Renesas Technology Releases SH-MobileR2 Application Processor for Car Navigation Systems and PNDs Supporting One-Seg TV Broadcasts

— Speed 1.5 times that of previous Renesas products and a variety of functions with superior processing performance —

Tokyo, November 13, 2007 — Renesas Technology Corp. today announced the SH-MobileR2 (product name: SH7723), the second offering in the SH-Mobile*[1] Series of application processors for applications other than mobile phones. The new SH-MobileR2 is intended for use in portable and mobile devices with support for One-Seg*[2] terrestrial digital TV broadcasts, such as car navigation systems and personal navigation devices (PNDs). Sample shipments will begin in January 2008 in Japan.

The features of the SH-MobileR2 are summarized below.

(1) 400 MHz high-speed operation and 256 Kbytes secondary memory cache

The earlier SH-MobileR (product name: SH7722) incorporates the SH4AL-DSP high-performance CPU core and operates at a maximum frequency of 266 MHz. The new SH-MobileR2 incorporates the SH-4A CPU core for higher-speed operation and a floating-point processing unit (FPU) that increases the efficiency of video and audio processing. The new application processor's maximum operating frequency of 400 MHz makes it approximately 1.5 times as fast as its predecessor. Processing performance when operating at 400 MHz is 720 MIPS (million instructions per second), and the FPU achieves a performance of 2.8 GFLOPS (giga floating-point operations per second). The SH-MobileR2 thus has more than enough power to handle parallel processing of multiple applications or general-purpose operating systems, such as Windows® CE*[3] or Linux,*[4] which impose a greater processing load than a dedicated OS. In addition, the 64 Kbytes primary cache memory (32 Kbytes each for instructions and data) is supplemented by a new 256 Kbytes secondary cache memory (mixed instructions and data), contributing to faster software execution.

(2) Multi-CODEC video processing IP for high performance and low power consumption

The SH-MobileR2 employs VPU5F (Video Processing Unit 5F), a high-performance multi-CODEC video processing IP that supports H.264/MPEG-4 AVC (H.264), the video compression standard used by the Japanese terrestrial digital broadcasting format ISDB-T.*[5] This IP enables VGA size encoding and decoding at a rate of 30 frames per second (fps). It supports MPEG-4 encoding and decoding and VC-1 decoding, making it possible to implement a variety of video applications such as video e-mail, videophone, and video capture. In addition, this application processors can support digital broadcasting systems used outside Japan, such as DVB-H*[6] in Europe and DMB*[7] in South Korea.

(3) A wide variety of high-performance on-chip peripheral functions for multimedia support

The SH-MobileR2 incorporates a 2-D graphics accelerator for map rendering that provides better functionality and performance than that of the earlier SH-MobileR. This enables high-quality and high-speed map rendering. It also has an expanded edge emphasis function for high-quality display of terrestrial digital TV broadcasts, ensuring that the picture does not appear fuzzy when enlarged from QVGA to VGA or WVGA size. Additional peripheral functions include USB 2.0 host/function support (high-speed), an ATAPI controller allowing connection to a hard disk or DVD drive, and an SD host controller with high-speed specification support. This array of high-performance peripheral functions makes it possible to reduce the total number of parts and reduce system cost while maintaining high-level performance. A wide variety of middleware is available for the SH-MobileR2, including video middleware supporting H.264, MPEG-4, and WMV and audio middleware supporting aacPlus (Advanced Audio Coding Plus).*[8] These software solutions assist in the development of a total system.

< Product Background >

In recent years an increasing number of multimedia terminals with support for terrestrial digital broadcasts have appeared on the market, with examples including mobile phones, car navigation systems, and portable media players. The proliferation of such products is particularly notable in the field of car navigation systems, with both dash-mounted models and simple navigation systems such as PNDs now providing TV receiver functionality. This trend is expected to expand still further in future.

