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**PRESS CONTACT:**

Akiko Ishiyama  
Renesas Technology America, Inc.  
(408) 382-7407  
akiko.ishiyama@renesas.com

**Renesas Technology's SH74504 and SH74513 Microcontrollers Have the Speed, Memory and Peripherals Needed for Creating Driver-Assist Safety Systems for New Cars and Trucks**

*— Operating at 240MHz, the 32-bit devices can rapidly process large volumes of sensor data for implementing “preventative safety” features such as lane departure warning systems —*

SAN JOSE, Calif. — November 13, 2008 — Renesas Technology America, Inc. today announced the SH74504 and SH74513, two fast 32-bit microcontrollers (MCUs) with large amounts of on-chip flash memory and peripheral sets tailored for driver-assist systems that implement the increasingly popular “preventative safety” features of new cars and trucks. The new 240MHz devices use the SH-4A CPU, the most powerful one in the Renesas Technology SuperH® family, and are fabricated with 90-nm process technology. Incorporating more on-chip memory (up to 2Mbytes of flash, plus 512Kbytes of SRAM and a total of 64Kbytes of cache), they deliver substantially better performance than comparable earlier-generation products.

Additionally, the new MCUs operate over a wide temperature range (-40°C to +125°C) and have a compact 17mm × 17mm, 292-pin BGA package. Both devices have a 5-channel CAN function to accommodate the larger number of sensor and actuator electronic control units (ECUs) in today's high-performance driver-assist systems. A distinguishing feature of the SH74504 is the addition of a higher-bandwidth 2-channel FlexRay function.

The new MCUs fill the need for increased speed and functionality, delivering the features and computing capabilities essential for safety systems that help drivers avoid potential accidents. The devices' SH-4A CPU has been used in MPUs for car navigation systems, a market in which Renesas currently holds the top share worldwide<sup>1</sup>. This 32-bit superscalar RISC-type CPU can smoothly process the large volumes of sensor data that characterize obstacle-detection and danger-avoidance functions. Examples of such “proactive” in-vehicle features include lane-departure warning systems, adaptive cruise control functions and blind-spot monitors. These and similar options are migrating down from premium automobiles to become persuasive selling points for buyers of mainstream vehicles.

“The SH74504 and SH74513 make it possible to build reliable preventative-safety designs that deliver important application benefits, while also meeting the tight cost targets necessary for affordable pricing,” said Paul Kanan, marketing manager, automotive business unit, Renesas Technology America, Inc. “In the years ahead, such technologies will play an important role in creating an anxiety-free driving experience by enhancing safety and convenience.”

When operating at 240MHz, the MCUs achieve high levels of performance — 432 MIPS (432 million instructions per second) and 1.68 GFLOPS (1.68 billion floating point operations per second) — when consuming only 1.5 watts of power. Additionally, the high-speed calculating capabilities of the built-in hardware floating point unit (FPU) accelerate vector and sine/cosine arithmetic computations. Thus, the devices can process data quickly to deliver rapid situation updates in fast-changing real-world driving situations. Their large on-chip flash memory (2Mbytes for the SH74504, 1.5Mbytes for the SH74513) can store the complex, sophisticated code typical of image-recognition and threat-analysis programs. Additionally, the MCUs' 512Kbyte on-chip SRAM allows the chips to handle large amounts of data, and their 64Kbyte cache (32Kbytes for instructions, 32Kbytes for data) enables the SH-4A CPU core to achieve the best possible throughput.

Further, the SH74504 and SH74513 integrate the following on-chip peripheral functions specifically required by many driver-assist systems:

- **Functions for onboard camera control** — A 3-channel direct RAM input interface (DRI) function supports a direct parallel connection at up to 40Mbps between a CMOS camera (with up to WVGA resolution) and the MCU's on-chip SRAM for implementing a lane departure warning system. A 1-channel I<sup>2</sup>C function handles the camera settings. The 512Kbyte SRAM capacity of the SH74504 and SH74513 is sufficient for storing the data for an entire photo, so designs can be smaller and cost less.
- **Functions for vehicle millimeter wave (milliwave) systems** — A parallel DAC controller (PDAC) circuit controls the D/A converter required by driver-assist systems that employ millimeter wave radar. The SH74504 and SH74513 MCUs also provide a parallel selector (PSEL) circuit for channel control of a high-speed A/D converter (ADC) and a DRI circuit for capturing data from a high-speed external A/D converter. They also have a timer output unification (TOU) timer for controlling the brushless DC (BLDC) motor that mechanically sweeps the radar antenna, and a 65-channel ATU-IIIS (ATU-III: Advanced Timer Unit III) multifunction timer unit for timing control. This combination of on-chip peripheral functions makes it easier to build more compact systems at reduced cost.
- **Functions for port-to-port communications** —The SH74504 and SH74513 MCUs incorporate four functions useful for multi-CPU in-vehicle system configurations. A DRI and a direct RAM output interface (DRO) minimize the CPU performance degradation caused by CPU-to-CPU communication overhead. A PSEL bus controller can set the optimal data bus width (8, 16 or 32 bits) when an external bus is utilized. An 8-channel serial communication interface (SCIF) with FIFO can be used for message exchanges. Lastly, an on-chip direct memory access controller (DMAC) supports data transfers to external bus areas, thereby enabling the efficient management of communication functions. These built-in functions make it possible to utilize the maximum computing and control capabilities of the SH-4A CPU for achieving the best overall system performance.

