MC9RS08LA8 and MC9RS08LE4

Target Applications

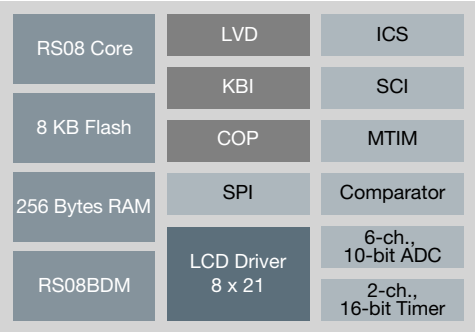
- Small appliance
- Toys
- Tools
- Meters
- Signage
- Timers
- Phones

Overview

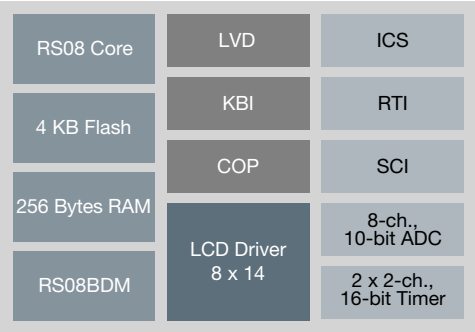
Freescale introduces the first RS08 cost-effective MCUs with LCD drivers. The highly integrated but extremely cost-effective MC9RS08LA8 and MC9RS08LE4 MCUs are intended for small appliances, health care equipment and other industrial and multi-market applications.

The LA and LE families provide design flexibility with a large segment-based (8x mode) driver and an integrated charge pump to provide true system-on-chip functionality.

RS08LA8 Block Diagram



RS08LE4 Block Diagram



Features	Benefits
8-bit RS08 Central Processor Unit (CPU)	
• Up to 10 MHz (bus frequency) RS08 CPU at 2.7V for 100 ns minimum instruction time	• Offers high performance for applications
• Subset of HCS08 instruction set with added BGND instruction	• Easy to learn and use architecture • Allows for efficient, compact module coding in assembly or C compiler • BGND allows user to enter background debug mode to debug
LCD Driver and Internal Charge Pump	
• Integrated LCD driver supports both standard 3V and 5V LCD glass	• Gives end customer flexibility in selecting ideal glass for application with respect to display quality, cost and power • Does not require expensive “chip-on-glass” display
• Configurable display for 8 x 21 or 4 x 25 segment display (LA8) • Configurable display for 8 x 14 or 4 x 18 segment display (LE4)	• LA8/LE4 can drive up to 14/9 alpha-numeric display (12 segments-based), perfect for scrolling text with simple display • Allows high mix of numbers, text and icons
• Capable of running in STOP mode	• Can drive display while the CPU sleeps, lowering overall system power consumption
• Internal charge pump for LCD (LA8 only)	• Provides option to run off single supply, dual supply for sustained contrast or customized implementation of contrast control
• Low-power blinking mode	• Does not require CPU intervention. Blinking mode can be activated, and the CPU can go to sleep, but segments will remain blinking at the pre-set frequency. Plus, an alternate display feature can be activated to display alternate data (i.e., to blink temperature and time).
• Front plane (FP) and black plane (BP) re-assignments	• FP and BP can be software selectable, making layout an easier task and very flexible for design changes
• LCD driver pins are muxed with GPIO and other functions	• Unused LCD pins can be used as GPIO and other functions
On-Chip Memory	
• LA8: Up to 8 KB flash over full operating voltage and temperature • LE4: Up to 4 KB flash over full operating voltage and temperature	• On-chip flash enabling cost-effective LCD applications
• 2.7V to 5.5V RAM	• Security circuitry prevents unauthorized access to flash contents, reducing system power consumption
Peripherals	
• Analog-to-digital converter (ADC)—2.5 µs conversion time; automatic compare function; internal temperature sensor; internal bandgap reference channel; operation in STOP mode • LA8: 6-channel,10-bit resolution • LE4: 8-channel,10-bit resolution	• Having 6/8 channels allows up to 6/8 analog devices to be sampled at extremely high speeds • Accuracy and full functionality guaranteed across 2.7V to 5.5V operating voltage of the MCU
• Timer—LA8: one 2-channel; LE4: two 2-channel selectable input capture, output compare, buffered-edge or center-aligned PWM on each channel	• Two TPMs allow for two different time bases, with a total of four timer channels

