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MC9S08JM60 Series MCUs

Product Brief

8-bit Low-Cost, Low-Power, High-Performance HCS08 MCU Covers MC9S08JM60 and MC9S08JM32

The 8-bit MC9S08JM devices feature a full-speed USB 2.0 device with internal USB transceiver, 3.3V regulator and USBDP pull-up resistor along with best in class module performance, system integration features, and software support. This family also has up to 60K bytes embedded flash, 4K Bytes RAM, and several serial peripherals such as IIC, SCI and SPI. In addition, these MCUs feature a 12ch 12bit ADC, independently clocked timers and peripherals, and up to 51 GPIO. These devices operate on a 48MHz HCS08 core with a 24MHz bus frequency and have an operating voltage range is from 2.7V to 5.5 V. This JM family is offered in 44LQFP, 48QFN, 64QFP, and 64LQFP packages.

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1 Application Examples

MC9S08JM60 series MCUs are general-purpose devices suitable for a wide range of applications, including:

- Uninterrupted power supplies
- Touch panels
- Gamepads
- Label printers
- Remote controls
- I/O modules
- Industrial networking products
- Stationary barcode scanners
- Barcode printers
- Utility meters
- Industrial printers
- Data loggers
- Automatic drug dispensers
- PC peripherals
- Motion controllers
- Laboratory equipment
- Lighting control systems
- Security control panels
- Cash register printers
- Measurement equipment

2 Features

2.1 MC9S08JM60 Series Family Comparison

Table 1 provides a summary of the different members of MC9S08JM60 series MCUs and their proposed features.

Table 1. Devices in the MC9S08JM60 Series

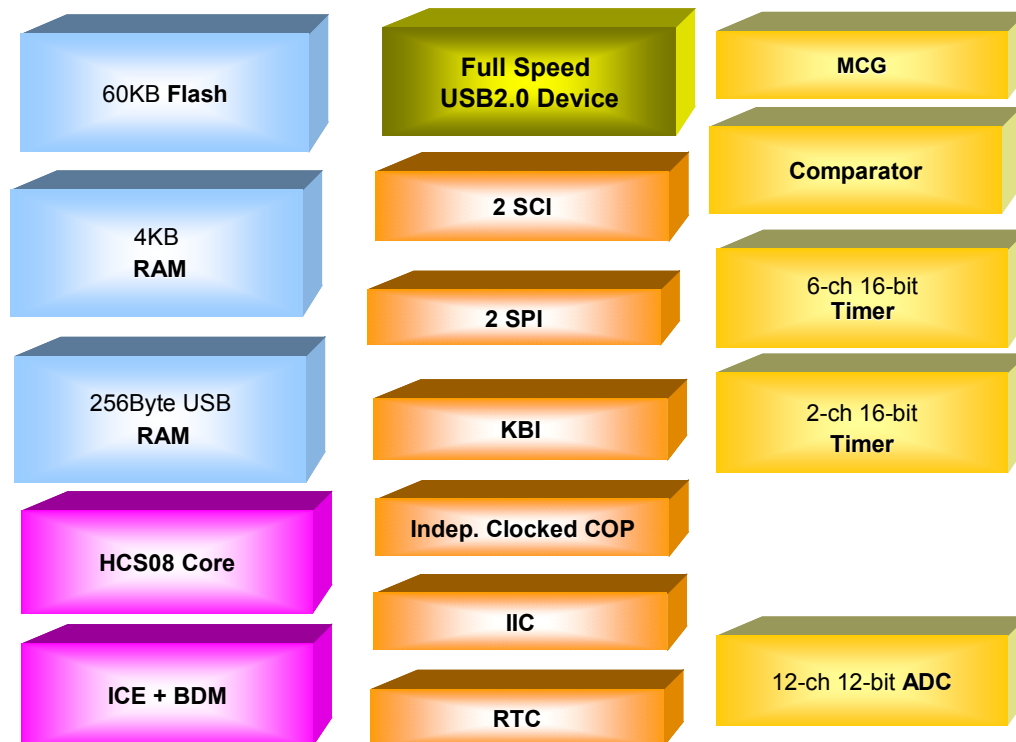
Feature	Device					
	MC9S08JM60			MC9S08JM32		
Package	64-pin	48-pin	44-pin	64-pin	48-pin	44-pin
Flash	60,912			32,768		
RAM	4096			2048		
USB RAM	256			256		
ACMP	yes			yes		
ADC	12-ch	8-ch	8-ch	12-ch	8-ch	8-ch
IIC	yes			yes		
IRQ	yes			yes		
KBI	8	7	7	8	7	7