#### Comprehensive system development tools are available

To accelerate system development with the SH74504 and SH74513 MCUs, Renesas offers a comprehensive set of hardware and software tools, including compilers, the High-performance Embedded Workshop (HEW) integrated development environment, the E10A-USB on-chip debugging emulator, flash development tools, and starter kits. A global support community of third-party vendors offers a variety of other hardware/software development products and services.

#### Price and Availability

Product Name	Product Number	Differences	Package (Size)	Sample Price/ Availability
SH74504	R5F74504KBG	2Mbytes flash, 2ch FlexRay	292-pin BGA (17mm × 17mm)	\$152/ February 2009
SH74513	R5F74513KBG	1Mbyte flash	292-pin BGA (17mm × 17mm)	\$142/ February 2009

**About Renesas Technology Corp.**

Renesas Technology Corp. is one of the world's leading semiconductor system solutions providers for mobile, automotive and PC/AV (Audio Visual) markets and the world's No.1 supplier of microcontrollers. It is also a leading provider of LCD Driver ICs, Smart Card microcontrollers, RF-ICs, High Power Amplifiers, Mixed Signal ICs, System-on-Chip (SoC) devices, System-in-Package (SiP) products 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 951 billion JPY in FY2007 (end of March 2008). Renesas Technology is based in Tokyo, Japan and has a global network of manufacturing, design and sales operations in around 20 countries with about 26,800 employees worldwide. For further information, please visit <http://www.renesas.com>

**Notes:**

1. Source: Renesas Technology estimate based on statistics from Strategic Analytics Inc.

SuperH™ is a trademark of Renesas Technology Corp. CAN (Controller Area Network): An automotive network specification promoted by Robert Bosch GmbH of Germany. FlexRay™: A communication protocol for next-generation vehicle control applications that is promoted by the FlexRay Consortium. FlexRay is a registered trademark of Daimler AG.

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

**Specifications: Renesas Technology SH74504 and SH74513 SuperH-series Microcontrollers for Automotive “Preventative Safety” Systems**

<b>Product name</b>	<b>SH74504</b>	<b>SH74513</b>
Product No.	R5F74504KBG	R5F74513KBG
Power supply voltage	1.5V (internal)/3.3V/5V, 1.5V (internal)/3.3V, 1.5V (internal)/5V	
Max. operating frequency	240MHz	
Processing performance	432 MIPS, 1.68 GFLOPS (operating at 240MHz)	
CPU core	SH-4A, 32-bit superscalar, RISC type with FPU, cache and RAM	
Operating temperature range	-40 to +125°C	
On-chip ROM (flash memory)	2Mbytes	1.5Mbytes
On-chip RAM	High-speed RAM: 8Kbytes + 16Kbytes, medium-speed RAM: 512Kbytes	
Cache memory	64Kbytes: 32Kbytes for instructions and 32Kbytes for data, 4-way set associative	
External bus interface	Local bus state controller: Supports connection to SRAM or ROM. Bus width selectable among 8, 16, and 32 bits. Max. operating frequency: 40MHz  External memory area: 64Mbytes × 2, 32Mbytes × 1 (max.)	
FlexRay	2 channels	—
Main on-chip peripheral functions	Controller area network (CAN): 64 mailboxes × 5 channels	
	Serial communication interface (SCIF/I <sup>2</sup> C, etc.): 8 channels	
	Timer ATU-IIIS: 65 channels ( including TOU timer: 40 channels)	
	Watchdog timer (WDT)	
	12-bit A/D converter: 2 modules (16 channels/module, 8 channels/module)	
	Direct memory access controller (DMAC): 12 channels	
	Direct RAM input interface (DRI): 3 channels	
	Direct RAM output interface (DRO): 1 channel	
	Parallel DAC control interface (PDAC): 1 channel	
	Parallel selector (PSEL) bus controller: 1 channel	
	Clock oscillator with built-in multiplier PLL	
	RAM monitor function	
	On-chip debug (OCD) function	
Package	292-pin BGA (17mm × 17mm, 0.8mm pin pitch)	

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