

A FLASH MCU SOLUTION

68HC908GR8/GR4 8-bit Microcontroller

TARGET APPLICATIONS

- Sensors
- Industrial and consumer communications
- Home appliances
- Security systems

The 68HC908GR8 and the 68HC908GR4 utilize integrated second generation FLASH and are enhanced with embedded, on-chip functions that eliminate the need for external serial components. The 32 kHz phase-locked loop 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 wakeup circuitry. Other features of the 68HC908GR8 and the 68HC908GR4 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

8K/4K Flash

8-ch 8-bit
ADC

384 RAM

SCI

PLL

SPI

COP

2-ch 16-bit
1-ch 16-bit
Timer

LVI

Up to 21 GPIO



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FEATURES

BENEFITS

HIGH-PERFORMANCE 68HC08 CPU CORE

- | | |
|---|--|
| <ul style="list-style-type: none"> • 8 MHz bus operation at 5V operation for 125 nsec minimum instruction cycle time • 4 MHz bus operation at 3V for 250 nsec minimum instruction cycle time • Efficient instruction set including multiply and divide • 16 flexible addressing modes including stack relative with 16-bit stack pointer • Fully static low-voltage, low-power design with wait and stop modes | <ul style="list-style-type: none"> • Object code compatible with the 68HC05 • Easy to learn and use architecture • C optimized architecture provides compact code |
|---|--|

INTEGRATED SECOND GENERATION FLASH MEMORY

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|---|--|
| <ul style="list-style-type: none"> • In-application re-programmable • Extremely fast programming, encoding 64 bytes in as fast as 2 msec • FLASH programming across the 68HC08's full operating supply voltage with no extra programming voltage • 10K write/erase cycles minimum over temperature • 100K write/erase cycles typical • Flexible block protection and security | <ul style="list-style-type: none"> • Cost-effective programming changes and field software upgrades via in-application programmability and re-programmability • Reduces production programming costs through ultra-fast programming • Allows re-programmable battery-powered applications • Byte-writable for data as well as program memory • Protects code from unauthorized reading and to guard against unintentional erasing/writing of user-programmable segments of code |
|---|--|

8-BIT ANALOG-TO-DIGITAL CONVERTER

- | | |
|--|---|
| <ul style="list-style-type: none"> • 8/6 channels • Single conversion in 17 µsec | <ul style="list-style-type: none"> • Fast, easy conversion from analog inputs like temperature, pressure and fluid levels to digital values for CPU processing |
|--|---|

CLOCK GENERATION MODULE WITH PLL

- | | |
|--|--|
| <ul style="list-style-type: none"> • Programmable clock frequency in integer multiples of external crystal reference • Crystal reference of 32 kHz to 100 kHz • External clock option with or without PLL | <ul style="list-style-type: none"> • Provides high-performance using low-cost, low-frequency reference crystals • Reduces generated noise while still providing high-performance (up to 32 MHz internal clock) |
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FOUR PROGRAMMABLE 16-BIT TIMER CHANNELS

- | | |
|---|--|
| <ul style="list-style-type: none"> • 125 nsec resolution at 8 MHz bus • Free-running counter or modulo up-counter | <ul style="list-style-type: none"> • Each channel independently programmable for input capture, output compare or unbuffered PWM • Pairing timer channels provides a buffered PWM function |
|---|--|

TIMEBASE MODULE

- | | |
|--|---|
| <ul style="list-style-type: none"> • 8 user-selectable periodic real-time interrupts • Optionally operate in low-power stop mode | <ul style="list-style-type: none"> • Provides auto wakeup from low-power stop mode to maintain real-time clock or check external device status such as sensors |
|--|---|

**For More Information On This Product,
Go to: www.freescale.com**

Freescale Semiconductor, Inc.

