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Renesas Technology Unveils R8C/Lx Series MCUs with Feature-rich LCD capabilities, 1.8V to 5.5V operation support and versatile peripherals for enhanced user interfaces

SAN DIEGO and SAN JOSE, Calif. — October 13, 2008 — Renesas Developers' Conference - Renesas Technology America, Inc. today announced a new generation of microcontrollers (MCUs) with an on-board LCD controller. The R8C/Lx Series is the latest addition to the Renesas R8C Family of MCUs, which incorporates the powerful 16-bit R8C CPU core. The new devices integrate a number of advanced features such as a data transfer controller (DTC) and data flash memory with a background operation (BGO) function, which are already available in many R8C devices today. The new R8C/Lx MCUs are designed to maintain full peripheral compatibility with the existing R8C/3x Series, which offers similar performance and features without LCD controllers. As a result, the Lx Series allows developers to design with multiple product models using various levels of user interface options and differentiating features.

In the initial release phase of the R8C/Lx Series, a total of 112 devices are available from eight different groups. The line-up includes the R8C/L3A group, which incorporates an LCD controller for displays of up to 416 pixels, 128KB of flash memory, 4KB of data flash and 10KB of RAM in a 100-pin package. For simpler LCD configurations, designers can select other lower-pin R8C/Lx devices, such as the 52-pin R8C/L35 group, which supports up to 96 display pixels. Primary applications of these devices include industrial control panels, security and fire alarm keypad systems, health-monitoring systems, audio/video equipment, irrigation systems, elevator control panels, and home appliances.

According to Ritesh Tyagi, director, system LSI business unit, Renesas Technology America, Inc., "In recent years, we have observed a trend throughout industries that many electronics manufacturers are attempting to augment and differentiate their end products by improving the ease of use. Recognizing this trend, Renesas decided to take advantage of the widely used R8C core to develop the new R8C/Lx Series, incorporating sophisticated functionality such as an LCD controller, which supports up to 416 pixels for enhanced user interface experience. With the new R8C/Lx series, which is built on the technology proven by millions of successfully adopted R8C MCUs around the world, designers now have the ability to achieve the enhanced level of human interface communication with minimum effort and cost."

Summary of key features of new R8C/Lx Series MCUs

- **Advanced LCD controller** — This highly integrated hardware block supports up to 416 pixels of segment- or dot matrix-type LCDs. The module incorporates a dedicated RAM area to store and manage all the data to be displayed. Configuration settings include the use of an automatic blink feature for each individual pixel. For maximum flexibility, 3V or 5V LCDs can be driven directly from the R8C/Lx without external chips by using an internal voltage multiplier.
 - **1.8V to 5.5V operation** — By supporting an extended operating voltage range, the new R8C/Lx Series MCUs give system designers options for configuring their power supplies, potentially reducing system cost by eliminating unnecessary components.
 - **Enhanced data flash with background operation** — Data flash is a type of high-endurance on-chip flash memory intended specifically for data storage. It is available exclusively from Renesas Technology. The data flash in the new R8C/Lx MCUs has a BGO function that allows the CPU to execute instructions while data is being written to or erased from the data flash. This makes program development much easier because no special consideration needs to be given to the timing of data flash write and erase operations.
 - **Data transfer controller** — All of the new R8C/Lx groups, incorporate a DTC that performs functions similar to those of a direct memory access controller. The DTC unit manages data transfers from memory to memory, or memory to peripherals, without CPU intervention. While the DTC is handling the data transfers automatically, the CPU can perform other operations, so overall system performance can increase. Moreover, the DTC is tightly coupled to the peripherals so that any hardware interrupt event can trigger the DTC to automatically move data from one location to another in memory for fast response. This capability is useful in many situations. For example, a frequent operation in embedded systems is a transfer of consecutive analog-to-digital (A/D) conversion results to RAM. When the DTC is used to move data from the A/D to RAM, it eliminates interrupt processing through the CPU, reducing this operation's execution time significantly.
- Highly accurate high-speed on-chip oscillator** — The new R8C/Lx series devices provide a high-speed on-chip oscillator that provides precise clock signals at 40MHz, 36.864MHz, or 32MHz. Frequency accuracy ranks in the industry's top class, with variation limited to $\pm 1\%$ (Target) over standard operating temperature and voltage. This high-speed internal clock makes it possible to eliminate the use of an external resonator, reducing overall system costs.
- **Extensive analog functions** — R8C/Lx devices also include functions such as multiple analog comparator circuits, a power-on reset controller that supports slow-rising power supplies, an A/D unit with multiple conversion-result registers and a two-channel D/A converter.

