Overview

Renesas’ H8S/2168 Series microcontrollers (MCUs) are high-speed (33MHz), low-voltage (3.3V), 16-bit devices for IPMI versions 1.5 and 2.0 remote management applications such as Baseband Management Controllers (BMCs), Satellite Management Controllers (SMCs), ATCA IPMI Controllers (IPMCs), and Peripheral Managers (PMs). Support for this device includes comprehensive software and hardware tools, debugging tools, and highly sophisticated IPMI firmware and software from third-party vendors.

Features

High Performance and Low Power
- Maximum clock speed: 33MHz
- Operating voltage: 3.0V to 3.6V
- Seven power-down modes

Large On-chip Memory
- 256KB, 384KB or 512KB of flash with simplified on-chip programming capability through a serial port
- 40KB of SRAM

6 channels of Inter IC (I²C) bus I/F
- Each channel supports master and slave mode
- Each channel supports two slave addresses
- Supports bus speed up to 400kHz in master mode
- Start and stop conditions generated automatically in master mode
- Conforms to Philips FC bus interface specification

3 channels of Low Pin Count (LPC) I/F
- Each channel supports I/O read/write mode
- Each channel has an independently programmable 16-bit address
- LPC channel 3 has separate 64-byte block transfer transmit and receive buffers
- LPC channel 3 supports Block Transfers (BT), KCS, and SMIC

3 channels of serial communication I/F
- Choice of asynchronous or synchronous mode
- Full duplex communication capability
- Supports smart-card interface, ISO/IEC 7816-3
- Supports IrDA interface, standard version 1.0
- Cyclic Redundancy Check (CRC) operation circuitry for error detection in data blocks

On-chip High-level User Debugging Interface (H-UDI)
- Enables easy real-time debugging using E10A emulator
- Supports boundary scan per IEEE Std. 1149.1 JTAG Interface

16/24-bit external bus interface
- 16-bit multiplexed bus for reduced pin count
- 24-bit non-multiplexed bus with programmable width for maximum pin flexibility
- Supports basic bus interface with 2-state or 3-state access and additional wait states when necessary
- Includes bus arbitration function

Up to 85-channel Data Transfer Controller
- More flexibility and better functionality than DMA controller
- Supports single burst, chain, and repeat transfer modes
- Can be activated by interrupt or software control

H8S/2168, 2167, 2166 Block Diagram

<table>
<thead>
<tr>
<th>H8S/2000 CPU Core</th>
<th>Serial Interface (3 ch) (IrDA x 1ch)</th>
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<tr>
<td>Flash 256KB/384KB/512KB</td>
<td>I²C (6 ch)</td>
</tr>
<tr>
<td>RAM 40KB</td>
<td>16-bit FRT</td>
</tr>
<tr>
<td>3-channel LPC</td>
<td>8-bit Timer x4</td>
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<tr>
<td>85-channel DTC</td>
<td>Watchdog Timer (2 ch)</td>
</tr>
<tr>
<td>PWM (4-channel x 14-bit)</td>
<td>PWM (16-channel x 8-bit)</td>
</tr>
<tr>
<td>A/D (8-channel x 10-bit)</td>
<td>D/A (2-channel x 8-bit)</td>
</tr>
<tr>
<td>115 General Purpose I/O pins</td>
<td></td>
</tr>
</tbody>
</table>

(continued inside)
Features (continued)

Rich-Featured Timers

- 2 channels of Watchdog timer
- 4-channel 14-bit PWM timer
  - Control frequency as low as 7Hz
- 16-bit Free Running Timer (FRT)
  - 2 channels of output compare
  - 4 channels of input capture
- 4 channels of 8-bit timer
  (TMR0, TMR1, TMR, TMRY)
  - 2 channels of output compare
  - Can also be used as 16-bit timer
- 8-bit PWM timer with 16 outputs
  - Duty cycle from 0 to 100% with 1/256 resolution
  - Direct or inverted PWM output

8 channels of 10-bit successive-approximation A/D converter
2 channels of 8-bit D/A converter
115 general-purpose I/O ports

- 24 ports can drive LEDs directly
- 8 pins with de-bounce capability
High-speed, low-voltage 16-bit microcontrollers for IPMI applications

Development Tools

- Evaluation Demo Board—A low-cost Renesas evaluation/design tool consisting of an H8S/2166 development board and schematic.
- E10A on-chip debugging emulator—A low-cost Renesas debugging tool that uses an industry-standard JTAG interface to access debugging features built into the H8S/2168 MCU.
- E6000 real-time in-circuit emulator—Renesas’ powerful zero-wait-state debugging tool that provides hardware and software breakpoints and a trace buffer.
- HEW integrated development environment—Renesas’ graphical code development environment that includes project creation and management tools and a fully integrated C/C++ toolchain.
- IPMI firmware and software—Third-party solutions enable control of different peripherals for remote management applications such as BMC, SMC and PM. Versions 1.5 and 2.0 of this firmware and software are available from third-party vendors under a separate license.
- HDI software—High-level Debugging Interface software allows high-level debugging in C and comes integrated with the HEW.
- FDT software—Renesas’ Flash Development Toolkit, a workspace-based environment, simplifies programming the on-chip flash memory of the H8S/2168.
- Many other support products—A wide range of hardware and software development tools is offered by the large community of vendors that supports H8S MCUs.

Third-Party IPMI Firmware

The BMC provides an autonomous management subsystem with monitoring, event logging, and recovery control capabilities. The BMC can be interfaced with both in-system and out-of-system mechanisms, serving as a gateway for management applications to access platform hardware.

Development Tool Features and Ordering Information