Renesas Technology released the SH-Mobile Series of application processors supporting terrestrial digital broadcasts for mobile phone systems early on, and it has achieved widespread adoption in mobile phones. The company subsequently introduced the SH-MobileR, the first application processor in the series designed for systems other than mobile phones. It retained the many peripheral functions, structure, and ease of use of preceding models and received an enthusiastic reception. SH-MobileR2 is the second offering in the SH-Mobile Series of application processors for applications other than mobile phones, retaining the excellent performance and ease of use of the SH-MobileR while responding to strong demand for enhanced performance. The SH-MobileR2 operates about 1.5 times as fast as the SH-MobileR and delivers functions providing an even higher level of performance.

< Product Details >

The SH-MobileR2 incorporates the SH-4A CPU core and achieves processing performance of 720 MIPS at the maximum operating frequency of 400 MHz, for an excellent unit-frequency performance of 1.8 MIPS/MHz. In addition, the 64 Kbytes primary cache memory is supplemented by a new 256 Kbytes secondary cache memory, enabling faster execution of software.

Also provided is the VPU5F IP core for high-performance video processing. VPU5F supports the H.264 video compression standard used for terrestrial digital broadcasts; encoding and decoding of MPEG-4, which is widely used for video recording and playback; and decoding of VC-1, which is used on PCs, etc. This enables video processing with excellent picture quality, high speed, and superior performance.

The SH-MobileR2 has a wide range of on-chip peripheral functions such as multimedia functions. It employs a 2-D graphics accelerator for map rendering that delivers improved functionality and performance. The thick-line rendering function makes it easy to draw lines of a uniform thickness, regardless of the direction, when representing roads. The anti-aliasing function enables smooth rendering of polygons and diagonal lines. These functions contribute to high-quality, high-speed map rendering.

An expanded edge emphasis function delivers high-quality display of terrestrial digital TV broadcasts. It ensures that the picture does not appear fuzzy when enlarged from QVGA to VGA or WVGA size by enhancing the edges, performing inter-pixel correction, and filtering out noise. Other on-chip functions include a 24-bit compatible TFT color LCD controller, USB 2.0 host/function (high-speed), an ATAPI controller allowing connection to a high disk or DVD drive, and an SD host controller with high-speed specification support. The SD memory card*[9] interface supports an optional CPRM (Content Protection for Recordable Media Specification) function, making possible recording and later playback of terrestrial digital broadcasts.

A range of system solutions is also planned to help shorten system development times and reduce system cost. These include a reference platform with the SH-MobileR2 mounted on it and a graphics library supporting the functions of the 2-D graphics accelerator. The reference platform will be a useful tool for examining system functions, evaluating performance, and more efficient software development. The graphics library conforms to the GDI-Sub*[10] specification and supports Windows® Automotive 5.0*[11] Service Pack 2 from Microsoft Corporation, making it possible to implement a variety of map rendering functions using the 2-D graphics accelerator. Scheduled third-party products that will support the SH-MobileR2 include middleware and a system development solution for One-Seg compatible applications from Hitachi ULSI Systems Co., Ltd., and, a BSP (Board Support Package) from Akita Electronics Systems Co., Ltd., with support for Windows® CE 5.0 and Windows® Automotive 5.0 Service Pack 2.

The package is a 449-pin BGA (21 mm × 21 mm, 0.8 mm pin pitch).

Renesas Technology plans to further extend the SH-Mobile Series in future by developing products for the increasingly advanced and sophisticated multimedia application systems of tomorrow and by introducing products optimized for evolving market needs in a timely manner.

< Notes >

Notes: 1. SH-Mobile (SuperH™ Mobile application processor): A processor for mobile phone systems exclusive to Renesas Technology that connects to the baseband processor and performs dedicated audio and video processing for multimedia applications. SuperH is a trademark of Renesas Technology Corp.

2. One-Seg: A service offering terrestrial digital broadcasts in Japan for mobile and portable devices.

3. Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

4. Linux is a registered trademark of Linus Torvalds in the United States and other countries.

5. ISDB-T (Integrated Services Digital Broadcasting-Terrestrial): A terrestrial digital broadcasting standard developed in Japan. Broadcasts for mobile devices such as mobile phones use one segment of the full 13 segments supported by ISDB-T, hence the name “One-Seg.”

