

8-bit Microcontrollers

MC9RS08KA8/4

Target Applications

- High-brightness LED
- Lighting systems control
- Toys
- Small handheld devices
- Space-constrained applications
- Small appliances
- AC line voltage monitoring
- Battery charger
- ASIC replacement

Overview

The MC9RS08KA8 microcontroller unit (MCU) is an extremely cost-effective and highly integrated, device intended for home appliances, health care equipment and as a general-purpose microcontroller. This device is composed of standard on-chip modules including a very small and highly efficient RS08 CPU core, 254 bytes RAM, 8K bytes flash, two 8-bit modulo timers,12-channel 10-bit ADC, 2-channel 16-bit timer/PWM, inter-integrated circuit bus module, keyboard interrupt and analog comparator. The device is available in 16- and 20-pin packages.

Cost-Effective Development tools

For more information on development tools, please refer to the Freescale Development Tool Selector Guide (SG1011).

CodeWarrior® Development Studio for Microcontrollers 6.1

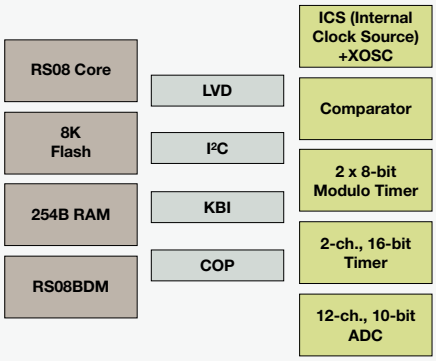
Complimentary*

CodeWarrior Development Studio for Microcontrollers is an integrated tool suite that supports software development for Freescale's 8-bit or 32-bit microcontrollers. Designers can further accelerate application development with the help of the Processor Expert™ tool, which is an award-winning rapid application development tool in the CodeWarrior tool suite.

DEMO9RS08KA8
$50 MSRP

Cost-effective demonstration board with potentiometer, LEDs and a built-in USB-BDM cable for debugging and programming.

Block Diagram



Package Options

Part Number	Package	Temp. Range
MC9RS08KA8CWG	16-pin SOIC	-40° C to +85° C
MC9RS08KA8CWJ	20-pin SOIC	-40° C to +85° C
MC9RS08KA8CPJ	20–pin PDIP	-40° C to +85° C
MC9RS08KA8CPG	16-pin PDIP	-40° C to +85° C
MC9RS08KA4CWJ	20-pin SOIC	-40° C to +85° C
MC9RS08KA4CWG	16-pin SOIC	-40° C to +85° C
MC9RS08KA4CPJ	20–pin PDIP	-40° C to +85° C
MC9RS08KA4CPG	16-pin PDIP	-40° C to +85° C

