8-bit Microcontrollers

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.

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

Features	Benefits

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

> 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

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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
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	Benefits
Integrated Analog Peripherals	
> 4-channel, 10-bit analog-to-digital converter (ADC) with automatic compare function	> Can be used for single slope APC and resistance-capacitance time
> ADC channel connected to on-chip temperature sensor	> Easy interface to analog inputs/sensors
> Automatic compare function, software programmable for greater-than, equal-to or less-than conditions	> Used to set conversion complete and generate interrupt only when result matches condition
> Asynchronous clock source	> Can be used to run ADC when MCU clocks are off, such as in STOP3 low-power mode
> Temperature sensor	> Calculates temperature without any external components and saves an ADC input channel for other use
> Internal bandgap reference channel	> Constant voltage source for calibrating ADC results requires no external components
> Hardware triggerable using the real-time interrupt counter	> 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
> Low-power and high-speed options	> 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	> 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
> 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	> Timer overflow interrupt can be enabled to generate periodic interrupts for time-based software loops
> 1 x 1-ch., 16-bit timer	> Two separate time bases provide different interrupt options
> 1 x 2-ch., 16-bit timer	
System Protection	
> Watchdog computer operating properly reset with option to run from dedicated 1 kHz internal clock source or bus clock	> Resets device in instance of runaway or corrupted code, and independent clock source provides additional protection in case of loss of clock
> Low-voltage detection with reset or interrupt	> Allows system to write/save important variables before voltage drops too low
> Illegal opcode detection with reset	> Can hold device in reset until reliable voltage levels are reapplied to the part
> Flexible flash block protection	> Helps to secure code sections so that they cannot be accidently corrupted by runaway code.
> Security feature for flash and RAM	> Option to protect various block sizes
> Always-on power-on reset circuitry	> 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**.

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