6. DVB-H (Digital Video Broadcast for Handhelds): A version for mobile devices of the Digital Video Broadcasting (DVB) standard developed in Europe.

7. DMB (Digital Multimedia Broadcasting): A digital TV broadcasting standard for mobile devices developed in South Korea. There are two versions: Terrestrial DMB (T-DMB), and Satellite DMB (S-DMB).

8. aacPlus is a trademark of Coding Technologies.

9. The SD memory card is a small memory card whose specification was originally formulated by 3C (Matsushita Electric Industrial Co., Ltd., Toshiba Corporation, and SanDisk Corporation) and has been progressively extended by the SDA (SD Card Association).

10. GDI-Sub: A graphic framework exclusive to Windows Automotive that provides call instruction compatibility with the GDI (Graphics Device Interface). It is designed specifically for high-speed rendering of GUI and map elements and is optimized to extract the maximum performance from the graphics chip.
11. Windows Automotive is an embedded operating system for car information terminals developed by Microsoft Corporation.

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

< Typical Applications >

- Car navigation systems and personal navigation devices (PNDs) with support for terrestrial digital broadcasts
- Portable media players and V2IP (video and voice over IP) terminals with support for terrestrial digital broadcasts

< Prices in Japan > *For Reference

Product Name (Type Name)	Operating Frequency	Operating Temperature Range	Unit Price for 10,000-Unit Lot (Yen) [Tax Included]
SH-MobileR2: SH7723 (R8A77230C400BG)	400 MHz	-20 to 70°C	3,000
SH-MobileR2: SH7723 (R8A77230D400BG)	400 MHz	-40 to 85°C	3,500

< **Specifications** >

Item	**SH-MobileR2 Specifications**	
Product name	SH7723 (R8A77230C400BG)	SH7723 (R8A77230D400BG)
Operating temperature range	-20 to 70°C	-40 to 85°C
CPU core	SH-4A (with MMU)	
Power supply voltage	Internal: 1.15 to 1.3 V External: 3.0 to 3.6 V DDR1 SDRAM: 2.3 to 2.7 V	
Max. operating frequency	400 MHz	
Max. processing performance	720 MIPS, 2.8 GFLOPS (at 400 MHz operation)	
Cache memory	Primary cache: Separated into 32 Kbytes for instructions and 32 Kbytes for data Secondary cache: Mixed 256 Kbytes for instructions and data	
Media data RAM	128 Kbytes	
On-chip RAM	16 Kbytes	
External memory	• DDR1 dedicated memory controller Support for connection via 32-bit bus Max. operating frequency: 133.4 MHz • Local bus controller Support for connection of burst ROM, SRAM, PCMCIA, etc. Support for connection via 16-bit or 32-bit bus Max. operating frequency: 66.7 MHz	
Main on-chip peripheral functions	• Video I/O (direct-connection interface for 5-megapixel camera module) • Video image processing functions (color conversion, image enlargement/reduction, filter processing) • Image blending function • VPU5F (H.264, MPEG-4, VC-1) • Video output unit • LCD control with support for 24-bit TFT color LCD panel • 2-D graphics accelerator • USB 2.0 host, function (high-speed support) • ATAPI interface • TS interface • DMAC × 12 channels • Sound interface unit × 2 channels • 32-bit timer unit × 6 channels • 32-bit compare-match timer × 1 channel • 16-bit timer pulse unit × 4 channels • Realtime clock × 1 channel • Watchdog timer × 1 channel • I^2C Bus interface × 1 channel • Key scan interface • Asynchronous/clock synchronous serial interface × 6 channels • IrDA interface (v1.2a support) • NAND flash memory interface • SD memory/SDIO card interface × 2 channels • A/D converter × 4 channels • H-UDI on-chip debug function	
Power-down modes	• Sleep mode • Standby mode • U-standby mode	
Package	449-pin BGA (21 mm × 21 mm, 0.8 mm pin pitch)	

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

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