

MC9S08QE128

8-bit Fact Sheet



Target Applications

- Health care monitoring and instrumentation
- HVAC and building control
- Gas, water and heater meters
- Security cameras
- Digital cameras
- Measurement equipment

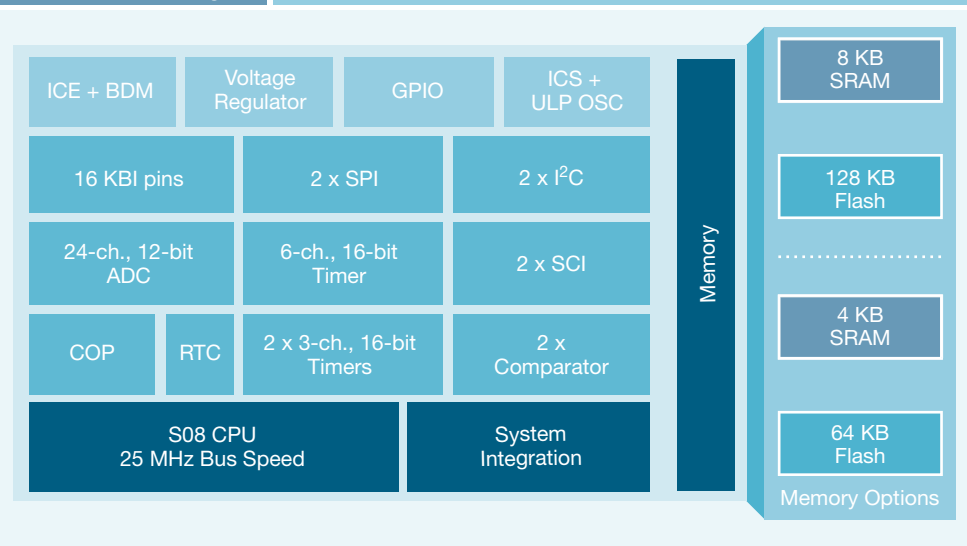
Overview

The Flexis™ series of controllers is the connection point on the Freescale Controller Continuum, where 8- and 32-bit compatibility becomes reality. The Flexis series includes complementary families of 8-bit S08 and 32-bit ColdFire® V1 microcontrollers that share a common set of peripherals and development tools to deliver the ultimate in migration flexibility. The QE family, comprised of a pin-compatible 8-bit and 32-bit device duo, is the first family in the Flexis series.

The S08QE128 device pushes the boundaries of 8-bit performance with up to 128 KB of flash memory and a 24-channel, 12-bit analog-to-digital converter (ADC). The S08QE128 includes up to 3.6V supply voltage, a 50 MHz CPU core and three timers for improved motor control—perfect for health care monitoring instrumentation and electronics such as digital and web cameras.

The 8-bit S08QE128 is pin-, peripheral- and tool-compatible with the 32-bit MCF51QE128 device, providing unprecedented design freedom across the performance spectrum.

S08QE128 Block Diagram



Features	Benefits
8-bit HCS08 Central Processing Unit (CPU) <ul style="list-style-type: none"> • Up to 50.233 MHz HCS08 CPU from 2.1V to 3.6V, and 20 MHz CPU at 1.8V to 2.1V across temperature range of -40°C to +85°C • HCS08 instruction set with added BGND instruction 	<ul style="list-style-type: none"> • Offers high performance, even at low voltage levels for battery-operated applications • Provides bus speed operation of 25.117 MHz from 2.1V to 3.6V and 10 MHz from 1.8 to 2.1V • Easy to learn and use architecture • Backward object code compatibility with 68HC08 and 68HC05 for reuse of existing libraries can still be used • Allows for efficient, compact module coding in assembly or C compiler • BGND allows user to enter background debug mode that takes advantage of on-chip in-circuit emulator (ICE)
<ul style="list-style-type: none"> • Support for up to 32 interrupt/reset sources 	<ul style="list-style-type: none"> • Allows for software flexibility and optimization for real-time applications
On-Chip Memory <ul style="list-style-type: none"> • Up to 128 KB flash read/program/erase over full operating voltage and temperature • Up to 8 KB random-access memory (RAM) 	<ul style="list-style-type: none"> • Allows user to take full advantage of in-application, reprogrammability benefits in virtually any environment • Security circuitry prevents unauthorized access to RAM and flash contents to reduce system power consumption
Power-Saving Modes <ul style="list-style-type: none"> • Two ultra-low-power (ULP) stop modes, one of which allows limited use of peripherals • New ULP power wait mode • 6 μs typical wake up time from stop3 mode • Internal clock Source (ICS)—Module containing a frequency locked-loop (FLL) controlled by internal or external reference • Oscillator (OSC)—Loop-control Pierce oscillator; crystal or ceramic resonator range of 31.25 kHz to 38.4 kHz or 1 MHz to 16 MHz 	<ul style="list-style-type: none"> • Allows continued application sampling in a reduced power state which extends battery life • Eliminates use of an external clock source. This ultimately reduces system costs associated with development • Includes ultra-low-power OSC for accurate timebase in low-power modes

