

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 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 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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Renesas MCUs

# H8SX Family



# H8SX



# Opening new doors to meet the needs of customers, the H8SX Family is the new world standard in MCUs.

The Renesas H8SX Family are high-performance MCUs that represent an evolutionary advance over the industry standard H8 architecture. These MCUs provide leading-edge functions to support a variety of applications and are available in a wide range of versions. These are the new world standard in MCUs and aim to meet our customer's ideals at a high level.

### High Performance

**High-performance CPU**

The internal bus is 32 bits wide, the maximum operating frequency is 50 MHz, and basic instructions execute in a single state.

**Two or three high-speed A/D converter units**

Simultaneous and independent triggering as well as continuous operation are supported.

### High Functionality

**Improved peripheral functionality**

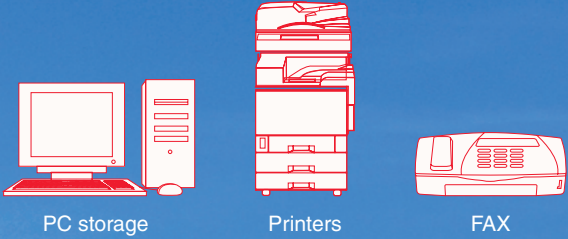
- Two TPU/PPG units
- 16-bit  $\Delta\Sigma$  A/D converter
- EXDMAC
- High-speed SCI/I<sup>2</sup>C bus support
- USB 2.0 support
- CAN

### Variations

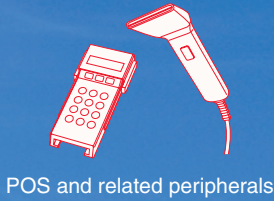
**Improved peripheral functionality**

- Flash memory variations: 256 KB to 1 MB
- RAM variations: 24 KB to 64 KB
- Package variations QFP: 120/144, BGA: 176, LGA: 145

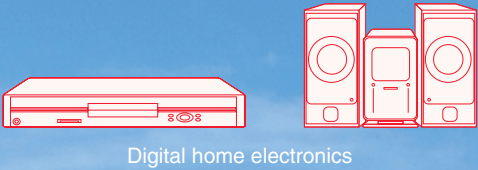
**PC Peripherals and OA Equipment**  
These MCUs provide the high performance and high functionality required to stay one step ahead in the world of PCs and OA, where new technologies are adopted one after another.



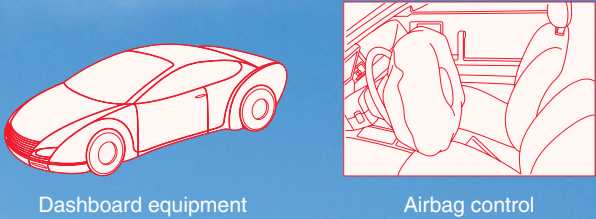
**Commercial Equipment**  
Applications range from POS terminals and readers that provide convenience to game machines for recreation.



**Consumer Electronics**  
These MCUs further enhance the level of entertainment provided by digital home electronics, AV equipment, and mobile equipment.



**Automotive Equipment**  
These MCUs allow for safe and comfortable cars as well as environment friendliness and functionality in an ideal single unit.



■ H8SX Series Features

H8SX /1668R Group H8SX /1658R Group	<ul style="list-style-type: none"><li>• Support for USB 2.0 (Hi-Speed), which is indispensable for PC connection</li><li>• Built-in EXDMAC for efficient program processing and data transfers</li><li>• DRAM and SDRAM interface support</li></ul>
H8SX /1648 Group H8SX /1638 Group	<ul style="list-style-type: none"><li>• Up to three high-speed A/D converter units</li><li>• Built-in flash/RAM capacities from 256 KB/24 KB to 1024 KB/56 KB</li><li>• Improved 8 and 16-bit timer and PPG* units for unified pulse control</li></ul>
H8SX /1622 Group	<ul style="list-style-type: none"><li>• Both high-precision 16-bit <math>\Delta\Sigma</math>A/D and successive approximation A/D converters</li><li>• 145-pin, 9 mm square miniature LGA package</li></ul>
H8SX /1568 Group H8SX /1558 Group	<ul style="list-style-type: none"><li>• Pin compatible with the H8SX/1638, 1648 group</li><li>• Up to three high-speed A/D converter units</li><li>• Improved 8 and 16-bit timer and PPG* units for unified pulse control</li></ul>
H8SX /1544 Group H8SX /1527R Group	<ul style="list-style-type: none"><li>• Built-in RCAN-ET for CAN control for real-time communication</li></ul>

