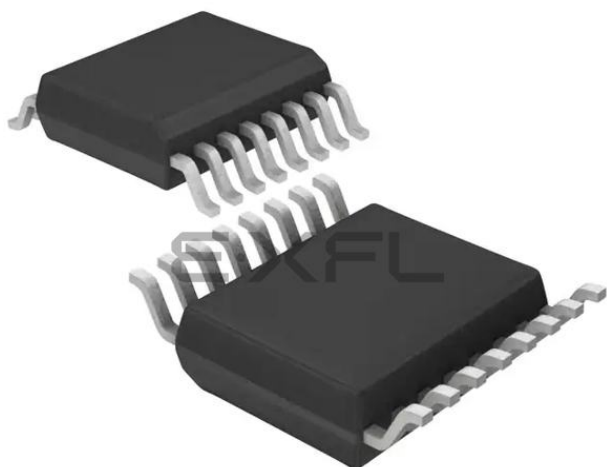




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### What is "[Embedded - Microcontrollers](#)"?

"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

### Applications of "[Embedded - Microcontrollers](#)"

#### Details

|                            |                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status             | Obsolete                                                                                                                                                    |
| Core Processor             | HC08                                                                                                                                                        |
| Core Size                  | 8-Bit                                                                                                                                                       |
| Speed                      | 8MHz                                                                                                                                                        |
| Connectivity               | SCI, SPI                                                                                                                                                    |
| Peripherals                | LVD, POR, PWM                                                                                                                                               |
| Number of I/O              | 12                                                                                                                                                          |
| Program Memory Size        | 16KB (16K x 8)                                                                                                                                              |
| Program Memory Type        | FLASH                                                                                                                                                       |
| EEPROM Size                | -                                                                                                                                                           |
| RAM Size                   | 512 x 8                                                                                                                                                     |
| Voltage - Supply (Vcc/Vdd) | 3V ~ 5.5V                                                                                                                                                   |
| Data Converters            | A/D 10x10b                                                                                                                                                  |
| Oscillator Type            | Internal                                                                                                                                                    |
| Operating Temperature      | -40°C ~ 85°C (TA)                                                                                                                                           |
| Mounting Type              | Surface Mount                                                                                                                                               |
| Package / Case             | 16-TSSOP (0.173", 4.40mm Width)                                                                                                                             |
| Supplier Device Package    | 16-TSSOP                                                                                                                                                    |
| Purchase URL               | <a href="https://www.e-xfl.com/product-detail/nxp-semiconductors/mc908qc16cdter">https://www.e-xfl.com/product-detail/nxp-semiconductors/mc908qc16cdter</a> |

## 8-bit Microcontrollers

# HC08 QC Family Fact Sheet

### Overview

Freescall's general market QC family of small-package, 8-bit microcontrollers is based on the popular HC08 core. The QC family members have strong analog capabilities, a complete set of serial modules and robust memory options. The QC family is fully local interconnect network (LIN) 2.0 and J2602 compliant and can function as LIN slaves for applications that require a cost-effective hardware solution.

A variety of small packages (16-, 20- and 28-pin), combined with optimized peripheral sets and a powerful HC08 CPU, make this an attractive low-end controller family for a wide range of applications.

### Typical Applications

One of the QC family's primary features, ideal for the automotive industry is LIN, a UART-based, single-master, multiple-slave networking architecture. With up to 16 KB of flash memory, high-pin-count packages and an additional timer with three-phase motion control, the QC is also a cost-effective solution for low-end consumer and industrial applications.

| Application Segments | Specific Application Examples                                                   |
|----------------------|---------------------------------------------------------------------------------|
| Roof                 | Sensor, light sensor, light control, sun roof                                   |
| Steering wheel       | Cruise control, wiper, turning signal, climate control, radio                   |
| Seat                 | Seat position motors, occupancy sensor, control panel                           |
| Engine               | Sensors, small motors                                                           |
| Climate              | Small motors, control panel                                                     |
| Door                 | Mirror, central ECU, mirror switch, window lift, seat control switch, door lock |
| Industrial control   | Robots, stepper motors, factory automation equipment                            |
| Motion control       | Camera zoom control, door openers, treadmills, toys                             |

### Cost-Effective LIN Family

| Features                                                                                                                                                                                              | Benefits                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Second-Generation Flash or Cost-Effective ROM Memory Options</b>                                                                                                                                   |                                                                                                                                                                                         |
| <ul style="list-style-type: none"> <li>Embedded, fully automotive-qualified flash available</li> <li>Range of memory from 4 KB to 16 KB</li> <li>10K write/erase cycles at -40°C to +125°C</li> </ul> | <ul style="list-style-type: none"> <li>Qualified for high temperatures, shock, vibration and humidity</li> <li>Cost-reduction path for high-volume, stable programs</li> </ul>          |
| <ul style="list-style-type: none"> <li>Ultra-fast programming: 64 bytes in 2 ms</li> </ul>                                                                                                            | <ul style="list-style-type: none"> <li>Reduced production costs through ultra-fast programming at operating voltage</li> </ul>                                                          |
| <ul style="list-style-type: none"> <li>Flash block protection</li> </ul>                                                                                                                              | <ul style="list-style-type: none"> <li>Helps protect code from unauthorized reading and to guard against unintentional writing/erasing of user-programmable segments of code</li> </ul> |
| <ul style="list-style-type: none"> <li>Flash reprogrammable in circuit</li> </ul>                                                                                                                     | <ul style="list-style-type: none"> <li>Allows real-time flash updates</li> </ul>                                                                                                        |