Table 1. Devices in the MC9S08JM60 Series (continued)

Feature	Device					
	MC9S08JM60			MC9S08JM32		
Package	64-pin	48-pin	44-pin	64-pin	48-pin	44-pin
SCI1	yes			yes		
SCI2	yes			yes		
SPI1	yes			yes		
SPI2	yes			yes		
TPM1	6-ch	4-ch	4-ch	6-ch	4-ch	4-ch
TPM2	2-ch			2-ch		
USB	yes			yes		
I/O pins	51	37	33	51	37	33
Package types	64 QFP 64LQFP	48 QFN	44 LQFP	64 QFP 64LQFP	48 QFN	44 LQFP

2.2 Block Diagram

Figure 1 shows a top-level block diagram for the MC9S08JM60 series.


Figure 1. MC9SJM60 Block Diagram

2.3 Operating Parameters

Table 2. MC9S08JM60 Series Operating Conditions

Parameter		Min	Max
Operating Voltage	V_{DD}	2.7 V	5.5 V
Operating Temperature	T_A	-40 °C	85 °C
Bus Frequency $V_{DD} > 2.7$ V	f_{Bus}	DC	24 MHz

Table 3 shows the design targets for supply currents. These are preliminary targets and are subject to change after the actual devices have been characterized.

Table 3. Supply Current Characteristics

Parameter	V_{DD} (V)	Typical ¹	Unit
Run supply current ² measured at (CPU clock = 2 MHz, f_{Bus} = 1 MHz, BLPE mode)	5	1.1	mA
	3	0.8	
Run supply current ² measured at (CPU clock = 8 MHz, f_{Bus} = 4 MHz, FBE mode)	5	4.9	mA
	3	4.3	
Run supply current ² measured at (CPU clock = 48 MHz, f_{Bus} = 24 MHz, FBE mode)	5	23	mA
	3	22	
Stop2 mode supply current	5	0.8	μ A
	3	0.8	
Stop3 mode supply current	5	0.9	μ A
	3	0.9	
RTC adder to stop2 or stop3 ³	5	300	nA
	3	300	
LVD adder to stop3 (LVDE = LVDSE = 1)	5	110	μ A
	3	90	
USB module enable current ⁴	5	1.5	mA
USB suspend current ⁵	5	270	μ A

NOTES:

- ¹ Typicals are measured at 25°C unless otherwise stated.
- ² Measured at the following conditions: all modules except USB and ADC are active, Oscillator disabled (ERCLKEN = 0), using external clock resource for input, and no DC loads are applied on port pins.
- ³ Auto-wakeup from stop2 or stop3 can be used instead of the higher current wait mode.
- ⁴ Here USB module is enabled and clocked at 48 MHz (USBEN = 1, USBVREN = 1, USBPHYEN = 1 and USBPU = 1), and D+ and D- pull down by two 15.1k Ω resistors independently. The current consumption may be much higher when the packets are being transmitted through the attached cable.
- ⁵ MCU enters into Stop3 mode, USB bus in idle state. The USB suspend current will be dominated by the D+ pull up resistor.

