

MC9S08QD4

Target Applications

- > DC cooling fan applications
 - Computers
 - Low power supplies
 - Battery chargers
- > Digital Capacitive Discharge Ignition (CDI) for motorcycles
- > Industrial compressors
- > Camera zoom control
- > Walkie-talkies
- > Vacuum cleaners
- > Small and large appliances
 - Toasters
 - Low-end microwaves
- > Industrial control
- > Watch-dog coprocessors
- > Security systems
- > Fan control
- > AC voltage line monitors
- > Microwave ovens

Overview

The MC9S08QD4 provides design flexibility and integrated functionality for small appliances and DC fans. The QD4 includes up to 5.5V supply voltage, a 10-bit ADC and two timers for improved motor control. The MC9S08QD4 extends the advantages of the low-end S08 core as low pin count, small package 8-bit MCU. With pin and tool compatibility with MC9RS08KA and MC9S08QG8, the QD4 allows designers to move up and down the performance chain quickly and easily.

Features

8-bit S08 Central Processing Unit (CPU)

- > Up to 8 MHz S08 CPU for 125 ns minimum instruction time
- > HC08 instruction set with added BGND instruction
- > Support for up to 32 interrupt/reset sources
- > Supply voltage range of 2.7–5.5V

Benefits

- > Backward object-code compatibility with 68HC08 and 68HC05 allows existing code libraries to be used
- > Allows for efficient, compact module coding in assembly or C compiler
- > Allows for software flexibility and optimization for real-time applications
- > Greater scalability of power and performance through range of voltage for application needs

Integrated Third-Generation Flash Memory and RAM

- > Embedded flash that is in-application reprogrammable over the full operating voltage and temperature range with a single power supply
- > Provides users a single solution for multiple platforms or a single platform that is field reprogrammable in virtually any environment
- > Allows for software flexibility and optimization for real-time applications

General Purpose Input/Output (I/O) Lines

- > Outputs 10 mA each; 100 mA max for package
- > Two GPIO
- > One input-only and one output-only line
- > Software selectable pull-ups on ports when used as input; internal pull-up on reset and interrupt request (IRQ) pin
- > Software selectable slew rate control and drive strength on ports when used as output
- > 4-pin keyboard interrupt module with software selectable polarity on edge or edge/level modes
- > 1-channel timer/pulse-width modulator; each channel can be used for input capture, output compare, buffered edge-aligned PWM or buffered center-aligned PWM
- > Software-selectable pull-ups on ports when used as input; internal pull-up
- > Software-selectable slew rate control and drive strength on ports when used as output
- > Single-wire background debug interface
- > 8-pin plastic dual-inline package (PDIP) and 8-pin narrow body small outline integrated circuit (SOIC) packages
- > Internal pull-up on RESET and IRQ pin
- > High-current I/O allows direct drive of LED and other circuits to virtually eliminate external drivers and to help reduce system costs
- > Helps to reduce customer system cost by eliminated need for external resistors
- > Can configure ports for slower slew rate and weaker drive to minimize noise emissions from the MCU
- > Keyboard scan with programmable pull-ups/pull-downs virtually eliminates external glue logic when interfacing to simple keypads
- > Reduce customer system cost

S08 CPU

4K Flash

4 KBI

256B RAM

4-ch., 10-bit ADC

ICS (0.2% Resolution, 2% Deviation)

1 x 1-ch., 16-bit Timer

COP

1 x 2-ch., 16-bit Timer

LVD

2 GPIO plus
1 In and 1 Out

Data Sheets

MC9S08QD4 MC9S08QD4 Data Sheet

Cost-Effective Development Tools

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

DEMO9S08QD4

US\$59*

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

CYCLONEPROE

US\$499*

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

USBMULTILINKBDM E

US\$99*

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

CWX-HXX-SE

Complimentary**

CodeWarrior® Special Edition for HC(S)08/RS08 MCUs includes integrated development environment, linker, debugger, unlimited assembler, Processor Expert™ auto-code generator, full-chip simulation and 16 KB C compiler

*Prices indicated are MSRP

**Subject to license agreement and registration

Package Options

Part Number	Package	Temp. Range
MC9S08QD4VSC	8-pin SOIC	-40° C to +105° C
MC9S08QD4VPC	8-pin PDIP	-40° C to +105° C
MC9S08QD4CSC	8-pin SOIC	-40° C to +85° C
MC9S08QD4CPC	8-pin PDIP	-40° C to +85° C

Features

Integrated Analog Peripherals

- > 4-channel, 10-bit analog-to-digital converter (ADC) with automatic compare function
- > ADC channel connected to on-chip temperature sensor
- > Automatic compare function, software programmable for greater-than, equal-to or less-than conditions
- > Asynchronous clock source
- > Temperature sensor
- > Internal bandgap reference channel
- > Hardware triggerable using the real-time interrupt counter
- > Low-power and high-speed options

Benefits

- > Can be used for single slope APC and resistance-capacitance time
- > Easy interface to analog inputs/sensors
- > Used to set conversion complete and generate interrupt only when result matches condition
- > Can be used to run ADC when MCU clocks are off, such as in STOP3 low-power mode
- > Calculates temperature without any external components and saves an ADC input channel for other use
- > Constant voltage source for calibrating ADC results requires no external components
- > Takes periodic measurements without CPU involvement; can be used in STOP3 with compare function to take measurement and wake MCU from STOP3 only when compare level is reached
- > Flexible configuration to meet high performance and low power requirements

Flexible Clock Options

- > Internal clock source module containing a frequency-locked loop controlled by internal reference
- > Can eliminate cost of external clock components, take little board space, and help to increase system reliability.

Two Timer Modules

- > Programmable 16-bit timer/PWM (TPM) module
- > 2-ch. TPM; each channel can be used for input capture, output compare, buffered edge-aligned pulse width modulation (PWM) or buffered center-aligned PWM
- > 1 x 1-ch., 16-bit timer
- > 1 x 2-ch., 16-bit timer
- > One of the most cost-effective and flexible timer modules; each channel is independently programmable for input capture, output compare or buffered edge-aligned PWM or buffered center-aligned PWM
- > Timer overflow interrupt can be enabled to generate periodic interrupts for time-based software loops
- > Two separate time bases provide different interrupt options

System Protection

- > Watchdog computer operating properly reset with option to run from dedicated 1 kHz internal clock source or bus clock
- > Low-voltage detection with reset or interrupt
- > Illegal opcode detection with reset
- > Flexible flash block protection
- > Security feature for flash and RAM
- > Always-on power-on reset circuitry
- > Resets device in instance of runaway or corrupted code, and independent clock source provides additional protection in case of loss of clock
- > Allows system to write/save important variables before voltage drops too low
- > Can hold device in reset until reliable voltage levels are reapplied to the part
- > Helps to secure code sections so that they cannot be accidentally corrupted by runaway code.
- > Option to protect various block sizes
- > Option to put bootloader code in protected space and clear flash for reprogramming
- > Helps prevent unauthorized access to memory to protect a customer's software

Learn More: For more information about Freescale products, please visit www.freescale.com/QD4.