16-bit Microcontrollers

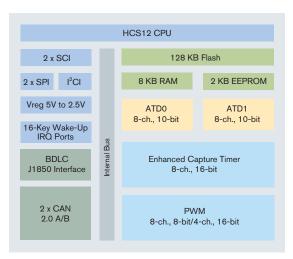
MC9S12DJ128

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 MC9S12DJ128 is part of a pin-compatible family that scales from 32 KB to 512 KB of Flash memory. The DJ128 provides an upward migration path from Freescale's 68HC08, 68HC11 and 68HC12 architectures for applications that need larger memory, more peripherals and higher performance. Also, with the increasing number of CAN/J1850-based electronic control units (ECUs), its multiple network modules support this environment by enabling highly efficient communications between different network buses.



Features Benefits High-Performance 16-bit HCS12 CPU Core > Opcode compatible with the 68HC11 > 25 MHz bus operation at 5V for 40 ns minimum instruction cycle time and 68HC12 > C-optimized architecture produces extremely compact code **On-Chip Debug Interface** > Dedicated serial debug interface > Real-time in-circuit emulation and debug without expensive and cumbersome > On-chip breakpoints box emulators > Read/write memory and registers while running at full speed

Network Modules

- > Two msCAN module implementing the CAN 2.0 A/B protocol
 - Five receive buffers per module with FIFO storage scheme
 - Three transmit buffers per module with internal prioritization
- > One J1850 module

- > Ability to link modules for higher buffer count
- > Programmable bit rate up to 1 Mbps
- > FIFO receive approach superior for event-driven networks
- > Ability to send and receive messages across an SAE J1850 serial communication network

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
- > 5V Flash program/erase/read
- > Flash granularity—512 byte Flash erase/2 byte Flash program
- > Two independently programmable Flash arrays
- > 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
- > Can erase one array while executing code from another

2 KB Integrated EEPROM

- > Flexible protection scheme for protection against accidental program or erase
- > EEPROM can be programmed in 46 μs
- Can erase 4 bytes at a time and program 2 bytes at a time for calibration, security, personality and diagnostic information

10-bit Analog-to-Digital Converter (ADC)

- > Two, 8-channel ADCs
- > 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
- Can effectively have 3.5 μs conversion time by sampling same signal with both ADCs



Features Benefits Clock Generation Module with Phase-Lock Loop (PLL) > Clock monitor with self clock mode in case > Reliable, robust operation of no external clock > Provides high performance using low-cost > Programmable clock frequency with 1024 reference crystals options ranging from divide by 16 to multiply > Reduces generated noise by 64 from base oscillator > Reduces power consumption > Real-time interrupt Easily able to implement real-time clock > Watchdog **Enhanced Capture Timer** > Flexible, programmable timer system > 8-channel, 16-bit with input capture, output compare and pulse accumulator > 16-bit modulus down counter 8-bit or 16-bit Pulse-Width Modulation (PWM) > 8-channel, 8-bit or 4-channel, 16-bit PWM > Efficiently implement motor control, battery charging or digital-to-analog (DAC) functions > PWM supports center-aligned operation **Two Serial Communications Interfaces** > 8192 prescaler options > Asynchronous communication between the MCU and a terminal, computer or a network of MCUs > Exact baud rate matching Two Serial Peripheral Interfaces > Up to 6.25 Mbps > High-speed synchronous communication between multiple MCUs or between MCU and serial peripherals Inter-IC (I2C) Bus > 256 clock-rate options > Provides a simple, efficient method of data exchange between devices > Minimizes the need for large numbers of connections between devices and eliminates he need for an address decoder Up to 91 Input/Output (I/O) Lines > Programmable pull-ups/pull-downs > Reduce system cost > Dual drive capability > Able to tailor application for minimum EMC or high current loads

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Security and Protection on the HCS12 Family				
Using Cosmic Software's M68HC12 Compiler for MC9S12DP256				
MC9S12DP256 Software Development Using Metrowerks CodeWarrior™				
Audio Reproduction on HCS12 Microcontrollers				
Bosch Controller Area Network (CAN) Version 2.0 Protocol Standard				
Byte Data Link Controller Reference Manual				
HCS12 D-Family Compatibility				

Data Sheets

9S12DT128BDGV1 MC9S12DB128, MC9S12DT128B,

MC9S12DG128 & MC9S12DJ128

Device Guide

MC9S12DP256 Port Integration S12DT128PIMV1

Module Block Guide

S12BDMV4 HCS12 Background Debug (BDM)

Block Guide

S12BKVD1 HCS12 Breakpoint (BKP) Block Guide HCS12 CPU Reference Manual S12CPUV2 S12MSCANV2 HCS12 Motorola Scalable Controller Area Network Block Guide

S12ATD10B8CV2 HCS12 10-bit 8-channel Analog to

Digital Block Guide

S12CRGV3 HCS12 Clock Reset Generator

Block Guide

S12ECT16B8CV1 HCS12 16-bit 8-channel Enhanced

Capture Timer Block Guide S12EETS2KV1 HCS12 2K EEPROM Block Guide HCS12 128K Flash Block Guide S12FTS128KV1 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).

M68KIT912DP256

\$495*

Evaluation kit for development and evaluation of HCS12 application code that includes the M68EVB912DP256 and

USBMULTILINKBDM

M68CYCLONEPRO

HC08/HCS08/HC12/HCS12 stand-alone Flash programmer or in-circuit emulator, debugger, Flash programmer; USB, serial or Ethernet interface options

\$99*

USBMULTILINKBDM Universal HCS08/HCS12 in-circuit emulator, debugger, and Flash programmer; USB PC interface

CWX-H12-SE

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

Package Options

Part Number Package Temp. Range -40°C to +85°C MC9S12DJ128BCFU 80 QFP MC9S12DJ128BVFU 80 QFP -40°C to +105°C MC9S12DJ128BMFU 80 QFP -40°C to +125°C MC9S12DJ128BCPV -40°C to +85°C 112 LQFP MC9S12DJ128BVPV **112 LQFP** -40°C to +105°C MC9S12DI128BMPV 112 I OFP -40°C to +125°C





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