### Internal Clock Oscillator

|                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1 MHz, 2 MHz and 3.2 MHz nominal bus frequencies</li> <li>Fully trimmable internal oscillator</li> <li>Less than 0.4 percent oscillator accuracy within a LIN frame</li> </ul> | <ul style="list-style-type: none"> <li>Eliminates the cost for external clock components</li> <li>Reduces board space</li> <li>Eliminates or reduces EMI generated from external clocks</li> <li>Allows option of external RC and external crystal</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Enhanced SCI—LIN Controller

|                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Full-duplex operation</li> <li>Programmable 8-bit or 9-bit character length</li> <li>Programmable baud rates</li> <li>Separately enabled transmitter and receiver</li> <li>Interrupt-driven operation with eight interrupt flags</li> <li>Capable of communication rates up to 115,000 bps, encompassing all LIN baud rates</li> </ul> | <ul style="list-style-type: none"> <li>Simultaneous transmission and reception of data</li> <li>Finely adjustable baud rate prescalers allow precise control of baud rate</li> <li>ESCI arbiter allows measurement of LIN synchronization data without separate timer hardware</li> <li>Enhanced detection of LIN break symbols to prevent false interrupts</li> </ul> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Periodic Wake-Up Module

|                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Selectable timeout periods (40 µs to three minutes)</li> <li>Dedicated low-power, 32 kHz internal oscillator separate from the main system clock sources</li> <li>Full-duplex operation</li> </ul> | <ul style="list-style-type: none"> <li>Accessible in all modes of operation (run, wait and stop)</li> <li>Flexibility to exit from low-power stop mode without external signals</li> <li>Provides simultaneous transmission and reception of data</li> </ul> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Root Part Number | Flash | ROM Available | RAM  | UART   | SPI | Analog (ADC)             | Timer         | Clock | Pin Count  | Additional Features            | Operating Voltage | Market Focus                        |
|------------------|-------|---------------|------|--------|-----|--------------------------|---------------|-------|------------|--------------------------------|-------------------|-------------------------------------|
| 908QC16          | 16 KB | ✓             | 512B | 1xESCI | 1   | Up to 10-ch., 10-bit ADC | 4-ch. + 2-ch. | OSC   | 16, 20, 28 | 16 MHz CPU, COP, LVI, POR, KBI | 3.3 to 5.0        | LIN/J2602, Watchdog, General Market |
| 908QC8           | 8 KB  | ✓             | 384B | 1xESCI | 1   | Up to 10-ch., 10-bit ADC | 4-ch. + 2-ch. | OSC   | 16, 20, 28 | 16 MHz CPU, COP, LVI, POR, KBI | 3.3 to 5.0        | LIN/J2602, Watchdog, General Market |
| 908QC4           | 4 KB  |               | 384B | 1xESCI | 1   | Up to 10-ch., 10-bit ADC | 4-ch. + 2-ch. | OSC   | 16, 20, 28 | 16 MHz CPU, COP, LVI, POR, KBI | 3.3 to 5.0        | LIN/J2602, Watchdog, General Market |

## Cost-Effective Development Tools

### DEMO908QC16 \$75\*

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

### FSICEKITQC16E \$1,695\*

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

### EML08QCBLTYE \$495\*

Emulation module for FSICE system

### M68CYCLONEPROE \$499\*

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

### USBMULTILINK08E \$99\*

Universal HC08 in-circuit debugger and flash programmer

### PAS08W1628T28E \$195\*

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 28 pins

### PAS08P40B3256E \$170\*

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

### CodeWarrior®

(Standard Edition: CWS-H08-STDED-CX, Professional Edition: CWS-H08-PROED-CX, Special Edition: CWX-HXX-SE)

CodeWarrior is a comprehensive tool set for fast and easy MCU development. This software tool provides the capabilities required by engineers in the development cycle to utilize the capabilities of the HC08 architecture. Key features include: project manager, assembler, compiler, debugger, full-chip simulation, flash programming and Processor Expert™ technology, which provides automatic C-code generation for most HC08 on-chip peripherals.

