

Renesas Technology to Release SH74552 and SH74562 MCUs with On-Chip Flash Memory and Compact Package for Applications of Advanced Driver Assistance Systems

— Compact 13 mm × 13 mm package, large-capacity memory, and carefully selected functions such as 4-channel CAN and 2-channel FlexRay to enable development of smaller, lower-cost systems for popularly priced vehicles —

Tokyo, December 21, 2009—Renesas Technology Corp. today announced the SH74552 and SH74562 32-bit MCUs for applications of advanced driver assistance systems needed in automobile “active safety” systems for obstacle detection, risk avoidance, etc., and featuring a compact 13 mm × 13 mm package, 160 MHz high-speed operation, 1 MB of high-speed on-chip flash memory, and on-chip functions such as 4-channel CAN.^{*1} Sample shipments will begin in May 2010 in Japan.

The specifications of the SH74552 and SH74562 have been carefully selected for systems intended for popularly priced vehicles. By integrating in a compact package the capability for high-speed and fine-grained processing of large amounts of data from sensors, they make it possible to build systems that are more compact and lower in cost. In addition, the SH74552 is equipped with 2-channel FlexRay.^{*2} controller.

Renesas Technology’s SH7450 Series MCUs for applications of advanced driver assistance combine on-chip flash memory and high-speed operation. Sample shipments of products with a high operating frequency of 240 MHz have already begun to manufacturers of luxury cars. In recent years, in response to rising market consciousness about safety, demand has grown for advanced driver assistance systems suitable not only for high-end vehicles but for popularly priced vehicles such as eco-friendly cars and compact cars as well. The new SH74552 and SH74562 retain the high performance and special characteristics of the earlier products in the SH7450 Series and provide a carefully selected function set in a package with a mounting area that is 42% smaller.

The main features of the SH74552 and SH74562 are as follows.

(1) Compact package measuring 13 mm × 13 mm for advanced driver assistance systems that are more compact and lower in cost

The SH74552 and SH74562 employ an FBGA package measuring only 13 mm × 13 mm, deliver the high-speed operation and large-capacity memory necessary for high-speed and fine-grained processing of large volumes of data from sensors in applications such as obstacle detection and risk avoidance, and integrate on-chip peripheral functions such as CAN. They are based on Renesas Technology’s existing 240 MHz products (17 mm × 17 mm) and provide a carefully selected subset of their specifications, enabling them to achieve a mounting area approximately 42% smaller. This makes it possible to build advanced driver assistance systems that require less space, are lower in cost, and are more lightweight, making them suitable for popularly priced vehicles.

(2) High-speed operation at 160 MHz for advanced driver assistance systems with high performance

The SH74552 and SH74562 deliver high-speed operation, with processing performance of 288 MIPS (million instructions per second) at the maximum operating frequency of 160 MHz. This enables them to process large volumes of data from sensors, etc., very rapidly. In addition, since these lower-end MCUs are based on the 240 MHz products that preceded them, existing software resources can be reused, making it possible to quickly develop advanced driver assistance systems for popularly priced vehicles by adapting systems originally intended for luxury cars.

(3) Large-capacity flash memory and SRAM on-chip

The SH74552 and SH74562 have an ample 1 MB of on-chip flash memory to accommodate the large software programs required by advanced driver assistance systems. Renesas Technology MCUs with on-chip flash memory have a proven track record in a wide range of fields, including automotive, consumer, and industrial equipment, and are highly regarded for their excellent reliability and high-speed operation. The SH74552 and SH74562 also have 256 KB of on-chip SRAM for storing large amounts of data such as milliwave data or image data from cameras.

(4) Communication functions needed by vehicle networks such as FlexRay controller and CAN

In an advanced driver assistance system, data detected by a sensor electronic control unit (ECU) linked to milliwave radar, cameras, etc., is transferred via a controller area network (CAN) to a sensor fusion ECU, which uses it to perform control functions. The SH74552 and SH74562 integrate 4-channel CAN functionality to accommodate additional sensor or actuator ECUs for higher-performance advanced driver assistance systems.

