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Renesas Technology to Release SH72546R MCU for Automotive Engine Control that Combines the Industry's Largest On-Chip Flash Memory Capacity of 3.75 MB and High-Speed Operation

— Delivers fine-grained and sophisticated real-time control for better performance, including reduced exhaust emissions and improved fuel economy —

SAN JOSE, Calif., September 10, 2009 — Renesas Technology America, Inc., today announced the addition to the SuperH*¹ Family of the SH72546R, a powertrain (automobile engine, transmission, etc.) control MCU that combines the industry's largest on-chip flash memory capacity of 3.75 MB and high-speed operation at 200 MHz. Sample shipments will begin in October 2009 in Japan.

The SH72546R is the third in Renesas Technology's line of high-performance control MCUs employing the 90 nm process node to integrate large-capacity flash memory. It is designed for powertrain control applications, which demand more fine-grained and agile response to achieve environmental goals such as reduced exhaust emissions and improved fuel economy. It retains the 200 MHz high-speed operation of the SH72544R, the first product in the line, while expanding the on-chip flash memory size by 50% to 3.75 MB, enabling storage of even larger programs. (Note: The second product in the line has lower-grade specifications than the first.)

The features of the SH72546R are summarized below.

- (1) Support for large-scale programs with industry's largest on-chip flash memory capacity of 3.75 MB

The SH72546R has 3.75 MB of on-chip flash memory, which is 1.5 times as much as the SH72544R, the first product in the line. This allows storage of large-scale programs for implementing more fine-grained and high-precision control of the engine or transmission.

Generally, a flash memory has a slower maximum operating speed than a logic circuit due to its operating principle. In addition to using Renesas' unique technologies to increase the speed of the flash memory in this product, the SH72546R also features a low-power cache system to optimize the use of flash memory. Not only do these technologies minimize increases in power consumption, but they achieve performance essentially equal to single-cycle access at 200 MHz.

The SH72546R also includes 128 Kbytes of flash memory with functions essentially equivalent to those of EEPROM for data storage. Using this on-chip flash memory can obviate the need for external memory and thus contribute to reduced system costs.

- (2) High-performance CPU core operating at 200 MHz for sophisticated real-time control and low power consumption

Like the SH72544R, the first product in the line, the SH72546R delivers excellent processing performance of 400 million instructions per second (MIPS) when operating at 200 MHz. This enables it to achieve sophisticated real-time control involving the more fine-grained and high-speed complex operation processing demanded by engine or transmission control applications.

Additionally, the SH72546R is able to withstand high environmental temperatures, something that is difficult to achieve in MCUs with on-chip flash memory. Though fabricated using the 90 nm process node to enable large-capacity on-chip flash memory, it supports operation at 200 MHz at temperatures up to 125°C with low power consumption. The SH72546R can therefore be mounted in the high-temperature environment of engine or transmission applications, allowing for a simpler system design.

- (3) Extensive set of peripheral functions designed for engine and transmission control system

The SH72546R includes a rich set of peripheral functions. In addition to a multifunction timer (ATU-III: Advanced Timer Unit III), which is useful for both engine and transmission control, the SH72546R also features a high-speed 12-bit A/D converter, CAN*² interface, and high-speed serial interface functions. The SH72546R can thus implement high-precision real-time control in a small mounting area.

- (4) Complete compatibility with SH72546RFCC for program development

The SH72546R's functions and package are fully compatible with the SH72546RFCC control MCU for program development, which was announced in August 2007.

The SH72546RFCC is an MCU intended to be used by customers in the development of MCU software. It predates both the new SH72546R, and even the first product in the line, and includes large-capacity emulation RAM*³ for highly efficient debugging. Customers can easily transfer to the new SH72546R systems developed using the SH72546RFCC. This enables a decrease in overall system development time.

The SH72546R is also a fully functioning, package, and pin compatible with the SH72544R, the first product in the line. This allows system hardware and software design resources developed for the SH72544R to be adapted to the SH72546R quickly and seamlessly.

< Product Background >

In the automotive field in recent years, exhaust emissions standards have been strengthened in the interest of environmental preservation, and demand has increased for improved fuel economy. This has created a need for more highly precise control in powertrain control systems for the engine, transmission, etc. In turn, in the MCUs used to control such systems, there is increasing demand for a higher level of processing performance to handle the high-speed and complex operation processing required on the one hand, and for larger-capacity on-chip flash memory to accommodate the large-scale programs needed for fine-grained control on the other. In addition, it is becoming more important to be able to reuse existing resources when developing systems incorporating MCUs to enable quicker system development and reduced cost.