Hardware/software tools

Renesas offers comprehensive system development support for the R8C/Lx series MCUs. The E8a universal low-cost on-chip debugging emulator aids system development and can also be used as in-system flash memory programmer. The Renesas High-performance Embedded Workshop integrated development and debugging environment includes a complete C/C++ compiler toolchain. (A version of HEW that can generate up to 64KB of application code is available at no charge.) Also, the E100 emulator is in development. This powerful in-circuit emulator will have extensive debugging capabilities and will provide a unified emulation platform for all Renesas MCUs. Its advanced features, such as drag-and-drop setting of complex hardware event points and instant filtering of trace data, will be operated via powerful, yet user-friendly graphical debugging interfaces.

Price and Availability

N Version (Operating Temperature Range: -20 to 85°C)

Group Name	Type Name	Flash Memory/ RAM	Data Flash	Package (Size)	Sample Price/ Availability
R8C/L3AA Group	R5F2L3A7ANFP	48KB/6KB	4KB	100-pin LQFP (14 mm × 14 mm, 0.50 mm pin pitch)	\$2.5 to 3.7/ Q1 2009
	R5F2L3A8ANFP	64KB/8KB	4KB		
	R5F2L3AAANFP	96KB/10KB	4KB		
	R5F2L3ACANFP	128KB/10KB	4KB		
	R5F2L3A7ANFA	48KB/6KB	4KB	100-pin QFP (14 mm × 20 mm, 0.65 mm pin pitch)	
	R5F2L3A8ANFA	64KB/8KB	4KB		
	R5F2L3AAANFA	96KB/10KB	4KB		
	R5F2L3ACANFA	128KB/10KB	4KB		
R8C/L3AB Group	R5F2L3A7BNFP	48KB/6KB	—	100-pin LQFP (14 mm × 14 mm, 0.50 mm pin pitch)	
	R5F2L3A8BNFP	64KB/8KB	—		
	R5F2L3AABNFP	96KB/10KB	—		
	R5F2L3ACBNFP	128KB/10KB	—		
	R5F2L3A7BNFA	48KB/6KB	—	100-pin QFP (14 mm × 20 mm, 0.65 mm pin pitch)	
	R5F2L3A8BNFA	64KB/8KB	—		
	R5F2L3AABNFA	96KB/10KB	—		
	R5F2L3ACBNFA	128KB/10KB	—		
R8C/L38A Group	R5F2L387ANFP	48KB/6KB	4KB	80-pin LQFP (12 mm × 12 mm, 0.50 mm pin pitch)	
	R5F2L388ANFP	64KB/8KB	4KB		
	R5F2L38AANFP	96KB/10KB	4KB		
	R5F2L38CANFP	128KB/10KB	4KB		
	R5F2L387ANFA	48KB/6KB	4KB	80-pin LQFP (14 mm × 14 mm, 0.65 mm pin pitch)	
	R5F2L388ANFA	64KB/8KB	4KB		
	R5F2L38AANFA	96KB/10KB	4KB		
	R5F2L38CANFA	128KB/10KB	4KB		
R8C/L38B Group	R5F2L387BNFP	48KB/6KB	—	80-pin LQFP (12 mm × 12 mm, 0.50 mm pin pitch)	
	R5F2L388BNFP	64KB/8KB	—		
	R5F2L38ABNFP	96KB/10KB	—		
	R5F2L38CBNFP	128KB/10KB	—		
	R5F2L387BNFA	48KB/6KB	—	80-pin LQFP (14 mm × 14 mm, 0.65 mm pin pitch)	
	R5F2L388BNFA	64KB/8KB	—		
	R5F2L38ABNFA	96KB/10KB	—		
	R5F2L38CBNFA	128KB/10KB	—		

R8C/L36A Group	R5F2L367ANFP	48KB/6KB	4KB	64-pin LQFP (10 mm × 10 mm, 0.50 mm pin pitch)
	R5F2L368ANFP	64KB/8KB	4KB	
	R5F2L36AANFP	96KB/10KB	4KB	
	R5F2L36CANFP	128KB/10KB	4KB	
	R5F2L367ANFA	48KB/6KB	4KB	64-pin LQFP (14 mm × 14 mm, 0.80 mm pin pitch)
	R5F2L368ANFA	64KB/8KB	4KB	
	R5F2L36AANFA	96KB/10KB	4KB	
	R5F2L36CANFA	128KB/10KB	4KB	
R8C/L36B Group	R5F2L367BNFP	48KB/6KB	—	64-pin LQFP (10 mm × 10 mm, 0.50 mm pin pitch)
	R5F2L368BNFP	64KB/8KB	—	
	R5F2L36ABNFP	96KB/10KB	—	
	R5F2L36CBNFP	128KB/10KB	—	
	R5F2L367BNFA	48KB/6KB	—	64-pin LQFP (14 mm × 14 mm, 0.80 mm pin pitch)
	R5F2L368BNFA	64KB/8KB	—	
	R5F2L36ABNFA	96KB/10KB	—	
	R5F2L36CBNFA	128KB/10KB	—	
R8C/L35A Group	R5F2L357ANFP	48KB/6KB	4KB	52-pin LQFP (10 mm × 10 mm, 0.65 mm pin pitch)
	R5F2L358ANFP	64KB/8KB	4KB	
	R5F2L35AANFP	96KB/10KB	4KB	
	R5F2L35CANFP	128KB/10KB	4KB	
R8C/L35B Group	R5F2L357BNFP	48KB/6KB	—	52-pin LQFP (10 mm × 10 mm, 0.65 mm pin pitch)
	R5F2L358BNFP	64KB/8KB	—	
	R5F2L35ABNFP	96KB/10KB	—	
	R5F2L35CBNFP	128KB/10KB	—	

