



The HCS08 IP from IPextreme is the same 8-bit HCS08 microcontroller core implemented in Freescale's MC9S08xx family devices. Building on decades of leadership in the 8-bit microcontroller domain, the HCS08 extends Freescale's popular 68HC08 architecture, offering improved debug support and additional addressing modes to improve C code efficiency.

The HCS08 also provides a migration path to Freescale's 32-bit ColdFire® architectures. HCS08 and V1 ColdFire use the same single-pin debug interface and share a common set of development tools. With Freescale's CodeWarrior integrated development environment, assembly code for the HCS08 can be retargeted to the V1 ColdFire processor with just a few mouse clicks.

FEATURES

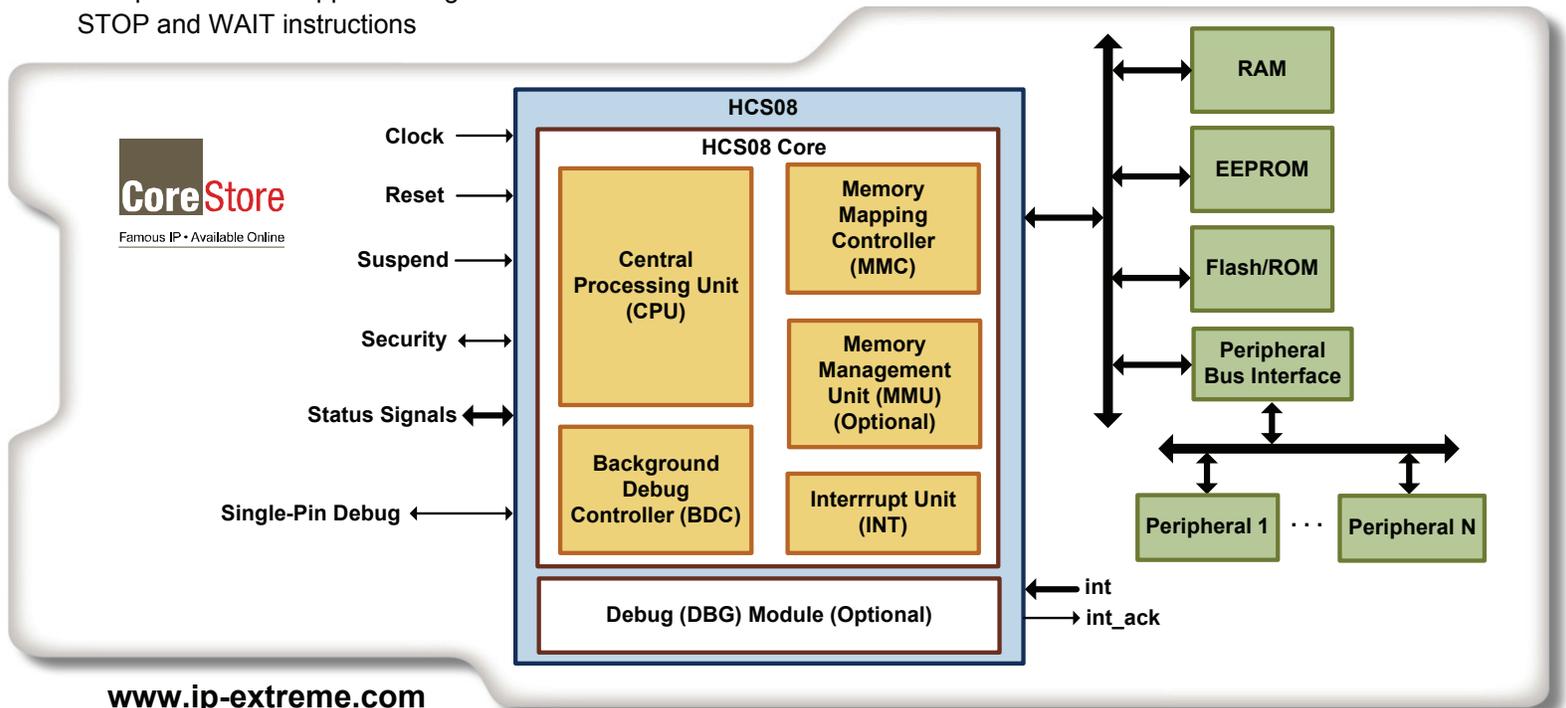
- ▶ 8-bit processor core with 16 or 17-bit address bus, depending on memory configuration
- ▶ 64-KB accessible program/data memory space (extended to up to 128 KB by an optional integrated Memory Management Unit (MMU))
- ▶ 68HC08 instruction set with added BGND instruction
- ▶ Additional addressing modes for the LDHX, STHX, and CPHX instructions improve C code efficiency
- ▶ 48 vectors for interrupt and reset sources
- ▶ Low-power mode support through the execution of the STOP and WAIT instructions

