Microcontrollers

MC9S12C32

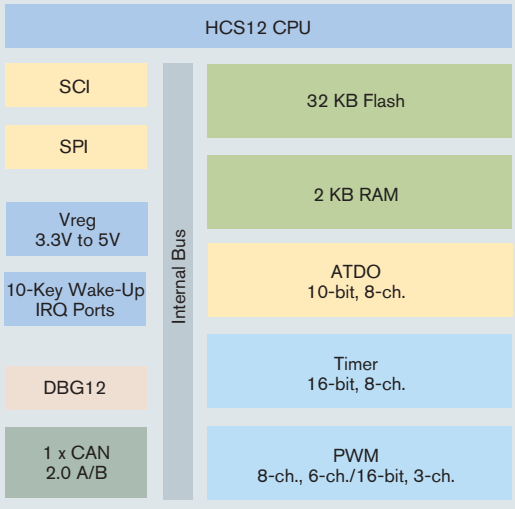
Target Applications

> Automotive applications

> Industrial control

Overview

Freescale Semiconductor's HCS12 family of microcontrollers (MCUs) is the next generation of the highly successful 68HC12 architecture. Using Freescale's industry-leading, 0.25 µs Flash, the MC9S12C32 is part of a pin-compatible family that scales from 32 KB to 128 KB of Flash memory. The MC9S12C32 provides an upward migration path from Freescale's 68HC08, 68HC11 and 68HC12 architectures for applications that need large memory, many peripherals and high performance.



Features	Benefits
High-Performance 16-bit HCS12 CPU Core	
> 25 MHz bus operation at 3.3V to 5V for 40 ns minimum instruction cycle time	> Opcode compatible with the 68HC11 and 68HC12 > C-optimized architecture produces extremely compact code
On-Chip Debug Interface	
> Single-wire background debug mode > On-chip trace buffer with nine flexible trigger modes and multiple hardware breakpoints > Non-intrusive emulation	> Real-time emulation of MCU functions at full operating voltage and frequency range with no limitations like traditional emulators > Real-time in-circuit emulation and debug without expensive and cumbersome box emulators > Read/write memory and registers while running at full speed > Bus state analysis without the expense of a traditional emulator
Network Module	
> One MSCAN module implementing the CAN 0 A/B protocol ▪ Five receive buffers per module with FIFO storage scheme ▪ Three transmit buffers per module with internal prioritization	> Programmable bit rate up to 1 Mbps > FIFO receive approach superior for event-driven networks
Integrated Third-Generation Flash Memory	
> In-application reprogrammable > Self-timed, fast programming ▪ Fast Flash page erase—20 ms (512 bytes) ▪ Can program 16 bits in 20 µs while in burst mode > 3.3V to 5V Flash program/erase/read > Flash granularity—512 byte Flash erase/ 2 byte Flash program > Flexible block protection and security	> Flexibility to change code in the field > Efficient end of line programming > Total program time for 128 KB code is less than five seconds > Reduces production programming cost through ultra-fast programming > No external high voltage or charge pump required > Virtual EEPROM implementation, Flash array usable for EE extension
10-bit Analog-to-Digital Converter (ADC)	
> One 8-channel ADC > 7 µs, 10-bit single conversion time; scan mode available	> Fast, easy conversion from analog inputs like temperature, pressure and fluid levels to digital values for CPU processing
Timer Module	
> 8-channel timer, each channel configurable as either input capture or output compare > Simple pulse width modulation (PWM) mode > 16-bit pulse accumulator	> Flexible, programmable timer system

freescale semiconductor

Features	Benefits
Clock Reset Generator Module	
> Clock monitor	> Reliable, robust operation
> Clock generation	> Provides high performance using cost-effective reference crystals
> Reset generation	> Reduces generated noise
> Phase-lock loop (PLL) clock frequency multiplier	> Reduces power consumption
> Limp home mode	> Easily able to implement real-time clock
> Real-time interrupt	
> Watchdog	
8-bit or 16-bit Pulse Width Modulation (PWM)	
> 6-channel, 8-bit or 3-channel, 16-bit PWM	> Efficiently implement motor control, battery charging or digital-to-analog (DAC) functions
> PWM supports center-aligned or left-aligned output	
> Separate control for each pulse width and duty cycle	
> Programmable clock select logic with a wide range of frequencies	
> Fast emergency shutdown input	
One Serial Communications Interface	
> 8192 prescaler option	> Asynchronous communication between the MCU and a terminal, computer or a network of MCUs
	> Exact baud rate matching
One Serial Peripheral Interface	
> Up to 6.25 Mbps	> High-speed synchronous communication between multiple MCUs or between MCU and serial peripherals
Up to 58 Input/Output (I/O) Lines	
> Programmable pull-ups/pull-downs	> Reduced system cost
> Dual drive capability	> Ability to tailor application for minimum EMC or high current loads