\* Programmable Pulse Generator





# The H8SX Family Strives to Meet Our Customers' Idea

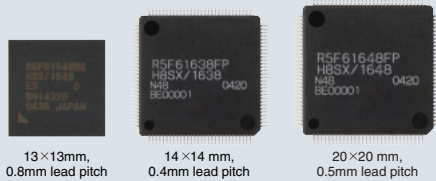


These new product groups added to the H8SX Family provide 256 KB to 1024 KB of built-in flash memory. All products in this new group support as standard a new standby mode (deep software standby mode) that reduces power consumption during standby, and the cost efficient E10A USB debugging tool. These products also feature many new functions that improve ease of use, such as an EXDMAC, which can operate the internal and external buses independently, and a 16-bit  $\Delta\Sigma$  A/D converter that is capable of high-precision analog conversion, while the H8SX core improves the system's processing performance. These products represent the next step in the evolution of the H8SX family.

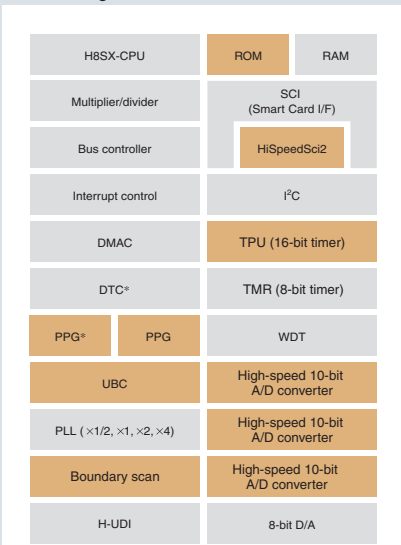
## H8SX/1648 Group and H8SX/1638 Group

These products achieve a maximum operating frequency of 50 MHz and provide strengthened peripheral functionality by including two TPU and two PPG units.

- H8SX CPU: 50 MHz at 3.0 to 3.6 V
  - Built-in multiplier and divider: 16 bits  $\times$  16 bits  
Basic instructions execute in 1 state
  - MCU operating modes: External expansion and single chip
  - Internal memory (flash ROM and RAM)  
H8SX/1648F, H8SX/1638F = 1024 KB/56 KB  
H8SX/1644F, H8SX/1634F = 512 KB/40 KB  
H8SX/1642F, H8SX/1632F = 256 KB/24 KB
  - Bus interface functions  
Basic bus, Burst ROM, Byte control SRAM, Separate/Multiplex SCI  $\times$  7ch, I<sup>2</sup>C  $\times$  4ch<sup>\*1</sup>, HSCi2  $\times$  2ch
  - Special functions  
Two TPU units: total of 12 channels  
Two 16-bit PPG units: total of 32 output bits  
High-speed A/D converters 4ch  $\times$  3 units: total of 12 channels (conversion time: 2.7  $\mu$ s)<sup>\*1</sup>  
Boundary scan  
UBC (user break controller)
  - Packages  
H8SX/1648 Group: PLQP0144KA-A (FP-144L), 20  $\times$  20 mm, 0.5 mm lead pitch, 1.7 mm thickness  
H8SX/1648 Group: PLBG0176GA-A (BP-176V), 13  $\times$  13 mm, 0.8 mm lead pitch, 1.4 mm thickness  
H8SX/1638 Group: PLQP0120LA-A (FP-120B), 14  $\times$  14 mm, 0.4 mm lead pitch, 1.7 mm thickness
- <sup>\*1</sup>: H8SX/1638 Group: Two I<sup>2</sup>C channels and two 4-channel high-speed A/D converters



■ Block Diagram



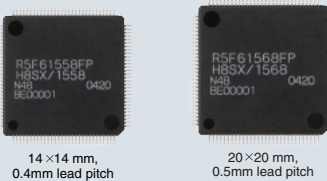
DTC: Data Transfer Controller  
PPG: Programmable Pulse Generator