**CodeWarrior Special Edition can be downloaded free\*\* of charge at [www.freescale.com/codewarrior](http://www.freescale.com/codewarrior).**

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

\*Manufacturer Suggested Resale Price

\*\*Subject to License Agreement and Registration

## Application Notes: A Selection of More Than 300 Available

|        |                                                                            |
|--------|----------------------------------------------------------------------------|
| AN2767 | LIN 2.0 Connectivity on Freescale 8/16-bit Using Volcano LTP               |
| AN2575 | MC68HC908EY16 ESCI LIN Drivers                                             |
| AN2884 | LIN 2.0 Door Lock Slave                                                    |
| AN2885 | LIN 2.0 Mirror Slave Unit                                                  |
| AN2573 | LINKits LIN Evaluation Boards                                              |
| AN2560 | MC68HC908EY16 IR Receiver for Remote Control of LIN Robot                  |
| AN2470 | MC68HC908EY16 Controlled Robot Using the LIN Bus                           |
| AN2343 | HC908EY16 LIN Monitor                                                      |
| AN2264 | LIN Node Temperature Display                                               |
| AN2205 | Car Door Keypad Using LIN                                                  |
| AN2295 | Developer's Serial Bootloader for M68HC08 and HCS08 MCUs                   |
| AN2312 | MC68HC908QY4 Internal Oscillator Usage Notes                               |
| AN2317 | Low-Cost Programming and Debugging Options for M68HC08 MCUs                |
| AN2396 | Servo Motor Control Application on a Local Area Interconnect Network (LIN) |
| AN2623 | LIN Temperature Sensor Using the MC68HC908QY/QYMCU                         |

## Device and Package Options

| Part Number   | Package | Temperature     |
|---------------|---------|-----------------|
| MC908QC16CDTE | 16TSSOP | -40°C to +85°C  |
| MC908QC16VDTE | 16TSSOP | -40°C to +105°C |
| MC908QC16MDTE | 16TSSOP | -40°C to +125°C |
| MC908QC16CDSE | 20TSSOP | -40°C to +85°C  |
| MC908QC16VDSE | 20TSSOP | -40°C to +105°C |
| MC908QC16MDSE | 20TSSOP | -40°C to +125°C |
| MC908QC16CDRE | 28TSSOP | -40°C to +85°C  |
| MC908QC16VDRE | 28TSSOP | -40°C to +105°C |
| MC908QC16MDRE | 28TSSOP | -40°C to +125°C |
| MC908QC8CDTE  | 16TSSOP | -40°C to +85°C  |
| MC908QC8VDTE  | 16TSSOP | -40°C to +105°C |
| MC908QC8MDTE  | 16TSSOP | -40°C to +125°C |
| MC908QC8CDSE  | 20TSSOP | -40°C to +85°C  |
| MC908QC8VDSE  | 20TSSOP | -40°C to +105°C |
| MC908QC8MDSE  | 20TSSOP | -40°C to +125°C |
| MC908QC8CDRE  | 28TSSOP | -40°C to +85°C  |
| MC908QC8VDRE  | 28TSSOP | -40°C to +105°C |
| MC908QC8MDRE  | 28TSSOP | -40°C to +125°C |
| MC908QC4CDTE  | 16TSSOP | -40°C to +85°C  |
| MC908QC4VDTE  | 16TSSOP | -40°C to +105°C |
| MC908QC4MDTE  | 16TSSOP | -40°C to +125°C |
| MC908QC4CDSE  | 20TSSOP | -40°C to +85°C  |
| MC908QC4VDSE  | 20TSSOP | -40°C to +105°C |
| MC908QC4MDSE  | 20TSSOP | -40°C to +125°C |
| MC908QC4CDRE  | 28TSSOP | -40°C to +85°C  |
| MC908QC4VDRE  | 28TSSOP | -40°C to +105°C |
| MC908QC4MDRE  | 28TSSOP | -40°C to +125°C |

| Part Number   | Package | Temperature    |
|---------------|---------|----------------|
| MC908QC16CDXE | 16SOIC  | -40°C to +85°C |
| MC908QC16CDYE | 20SOIC  | -40°C to +85°C |
| MC908QC16CDZE | 28SOIC  | -40°C to +85°C |
| MC908QC8CDXE  | 16SOIC  | -40°C to +85°C |
| MC908QC8CDYE  | 20SOIC  | -40°C to +85°C |
| MC908QC8CDZE  | 28SOIC  | -40°C to +85°C |

Automotive customers should request parts beginning in S instead of MC.

16-Lead TSSOP



25.6 mil/0.65 mm Pitch  
5.0 mm x 4.4 mm Body

16-Lead SOIC



50 mil/1.27 mm Pitch  
10.30 mm x 7.5 mm Body

20-Lead TSSOP



25.6 mil/0.65 mm Pitch  
6.50 mm x 4.4 mm Body

20-Lead SOIC



50 mil/1.27 mm Pitch  
1.28 mm x 7.5 mm Body

28-Lead TSSOP



25.6 mil/0.65 mm Pitch  
9.7 mm x 4.4 mm Body

28-Lead SOIC



50 mil/1.27 mm Pitch  
18.0 mm x 7.5 mm Body

## Learn More:

For current information about Freescale products and documentation, please visit [www.freescale.com](http://www.freescale.com).