icrocontrollers

MC9S08GB60/32

Target Applications

> Handheld instruments

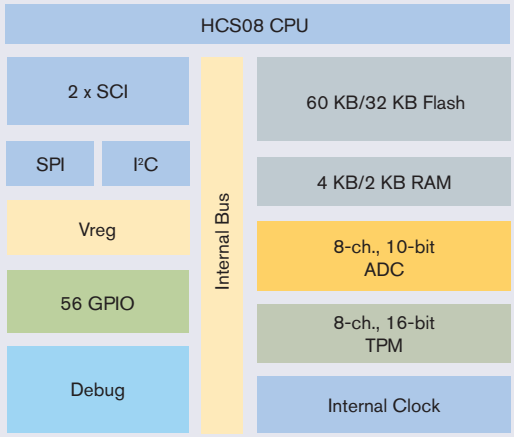
> Utility meters

> Security systems

> Portable consumer devices

Overview

The HCS08 family of microcontrollers is part of the popular and rapidly growing HC08 Family with advanced technology for long battery life, high performance and additional enhancements, such as advanced on-chip development support. Using Freescale Semiconductor's industry-leading, 0.25µ Flash, the GB60/32 offers an upward migration path from Freescale's 68HC05 and 68HC08 architectures for applications that need lower power, more peripherals and higher performance. Other features include two serial communications interfaces (SCIs), a serial peripheral interface (SPI), an analog-to-digital converter (ADC) and eight programmable timer channels.



Features	Benefits
8-bit HCS08 CPU Core	
> Low-power technology ▪ Multiple power management modes, including 20 nA powerdown ▪ Optional autowake-up from Stop 2 or Stop 3 modes with internal timer typically requires only 300 nA additional current ▪ 1.8V operation > High performance when needed ▪ 50 ns minimum instruction cycle time down to 2.1V at 20 MHz bus ▪ 125 ns minimum instruction cycle time down to 1.8V at 8 MHz bus > C-optimized architecture with multiply and divide instructions	> Extends battery life with flexible power management > Designed to provide the higher performance required of many 8-bit applications while allowing low-power 1.8V operation > C-optimized architecture produces extremely compact code with full 16-bit stack-pointer and stack-relative addressing > Multiply and divide instructions increase performance while reducing code size
On-Chip Debug Interface	
> Single-wire background debug mode > On-chip trace buffer with nine flexible trigger modes and multiple hardware breakpoints > Nonintrusive emulation	> Real-time emulation of MCU functions at full operating voltage and frequency range with no limitations as compared to traditional emulators > On-chip trigger and buffer hardware replaces an emulator's expensive bus state analyzer > Nonintrusive debugging through a single, dedicated pin helps eliminate the need and cost of cumbersome emulator cables > View and change internal registers and memory while running application
Integrated Third-Generation Flash Memory	
> In-application reprogrammable > Self-timed, fast programming ▪ Can program 8 bits in 20 µs ▪ Fast Flash page erase › 20 ms (512B) > 10K write/erase cycles minimum, 100K typical > 15-year minimum data retention, 100 years typical > Internal program/erase voltage generation > Fine Flash granularity—512B Flash erase/1B Flash program > Flexible block protection and enhanced security	> Program Flash down to 2.1V; read down to 1.8V > Ultra-fast programming reduces system cost (up to 100x faster than most embedded Flash) > Command programming interface virtually eliminates complex programming algorithms > Flexibility/maximum creativity—Flash-based systems can be reprogrammed many times during development cycle or late into the manufacturing cycle and can make in-application upgrades in the field > Flash easily used for data EEPROM

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Features	Benefits
Internal Clock Generator	
> Programmable frequency-locked loop (FLL) generates 8 MHz to 40 MHz (for bus rates up to 20 MHz) > Post-FLL divider gives one of eight bus rate dividers > Trimmable with temperature and voltage compensation (<2 percent drift) > Provides multiple options for clock sources and in-application clock switching ▪ 32 kHz to 16 MHz external crystal/resonator ▪ Internal clock generator ▪ External clock	> Designed to reduce board space and system costs by eliminating external components > Allows fast start-up from low power modes > Improved accuracy across temperature and voltage allows reliable serial communications with no external clock components > Improved flexibility when making choices between cost, precision, current draw and performance > Designed to eliminate noise due to external clock components
10-bit Analog-to-Digital Converter (ADC)	
> Eight-channel ADC > 14 µs, 10-bit single conversion time	> Fast, easy conversion from analog inputs, such as temperature, pressure and fluid levels, to digital values > Robust specified operation down to 1.8V
Timer with Eight Programmable Channels	
> Three-channel and five-channel, 16-bit timer systems > Each channel programmable for ▪ Input capture, output compare or buffered pulse-width modulator (PWM) ▪ PWM can be edge- or center-aligned > 16-bit free-running or up/down (CPWM) count operation	> Flexible, programmable timer system > Center-aligned PWMs are designed to allow noise minimization by distributing the edges of PWMs
Extensive Serial Communications	
> Dual asynchronous SCIs ▪ Flexible 13-bit module-based baud rate generators ▪ Double-buffered receive and transmit > Synchronous SPI ▪ Up to 5 Mbps > Inter-IC (I^2C) bus ▪ Multimaster operation ▪ 256 clock options	> Asynchronous communication between the MCU and a terminal, computer or a network of microcontrollers with accurate baud rate matching > High-speed synchronous communication between multiple MCUs or between MCU and serial peripherals > Designed to provide a simple, efficient method of data exchange between devices
System Protection	
> Selectable low-voltage detect/reset at nominal 1.8V > Low-battery warning at nominal 2.4V or 2.1V > COP watchdog timer	> Designed to reduce system cost > Designed to improve reliability by resetting the MCU in the event of code runaway or when voltage drops below trip point
56 Input/Output (I/O) Lines	
> Programmable pull-ups > High-current drivers > Eight keyboard interrupts > Controlled rise/fall times minimize noise	> Designed to reduce system cost > Designed to allow direct drive of LED and other circuits to eliminate external drivers and reduce system costs

Cost-Effective Development Tools

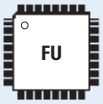
For more information, please refer to the Freescale Development Tool Selector Guide (SG1011).

M68DEMO908GB60 ***$49***	MC9S08GB60 Demonstration Board: battery-operated board with dual serial ports, switches, LEDs and small proto area
M68EVB908GB60 ***$249***	MC9S08GB60 Evaluation Board: evaluation board with LCD display, large breadboard area and universal power supply
USBMULTILINKBDM ***$99***	Universal HCS08/HCS12 in-circuit emulator, debugger and Flash programmer; USB PC interface
M68CYCLONEPRO ***$499***	HC08/HCS08/HC12/HCS12 stand-alone Flash programmer or in-circuit emulator, debugger, Flash programmer; USB, serial or Ethernet interface options
CWX-H08-SE ***Free***	CodeWarrior™ Special Edition for HC(S)08 MCUs; includes integrated development environment (IDE), linker, debugger, unlimited assembler, Processor Expert™ auto-code generator, full-chip simulation and 16 KB C compiler

Package Options

Part Number	Package	Temp. Range
MC9S08GB32CFU	64 QFP	-40°C to +85°C
MC9S08GB60CFU	64 QFP	-40°C to +85°C

64-Pin QFP
8 mm Pitch
14 mm x 14 mm Body



Learn More: For more information about Freescale's products, visit **www.freescale.com**.

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