

# MC9S08JS16/8

## 8-bit USB microcontroller

### Target Applications

- PC peripherals
- Wireless Keyboard/Mouse Receiver
- Wireless adapter
- USB dongle
- SD card reader
- RS-232 to USB bridge
- Remote Control
- UPS

### Overview

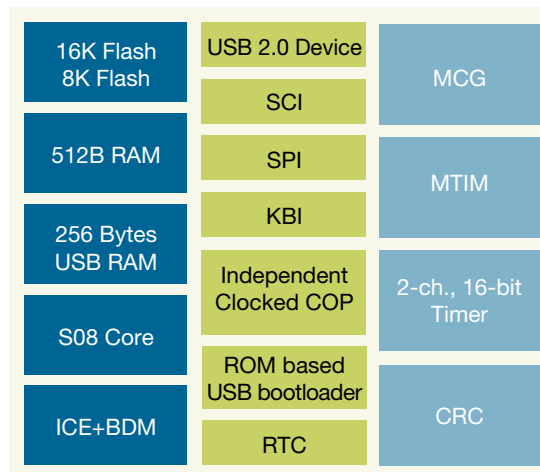
An entry-level 8-bit USB MCU designed for affordable wireless PC peripherals; the MC9S08JS16 (JS16) meets the market demand for cost-effective devices by enabling reduced design time and lower system costs.

The JS16 extends Freescale’s entry-level 8-bit embedded USB controller family with up to 16 KB of flash memory and a full-speed USB 2.0 device controller. The JS16 also has several features for system protection, such as low voltage detection and a Computer Operating Properly (COP) module. The JS16 device is ideal for a variety of industrial control applications and consumer devices, including PC peripherals and remote controls.

The JS16 devices are supported by Freescale USB-LITE Stack by CMX and USB-MINI Stack with HID and CDC classes. These stacks are complimentary and are supplied with source code.

The JS16 is software compatible with other devices in the Controller Continuum, providing a direct migration path to higher performing USB microcontrollers.

### JS16/8 Block Diagram



Features	Benefits
<b>8-Bit HCS08 Central Processing Unit (CPU)</b>	
<ul style="list-style-type: none"> <li>• Up to 24MHz internal bus (48MHz HCS08 Core) frequency offering 2.7V to 5.5V across temperature range of -40°C to 85°C</li> </ul>	<ul style="list-style-type: none"> <li>• Offers reliable performance throughout the entire voltage range</li> </ul>
<b>On-Chip Memory</b>	
<ul style="list-style-type: none"> <li>• Up to 16K flash read/program/erase over entire operating voltage and temperature ranges</li> </ul>	<ul style="list-style-type: none"> <li>• Allows user to take full advantage of in-application, re-programmability benefits in virtually any environment</li> </ul>
<ul style="list-style-type: none"> <li>• Up to 512 bytes random access memory (RAM)</li> </ul>	<ul style="list-style-type: none"> <li>• Offers a security circuitry to help prevent unauthorized access to RAM</li> <li>• Flash contents help to reduce system power consumption</li> </ul>
<ul style="list-style-type: none"> <li>• 256 byte USB RAM</li> </ul>	<ul style="list-style-type: none"> <li>• Provides data buffering to improve data transfer rate</li> </ul>
<b>Power-Saving Modes</b>	
<ul style="list-style-type: none"> <li>• Wait plus two stop modes</li> </ul>	<ul style="list-style-type: none"> <li>• Allows uninterrupted sampling application in a reduced power state which reduces overall system power consumption</li> </ul>
<b>Clock Source Options</b>	
<ul style="list-style-type: none"> <li>• Clock source options include crystal, resonator and external clock</li> <li>• Multi-purpose clock generator (MCG)—PLL and FLL;</li> <li>• Internal reference clock with trim adjustment</li> <li>• Option to drive USB module with 32.768 kHz crystal</li> </ul>	<ul style="list-style-type: none"> <li>• Optimizes power consumption and provides flexibility to user</li> <li>• Multiple clock options provide design feasibility.</li> </ul>

## Features

## Benefits

### Peripherals

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• USB device module</li></ul>  | <ul style="list-style-type: none"><li>• Full-speed USB 2.0 (12 Mbps) module with dedicated on-chip 3.3V regulator</li><li>• Supports control, interrupt, isochronous and bulk transfer</li></ul>                                 |
| <ul style="list-style-type: none"><li>• Serial Communications Interface (SCI) module with optional 13 bit break.</li></ul>   | <ul style="list-style-type: none"><li>• Provides standard UART communications peripheral</li><li>• Allows full-duplex, asynchronous, NRZ serial communication between MCU and remote devices</li></ul>                           |
| <ul style="list-style-type: none"><li>• Serial Peripheral Interface (SPI) - A single 8-bit or 16-bit module with receive data buffer (RDB) hardware match function</li></ul> | <ul style="list-style-type: none"><li>• Delivers fast communication to and from peripheral devices.</li></ul>  |
| <ul style="list-style-type: none"><li>• TPM — Up to 2-channel 16-bit timer/pulse-width modulator (TPM) module</li></ul>  | <ul style="list-style-type: none"><li>• Allows selectable input capture, output compare, and edge-aligned PWM capability on each channel</li><li>• Can be configured for buffered, centered PWM (CPWM) on all channels</li></ul> |
| <ul style="list-style-type: none"><li>• RTC—(Real-time counter) 8-bit modulus counter with binary or decimal based prescaler</li></ul>                                       | <ul style="list-style-type: none"><li>• Improves task-scheduling for applications requiring Time of Day calendar functions. Frees up timers for other activities.</li></ul>  |