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Features	Benefits
Peripherals (continued)	
• Serial communications interface (SCI)—module offering asynchronous communications,13-bit break option, flexible baud rate generator, double buffered transmit and receive and optional H/W parity checking and generation	• Provides standard UART communications peripheral • Allows full-duplex, asynchronous, NRZ serial communication between MCU and remote devices • Edge interrupt can wake up MCU from low-power mode
• Analog comparator with selectable interrupt on rising, falling or either edge of comparator output; compare option to fixed internal bandgap reference voltage; outputs can be optionally routed to TPM module (LA8 only)	• Requires only single pin for input signal, freeing additional pins for other use • Allows other components in system to see result of comparator with minimal delay • Can be used for single-slope ADC and RC time constant measurements
• Serial peripheral interface (SPI)—one module with full-duplex or single-wire bidirectional; double-buffered transmit and receive; master or slave mode; MSB-first or LSB-first shifting (LA8 only)	• Allows high-speed (up to 5 Mbps) communications to other MCUs or peripherals
Input/Output	
• LA8: 33 general purpose input/output (GPIO), one output-only pin and one input-only pin • LE4: 26 general purpose input/output (GPIO), one output-only pin and one input-only pin	• Results in large number of flexible I/O pins that allow developers to easily interface devices to their own designs
• Eight keyboard interrupt (KBI) pins with selectable polarity	• Can be used for reading input from a keypad or used as general pin interrupts
System Protection	
• Watchdog computer operating properly (COP) reset with option to run from dedicated 1 kHz internal clock source	• Allows device to recognize runaway code (infinite loops) and resets processor to avoid lock-up states
• Low-voltage detection with reset or interrupt	• Alarms the developer of voltage drops outside of the typical operating range
• Illegal op code and illegal address detection with reset	• Allows the device to recognize erroneous code and resets the processor to avoid lock-up states
• Flash protection	• Prevents unintentional programming of protected flash memory, which greatly reduces the chance of losing vital system code for vendor applications
Development Support	
• Single-wire background debug interface	• Allows developers to use the same hardware cables between S08 and V1 ColdFire® platforms
• Breakpoint capability	• Allows single breakpoint setting during in-circuit debugging

Cost-Effective Development Tools

DEMO9RS08LA8 or DEMO9RS08LE4 $59*

Cost-effective demonstration kits that include the serial port and built-in USB-BDM cable for debugging and programming. Each tool also has a lab that demonstrates the LCD feature.

CodeWarrior™ Development Studio for Microcontrollers 6.2 Complimentary** Special Edition

CodeWarrior Development Studio for Microcontrollers is a suite of tools that supports software development for Freescale's 8-bit MCUs and 32-bit V1 ColdFire devices. Designers can further accelerate application development with the help of Processor Expert™, an award-winning rapid application development tool integrated into the CodeWarrior tool suite.

*Prices indicated are MSRP

**Subject to license agreement

Package Options

Part Number	Package	Temp. Range
MC9RS08LA8CGT	48QFN	-40°C to +85°C
MC9RS08LA8CLT	48LQFP	-40°C to +85°C
MC9RS08LE4CPC	28SOIC	-40°C to +85°C

Device	Core	LCD (Segments)	Flash	RAM	GPIO Pins	ADC Channels 10-bit	16-bit Timer Channels	Internal Charge Pump	SCI	SPI	ACMP
MC9RS08LA8	RS08	Up to 168	8 KB	256B	33	6	2-ch.	√	√	√	√
MC9RS08LE4	RS08	Up to 112	4 KB	256B	26	8	2 x 2-ch.		√		

Learn More: For more information, please visit **www.freescale.com/lcd**.

Document Number: LA8LE4FS
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