A FLASH MCU SOLUTION

68HC908GR FAMILY

PART NUMBER | DESCRIPTION | RESALE*

EASY-TO-ORDER DEVELOPMENT TOOL KITS

| | | |
|--------------|--|--------|
| M68ICS08GR | 68HC908GRx programmer/in-circuit debug kit | \$295 |
| KITMMEVS08GR | Cost-effective real-time in-circuit emulator kit | \$1450 |
| KITMMDS08GR | High-performance real-time in-circuit emulator kit | \$3950 |

INDIVIDUAL DEVELOPMENT TOOL COMPONENTS

| | | |
|----------------|---------------------------------|--------|
| M68MMDS0508 | High-performance emulator | \$2950 |
| M68MMPFB0508 | MMEVS platform board | \$395 |
| M68EML08GP32 | Emulation module daughter board | \$495 |
| M68CBL05C | Low-noise flex cable | \$120 |
| M68TC08GR8FA32 | 32-pin QFP target head adapter | \$200 |
| M68TC08GR8P28 | 28-pin DIP target head adapter | \$100 |
| M68TQS032SAG1 | 32-pin TQ socket with guides | \$50 |
| M68TQP032SA1 | 32-pin TQPACK | \$70 |
| M68DIP28SOIC | 28-pin surface mount adapter | \$50 |

APPLICATION NOTES
AND ENGINEERING BULLETINS

- EB368/D In-circuit Programming of 68HC908GR8 FLASH Memory
 - AN1218/D HC05 to HC08 Optimization
 - AN1831/D Using MC68HC908 On-Chip Programming Routines
 - AN1837/D Non-Volatile Memory Technology Review
 - AN2093/D Creating Efficient C Code for the MC68HC08
 - AN1752/D Data Structures for 8-Bit MCUs
 - AN1219/D M68HC08 Integer Math Routines
 - AN1705/D Noise Reduction Techniques for MCU-Based Systems
 - AN1259: System Design and Layout Techniques for Noise Reduction in MCU-Based Systems
 - AN1263: Designing for Electromagnetic Compatibility with Single-Chip Microcontrollers
 - AN1050: Designing for Electromagnetic Compatibility (EMC) with HCMOS Microcontrollers
 - AN1705: Noise Reduction Techniques for Microcontroller-Based Systems
- And many more—see our Web site at <http://www.motorola.com/mcu>

FEATURES

BENEFITS

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 3-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 EEPROM, high-precision A/D and D/A converters, real-time clocks, etc.

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 21 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 pullups on thirteen 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 pullups eliminates external glue logic when interfacing to simple keypads

PACKAGE OPTIONS

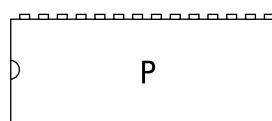
| PART NUMBER | PACKAGE | TEMPERATURE RANGE |
|-----------------|---------|-------------------|
| MC68HC908GR8CFA | 32 QFP | -40 to 85°C |
| MC68HC908GR8CP | 28 DIP | -40 to 85°C |
| MC68HC908GR8CDW | 28 SOIC | -40 to 85°C |
| MC68HC908GR4CFA | 32 QFP | -40 to 85°C |
| MC68HC908GR4CP | 28 DIP | -40 to 85°C |
| MC68HC908GR4CDW | 28 SOIC | -40 to 85°C |

| SAMPLE PACKS | PACKAGE | TEMPERATURE RANGE |
|--------------|---------|-------------------|
| KMC908GR8CFA | 32 QFP | -40 to 85°C |
| KMC908GR8CP | 28 DIP | -40 to 85°C |
| KMC908GR8CDW | 28 SOIC | -40 to 85°C |
| KMC908GR4CFA | 32 QFP | -40 to 85°C |
| KMC908GR4CP | 28 DIP | -40 to 85°C |
| KMC908GR4CDW | 28 SOIC | -40 to 85°C |

28-Lead SOIC



28-Pin DIP



32-Lead QFP



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68HC908GRFAMPB/D

* All prices are manufacturer's suggested resale for North America.

For More Information On This Product,
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Printed in USA 05/03 Imperial Litho 56466 5,000 LITCSG1