### Input/Output

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• 8 interrupt pins with selectable polarity</li></ul>                          | <ul style="list-style-type: none"><li>• Offers flexibility by interfacing to a large number of pins that are capable of generating interrupts.</li></ul> |
| <ul style="list-style-type: none"><li>• 12 general purpose input/output (GPIO) pins and 2 output only pins</li></ul> | <ul style="list-style-type: none"><li>• Results in a large number of flexible I/O pins</li></ul>   |

### System Protection

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• A watchdog Computer Operating Properly (COP) module that can be reset with option to run from dedicated 1-kHz internal clock source or bus clock</li></ul> | <ul style="list-style-type: none"><li>• Provides system protection using backup oscillator by resetting the MCU to a known state.</li></ul>   |
| <ul style="list-style-type: none"><li>• Low-voltage detection with reset or interrupt; selectable trip points</li></ul>  | <ul style="list-style-type: none"><li>• Built in system protection to help secure data and warn of possible voltage loss conditions.</li></ul>  |
| <ul style="list-style-type: none"><li>• Illegal opcode detection with reset</li></ul>  | <ul style="list-style-type: none"><li>• Allows the device to recognize erroneous code and resets the processor to help avoid lock-up states</li></ul>                                 |
| <ul style="list-style-type: none"><li>• Illegal address detection with reset</li></ul>   | <ul style="list-style-type: none"><li>• Resets the MCU to a known state due to inadvertent access to unimplemented or reserved address space.</li></ul>                               |
| <ul style="list-style-type: none"><li>• Flash block protection</li></ul>   | <ul style="list-style-type: none"><li>• Helps provide security by protecting code from unauthorized reading and guards against unintentional write/erase of user-code/data.</li></ul> |

### Development Support

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• ROM based USB boot loader</li></ul>  | <ul style="list-style-type: none"><li>• Program/erase flash array without using additional development tools</li></ul>   |
| <ul style="list-style-type: none"><li>• Single-wire background debug interface</li></ul>                             | <ul style="list-style-type: none"><li>• Allows developers to use the same interface for multiple platforms</li></ul>   |
| <ul style="list-style-type: none"><li>• On-chip in-circuit emulator (ICE) debug with real time bus capture</li></ul> | <ul style="list-style-type: none"><li>• Grants full access to built-in chip emulation without the added expense of traditional emulator hardware</li><li>• Reduces development time by enabling real-time, on-chip emulation</li></ul> |

## Package Options

Part Number	Temperature Ranges	Package
MC9S08JS16CFK	-40°C to + 85°C	24 QFN
MC9S08JS16CWJ	-40°C to + 85°C	20 SOIC
MC9S08JS8CFK	-40°C to + 85°C	24 QFN
MC9S08JS8CWJ	-40°C to + 85°C	20 SOIC

## Cost-effective Development Tools

### DEMO9S08JS16

**\$79\***

This cost-effective demonstration kit features the JS16 daughter card and getting-started DVD, complete with necessary software, documents and resources. The kit provides support for USB full speed device function. Built-in USB-BDM circuitry is available for debugging and programming, serial communication, and simple logic analyzer.

### DC9S08JS16

**\$10\***

The JS16 daughter card can also be ordered independently for use on the DEMOJM demonstration kit.

### CodeWarrior® Development Studio for Microcontrollers 6.2 Special Edition (Complimentary\*\*)

CodeWarrior Development Studio for Microcontrollers is an integrated tool suite that supports software development for Freescale's microcontrollers.

### Freescale ROM Based USB Boot Loader

A comprehensive USB bootloader in ROM is provided to upgrade the firmware in flash via USB interface. Using Freescale PC GUI, the update process is quick and reliable.

### Freescale USB Stack (Complimentary\*\*)

Freescale provides two comprehensive USB stacks:

- The USB-LITE Stack by CMX
- The USB-MINI Stack by Freescale
- The two stacks enable USB device modes of operation and support several HID and CDC classes.

\*Prices indicated are MSRP

\*\*Subject to license agreement

## Learn More:

For more information about the JS family, please visit [www.freescale.com/usb](http://www.freescale.com/usb).