

# MC9RS08KA2/1

## Fact sheet

### Applications

- High-brightness LED
- Lighting systems control
- Toys
- Small handheld devices
- Space-constrained applications
- Small appliances
- AC line voltage monitoring
- Simple logic replacement
- Analog driver replacement
- ASIC replacement

### Overview

The MC9RS08KA2 extends the advantages of Freescale Semiconductor's 8-bit microcontrollers into the ultra low-end marketplace. Based on the RS08 reduced instruction set architecture, the cost-effective KA2, in either 6- or 8-pin packaging, features more flash memory than its nearest competitor plus a wide range of operating voltages to efficiently power all kinds of consumer goods, from children's toys and electronic toothbrushes to speakers and lighting systems.

Simple implementation and ease of integration can help even novice designers cut the design cycle down from several months to just a few weeks. Through Freescale's extensive support ecosystem that includes Fast Track™ services, designers have online access to hardware and software development tools, training modules, a quick-start guide and a broad number of design examples to help launch new products faster.

The KA2 pushes the boundary of Freescale's existing low-end 8-bit portfolio and brings new opportunities to life.

RS08 Core	SIM
63B RAM	BDC
ICS	COP
Analog Comparator	1 KB/2 KB Flash
KBI	8-bit MTIM

### Features

#### 8-bit RS08 Central Processor Unit (CPU)

- Up to 10 MHz (bus frequency) RS08 CPU at 1.8V for 100 ns minimum instruction time
- RS08 instruction set—a subset of the powerful HC08 instruction set

- Supports tiny/short address mode

- Index addressing scheme through memory mapped registers X and D[X] within the tiny address range

- 14B code-efficient RAM
- X and D[X] mapped within code-efficient tiny address space
- 16B code-efficient peripheral register space

- Page window

- Simplified interrupt mechanism

- Subroutine call/return mechanism

### Benefits

- 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

- 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

- 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

- 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 16 KB through 256 pages of 64B

- Helps eliminate hardware overhead for the vector lookup and the stacking mechanism
- Provides short wake-up latency for WAIT/STOP
- SHA/SLA instructions enable multilevel software stacking implementation

- 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

- Offers 1 KB write/erase cycles minimum over temperature

- Helps reduce production programming costs through ultra-fast programming
- Helps lower system power consumption from shorter writes

- Allows electrically erasable nonvolatile memory to help reduce firmware development cycle

## Cost-Effective Development Tools

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

### DEMO9RS08KA2 \$50\*

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

### M68CYCLONEPROE \$499\*

RS08/HC08/HCS08/HC12/HCS12 stand-alone flash programmer or in-circuit emulator, debug tool, flash programmer; USB, serial or Ethernet interface options

### USBMULTILINKBDM \$99\*

Universal HCS08/RS08 in-circuit debug tool and Flash programmer; USB PC interface

### USBSPYDER08 \$29\*

Cost-effective USB debug tool for use with 8-pin PDIP package

### CWX-H08-SE Free\*\*

CodeWarrior™ Special Edition for HC(S)08/RS08 MCUs. Includes integrated development environment (IDE), linker, debug tool, unlimited assembler, Processor Expert™ auto-code generator and full-chip simulation. 16 KB C Compiler included for HC(S)08 MCUs.

\*Prices indicated are MSRP

\*\*Subject to license agreement and registration

## Data Sheets

MC9RS08KA2 Data Sheet for KA2/KA1

### Flexible Clock Options

- Internal clock source module (ICS) contains a frequency-locked loop (FLL) controlled by internal reference
- Helps eliminate the cost of all external clock components
- Reduces board space
- Increases system reliability
- Precision trimming of internal reference allows typical 0.1% resolution and +0.5% to -1% deviation over operating temperature and voltage
- Provides one of the most accurate internal clock sources on the market for the money
- Internal reference can be trimmed from 31.25 kHz to 39.065 kHz, allowing for 8 MHz to 10 MHz FLL output
- Allows for trimming to adjust bus clock in specific applications

### Timer

- 8-bit modulo timer with 8-bit prescaler
- Generates periodic trigger for time-based software loops using timer overflow interrupt
- Allows external timer clock source
- Utilizes TCLK input as event trigger; the timer can be used as an 8-bit event counter

### 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

### Real-Time Interrupt

- Real-time interrupt trigger with 3-bit prescaler
- Allows periodic wake-up or software trigger with delay ranging from 8 ms to 1.024s
- Built-in low power 1 kHz clock source
- Options to use low power 1 kHz internal clock to drive the RTI
- Minimizes power consumption in MCU STOP

### Four Bidirectional Input/Output (I/O) Lines; One Input-Only Line and One Output-Only Line

- 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
- 5-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 memory
- 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 Options

Part Number	Package	Temp. Range
MC9RS08KA2CDB	6-pin DFN	-40°C to +85°C
MC9RS08KA2CSC	8-pin SOIC-NB	-40°C to +85°C
MC9RS08KA2CPC	8-pin PDIP	-40°C to +85°C
MC9RS08KA1CDB	6-pin DFN	-40°C to +85°C
MC9RS08KA1CSC	8-pin SOIC-NB	-40°C to +85°C
MC9RS08KA1CPC	8-pin PDIP	-40°C to +85°C

**Learn More:** For more information about Freescale, please visit [www.freescale.com](http://www.freescale.com).