* Subject to license agreement and registration

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Features	Benefits
8-bit RS08 Central Processor Unit (CPU)	
• Up to 10 MHz (bus frequency) RS08 CPU at 1.8 volts for 100 ns minimum instruction time	• Offers high performance for applications operated by battery—even at low voltage
• Subset of HC08 instruction set with added BGND instruction	• Provides source code compatibility with 68HC05/68HC08/S08 • Allows easier code debugging through additional BGND instruction • Offers direct access to the shadow PC register through additional SHA and SLA instructions
• Supports tiny/short address mode	• Allows single-byte instructions for the most frequently used operations, including INC, DEC, ADD, SUB, LDA, STA and CLR • Offers optimized coding efficiency and code density
• Index addressing scheme through memory mapped registers X and D[X] within the tiny address range	• Allows emulation for HC08/S08-style zero-offset index addressing mode instructions • Performs index addressing through X and D[X] registers with all direct, tiny and short addressing instructions capable of operating on/with X and D[X] registers • Extends addressing to the entire memory space through the paging scheme
• 14 byte code-efficient RAM • X and D[X] mapped within code-efficient tiny address space • 16 byte code-efficient peripheral register space	• Enables direct access to the code-efficient RAM through single-byte tiny/short address mode instructions • Provides code-efficient access to most frequently accessed peripherals within the short addressing space • Enables most frequently used variables and software flags to optimize coding efficiency
• Page window	• Provides access to entire 8K through 128 pages of 64 bytes
• Simplified interrupt mechanism	• Helps eliminate hardware overhead for the vector lookup and the stacking mechanism • Provides short wake-up latency for WAIT/STOP • SHA/SLA instructions enable multi-level software stacking implementation
• Subroutine call/return mechanism	• Allows single level of subroutine call through hardware stacking with a shadow PC register • Allows fast jump to subroutine (JSR/BSR) and return from subroutine (RTS) operation
Integrated Third-Generation Flash	
• Extremely fast, byte-writable programming— up to 20 µs/byte	• Helps reduce production programming costs through ultra fast programming • Helps lower system power consumption from shorter writes
• Offers 1 KB write/erase cycles minimum over temperature	• Allows electrically erasable nonvolatile memory to help reduce firmware development cycle
Flexible Clock Options	
• Internal clock source module containing a frequency-locked loop (FLL) controlled by internal or external reference	• Helps eliminate the cost of all external clock components • Reduces board space • Increases system reliability • Provides more options to use internal or external reference clock
• Precision trimming of internal reference allows typical 0.2 percent resolution and +1 percent to -1 percent deviation over operating temperature and voltage	• Provides one of the most accurate internal clock sources on the market for the money
• Internal reference clock can be trimmed from 31.25 kHz to 39.065 kHz, allowing for maxim 10 MHz Bus frequency output	• Allows for trimming to adjust bus clock in specific applications
Timer	
• 2 x 8-bit modulo timer with 8-bit prescaler	• Generates periodic trigger for time-based software loops using timer overflow interrupt
• 2-ch., 16-bit timer/PWM	• Provide selectable input capture, output compare or buffered edge or center-aligned PWM on each channel
• Allows external timer clock source	• Utilizes TCLK input as event trigger; the timer can be used as an 8-bit event counter
ADC	
• 12-ch., 10-bit resolution	• Easily interface to analog inputs
• 2.5 µs conversion time; automatic compare function	• 400 sample/second conversion rate allows for sampling high-speed signals • Used to set conversion complete and generate interrupt only when result matches condition, freeing up system resources
• Trigger conversion using RTI counter	• Takes periodic measurements without CPU involvement • Can be used in STOP3 with compare function to take measurements and wake MCU only when compare value is reached
Analog Comparator	
• Option to compare to internal reference	• Requires only a single pin for input signal
• Option to route comparator output directly to pin	• Allows other components in system to see result of comparator with minimal delay
• Allows operation in MCU STOP mode	• Offers function to wake up the MCU from WAIT/STOP
I²C	
• Inter-integrated circuit bus module capable of operation up to 100 kbps with maximum bus loading	• Provide communication interface • Extend more peripheral
Real-Time Interrupt	
• Real-time interrupt trigger with 3-bit prescaler • Built-in low-power 1 kHz clock source	• Allows periodic wake-up or software trigger with delay ranging from 8 ms to 1.024s • Options to use low-power 1 kHz internal clock to drive the RTI • Minimizes power consumption in MCU STOP
Up to 18 GPIOs Including One Output-Only and One Input-Only Pin	
• Software selectable pull-ups on ports when used as input (internal pull-up on RESET)	• Eliminates need for external resistors to help reduce customer system cost
• Software selectable slew rate control on ports when used on output	• Configures ports for slower slew rate to help minimize noise emissions from the MCU
• 8-pin keyboard interrupt module with software selectable polarity on edge or edge/level modes	• Helps to virtually eliminate external glue logic when interfacing to simple keypads using keyboard scan with programmable pull-up/pull-down functionality
System Protection	
• Watchdog computer operating properly (COP) reset with option to run from dedicated 1 kHz internal clock source or bus clock	• Resets device in instance of runaway or corrupted code • Helps protect in case of clock loss with independent clock source
• Low voltage detection with reset or interrupt	• Allows system to write/save important variables before voltage drops to low • Holds devices in reset until reliable voltage levels are reapplied to the part
• Illegal opcode and illegal address detection with reset	• Resets device in instance of runaway or corrupted code
• Security feature for flash	• Helps prevent unauthorized access to memory to protect valuable software intellectual property
Background Debugging System	
• On-chip BDM	• Provides single-wire debugging and emulation interface • Eliminates need for expensive emulation tools • Provides circuit emulation without the need for additional, expensive development hardware
Package	
• Pin-compatible with SH, QG family	• Easy migration within Freescale Controller Continuum MCU family

Learn More: For current information about Freescale products and documentation, please visit **www.freescale.com**.

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