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Renesas' R32C, 32-bit CISC Microcontroller with On-board Floating Point Unit is Now Available in Smaller 5.5 x 5.5 mm LGA Package

SAN JOSE, Calif., — March 4, 2009 — Renesas Technology America, Inc. today announced the availability of 64-pin QFP, 80-pin QFP and 100-pin 5.5mm x 5.5mm LGA package versions of its popular 32-bit CISC (Complex Instruction Set Computer) R32C/111 microcontroller. The R32C/100 series is the top-end product series in the M16C platform¹ and is compatible with existing CPU cores in the platform. The new devices provide improvements in operation processing performance, bus usage efficiency and code efficiency, while minimizing power consumption.

The R32C/111 LGA product, one of the three package types offered, comes in a small 100-pin LGA (5.5mm × 5.5 mm) package, the smallest in the Renesas CISC product offering with large memory integration. All of these devices are scalable with on-chip flash and RAM memory in densities of 256kB/32kB to 512kB/63kB and achieve excellent power efficiency, as low as ~600µA/MHz — much better than classic RISC-type devices.

“The new compact, low-pin package offering expands the existing R32C product lineup and provides current M16C customers a powerful migration path for their 64 to 144-pin sockets,” comments Ritesh Tyagi, director of product marketing for the system LSI business unit, Renesas Technology America, Inc. “Furthermore, our new R32C/111 LGA package is the smallest package available for a 32-bit CISC device with up to 512kB flash memory on chip. This addition makes the device an ideal solution for size-sensitive applications such as Bluetooth, GPS modules or other handheld consumer electronics where miniaturization is a must criterion.”

An on-chip FPU for complex mathematical calculations and fast execution of applications

To eliminate arithmetic computation bottlenecks, devices in Renesas' R32C/111 series are designed with an on-chip IEEE754 floating point unit (FPU) capability, the first of a kind for CISC devices. The on-chip FPU requires fewer cycles to complete complex mathematical operations, thus allowing the fast (50MHz) 32-bit CPU to quickly execute applications and control tasks. With the FPU, the devices also eliminate the need to use separate DSP chips or faster, energy-wasting microcontrollers by replacing integer mathematics and floating-point libraries. Moreover, to further reduce calculation time, the FPU is supplemented by a 32-bit x 32-bit + 64-bit multiply-and-accumulate (MAC) block and a 32-bit barrel shifter for maximum accuracy and efficiency. The combination of these capabilities makes the R32C/111 series an ideal solution for math-intensive operations such as PI loops, digital filters and wide-dynamic-range calculations.

Several other features of the R32C/111 microcontrollers directly address important requirements of many new system designs:

Support for operation from 3V to 5V — The microcontrollers have better noise immunity backed by expanded support for true 5V operation, in addition to standard 5V I/O-tolerant operation. The 100-pin

version even includes two separate voltage rails to allow support for both 5V peripherals and 3.3V devices like SRAM.

Memory interface for up to 16MB — The device’s abundant external memory support allows engineers to enhance their designs using external components such as an ASIC, FPGA, or external 10/100 MAC/PHY.

Optimized on-chip functions — The R32C/111 microcontrollers have nine serial interfaces for asynchronous/synchronous communications, and I2C, as well as up to 26 channels of 10-bit A/D and, up to two channels of 8-bit D/A. Eleven advanced 16-bit timers include features supporting three-phase motor control. The intelligent I/O has an input-capture/output-compare capability. Additionally, the devices have both a direct memory access controller (DMAC) and a DMAC-II that enable complex transfers, including those with data summations.

The new E8a on-chip debugging emulator is available as a low-cost development environment. The E8a can also be used as a flash programmer. To meet the needs of enhanced debugging requirements, a single line E30A debugger is also available.

Product Name	Maximum Operating Frequency	Package	Price in 10K quantities / Availability
R5F6411EDFN	50MHz	64-pin QFP	\$5.40- \$8.00 / NOW
R5F6411FDFN		64-pin QFP	
R5F6411EDFP		80-pin QFP	
R5F6411FDFP		80-pin QFP	
R5F6411FNLG		100-pin LGA	
R5F64112NLG		100-pin LGA	

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), 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 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 17 countries with 26,800 employees worldwide. For further information, please visit <http://www.renesas.com>

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Notes: 1. M16C Platform: A family of CISC microcontrollers, comprising of compatible 16-bit and 32-bit products in the M16C Series, M32C Series and R32C Series. Features include highly efficient C-language support, excellent noise characteristics, low power consumption, and comprehensive on-chip peripheral functions. The range of low-end to high-end series featuring the same architecture, pin assignment compatibility, and peripheral function upward-compatibility provides support for a wide range of application areas, including the automotive, industrial, and consumer fields.

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Specifications of R32C/111 Product Groups

Item	R32C/111 Group		
Product name	R5F6411FDFN	R5F6411FDFP	R5F64112NLG
CPU core	R32C/100		
Power supply voltages	3/5V		
Max. operating frequency	50MHz		
Min. instruction execution time	2.0ns		
Basic instruction set	108		
Operating temperature range	-40 to 85C		-20 to 85C
Flash memory	256KB		512KB
RAM	32KB		63KB
On-chip peripheral functions	<ul style="list-style-type: none"> Serial interface x 6 channels <ul style="list-style-type: none"> Clock synchronous/asynchronous I²C Bus, etc. 	<ul style="list-style-type: none"> Serial interface x 7 channels <ul style="list-style-type: none"> Clock synchronous/asynchronous I²C Bus, etc. 	<ul style="list-style-type: none"> Serial interface x 9 channels <ul style="list-style-type: none"> Clock synchronous/asynchronous I²C Bus, etc.
	<ul style="list-style-type: none"> DMAC <ul style="list-style-type: none"> DMAC x 4 channels: Cycle steal operation DMAC II: Immediate transfer, calculation transfer, and chain transfer functions 		
	<ul style="list-style-type: none"> Timer A x 5 channels, timer B x 6 channels <ul style="list-style-type: none"> Timers for 3-phase motor control (using timers A1, A2, A4, and B2) 		
	<ul style="list-style-type: none"> 10-bit A/D converter x 20 channels 	<ul style="list-style-type: none"> 10-bit A/D converter x 26 channels 	<ul style="list-style-type: none"> 10-bit A/D converter x 26 channels
	<ul style="list-style-type: none"> 8-bit D/A converter x 1 channels 		<ul style="list-style-type: none"> 8-bit D/A converter x 2 channels
	<ul style="list-style-type: none"> Intelligent I/O <ul style="list-style-type: none"> Time calculation function (input capture): 16-bit x 16 Waveform generation function (output capture): 16-bit x 19 Communication feature: 1 channel 		
	<ul style="list-style-type: none"> CRC calculation circuit 		
	<ul style="list-style-type: none"> X-Y conversion circuit 		
	<ul style="list-style-type: none"> Watchdog timer 		
	<ul style="list-style-type: none"> 57 I/O 	<ul style="list-style-type: none"> 73 I/O 	<ul style="list-style-type: none"> 86 I/O
Package	64-pin QFP PLQP0064KB-A	80-pin QFP PLQP0080KB-A	100-pin LGA PTLG0100KA-A

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