

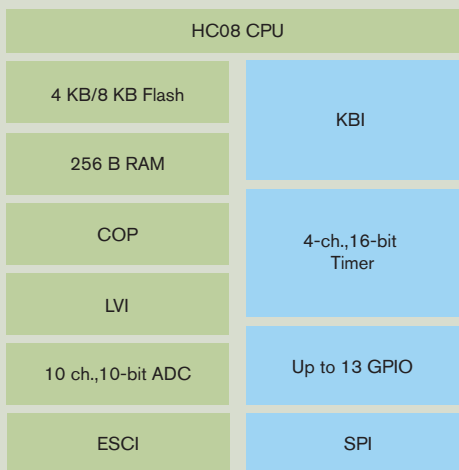
# MC908QB8/4

### Target Applications

- > Discrete replacement
- > Appliances
- > Control systems
- > Home and industrial security systems
- > Fluorescent light ballasts
- > Electromechanical replacement
- > Motion control

### Overview

Freescale Semiconductor's MC908QB8/4 microcontrollers (MCUs) help reduce system cost by eliminating the need for external low-voltage inhibit (LVI), external drivers with high-current input/output (I/O) and external data EEPROM and help reduce programming cost with fast Flash programming. Other valuable features include a 10-bit analog-to-digital converter (ADC) and an internal clock oscillator. It helps maximize efficiency and speed time to market with the ability to change code in-application with Flash and free professional-quality development tools including a C compiler, simulator, assembler, linker, Flash programmer and auto-code generator, all specifically geared to function with Freescale's QY/QB lines of MCUs.



### Features

#### High-Performance 68HC08 CPU Core

- > 8 MHz bus operation at 5V operation for 125 ns minimum instruction cycle time
- > 4 MHz bus operation at 3V operation for 250 ns minimum instruction cycle time
- > Efficient instruction set, including multiply and divide
- > 16 flexible addressing modes, including stack relative with 16-bit stack pointer

#### Integrated Second-Generation Flash Memory

- > In-application reprogrammable
- > Extremely fast programming
  - As fast as 32  $\mu$ s/byte
  - Up to 100x faster than most embedded Flash
- > Flash easily used for data EEPROM
  - 10K minimum write/erase cycles across temperature
  - 100K typical
  - Byte writeable
  - No restrictions or special instructions to access data in Flash program memory
- > Flexible block protection and security

#### Internal Clock Oscillator

- > 3.2 MHz nominal bus frequency
- >  $\pm$  25 percent trimmable
- >  $\pm$  5 percent accurate to 125°C
- >  $\pm$  2 percent typical

#### Up to 13 Bidirectional Input/Output (I/O) Lines

- > High-current drive
- > Programmable pull-ups/keyboard interrupt

### Benefits

- > Easy to learn and use architecture
- > Object compatible with 68HC05
- > Allows for efficient, compact modular coding in assembly or C compiler
- > Cost-effective programming changes and field software upgrades via in-application programmability and reprogrammability
- > Virtually eliminates scrap, costly rework and cost of socket
- > The benefits of Flash at competitive one-time programmable (OTP) prices
- > Helps to reduce production programming costs through ultra-fast programming
- > Helps to reduce power and speed application when writing nonvolatile data is required
- > Virtually eliminates the need and cost for external serial data EEPROM
- > Easily performs table lookup and data manipulation without slow and cumbersome special table instructions
- > Helps to protect code from unauthorized reading
- > Guards against unintentional writing/erasing of user-programmable segments of code

- > Can eliminate the cost of all external clock components
- > Helps to reduce board space
- > Can eliminate electromagnetic interface (EMI) generated from external clocks
- > Allows option of external radio controller (RC), external clock or external crystal/resonator

- > High-current I/O allows direct drive of LED and other circuits to virtually eliminate external drivers and reduce system costs
- > Keyboard scan with programmable pull-ups virtually eliminates external glue logic when interfacing to simple keypads



## Features

## Benefits

### 10-bit Analog-to-Digital Converter (ADC)

- > Up to 10 channels

- > Fast conversion in <math>< 10 \mu\text{s}</math>
- > Easy interface to analog inputs, such as sensors

### Four Programmable 16-bit Timer Channels

- > 125 ns resolution at 8 MHz
- > Free-running counter or modulo up-counter

- > Each channel independently programmable for input capture, output compare or unbuffered pulse-width modulation (PWM)
- > Pairing timer channels provides a buffered PWM function

