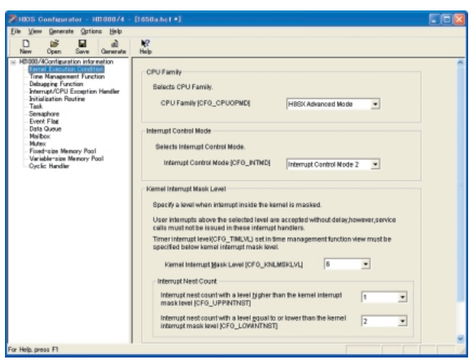
- Support for H8SX, H8S, and H8 Family CPUs
- Support for ANSI/ISO standard C and C++
- ROM capacity is reduced and execution speed improved by the latest optimization technologies and an extensive set of optimization options.
- Provision of an extensive set of embedded functions and extended functions to take advantage of the special functions provided by the MCU used.
- Simulator/debugger for efficient debugging of programs created in either C/C++ or assembler

Real-Time OS

This OS allows large-scale complex applications to be implemented simply and with real time control. It also reduces program development times and promotes reusability and maintainability.

- Conforms to the µITRON 4.0 standard*
- Superlative real-time characteristics (interrupt response time and task switching time)
- A configurator is provided
- Extensive set of OS debugging functions provided by embedding the Renesas debugger.

*: The copyrights to the µITRON specifications are held by the TRON Association. TRON, ITRON, and µITRON are names of specifications, and are not names of any specific product or groups of products.



E10A-USB

H8S/H8SX Family E10A-USB Emulator

Ease of use is improved significantly by adopting USB (full speed) as the PC interface.
The hardware is common, and can support multiple debugging platforms.
The High-performance Embedded Workshop is adopted as the emulator/debugger, and program construction, building, and debugging are supported in a single window.

- OCD emulator with superb cost-performance characteristics
- Achieves real-time emulation at the CPU's highest operating frequency.

*: Only supports MCUs with on-chip debugging functions.

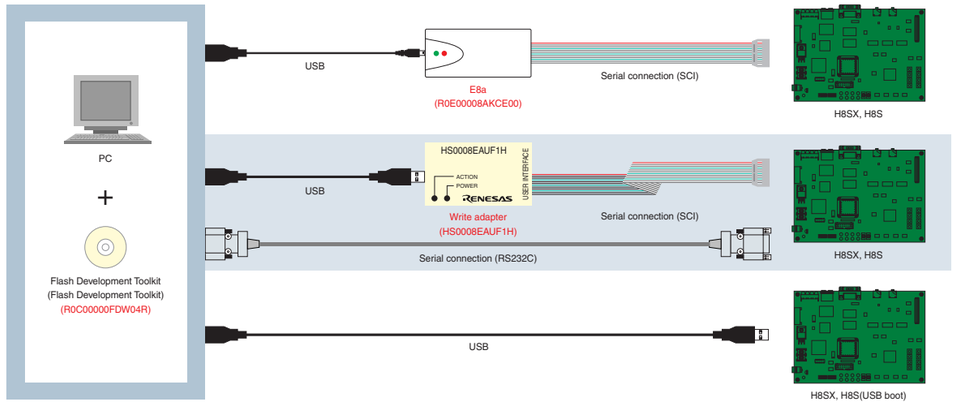
E6000/E6000H

H8S/H8SX Family Full-Spec Emulators: E6000/E6000H

The E6000/E6000H full-spec emulators implement real-time emulation at the CPU's top operating frequency. User programs can be debugged using a mouse and GUI with the High-performance Embedded Workshop. Rapid downloading of load module files is also supported.

- Powerful debugging functions
  (including trace, RAM monitor, conditional break and trace, and performance analysis)
- Source level debugging of C/C++ programs

Renesas Flash Memory Programming Environment



■ Onboard Programmers

Renesas Technology Corp

- E8a adapter board
- Programming software

Onboard programmer	URL
Renesas Technology Corp.	http://www.renesas.com/flash_programming_tools

Hokuto Denshi Co., Ltd.

- Flash2
- Flash Mate5V1
- FM-ONE

Onboard programmer	URL
Hokuto Denshi Co., Ltd.	http://www.hokutodenshi.co.jp/
Yokogawa Digital Computer Corporation	http://www.yokogawa-digital.com/en/

Yokogawa Digital Computer Corporation

- MegaNETIMPRESS
- C*arNETIMPRESS
- G-NETIMPRESS

■ PROM Programmers

Wave Technology Inc.

- Y3000-8

Data I/O Corporation

- FLX500
- FlashPAKII
- Optima
- Dual
- Octal
- Plus48

Hi-Lo Systems Co., Ltd.

- ALL-100Family

Flash Support Group, Inc.

- AF9710
- AF9723

Hokuto Denshi Co., Ltd.

- PROM401F

Minato Electronics, Inc.

- M1940
- M1896
- M1895
- M1895/2
- M1881UXP

PROM Programmer Manufacturer	URL
Wave Technology Inc.	http://www.y1000.com/english/
Data I/O Corporation	http://www.dataio.com/
Hi-Lo Systems Co., Ltd.	http://www.hilosystems.com.tw/
Flash Support Group, Inc.	http://www.j-fsg.co.jp/e/shop/index.html
Hokuto Denshi Co., Ltd.	http://www.hokutodenshi.co.jp/
Minato Electronics, Inc.	http://www.minato.co.jp/index_e.html

If a PROM programmer is used, the appropriate socket adapter must be purchased separately for each MCU used.
See the "Renesas Development Environment Products List (Renesas and partner vendor products)", which is a separate document, for details.

*: Company names are listed in Japanese alphabetic order.

