



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

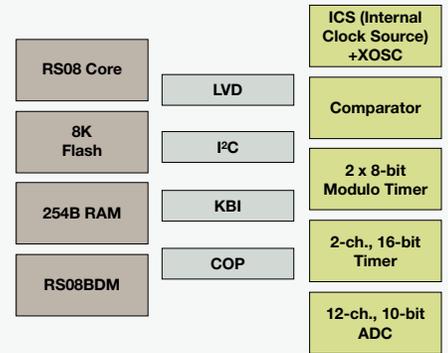
Complimentary*

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

Features	Benefits
8-bit RS08 Central Processor Unit (CPU)	
<ul style="list-style-type: none"> Up to 10 MHz (bus frequency) RS08 CPU at 1.8 volts for 100 ns minimum instruction time Subset of HC08 instruction set with added BGND instruction 	<ul style="list-style-type: none"> Offers high performance for applications operated by battery—even at low voltage 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
<ul style="list-style-type: none"> Supports tiny/short address mode 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Index addressing scheme through memory mapped registers X and D[X] within the tiny address range 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> 14 byte code-efficient RAM X and D[X] mapped within code-efficient tiny address space 16 byte code-efficient peripheral register space Page window 	<ul style="list-style-type: none"> 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 Provides access to entire 8K through 128 pages of 64 bytes
<ul style="list-style-type: none"> Simplified interrupt mechanism 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Subroutine call/return mechanism 	<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Extremely fast, byte-writable programming—up to 20 μs/byte 	<ul style="list-style-type: none"> Helps reduce production programming costs through ultra fast programming Helps lower system power consumption from shorter writes
<ul style="list-style-type: none"> Offers 1 KB write/erase cycles minimum over temperature 	<ul style="list-style-type: none"> Allows electrically erasable nonvolatile memory to help reduce firmware development cycle
Flexible Clock Options	
<ul style="list-style-type: none"> Internal clock source module containing a frequency-locked loop (FLL) controlled by internal or external reference 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Precision trimming of internal reference allows typical 0.2 percent resolution and +1 percent to -1 percent deviation over operating temperature and voltage 	<ul style="list-style-type: none"> Provides one of the most accurate internal clock sources on the market for the money
<ul style="list-style-type: none"> Internal reference clock can be trimmed from 31.25 kHz to 39.065 kHz, allowing for maxim 10 MHz Bus frequency output 	<ul style="list-style-type: none"> Allows for trimming to adjust bus clock in specific applications
Timer	
<ul style="list-style-type: none"> 2 x 8-bit modulo timer with 8-bit prescaler 	<ul style="list-style-type: none"> Generates periodic trigger for time-based software loops using timer overflow interrupt
<ul style="list-style-type: none"> 2-ch., 16-bit timer/PWM 	<ul style="list-style-type: none"> Provide selectable input capture, output compare or buffered edge or center-aligned PWM on each channel
<ul style="list-style-type: none"> Allows external timer clock source 	<ul style="list-style-type: none"> Utilizes TCLK input as event trigger; the timer can be used as an 8-bit event counter
ADC	
<ul style="list-style-type: none"> 12-ch., 10-bit resolution 	<ul style="list-style-type: none"> Easily interface to analog inputs
<ul style="list-style-type: none"> 2.5 μs conversion time; automatic compare function 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Trigger conversion using RTI counter 	<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Option to compare to internal reference 	<ul style="list-style-type: none"> Requires only a single pin for input signal
<ul style="list-style-type: none"> Option to route comparator output directly to pin 	<ul style="list-style-type: none"> Allows other components in system to see result of comparator with minimal delay
<ul style="list-style-type: none"> Allows operation in MCU STOP mode 	<ul style="list-style-type: none"> Offers function to wake up the MCU from WAIT/STOP
I²C	
<ul style="list-style-type: none"> Inter-integrated circuit bus module capable of operation up to 100 kbps with maximum bus loading 	<ul style="list-style-type: none"> Provide communication interface Extend more peripheral
Real-Time Interrupt	
<ul style="list-style-type: none"> Real-time interrupt trigger with 3-bit prescaler Built-in low-power 1 kHz clock source 	<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Software selectable pull-ups on ports when used as input (internal pull-up on RESET) 	<ul style="list-style-type: none"> Eliminates need for external resistors to help reduce customer system cost
<ul style="list-style-type: none"> Software selectable slew rate control on ports when used on output 	<ul style="list-style-type: none"> Configures ports for slower slew rate to help minimize noise emissions from the MCU
<ul style="list-style-type: none"> 8-pin keyboard interrupt module with software selectable polarity on edge or edge/level modes 	<ul style="list-style-type: none"> Helps to virtually eliminate external glue logic when interfacing to simple keypads using keyboard scan with programmable pull-up/pull-down functionality
System Protection	
<ul style="list-style-type: none"> Watchdog computer operating properly (COP) reset with option to run from dedicated 1 kHz internal clock source or bus clock 	<ul style="list-style-type: none"> Resets device in instance of runaway or corrupted code Helps protect in case of clock loss with independent clock source
<ul style="list-style-type: none"> Low voltage detection with reset or interrupt 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Illegal opcode and illegal address detection with reset 	<ul style="list-style-type: none"> Resets device in instance of runaway or corrupted code
<ul style="list-style-type: none"> Security feature for flash 	<ul style="list-style-type: none"> Helps prevent unauthorized access to memory to protect valuable software intellectual property
Background Debugging System	
<ul style="list-style-type: none"> On-chip BDM 	<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Pin-compatible with SH, QG family 	<ul style="list-style-type: none"> Easy migration within Freescale Controller Continuum MCU family

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