8-bit Microcontrollers

MC68HC908GR16

Target Applications
> Sensors
> Industrial and consumer communications
> Home appliances
> Security systems

Overview
Freescale Semiconductor's MC68HC908GR16 microcontroller (MCU) uses integrated second-generation Flash and is enhanced with embedded, on-chip functions that eliminate the need for external serial components. The 32 kHz Phase-Lock Loop (PLL) provides cost savings by replacing the need for expensive, high-speed crystals or noisy oscillators. The on-chip timebase module (TBM) further reduces costs by eliminating the need for external real-time clock and wake-up circuitry. Other features of the MC68HC908GR16 are an analog-to-digital converter (ADC), a serial communications interface (SCI), a serial peripheral interface (SPI), low-voltage inhibit (LVI) and a watchdog timer.

HC08 CPU	KBI
16 KB Flash	8-ch., 10-bit ADC
1 KB RAM	ESCI
PLL	SPI
COP	2-ch., 16-bit Timer
LVI	Up to 37 GPIO

Features	Benefits
High-Performance 68HC08 CPU Core	
> 8 MHz bus operation at 5V operation for 125 ns minimum instruction cycle time	> Object code compatible with the 68HC05
> 4 MHz bus operation at 3V for 250 ns minimum instruction cycle time	> Easy to learn and use architecture
> Efficient instruction set, including multiply and divide	> C-optimized architecture provides compact code
> 16 flexible addressing modes, including stack relative with 16-bit stack pointer	
> Fully static, low-voltage, low-power design with wait and stop modes	
Integrated Second-Generation Flash Memory	
> In-application reprogrammable	> Cost-effective programming changes and field software upgrades via in-application programmability and reprogrammability
> Extremely fast programming, encoding 64B in as fast as 2 ms	
> Flash programming across the 68HC08's full operating supply voltage with no extra programming voltage	> Reduces production programming costs through ultra-fast programming
> 10K write/erase cycles minimum over temperature	> Allows reprogrammable battery-powered applications
> 100K write/erase cycles typical	> Byte-writable for data as well as program memory
> Flexible block protection and security	> Protects code from unauthorized reading and guards against unintentional writing/erasing of user-programmable segments of code
10-bit Analog-to-Digital Converter (ADC)	
> 8 channels	> Fast, easy conversion from analog inputs, such as temperature, pressure and fluid levels, to digital values for CPU processing
> Single conversion in 17 µs	
Clock Generation Module with Phase-Lock Loop (PLL)	
> Programmable clock frequency in integer multiples of external crystal reference	> Provides high-performance using low-cost, low-frequency reference crystals
> Crystal reference of 32 kHz to 100 kHz	> Reduces generated noise while still providing high-performance (up to 32 MHz internal clock)
> External clock option with or without PLL	
Four Programmable 16-bit Timer Channels	
> 125 ns resolution at 8 MHz bus	> Each channel independently programmable for input capture, output compare or unbuffered pulse-width modulation (PWM)
> Free-running counter or modulo up-counter	> Pairing timer channels provides a buffered PWM function

Features	Benefits
Timebase Module	
> Eight user-selectable periodic real-time interrupts > Optionally operate in low-power stop mode	> Provides autowake-up from low-power stop mode to maintain real-time clock or check external device status such as sensors
Enhanced Serial Communications Interface	
> UART asynchronous communications system > Flexible baud rate generator > Double-buffered transmit and receive > Optional hardware parity checking and generation	> Enables high-speed asynchronous communication
Serial Peripheral Interface	
> Full-duplex, three-wire synchronous transfers > Maximum master bit rate of 4 MHz for 8 MHz system clock	> High-speed synchronous communication between multiple MCUs or between MCU and serial peripherals > Cost-effective serial peripheral expansion to applications including EEPROM, high-precision analog-to-digital and digital-to-analog converters, and real-time clocks
Computer Operating Properly Watchdog Timer	
	> Issues reset in the event of runaway code
Selectable Trip Point Low-Voltage Inhibit	
	> Improves reliability by resetting the MCU when voltage drops below trip point > Two trip points allow optimum operation in both 5V and 3V nominal systems > Integration reduces system cost
Up to 37 Bidirectional Input/Output (I/O) Lines	
> 10 mA sink/source capability on all I/O pins > 15 mA sink capability on two I/O pins > Keyboard scan with selectable interrupts on four I/O pins > Software programmable pull-ups on 13 I/O pins	> High-current I/O allows direct drive of LED and other circuits to eliminate external drivers and reduce system costs > Keyboard scan with programmable pull-ups eliminates external glue logic when interfacing to simple keypads

Application Notes

AN1050	Designing for Electromagnetic Compatibility (EMC) with HCMOS Microcontrollers
AN1218	HC05 to HC08 Optimization
AN1219	M68HC08 Integer Math Routines
AN1259	System Design and Layout Techniques for Noise Reduction in MCU-Based Systems
AN1263	Designing for Electromagnetic Compatibility with Single-Chip Microcontrollers
AN1705	Noise Reduction Techniques for Microcontroller-Based Systems
AN1752	Data Structures for 8-bit MCUs
AN1831	Using MC68HC908 On-Chip Programming Routines
AN1837	Non-Volatile Memory Technology Overview
AN2093	Creating Efficient C Code for the MC68HC08
EB368	In-Circuit Programming of 68HC908GR8 Flash Memory

Cost-Effective Development Tools

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

DEMO908GZ60 *$49*	Cost-effective demonstration board in a small form factor with a serial port, switches, LEDs, MON08 header, input/output (I/O) header, photocell and potentiometer
FSICEKITGRGZ *$2,195*	Complete FSICE high-performance emulator kit; includes emulator module, cables, head adapters and programming adapters
M68EML08GZ *$495*	Emulation module for FSICE system
M68CYCLONEPRO *$499*	HC08/HCS08/HC12/HCS12 stand-alone Flash programmer or in-circuit emulator, debugger, Flash programmer; USB, serial or Ethernet interface options
USBMULTILINK08 *$99*	Universal HC08 in-circuit debugger and Flash programmer; USB PC interface
M68CPA08QF324448 *$199*	Programming adapter for MON08 cables and single MCU: 32-pin 0.8 mm QFP packages, 44-pin 0.8 mm QFP packages and 48-pin 0.5 mm QFP packages
CWX-H08-SE *Free*	CodeWarrior™ Special Edition for HC(S)08 MCUs; includes integrated development environment (IDE), linker, debugger, unlimited assembler, Processor Expert™ auto-code generator, full-chip simulation and 16 KB C compiler

Package Options

Part Number	Package	Temp. Range
MC68HC908GR16CFJ	32 QFP	-40°C to +85°C
MC68HC908GR16VFJ	32 QFP	-40°C to +105°C
MC68HC908GR16MFJ	32 QFP	-40°C to +125°C
MC68HC908GR16CFA	48 QFP	-40°C to +85°C
MC68HC908GR16VFA	48 QFP	-40°C to +105°C
MC68HC908GR16MFA	48 QFP	-40°C to +125°C

32-Lead QFP [FJ] 48-Lead QFP [FA]

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

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