### System Protection

- > COP watchdog timer with autowake-up from stop capability
- > Low-voltage inhibit with selectable trip points

- > Provides system protection in the event of runaway code by resetting the MCU to a known state
- > Helps to reduce power usage while automatically providing wake-up to check external sensors or perform periodic servicing
- > Designed to improve reliability by resetting the MCU when voltage drops below trip point

### Enhanced Serial Communications Interface (ESCI)

- > UART asynchronous communications system
- > Flexible baud rate generator
- > Double buffered transmit and receive
- > Optional hardware parity checking and generation

- > Enables synchronous serial communications with peripheral devices
- > Allows full-duplex, asynchronous, NRZ serial communication between the MCU and remote devices

### Serial Peripheral Interface

- > Full-duplex 3-wire synchronous transfers
- > Maximum master bit rate of 4 MHz for 8 MHz system clock

- > High-speed synchronous communication between multiple MCUs or between MCU and serial peripherals
- > Cost-effective serial peripheral expansion to applications including EEPROM, high-precision analog-to-digital and digital-to-analog converters, and real-time clocks

## Application Notes

- AN2305 User Mode Monitor Access for MC68HC908QT/QY Series MCUs
- AN2312 QY4 Internal Oscillator Usage Notes
- AN2317 Low-Cost Programming and Debugging Options for M68HC08 MCUs

## Data Sheets

- MC68HC908QB8 Data Sheet for QB8/QB4/QY8

## Package Options

Part Number	Package	Temp. Range
MC908QB4CPE	16 DIP	-40°C to +85°C
MC908QB4VPE	16 DIP	-40°C to +105°C
MC908QB4MPE	16 DIP	-40°C to +125°C
MC908QB4CDWE	16 SOIC	-40°C to +85°C
MC908QB4VDWE	16 SOIC	-40°C to +105°C
MC908QB4MDWE	16 SOIC	-40°C to +125°C
MC908QB4CDTE	16 TSSOP	-40°C to +85°C
MC908QB4VDTE	16 TSSOP	-40°C to +105°C
MC908QB4MDTE	16 TSSOP	-40°C to +125°C
MC908QB8CPE	16 DIP	-40°C to +85°C
MC908QB8VPE	16 DIP	-40°C to +105°C
MC908QB8MPE	16 DIP	-40°C to +125°C
MC908QB8CDWE	16 SOIC	-40°C to +85°C
MC908QB8VDWE	16 SOIC	-40°C to +105°C
MC908QB8MDWE	16 SOIC	-40°C to +125°C
MC908QB8CDTE	16 TSSOP	-40°C to +85°C
MC908QB8VDTE	16 TSSOP	-40°C to +105°C
MC908QB8MDTE	16 TSSOP	-40°C to +125°C

## Cost-Effective Development Tools

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

### DEMO908QB8 \$75

Cost-effective demonstration board with potentiometer, LEDs, serial port, LIN ports and built-in USB-MON08 cable for debugging and programming with potentiometer, LEDs, and a serial port for debugging and programming

### FSICEKITQBLTY \$1,695

Complete FSICE high-performance emulator kit; includes emulator module, cables, head adapters and programming adapters

### M68EML08QBLTY \$495

Emulation module for FSICE system

### M68CYCLONEPRO \$499

HC08/HCS08/HC12/HCS12 stand-alone Flash programmer or in-circuit emulator, debugger, Flash programmer; USB, serial or Ethernet interface options

### USBMULTILINK08 \$99

Universal HC08 in-circuit debugger and Flash programmer; USB PC interface

### M68CPA08W1628T20 \$149

Programming adapter for MON08 cables and single MCU: 7.5 MM SOIC packages up to 28 pins, 5.3 mm SOIC packages up to 16 pins and TSSOP packages up to 20 pins

### M68CPA08P40B56 \$99

Programming adapter for MON08 cables and single MCU: DIP packages up to 40 pins and SDIP packages up to 56 pins

### CWX-H08-SE Free

CodeWarrior™ Special Edition for HC(S)08 MCUs; includes integrated development environment (IDE), linker, debugger, unlimited assembler, Processor Expert™ auto-code generator, full-chip simulation and 16 KB C compiler

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

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