Renesas Technology Releases SH7206, First SuperH™ Microcomputer Incorporating New SH-2A CPU Core

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Renesas Technology Corp. today announced the release of the SH7206, the first product incorporating the new SH-2A CPU core from the SuperH™ family of 32-bit RISC (reduced instruction set computer) microcomputers. The SH7206 incorporates large-capacity RAM and cache memory and a variety of on-chip peripheral functions, such as multifunction timer units for motor control. It is suitable for applications including industrial equipment, such as AC servos and inverters, office equipment, such as video printers, and consumer electronics products. Sample shipments will begin in September 2004 in Japan .

The SH7206 offers the following features.

(1) High-performance SH-2A CPU core and large-capacity RAM for superior functional products
The SH-2A is a newly developed high-performance CPU with a superscalar architecture that enables two instructions to execute simultaneously. It provides substantially better real-time control performance than the earlier SH-2 CPU core. Compared with the 104 MIPS (million instructions per second) processing performance of the SH-2 (at 80 MHz operation), the SH-2A delivers 360 MIPS (at 200 MHz operation). Thus, the SH-2A provides approximately 3.5 times the processing power of the SH-2. In addition, The SH-2A has 15 internal dedicated register banks and the response cycles have been reduced dramatically. Also, 128 Kbytes of RAM access-able in a single clock

cycle and 16 Kbytes of cache memory are implemented on-chip. This further contributes to rapid program execution. The SH7206 is therefore suitable for applications demanding superior performance.
(2) A variety of on-chip peripheral functions, including multifunction timer units, suitable for industrial equipment, office equipment, and consumer electronics products
The SH7206 incorporates two multifunction timer units (MTU2) that can be used to control AC motors. This means it can control two motors at once. In addition, it is equipped with 10-bit A/D converters and an 8-bit D/A converters, which are useful for many types of industrial equipment, as well as a serial communication interface with 16-stage FIFO and an I2C-bus interface, which can be used to implement a wide variety of communications functions. The SH7206 can thus be used to build equipment providing high-level functionality. Also, external buses are supported by means of bus state controller settings. The SH7206 can connect directly to external RAM, SRAM, burst ROM, multiplex I/O, etc. The many peripheral functions reduce the number of external devices needed, making it possible to implement applications that are both compact and lower cost.

Product Background

In recent years, as the functions and performance of industrial equipment such as AC servos, office equipment such as video printers, and consumer electronics products have advanced, demand has been growing for control microcomputers offering higher-performance. At the same time, application programs have been growing larger in order to implement new functions, and improving code efficiency has become an ever more important consideration. Renesas Technology has already developed a number of products incorporating the SH-2 32-bit RISC CPU core for industrial, office, and consumer electronics products. Renesas Technology has released the SH7206 incorporating the SH-2A

CPU core, which offers high-performance instruction compatibility with the SH-2 and improved ROM code efficiency, and a variety of on-chip peripheral functions, such as a multifunction timer unit for control applications and A/D converters.

Product Details

The SH7206 incorporates the newly developed high-performance SH-2A CPU core. It offers processing performance of 360 MIPS when operating at 200 MHz. This is equivalent to approximately 3.5 times the processing performance of the earlier SH-2 CPU core. Its instruction set is upward compatible with the SH-2 and ROM code efficiency has been improved by about 75%, so programs written for the SH-2 can be used unmodified and they can also be shrunk to about three-quarters of their original size. In addition, the SH-2A CPU core delivers improved real-time performance. The CPU has 15 internal dedicated register banks for interrupts, and the number of response cycles until interrupt processing have been reduced from 37 cycles in the SH-2 to 6 cycles in the SH-2A. As a result, the interrupt response time of the SH-2A operating at 200 MHz is a mere one-fifteenth that of the SH-2 operating at 80 MHz. Thanks to this, program switching is extremely rapid when an interrupt event occurs.

The SH7206 has 128 Kbytes of on-chip RAM, and both read and write accesses are accomplished in a single clock cycle when operating at 200 MHz. Programs that must run at high-speed can be stored in on-chip RAM and executed at 200 MHz, thereby providing excellent real-time performance. Programs larger than 128 Kbytes that perform multitasking and the like must be stored in external memory. However, the 16-Kbyte cache memory allows such programs to execute quickly. The SH7206 is thus well suited for high-end industrial applications where real-time performance is critical, such as AC servos and inverters, as well as office and consumer applications requiring high-speed

processing, such as middleware for handling JPEG graphics data or MP3 audio data.

In addition to the above, the SH7206 implements a variety of interface and peripheral functions. A 1-channel I2C-bus interface and a 4-channel serial communication interface with 16-stage FIFO are built in. Also, the external data bus can be expanded to 32 bits, allowing direct connections to external flash ROM, SDRAM, and SRAM without the need for additional external devices.

Furthermore, the SH7206 incorporates two multifunction timer units, suitable for motor control, that can each output 3-phase PWM waveforms for controlling AC motors; 8-channel 10-bit A/D converters (two units with four channels each); a 2-channel 8-bit D/A converter; and an 8-channel DMAC. The maximum number of supported I/O channels is 81, allowing connections with a variety of peripheral devices and effective control of integrated equipment. The wide array of peripheral functions helps reduce the number of external devices and makes it possible to realize high-performance applications at reduced cost.

The package is a 176-pin LQFP.

On-chip debugging functions make it possible to perform real-time debugging at the maximum operating frequency. The E10A-USB emulator is available as a development environment. It is bus-powered USB and requires no external power supply. The SH7206 is also compatible with the E200F, which supports high-speed emulation functions including real-time traces at the maximum operating frequency.

In the years ahead Renesas Technology will continue to respond to the requirements of the market with high-speed, high-performance products

offering faster operating frequencies, more on-chip RAM capacity, and enhanced peripheral functions. Plans call for the release of single-chip products incorporating the SH-2A and flash memory. Development work is also actively underway on SoC (system on chip) and SiP (system in package) products incorporating the SH-2A.

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