2.4 Packages

MC9S08JM60 series devices are offered in the following packages:

- 64-pin quad flat package (QFP)
- 64-pin low-profile quad flat package (LQFP)

- 48-pin quad flat no-lead (QFN)
- 44-pin low-profile quad flat package (LQFP)

2.5 Chip-Level Features

- New high speed S08 platform, HCS08 core can run under 48 MHz
- On-chip USB transceiver, 3.3V regulator and USBDP pull-up resistor
- Ideal for USB applications that also require fast speed ADC

2.6 Module Features

2.6.1 8-Bit HCS08 Central Processor Unit (CPU)

- 48 MHz HCS08 CPU (central processor unit)
- 24 MHz internal bus frequency
- HC08 instruction set with added BGND instruction
- Support for up to 32 interrupt/reset sources
- Background debugging system
- Breakpoint capability to allow single breakpoint setting during in-circuit debugging (plus two more breakpoints in on-chip debug module)

2.6.2 On-Chip Memory

- Up to 60 KB of on-chip in-circuit programmable flash memory with block protection and security options
- Up to 4 KB of on-chip RAM
- 256 bytes of USB RAM

2.6.3 Power-Saving Modes

- Wait plus two stops

2.6.4 Clock Source Options

- Clock source options include crystal, resonator, external clock
- MCG (multi-purpose clock generator) supports PLL and FLL modes
- Internal reference clock with trim adjustment

2.6.5 System Protection

- Optional computer operating properly (COP) reset with option to run from independent 1 kHz internal clock source or the bus clock
- Low-voltage detection with reset or interrupt

Features

- Illegal opcode detection with reset
- Illegal address detection with reset

2.6.6 USB Device Controller

- USB 2.0 full-speed (12 Mbps) with dedicated on-chip USB transceiver, 3.3V regulator and USBDP pull-up resistor
- Supports control, interrupt, isochronous, and bulk transfers
- Supports endpoint 0 and up to 6 additional endpoints
- Endpoints 5 and 6 can be combined to provide double buffering capability

2.6.7 Analog-to-Digital Converter (ADC)

- 12-channel, 12-bit analog-to-digital converter with automatic compare function

2.6.8 Analog Comparator (ACMP)

- Analog comparator with option to compare to internal reference
- Operation in stop3 mode

2.6.9 Serial Communications Interface (SCI)

- Two serial communications interface modules with optional 13-bit break LIN extensions

2.6.10 Serial Peripheral Interface (SPI)

- Two 8- or 16-bit selectable serial peripheral interface modules with a receive data buffer hardware match function

2.6.11 Inter-Integrated Circuit (IIC)

- Inter-integrated circuit bus module to operate at up to 100 kbps with maximum bus loading
- Multi-master operation
- Programmable slave address, 10-bit addressing & broadcast modes support
- Interrupt-driven byte-by-byte data transfer

2.6.12 Timer/Pulse-Width Modulator (TPM)

- One 2-channel and one 6-channel 16-bit timer/pulse-width modulator (TPM) module
- Selectable input capture, output compare, and edge-aligned PWM capability on each channel
- Each timer module may be configured for buffered, centered PWM (CPWM) on all channels

2.6.13 Keyboard Interrupt Module (KBI)

- 8-pin keyboard interrupt module

2.6.14 Real-Time Counter (RTC)

- Real-time counter with binary- or decimal-based prescaler

2.6.15 Input/Output

- Up to 51 general-purpose input/output pins
- Software selectable pullups on ports when used as inputs
- Software selectable slew rate control on ports when used as outputs
- Software selectable drive strength on ports when used as outputs
- Master reset pin and power-on reset (POR)
- Internal pullup on RESET, IRQ, and BKGD/MS pins to reduce customer system cost

2.6.16 Debug

- Single-wire background debug interface
- Breakpoint capability to allow single breakpoint setting during in-circuit debugging (plus two more breakpoints in on-chip debug module)
- On-chip in-circuit emulator (ICE) debug module containing three comparators and nine trigger modes; eight deep FIFO for storing change-of-flow addresses and event-only data; debug module supports both tag and force breakpoints

3 Developer Environment

- Cost-effective demonstration kit featuring the daughter cards with built-in USB-BDM circuitry
- CodeWarrior™ Development Studio for Microcontrollers 6.1 supports software development
- Freescale USB-LITE stack by CMX supports HID and CDC class

4 Document Revision History

Table 4. Revision History

Revision	Substantive Change(s)
1	Initial release

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