Going forward, the amount of communication data handled is expected to increase rapidly to support coordinated control among vehicle systems, and it is possible that the communication speed of the present CAN specification may prove inadequate. For this reason, the SH74552 is equipped with a 2-channel FlexRay controller, a next-generation backbone network specification providing faster communication speed and enhanced reliability.

< Product Background >

Efforts to enhance safety and improve environmental performance have been gaining prominence in the automotive field. Demand for “passive safety” (such as airbags) systems that decrease the harmful effects of traffic accidents is increasingly joined by demand for “active safety” measures such as advanced driver assistance systems that are designed to prevent traffic accidents proactively.

The idea of “active safety” is to detect ahead of time the possibility that an accident may occur under conditions of driver inattentiveness or poor visibility and to prevent an accident from occurring through cooperation between the driver and the vehicle. Going forward, systems based on this principle will be indispensable in achieving a truly safe driving experience in which both safety and convenience are enhanced.

Renesas Technology already mass produces the M32192, a 32-bit MCU with on-chip flash memory that is built around the M32R CPU core and designed for use in advanced driver assistance systems. It has achieved excellent results in the advanced driver assistance system market. In addition, sample shipments to many makers of high-end automobiles have begun of the SH74504 and SH74513, the first two products in the SH7450 Series of 240 MHz MCUs employing the SH-4A CPU core, which has a proven track record in MCUs for car navigation systems.

In recent years, as the safety consciousness of the market has increased, and strong demand has emerged for advanced driver assistance systems suitable for popularly priced vehicles such as eco-friendly cars and compact cars, as well as luxury cars. This has increased demand for systems that are more compact and less costly. In an effort to encourage the spread of active safety systems, Renesas Technology is releasing the SH74552 and SH74562, smaller versions of the SH74504 and SH74513 that retain their high performance and special characteristics while providing a carefully selected subset of their on-chip functions.

< Product Details >

In addition to the CPU core, the SH74552 and SH74562 also incorporate a floating-point processing unit (FPU) operating at 160 MHz. The FPU supports both single-precision and double-precision calculations, and in single-precision operations it achieves a maximum performance of 1.12 GFLOPS (giga [billion] floating-point operations per second). Hardware support for vector operations and arithmetic operations such as sine/cosine operations enables high-speed operation processing. The SH74552 and SH74562 also have a wide operating temperature range (–40 to +125°C) to accommodate the wide temperature range under which advanced driver assistance systems must operate. Finally, they incorporate a careful selection of the on-chip peripheral functions of the first two products in the SH7450 Series.

(A) On-chip functions needed for controlling vehicle cameras

The following camera interface functions required by lane departure warning systems, which detect the white lines on the road surface and issue warnings when the vehicle deviates from the lane, are integrated on-chip

- For image data captured by CMOS cameras, the SH74552 and SH74562 incorporate two clock synchronous parallel interface direct RAM inputs (DRIs) that are connected directly to the on-chip

SRAM and support a maximum data transfer speed of 40 MB per second. In addition to a function for reading in an entire image at once, there are built-in functions for selectively reading in only necessary pixels and for reading in images with a reduced pixel count. This allows more efficient utilization of the on-chip RAM and helps boost operation efficiency.

- A single-channel I²C function required for camera settings is provided. This makes it possible to design systems that are more compact and less costly.

(B) On-chip functions needed for vehicle milliwave systems

The following interface functions required by milliwave radar systems such as adaptive cruise control systems that detect obstacles and pedestrians in front of the vehicle, automatically track leading vehicles, and perform emergency braking, etc., are integrated on-chip.