Special functions

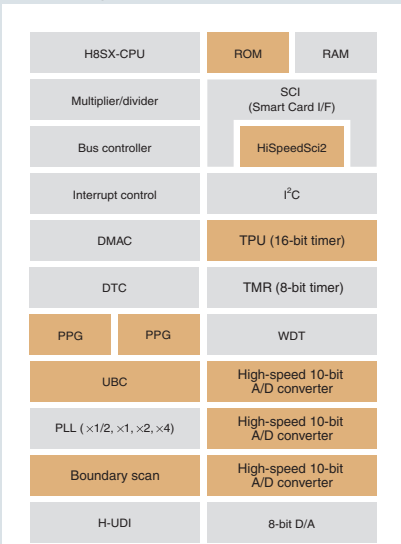
## H8SX/1568 Group and H8SX/1558 Group

These products achieve a maximum operating frequency of 40 MHz and provide strengthened peripheral functionality by including two TPU and two PPG units.

- H8SX CPU: 40 MHz at 4.5 to 5.5 V
  - Built-in multiplier and divider: 16 bits  $\times$  16 bits  
Basic instructions execute in 1 state
  - MCU operating modes: Single chip
  - Internal memory (flash ROM and RAM)  
H8SX/1568F, H8SX/1558F = 1024 KB/56 KB  
H8SX/1564F, H8SX/1554F = 512 KB/40 KB  
H8SX/1562F, H8SX/1552F = 256 KB/24 KB
  - Bus interface functions  
SCI  $\times$  7ch, I<sup>2</sup>C  $\times$  4ch<sup>\*1</sup>, HSCi2  $\times$  2ch
  - Special functions  
Two TPU units: total of 12 channels  
Two 16-bit PPG units: total of 32 output bits  
High-speed A/D converters 4ch  $\times$  3 units: total of 12 channels (conversion time: 2.7  $\mu$ s)<sup>\*1</sup>  
Boundary scan  
UBC (user break controller)
  - Packages  
H8SX/1568 Group: PLQP0144KA-A (FP-144L), 20  $\times$  20 mm, 0.5 mm lead pitch, 1.7 mm thickness  
H8SX/1558 Group: PLQP0120LA-A (FP-120B), 14  $\times$  14 mm, 0.4 mm lead pitch, 1.7 mm thickness
- <sup>\*1</sup>: H8SX/1558 Group: Two I<sup>2</sup>C channels and two 4-channel high-speed A/D converters



■ Block Diagram

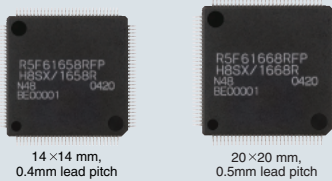


Special functions

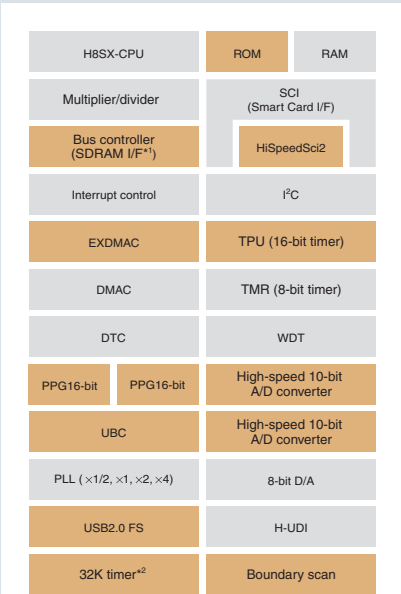
## H8SX/1668 Group and H8SX/1658 Group

These products provide strengthened peripheral functionality by including two TPU and two PPG units. They also achieve improved processing performance by including a built-in EXDMAC.

