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
- Industrial control
- Watchdog 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 analog-to-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

Features	Benefits
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	• 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 (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 • 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

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Features	Benefits
Integrated Analog Peripherals	
• 4-ch., 10-bit 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 • 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, use 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	• 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 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

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 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

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

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