- Parallel DAC controller (PDAC) circuit for D/A converter control
- Parallel selector (PSEL) circuit for channel control of external high-speed A/D converters (ADCs)
- DRI circuit ideal for reading in data from external high-speed ADCs
- Timer TOU for controlling a brushless DC motor (BLDC) as part of mechanical milliwave scan control and 62-channel ATU-IIIS (Advanced Timer Unit III) multifunction timer unit ideal for timing control

These on-chip functions make it possible to build systems that are more compact and lower in cost.

(C) On-chip port-to-port communication function ideal for multi-MPU configurations

In response to the constantly rising performance demands on advanced driver assistance systems, the SH74552 and SH74562 incorporate the following communications functions.

- a direct RAM input interface (DRI) and direct RAM output interface (DRO) to minimize performance drag on the MCU's CPU caused by communications functions
- serial communication interfaces (SCIF) with FIFO

There is also an on-chip direct memory access controller (DMAC) supporting data transfer to external bus areas to enable management of the above communication functions. By combining these functions it is possible to utilize the performance of the SH-4A CPU to the full and to achieve improved system performance.

The compact package measures only 13 mm × 13 mm, and the individual pins are multiplexed for up to six functions to provide support for a wide range of applications. The FBGA package has a 0.8 mm pin pitch and can withstand operating temperatures up to 125°C.

< **Development Environment** >

Compilers, the E10A-USB on-chip debugging emulator, flash development toolkits, and starter kits manufactured by Renesas Technology are available for use in system development. A variety of additional development tools are available from third-party vendors.

Renesas Technology plans to continue to respond to market demand by developing new products with a range of flash memory capacities and package options as well as higher operating frequencies, better performance, and more advanced functions for the systems of today and tomorrow.

< **Notes** >

- Notes: 1. CAN (Controller Area Network): An automotive network specification promoted by Robert Bosch GmbH of Germany.
2. 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, or brands mentioned are the property of their respective owners.

< **Typical Applications** >

- Automobile equipment control (advanced driver assistance systems, etc.)

< **Prices in Japan** > *For Reference

Product Name	Product No	Package (Size)	Sample Price [Tax Included] (Yen)
SH74552	R5F74552KBG	176-pin BGA (13 mm x 13 mm)	9,500
SH74562	R5F74562KBG	176-pin BGA (13 mm x 13 mm)	8,500

< Specifications >

Product name	SH74552	SH74562
Product No.	R5F74552KBG	R5F74562KBG
Power supply voltage	1.5 V (internal)/3.3 V, 1.5 V (internal)/5 V	
Max. operating frequency	160 MHz	
Processing performance	288 MIPS, 1.12 GFLOPS (operating at 160 MHz)	
CPU core	SH-4A	
Operating temperature range	-40 to +125°C	
On-chip ROM (flash memory)	1 Mbytes	
On-chip RAM	High-speed RAM: 8 Kbytes + 16 Kbytes, medium-speed RAM: 256 Kbytes	
Cache memory	Separate, 32 Kbytes for instructions/32 Kbytes for data, 4-way set associative	
FlexRay	2 channels	—
Main on-chip peripheral functions	Timer ATU-IIIS: 62 channels	
	On-chip watchdog timer	
	12-bit A/D converter: 2 modules (12 channels/ module, 4 channels/ module)	
	Direct memory access controller: 12 channels	
	Direct RAM input interface (DRI): 2 channels	
	Direct RAM output interface (DRO): 1 channel	
	Parallel DAC control interface (PDAC): 1 channel	
	Parallel selector (PSEL): 1 channel	
	Serial communication interface (SCIF/I ² C, etc.): 8 channels	
	Controller area network (CAN): 4 channels (64 message boxes)	
	Clock oscillator: Built-in multiplier PLL	
	On-chip debug function (H-UDI)	
	RAM monitor function (AUDR)	
Package	176-pin BGA (13 mm x 13 mm, 0.8 mm pin pitch)	

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*** Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice. ***