**Target Applications**

- Appliance compressors
- Smart appliances
- Industrial compressors (HVAC)
- Variable speed pumps (well, gas)
- HVAC blowers and fans
- General-purpose drives
- Exercise equipment
- Electric-powered recreational vehicles
- Medical scanners/pumps
- Printers/scanners/fax machines
- Electric lawn equipment
- Seat module control
- Uninterruptable power supplies

**Overview**

Higher performance, advanced integration and reduced system costs are among the benefits generated by the MC68HC908MR32 and the MC68HC908MR16, Freescale Semiconductor’s highly integrated 8-bit Flash microcontrollers (MCUs) designed for enhanced electronic motion control. Engineered for applications as varied as smart appliances, automotive subsystems, industrial controls and uninterruptible power supplies, the MC68HC908MR32 and the MC68HC908MR16 include 6-channel, 12-bit pulse-width modulation (PWM) for a comprehensive AC motor timer solution supporting both center- and edge-aligned modes with automatic dead-time insertion and patented dead-time compensation capability. This leading-edge technology promotes versatility, while lowering costs with greater flexibility allowing configuration for several drive topographies in various motor types.

**Features**

- **High-Performance 68HC08 CPU Core**
  - 8 MHz bus operation at 5V operation for 125 ns 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
  - Object code compatible with the 68HC05
  - Easy to learn and use architecture
  - C-optimized architecture provides compact code

- **Integrated Second-Generation Flash Memory**
  - In-application reprogrammable
  - 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
  - 10K write/erase cycles minimum over temperature
  - Flexible block protection and security
  - Cost-effective programming changes and field software upgrades via in-application programmability and reprogrammability
  - Reduces production programming costs through ultra-fast programming
  - Byte-writable for data as well as program memory
  - Protects code from unauthorized reading and guards against unintentional writing/erasing of user-programmable segments of code

- **10-bit Analog-to-Digital Converter (ADC)**
  - 10 channels
  - Single conversion in 17 µs
  - Provides single or continuous conversion
  - Generates an interrupt when input signal exceeds a software programmable limit

- **12-bit Pulse-Width Modulation for Motor Control (PWMMC)**
  - Three complementary or six independent PWM signals
  - Programmable output polarity
  - Edge- or center-aligned waveforms
  - Automatic dead-time generation/compensation
  - 20 mA sink on all PWMMC pins
  - Programmable fault detection
  - Provides multiple motor or multiphase control capability
  - Reduces system cost through integration of digital-to-analog circuitry
  - Includes patented distortion correction circuitry that dramatically reduces system noise and improves efficiency of the drive without the need for external current sensors
  - Allows direct drive of the optocoupling stage
  - Guarantees immediate shutdown of the PWM outputs, ensuring motor and consumer safety

- **Clock Generation Module with Phase-Lock Loop (PLL)**
  - Programmable clock frequency in integer multiples of external crystal reference
  - Crystal reference of 1 MHz to 8 MHz
  - External clock option with or without PLL
  - Provides high performance using low-cost, low-frequency reference crystals
  - Reduces generated noise while still providing high performance (up to 32 MHz internal clock)
### Features

#### Serial Communications Interface (SCI)
- UART asynchronous communications system
- Flexible baud rate generator
- Double-buffered transmit and receive
- Optional hardware parity checking and generation

Asynchronous communication between the microcontroller (MCU) and a terminal, computer or a network of microcontrollers.

#### Serial Peripheral Interface (SPI)
- 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 EEPROM, high-precision ADCs and digital-to-analog converters (DACs), real-time clocks, etc.

#### Computer Operating Properly (COP) Watchdog Timer

Provides system protection in the event of runaway code by resetting the MCU to a known state.

#### Low-Voltage Inhibit (LVI)

Improves reliability by resetting the MCU when voltage drops below trip point.

#### Up to 44 Bidirectional Input/Output (I/O) Lines

- 10 mA sink/source capability on all I/O pins
- 15 mA sink capability on eight I/O pins
- Keyboard scan with selectable interrupts on five I/O pins
- Software programmable pull-ups on 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.

### Package Options

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC68HC908MR32CFU</td>
<td>64 QFP</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>MC68HC908MR32VFU</td>
<td>64 QFP</td>
<td>-40°C to +105°C</td>
</tr>
<tr>
<td>MC68HC908MR32CB</td>
<td>56 SDIP</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>MC68HC908MR32VB</td>
<td>56 SDIP</td>
<td>-40°C to +105°C</td>
</tr>
<tr>
<td>MC68HC908MR16CFU</td>
<td>64 QFP</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>MC68HC908MR16VFU</td>
<td>64 QFP</td>
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### Application Notes

- AN1857: A 3-Phase AC Induction Motor Control System
- AN1218: HC05 to HC08 Optimization
- AN1844: Using 68HC908MR32 in Place of MC68HC908MR24
- AN1837: Non-Volatile Memory Technology Review
- AN2093: Creating Efficient C Code for the MC68HC08
- AN1752: Data Structures for 8-bit MCUs
- AN1219: MC68HC08 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
- 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 www.freescale.com/mcu.

### Learn More

For more information about Freescale’s products, please visit www.freescale.com.