Powertrain control MCUs from Renesas Technology are widely used in many systems and have a high market share. Building on the technology and experience gained from earlier products, in August 2007, Renesas Technology developed the SH72546RFCC in response to heightened demand for even better performance. Designed for use in program development, the SH72546RFCC is built around an SH-2A

32-bit CPU core with excellent real-time control performance and is fabricated at the 90 nm process node to provide high-speed operation at 200 MHz and 3.75 MB of large-capacity on-chip flash memory. In July 2008, the SH72544R, with high-speed operation of 200 MHz and 2.5 MB of on-chip flash memory, was announced as the first product in a new line of MCUs. It is now succeeded by the SH72546R, which offers even larger flash memory capacity and retains full compatibility with the SH72546RFCC program development MCU.

< Product Details >

The SH72546R is built around the SH-2A high-performance CPU core, which has a superscalar that enables it to execute two instructions simultaneously and a Harvard architecture. This enables it to achieve processing performance of 400 MIPS when operating at 200 MHz.

The SH72546R is fully compatible with the earlier SH72546RFCC and SH72544R, while including a large number of peripheral functions for engine control applications.

The ATU-III multifunction timer unit, an on-chip peripheral function, is useful in engine or transmission control. It supports 32-bit input capture/output compare, one-shot pulse output, and pulse width modulation (PWM) output, among other functions, and can generate up to 106 pulse outputs. The 12-bit A/D converter supports 37 input channels, enabling high-speed conversion of analog data from multiple sensors. Many interfaces are provided, including a CAN interface for vehicle networks and a high-speed serial interface for connecting external devices. These on-chip peripheral functions and interfaces help to reduce the total number of components in the system.

The package is a 272-pin P-BGA (21 mm × 21 mm), and full pin compatibility is maintained with the SH72546RFCC and SH72544R.

The E10A-USB on-chip debugging emulator is available as a development tool. Compact in size, it runs off USB bus power and requires no external power supply.

Renesas Technology will continue to respond to evolving market demand by developing new powertrain MCU products that offer higher operating frequencies, better performance, and enhanced functions.

< Notes >

Notes: 1. SuperH: A line of embedded reduced instruction set computer (RISC) MCUs designed to provide high performance per unit of power consumption (MIPS*/W), compact size, and a high cost-performance ratio.

*SuperH™ is a trademark of Renesas Technology Corp.

2. CAN (Controller Area Network): An automotive network specification proposed by Robert Bosch GmbH.

3. Emulation RAM is used for adjustments during debugging. The emulation RAM address space is set up to overlap the flash memory area so that data values can be rewritten freely, even during microcontroller operation.

** Other product names, company names, or brands mentioned are the property of their respective owners.

< Typical Applications >

- Automotive systems: Control of the power train, including engine and transmission systems

About Renesas Technology Corp.

Renesas Technology Corp. is the world's No.1 supplier of microcontrollers and one of the world's leading semiconductor system solutions providers for mobile, automotive and PC/AV (Audio Visual) markets. It is also a leading provider of Power MOSFETs, Smart Card microcontrollers, RF-ICs, High Power Amplifiers, Mixed Signal ICs, System-on-Chip (SoC), System-in-Package (SiP) and more. Established in 2003 as a joint venture between Hitachi, Ltd. (TSE:6501, NYSE:HIT) and Mitsubishi Electric Corporation (TSE:6503), Renesas Technology achieved consolidated revenue of 702.7 billion JPY in FY2008 (end of March 2009). Renesas Technology is based in Tokyo, Japan and has a global network of manufacturing, design and sales operations in 16 countries with 25,000 employees worldwide. For further information, please visit <http://www.renesas.com>

< Specifications >

| Item | SH72546R Specifications |
|--------------------------------|--|
| Product No. | R5F72546RKBGV |
| Power supply voltage | 3.3 V/5 V (dual power supply) |
| Maximum operating frequency | 200 MHz |
| Maximum processing performance | 400 MIPS (at 200 MHz operation) |
| CPU core | SH-2A (double-precision FPU support) |
| Operating ambient temperature | -40 to +125°C |
| On-chip flash memory | 3.75 Mbytes + 128 Kbytes (EEPROM function) |
| On-chip RAM | 256 Kbytes |
| On-chip peripheral functions | Advanced Timer Unit III (ATU-III) A/D converter (12-bit resolution) × 37 channels Serial communications interface (SCI) × 5 channels High-speed serial communications interface (High-Speed SCI) × 3 channels Controller area network (RCAN) × 3 channels Compare match timer (CMT) × 2 channels User break controller (UBC) On-chip debugging functions <ul style="list-style-type: none">• Advanced user debugger II (AUD-II)• JTAG interface• Direct memory access controller (DMAC) × 8 channels• Automotive direct memory access controller (A-DMAC) × 66 channels Interrupt controller (INTC) Watchdog timer (WDT) Bus state controller (BSC) Multi-input signature generator (MISG) Clock oscillator (CPG): built-in multiplication PLL |
| Power-down modes | Sleep mode Hardware standby mode Module standby function |
| Package | 272-pin P-BGA (21 × 21 mm) |