

MC9S08QD4/2

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
- coprocessors
- Security systems
- Fan control
- AC voltage line monitors
- **Overview**

The MC9S08QD4/2 provides design flexibility and integrated functionality for small appliances and DC fans. The QD includes up to 5.5V supply voltage, a 10-bit analogto-digital converter (ADC) and two timers for improved motor control. The MC9S08QD extends the advantages of the low-end S08 core as a low pin count, small package 8-bit MCU. With pin and tool compatibility with MC9RS08KA and MC9S08QG8, the QD allows designers to move up and down the performance chain quickly and easily.

Data Sheets

MC9S08QD MC9S08QD Data Sheet

S08 CPU		
Up to 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	4 GPIO plus 1 in and 1 out	

- Industrial control
- Watchdog

Features

8-bit HCS08 Central Processor Unit (CPU)

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

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

General Purpose Input/Output (GPIO) Lines

- Outputs 10 mA each; 100 mA max for package
- Four general-purpose input output (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-ch. 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

· Backward object-code compatibility with

68HC08 and 68HC05 allows existing code

· Allows for efficient, compact module coding

· Allows for software flexibility and optimization

Greater scalability of power and performance

through range of voltage for application needs

• 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

- Helps to reduce customer system cost by eliminating 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

Benefits

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libraries to be used

in assembly or C compiler

for real-time applications

for real-time applications





Features **Benefits Integrated Analog Peripherals** • 4-ch., 10-bit ADC with automatic • Can be used to run ADC when MCU clocks compare function are off, such as in STOP3 low-power mode ADC channel connected to on-chip • Calculates temperature without any external components and saves an ADC input channel temperature sensor for other use · Automatic compare function, software programmable for greater-than, equal-to Constant voltage source for calibrating ADC or less-than conditions results requires no external components Takes periodic measurements without CPU Asynchronous clock source involvement; can be used in STOP3 with Temperature sensor compare function to take measurement and Internal bandgap reference channel wake MCU from STOP3 only when compare · Hardware triggerable using the real-time level is reached interrupt counter Flexible configuration to meet high Low-power and high-speed options performance and low power requirements 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 Flexible Clock Options · Internal clock source module containing Can eliminate cost of external clock a frequency-locked loop controlled by components, use little board space and help internal reference to increase system reliability **Two Timer Modules** Programmable 16-bit timer/PWM (TPM) Cost-effective and flexible timer modules; each channel is independently programmable module for input capture, output compare or buffered 2-ch. TPM; each channel can be used for edge-aligned PWM or buffered center-aligned input capture, output compare, buffered PWM edge-aligned pulse width modulation (PWM) Timer overflow interrupt can be enabled to or buffered center-aligned PWM generate periodic interrupts for time-based 1 x 1-ch., 16-bit timer software loops 1 x 2-ch., 16-bit timer Two separate time bases provide different interrupt options System Protection Watchdog computer operating properly reset · Resets device in instance of runaway or with option to run from dedicated 1 kHz corrupted code, and independent clock internal clock source or bus clock source provides additional protection in case of loss of clock Low-voltage detection with reset or interrupt Allows system to write/save important Illegal opcode detection with reset variables before voltage drops too low · Flexible flash block protection • Can hold device in reset until reliable voltage · Security feature for flash and RAM levels are reapplied to the part · Always-on power-on reset circuitry Helps to secure code sections so that they cannot be accidently 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:

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 potentimeter, LEDs, serial port and builtin 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

USBMULTILINKBDME

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
MC9S08QD2CSC	8-pin SOIC	-40° C to +85° C
MC9S08QD2CPC	8-pin PDIP	-40° C to +85° C
MC9S08QD4CSC	8-pin SOIC	-40° C to +85° C
MC9S08QD4CPC	8-pin PDIP	-40° C to +85° C
MC9S08QD4VSC	8-pin SOIC	-40° C to +105° C
MC9S08QD4VPC	8-pin PDIP	-40° C to +105° C
MC9S08QD4MSC	8-pin SOIC	-40° C to +125° C
MC9S08QD4MPC	8-pin PDIP	-40° C to +125° C

For current information about Freescale products and documentation, please visit **www.freescale.com/QD**.



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