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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< Specifications >

Item	Specifications of R8C/Lx series				
Group name	R8C/L3AA and R8C/L3AB :100-Pin-Package Versions R8C/L38A and R8C/L38B :80-Pin-Package Versions R8C/L36A and R8C/L36B :64-Pin-Package Versions R8C/L35A and R8C/L35B :52-Pin-Package Versions				
CPU core	16-bit CPU core: R8C CPU				
Maximum operating frequency/power supply voltage	20 MHz/2.7 to 5.5 V 5 MHz/1.8 to 5.5 V				
Operating temperature range	-20 to 85°C (N Version) and -40 to 85°C (D Version)				
Flash memory	48KB	64KB	96KB	128KB	
Data flash	1 kbyte × 4 blocks <in R8C/L3xA only>				
RAM	6KB	8KB	10KB	10KB	
On-chip peripheral functions	Timers <ul style="list-style-type: none"> • 16-bit timer: 4 channels (input capture/output compare function) • 8-bit timer: 3channels 				
	Watchdog timer: 14 bits × 1 channel (with prescaler)				
	Data transfer controller: 1 channel				
	Serial interfaces: <ul style="list-style-type: none"> • UART (dual synchronous/asynchronous serial I/O use): 2 channels • UART (dual synchronous/asynchronous serial I/O use / I²C / IEBus* / special mode 2 / SIM mode / multiprocessor communication synchronization): 1 channel • I²C bus interface / Synchronous Serial Communication Unit: 1 channel 				
	LIN interface: 1 channel (using 8-bit timer and UART)				
	Programmable I/O ports				
		Group name	CMOS I/O ports (pull-up resistor selection possible)	Large-current drive ports	Input ports
		R8C/L3AA and R8C/L3AB	88	16	4
		R8C/L38A and R8C/L38B	68	8	4
		R8C/L36A and R8C/L36B	52	8	4
	R8C/L35A and R8C/L35B	41	5	4	
	Power-on reset circuit				
	Voltage detection circuit: 3 channels (detection level selectable for voltage detection 1)				

<p>Oscillation circuit</p> <ul style="list-style-type: none"> • Main clock oscillation circuit (with built-in main clock oscillation stoppage detection function) • Subclock oscillation circuit (32 kHz) • High-speed on-chip oscillator • Low-speed on-chip oscillator • Low-power-consumption features (standard mode <high-speed clock, low-speed clock, high-speed on-chip oscillator, low-speed on-chip oscillator> wait mode, stop mode, power-off mode) 																								
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<p>LCD drive control circuit</p> <ul style="list-style-type: none"> • Bias value : 1/2, 1/3, 1/4(except R8C/L35A and R8C/L35B) • Duty cycle: static 1/2, 1/3, 1/4, 1/8(except R8C/L35A and R8C/L35B) • Built-in step-up voltage circuit, Built-in regulator for step-up voltage circuit 																								
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Packages	<p>R8C/L3AA and R8C/L3AB : (1) 100-pin LQFP (14 mm × 14 mm, 0.50 mm pitch) (2) 100-pin QFP (14 mm × 20 mm, 0.65 mm pitch)</p> <p>R8C/L38A and R8C/L38B : (1) 80-pin LQFP (12 mm × 12 mm, 0.50 mm pin pitch) (2) 80-pin LQFP (14 mm × 14 mm, 0.65 mm pin pitch)</p> <p>R8C/L36A and R8C/L36B: (1) 64-pin LQFP (10 mm × 10 mm, 0.50 mm pin pitch) (2) 64-pin LQFP (14 mm × 14 mm, 0.80 mm pin pitch)</p> <p>R8C/L35A and R8C/L35B : 52-pin LQFP (10 mm × 10 mm, 0.65 mm pin pitch)</p>
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