- H8SX CPU: 50 MHz at 3.0 to 3.6 V
  - Built-in multiplier and divider: 16 bits  $\times$  16 bits  
Basic instructions execute in 1 state
  - MCU operating modes: External expansion and single chip
  - Internal memory (flash ROM and RAM)  
H8SX/1668RF, H8SX/1658RF = 1024 KB/56 KB  
H8SX/1664RF, H8SX/1654RF = 512 KB/40 KB  
H8SX/1663RF, H8SX/1653RF = 384 KB/40 KB
  - Bus interface functions  
Basic bus, Burst ROM, Byte control SRAM, Separate/Multiplex SDRAM<sup>\*1</sup>, SCI  $\times$  6ch (HSCi2  $\times$  2ch), I<sup>2</sup>C  $\times$  2ch
  - Special functions  
USB Ver2.0 Full-Speed Function: 12Mbps  
• Transfer mode: 3 modes  
• Endpoint: 4 points (Control  $\times$  1, Interrupt  $\times$  1, Bulk  $\times$  2)  
• FIFO Total 288bytes (Max  $\times$  64bytes)  
EXDMAC  $\times$  4ch<sup>\*1</sup>  
Two TPU units: total of 12 channels  
Two 16-bit PPG units: total of 32 output bits  
32K timer and 32 kHz sub-clock input <sup>\*1</sup>  
High-speed A/D converters 4ch  $\times$  2 units: total of 12 channels (conversion time: 2.7  $\mu$ s)<sup>\*1</sup>  
SCI/USB boot mode support
  - Packages  
H8SX/1668 Group: PLQP0144KA-A (FP-144L), 20  $\times$  20 mm, 0.5 mm lead pitch, 1.7 mm thickness  
H8SX/1658 Group: PLQP0120LA-A (FP-120B), 14  $\times$  14 mm, 0.4 mm lead pitch, 1.7 mm thickness
- <sup>\*1</sup>: H8SX/1658 Group: SDRAM interface, the 32 kHz sub-clock is not supported, two EXDMAC channels, and 24 bits of PPG output



■ Block Diagram

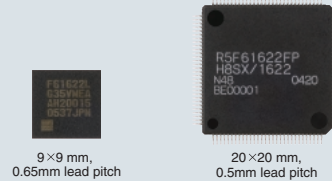


Special functions

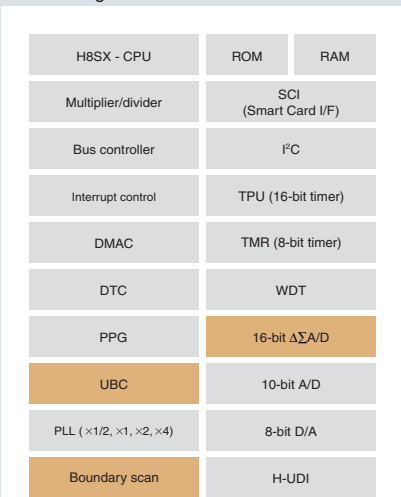
## H8SX/1622 Group

These devices include a 16-bit  $\Delta\Sigma$  A/D converter and are optimal for sensor applications that require high-precision measurement.

- H8SX CPU: 50 MHz at 3.0 to 3.6 V
- Built-in multiplier and divider: 16 bits  $\times$  16 bits  
Basic instructions execute in 1 state
- MCU operating modes: External expansion and single chip
- Internal memory (flash ROM and RAM)  
H8SX/1622F = 256 KB/ 24 KB
- Bus interface functions  
Basic bus, Burst ROM, Byte control SRAM, Separate/Multiplex SCI  $\times$  5ch (HSCi2  $\times$  2ch), I<sup>2</sup>C  $\times$  2ch
- Peripheral functions  
TPU (16-bit timer): 6 channels, DMAC: 2 channels, DTC, 8-bit timer, D/A converter: 2 channels.
- Special functions  
Improved analog modules  
16-bit  $\Delta\Sigma$  A/D converter: 6 channels (conversion time: 91.5  $\mu$ s at 25 MHz)  
Single ended inputs: 4 channels  
Differential inputs: 2 channels  
Successive approximation 10-bit A/D converter: 8 channels
- Packages  
PTLG0145JB-A (TLP-145V): 9  $\times$  9mm, 0.65 mm lead pitch, 1.2 mm thickness  
PLQP0144KA-A (FP-144L): 20  $\times$  20mm, 0.5 mm lead pitch, 1.7 mm thickness



■ Block Diagram



Special functions

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