Application Notes and Engineering Bulletins

AN2206	Security and Protection on the HCS12 Family
AN1280	Using and Extending D-Bug12 Routines
AN2255	MSCAN Low-Power Applications
AN2287	HCS12 External Bus Design
AN2302	EEPROM Emulation for the MC9S12C32
BCANPSV2.0	Bosch Controller Area Network (CAN) Version 2.0 Protocol Standard
HCS12CFAMILYPP	HCS12 C-Family Product Proposal

Package Options

Part Number	Package	Temp. Range
MC9S12C32CFA	48 LQFP	-40°C to +85°C
MC9S12C32VFA	48 LQFP	-40°C to +105°C
MC9S12C32MFA	48 LQFP	-40°C to +125°C
MC9S12C32CPB	52 LQFP	-40°C to +85°C
MC9S12C32VPB	52 LQFP	-40°C to +105°C
MC9S12C32MPB	52 LQFP	-40°C to +125°C
MC9S12C32CFU	80 QFP	-40°C to +85°C
MC9S12C32VFU	80 QFP	-40°C to +105°C
MC9S12C32MFU	80 QFP	-40°C to +125°C

48-Pin LQFP
0.5 mm Pitch
7 mm x 7 mm Body

52-Pin LQFP
0.65 mm Pitch
10 mm x 10 mm Body

80-Lead QFP/LQFP
0.65 mm Pitch
14 mm x 14 mm Body

Data Sheets

9S12C32DGV1	MC9S12C32 Device User Guide
9S12DP256BDGV2	MC9S12A256 Device Guide
S12DP256BPIMV2	MC9S12A256 Port Integration Module Block Guide
S12ATD10B8CV2	HCS12 10-bit 8-channel Analog to Digital Block Guide
S12BDMV4	HCS12 Background Debug (BDM) Block Guide
S12BKVD1	HCS12 Breakpoint (BKP) Block Guide
S12CPUV2	HCS12 CPU Reference Manual
S12CRGV2	HCS12 Clock Reset Generator Block Guide
S12ECT16B8CV1	HCS12 16-bit 8-channel Enhanced Capture Timer Block Guide
S12EETS4KV2	HCS12 4K EEPROM Block Guide
S12FTS256KV2	HCS12 256K Flash Block Guide
S12IICV2	HCS12 I²C Block Guide
S12INTV1	HCS12 Interrupt (INT) Block Guide
S12MEBIV3	HCS12 Multiplexed External Bus Interface (MEBI) Block Guide
S12MMCV4	HCS12 Module Mapping Control (MMC) Block Guide
S12PWM8B8CV1	HCS12 8-bit 8-channel Pulse-Width Modulator Block Guide
S12SCIV2	HCS12 Serial Communications Interface Block Guide
S12SPIV2	HCS12 Serial Peripheral Interface Block Guide
S12VREGV1	HCS12 Voltage Regulator Block Guide

Cost-Effective Development Tools

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

M68MOD912C32 ***$24.95***	MC9S12C32 MCU module board; stand-alone MCU board in a 32-pin DIP form factor
M68DKIT912C32 ***$49.95***	MC9S12C32 demo kit that includes docking board, M68MOD912C32 and power supply
M68DKIT912C32-E ***$64.95***	Universal Power supply included
M68EVB912C32 ***$150***	Evaluation board for development and evaluation of MC9S12C32 application code
M68EVB912C32E ***$170***	Universal Power supply included
M68CYCLONEPRO ***$499***	HC08/HCS08/HC12/HCS12 stand-alone Flash programmer or in-circuit emulator, debugger, Flash programmer; USB, serial or Ethernet interface options
USBMULTILINKBDM ***$99***	Universal HCS08/HCS12 in-circuit emulator, debugger, and Flash programmer; USB PC interface
CWX-H12-SE ***Free***	CodeWarrior™ Special Edition for HCS12 MCUs; includes integrated development environment (IDE), linker, debugger, unlimited assembler, Processor Expert™ auto-code generator, full-chip simulation and limited C compiler

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

Document Number: MC9S12C32FS
REV 1

freescale semiconductor