Features	Benefits
Peripherals <ul style="list-style-type: none"> Two analog comparators with option to compare to an internal reference—output can be optionally routed to timer/pulse width modulator (PWM) as input capture trigger Analog Digital Converter (ADC)—24-channel, 12-bit resolution; 2.5 μs conversion time; automatic compare function; 1.7 mV/$^{\circ}$C temperature sensor; internal bandgap reference channel; operation in stop3 2x Serial Communications Interface (SCI)—Two modules offering asynchronous communications, 13-bit break option, flexible baud rate generator, double buffered transmit and receive and optional H/W parity checking and generation 2x SCI (Serial Peripheral Interfaces)—Two modules with full-duplex or single-wire bidirectional; double-buffered transmit and receive; master or slave mode; MSB-first or LSB-first shifting Time pulse-width modulation (TPM)—one 6-channel (TMP3) and two 3-channel (TPM1 and TPM2); selectable input capture, output compare, or buffered edge- or center-aligned PWM on each channel Two I²C with up to 100 kbps with maximum bus loading; multi-master operation; programmable slave address; interrupt-driven byte-by-byte data transfer; supports broadcast mode and 10-bit addressing 	<ul style="list-style-type: none"> Requires only single pin for input signal, freeing additional pins for other use Allows other components in system to see result of comparator with minimal delay Can be used for single slope ADC and RC time constant measurements Having 24 channels allows up to 24 analog devices to be sampled at extremely high speeds. Full functionality across operational voltage of the MCU Provides standard UART communications peripheral Allows full-duplex, asynchronous, NRZ serial communication between MCU and remote devices Edge interrupt can wake up MCU from low-power mode Having two SPI provides dedication to two separate devices. An example would be to have one SPI dedicated to a ZigBee[®]-ready transceiver and the other for MCUs or peripherals Three TPMs allow for three different time bases, with a total of twelve timer channels Two I²C ports enable increased system memory by using an additional I²C EEPROM. This also creates an opportunity to add an additional I²C device
Input/Output <ul style="list-style-type: none"> 70 GPIO (General Purpose Input/Output), one input-only and one output-only pin 16 Keyboard Interrupts (KBI) pins with selectable polarity 	<ul style="list-style-type: none"> Results in large number of flexible I/O pins that allow developers to easily interface device into their own designs Can be used for reading input from a keypad or used as general pin interrupts
System Protection <ul style="list-style-type: none"> Watchdog computer operating properly (COP) reset with option to run from dedicated 1 kHz internal clock source or bus clock Low-voltage detection with reset or interrupt; selectable trip points Illegal op code detection with reset Flash block protection 	<ul style="list-style-type: none"> Allows device to recognize runaway code (infinite loops) and resets processor to avoid lock-up states Alarms the developer of voltage drops outside of the typical operating range Allows the device to recognize erroneous code and resets the processor to avoid lock-up states Prevents unintentional programming of protected flash memory, which greatly reduces the chance of losing vital system code for vendor applications
Development Support <ul style="list-style-type: none"> Single-wire background debug interface Breakpoint capability 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 	<ul style="list-style-type: none"> Allows developers to use the same hardware cables between S08 and ColdFire V1 platforms Allows single breakpoint setting during in-circuit debugging (plus three more breakpoints in on-chip debug module) Provides built-in full emulation without expense of traditional emulator

Package Options		
Part Number	Temp. Range	Package
MC9S08QE128CLK	-40 $^{\circ}$ C to +85 $^{\circ}$ C	80 LQFP
MC9S08QE128CLH	-40 $^{\circ}$ C to +85 $^{\circ}$ C	64 LQFP
MC9S08QE128CFT	-40 $^{\circ}$ C to +85 $^{\circ}$ C	48 QFN
MC9S08QE128CQD	-40 $^{\circ}$ C to +85 $^{\circ}$ C	44 QFP
MC9S08QE128CLC	-40 $^{\circ}$ C to +85 $^{\circ}$ C	32 LQFP
MC9S08QE64CLH	-40 $^{\circ}$ C to +85 $^{\circ}$ C	64 LQFP

Cost-Effective Development Tools

DEMOQE128

\$99*

Cost-effective demonstration kit, including the S08 and ColdFire[®] V1 daughter cards, as well as a serial port and built-in USB-BDM cable for debugging and programming.

EVBQE128

\$325*

Full-featured evaluation system for the QE128 device family. This evaluation system enables full evaluation of both the MC9S08QE128 and MCF51QE128 devices.

CodeWarrior[®] Development Studio for Microcontrollers 6.0

Complimentary** Special Edition

CodeWarrior Development Studio for Microcontrollers is a single tool suite that supports software development for Freescale's 8- and 32-bit ColdFire V1 microcontrollers. Designers can further accelerate application development with the help of Processor Expert, an award-winning rapid application development tool integrated into the CodeWarrior tool suite.

* Prices indicated are MSRP

** Subject to license agreement

Learn More:

For more information about the Flexis QE family, please visit www.freescale.com/flexis.