Renesas Software and Tools Web Page http://www.renesas.com/tools

This page provides detailed functional overviews of the development tools, trial versions of the software, and other information. It also provides the latest information in a timely manner.

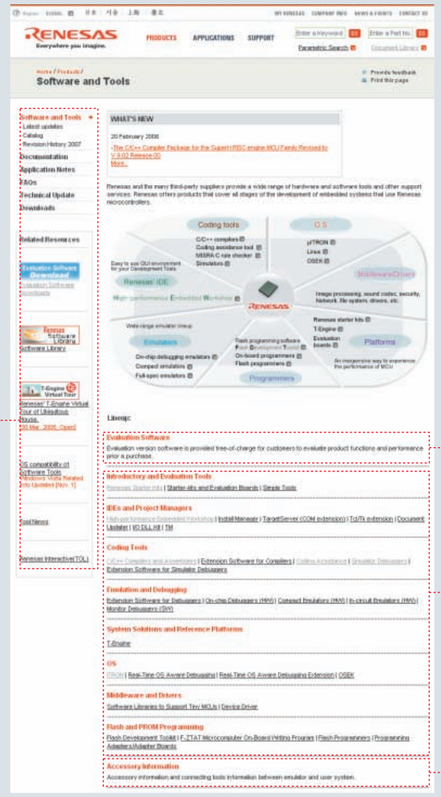
Application Notes
This link displays a page containing application examples and sample program listings.

FAQs
This link displays a page providing answers to questions about the main Renesas tool products in Q&A format.

Downloads (Upgrades and sample programs)
This link displays a page where customers who have purchased software tools can download upgrades free of charge.

Technical Updates
This link displays a page containing important usage information on Renesas MCUs and tools.

Tool News
This link displays the latest information on Renesas tools, updated twice a month.



Evaluation Software
Evaluation versions of software are provided free of charge to enable customers to assess product functions and performance.

Product Information
These links display pages containing datasheets providing overviews, features, and functions of the main Renesas tool products.

Accessory Information
This link displays a page with information such as patterns for connecting emulators and user systems and details of accessories used to make connections.

Partner Information

Alliance Search
Search alliance partners in your region.

Americas
http://america.renesas.com/alliance

Europe
http://eu.renesas.com/alliance

Japan
http://japan.renesas.com/alliance

Alliance Partner Program
The Alliance program provides online tools to increase the synergy between our Customers, 3rd Party Partners, and Renesas.

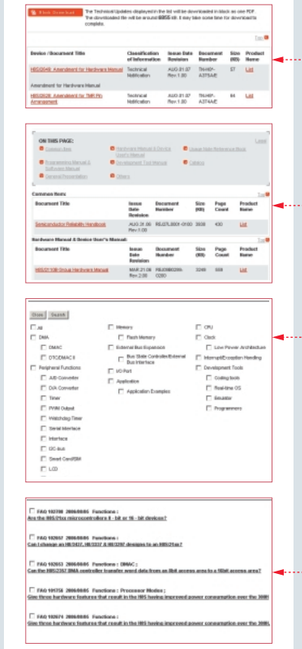
Customers can search our online database to quickly find qualified Design Consultants, Programming Houses, 3rd Party Development Tools, and Manufacturing Companies that provide services or products that support Renesas products and customers.

Web Site Introduction

The Renesas web site provides comprehensive support for our customers' development efforts.

H8S Family http://www.renesas.com/en/h8s H8SX Family http://www.renesas/en/h8sx

■ Display limited to related information



Technical Updates

This section provides usage notes, additional information for the documentation, and other information in .PDF format.

Documents

Manuals, datasheets, catalogs, and other documents can be downloaded in .PDF format.

Application Notes

These provide information on the use of internal peripheral functions and application technologies in .PDF format.

Frequently Asked Questions

This section presents questions and their answers in a Q&A format.

Series Page

This section presents outlines of the specifications of the different series and the group deployment.

Group Page

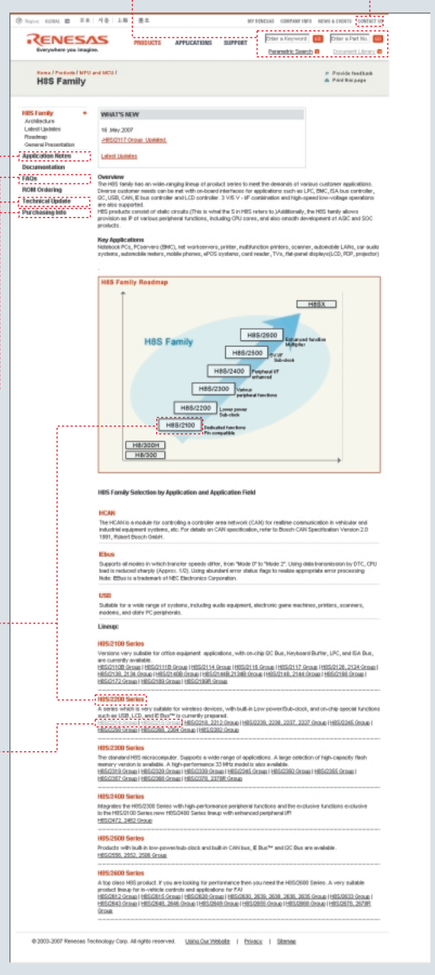
This section presents details specifications for each group, and lists of models. You can find sample programs, oscillator circuit constants for reference purposes, and other information here.

Search

Diverse search functions are provided for your use.
Model name search: Detailed specifications can be verified for specific models.
Function/feature search: This function is useful for finding products that match desired specifications.

Inquiries

Renesas accepts technical questions from this section. We also accept inquiries by email.
Email : csc@renesas.com



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RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

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