16-bit Microcontrollers

MC9S12DG256

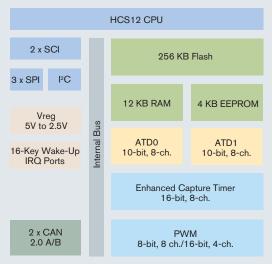
Target Applications

- > Automotive applications
- > Industrial control

Features	Benefits
High-Performance 16-bit HCS12 CPU Core	
> 25 MHz bus operation at 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	
> Dedicated serial debug interface> On-chip breakpoints	 Real-time in-circuit emulation and debug without expensive and cumbersome box emulators
	 Read/write memory and registers while running at full speed
Network Modules	
> Two msCAN modules implementing the CAN 2.0 A/B protocol	 Ability to link modules for higher buffer count
 Five receive buffers per module with FIFO 	> Programmable bit rate up to 1 Mbps
storage scheme Three transmit buffers per module with internal prioritization	 FIFO receive approach superior for event-driven networks
Integrated Third-Generation Flash Memory	
> In-application reprogrammable	> Flexibility to change code in the field
> Self-timed, fast programming	> Efficient end-of-line programming
 Fast Flash page erase—20 ms (512 bytes) 	> Total program time for 256 KB code is less than 10 seconds
 Can program 16 bits in 20 μs while in burst mode 	 Reduces production programming cost through ultra-fast programming
 > 5V Flash program/erase/read > Flash granularity—512 byte Flash 	> No external high voltage or charge pump required
Flash granularity—512 byte Flash erase/2 byte Flash program Four independently programmable	> Virtual EEPROM implementation, Flash array usable for EE extension
Flash arrays	> Can erase one array while executing code
> Flexible block protection and security	from another
4 KB Integrated EEPROM	
 Flexible protection scheme for protection against accidental program or erase 	> Can erase 4 bytes at a time and program 2 bytes at a time for calibration, security,
> EEPROM can be programmed in 46 μ s	personality and diagnostic information



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 MC9S12DG256 is part of a pin-compatible family that scales from 32 KB to 512 KB of Flash memory. The MC9S12DG256 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-based electronic control units (ECUs), its multiple network modules support this environment by enabling highly efficient communications between different network buses.





Features	Benefits			
10-bit Analog-to-Digital Converter (ADC)				
 > Two 8-channel ADC > 7 μs, 10-bit single conversion time, scan mode available 	 Fast, easy conversion from analog inputs like position sensors, analog meters and photovoltaic cells to digital values for CPU processing 			
	> Can effectively have 3.5 µs conversion time by sampling same signal with both ADCs			
Clock Generation Module with Phase-Lock Loop (PLL)				
 Clock monitor with self clock mode in case of no external clock Programmable clock frequency with 1024 options ranging from divide by 16 to multiply by 64 from base oscillator 	> Reliable, robust operation			
	 Provides high performance using low-cost reference crystals 			
	> Reduces generated noise			
 Real-time interrupt 	> Reduces power consumption			
·	> Easily able to implement real-time clock			
 Watchdog Enhanced Capture Timer 				
 > 8-channel, 16-bit with input capture, output compare and pulse accumulator 	> Flexible, programmable timer system			
> 16-bit modulus down counter				
8-bit or 16-bit Pulse-Wide Modulation (PWM)				
> 8-channel, 8-bit or 4-channel, 16-bit PWM	> Efficiently implement motor control, battery			
> PWM supports center aligned operation	charging or digital-to-analog functions			
Two Serial Communications Interfaces				
> 8192 prescaler option	 Asynchronous communication between the MCU and a terminal, computer or a network of MCUs 			
	> Exact baud rate matching			
Three Serial Peripheral Interfaces				
> Up to 6.25 Mbps	 > High-speed synchronous communication between multiple MCUs or between MCU and serial peripherals 			
Inter IC (I ² C) 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 the 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			

Application Notes and Engineering Bulletins

	AN2206	Security and Protection on the HCS12 Family
	AN2213	Using Cosmic Software's M68HC12 Compiler for MC9S12DP256
	AN2216	MC9S12DP256 Software Development Using Metrowerks CodeWarrior™
	AN2250	Audio Reproduction on HCS12 Microcontrollers
	EB386	HCS12 D-Family Compatibility

Data Sheets	
9S12DP256BDGV1	MC9S12DP256 Device Guide
S12DP256PIMV2	MC9S12DP256 Port Integration Module Block Guide
S12BDMV4	HCS12 Background Debug (BDM) Block Guide
S12BKVD1	HCS12 Breakpoint (BKP) Block Guide
S12CPUV2	HCS12 CPU Reference Manual
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
S12EETS4KV2	HCS12 4K EEPROM Block Guide
S12FTS256KV2	HCS12 256K Flash Block Guide
S12IICV2	HCS12 I ² C 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 <i>\$495*</i>	Evaluation kit for development and evaluation of HCS12 application code that includes the M68EVB912DP256 and USBMULTILINKBDM
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

Package Options

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Part Number	Package Temp. Range
MC9S12DG256BCFU	80 QFP -40°C to +85°C
MC9S12DG256BVFU	80 QFP -40°C to +105°C
MC9S12DG256BMFU	80 QFP -40°C to +125°C
MC9S12DG256BCPV	112 LQFP -40°C to +85°C
MC9S12DG256BVPV	112 LQFP -40°C to +105°C
MC9S12DG256BMPV	112 LQFP -40°C to +125°C
80-Lead QFP	112-Lead LQFP
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Learn More: For more information about Freescale products, please visit www.freescale.com.

*Price indicated is MSRP.

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