- ▶ Illegal address detection and management
- ▶ Security management
- ▶ Suspend mode to support initialization of memories before executing the first instruction
- ▶ Debug support through Background Debug Controller (BDC) module with single-wire interface to debug host
- ▶ Optional Debug (DBG) module for on-chip trace and enhanced breakpoint capabilities
- ▶ Fully-synthesizable, synchronous design
- ▶ Functional I/O signals registered at the core boundary

CONFIGURABLE MEMORY MAP

You can configure the HCS08 memory map to match any of 47 popular Freescale HCS08-based devices. The configuration that you select determines the address ranges assigned to RAM, EEPROM, flash/ROM, Direct Page registers, and High Page registers. The configuration that you select also determines whether or not the MMU and DBG module are included. For example, if you select the MC9S08DZ128 configuration, the HCS08 includes the MMU and can address up to 128 KB (17-bit address bus), using both memory paging and linear addressing.

The MC9S08DZ128 configuration also includes the DBG module. For devices that include the DBG module, you can choose to remove the DBG module from your HCS08 IP configuration. For example, you can include the DBG module for prototyping and software development, then exclude the DBG module from your production devices.



DEBUG SUPPORT

An integrated BDC module provides sophisticated, non-intrusive software debugging and in-circuit programming of non-volatile memory. BDC features include:

- Single-wire interface to host development system
- SYNC command to determine communication rate
- BDC registers not located in memory map
- Background Debug Mode (BDM) out of reset
- BGND instruction or BACKGROUND command to enter BDM
- Foreground commands for memory access
- Background commands for CPU register access
- GO, GO_UNTIL, and TRACE1 commands
- One hardware address breakpoint built into BDC
- BACKGROUND command can wake CPU from WAIT or STOP mode
- Hardware handshake protocol to increase the performance of the serial communication
- Self-clocked interface for reliable serial communication using either CPU clock or dedicated (asynchronous) debug clock
- Debug clock can be disabled when BDC is not in use
- Special secure operation mode

The optional DBG module provides enhanced debug capabilities including:

- On-chip trace support using integrated FIFO with flexible triggering capabilities
- Address/data comparators generating FIFO triggers and/or breakpoints

ECOSYSTEM

Freescale provides a complete development environment for the HCS08. Freescale's CodeWarrior suite for S08 and V1 ColdFire includes an assembler, compiler, debug suite with flash programming, device initialization, and advanced features such as profile analysis and code coverage. Protocol stack and driver software is also available, including a complimentary USB stack.

Freescale also offers a demonstration/development hardware platform with interchangeable daughter cards containing the S08-based MC9S08QE128 and V1 ColdFire-based MCF51QE128 microcontrollers. For more information, go to www.freescale.com.

Development tools for the HCS08 are also available from [IAR Systems](#), [Cosmic Software](#), [P&E Microcomputer Systems](#), and many other commercial and open source providers.

GATE COUNT AND PERFORMANCE

Gate count and maximum frequency depend on synthesis tool and target technology. Example values for a typical 90-nm technology are:

- 8K–11K (NAND2 equivalent) gates depending on configuration
- Up to 200 MHz; maximum system frequency depends on memory performance

DELIVERABLES

The HCS08 is available in either of two product packages:

- The source (SRC) package includes fully configurable, synthesizable Verilog source code for the HCS08.
- The encrypted (ENC) package, available from the IPextreme Core Store, includes encrypted Verilog source code for the MC9S08AC16/MC9S08AC16A configuration of the HCS08 with the DBG module excluded.

Both packages also include:

- Integration testbench and tests
- Documentation
- Scripts for simulation and synthesis with support for common EDA tools

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