

# MC9S12NE64

## Target Applications

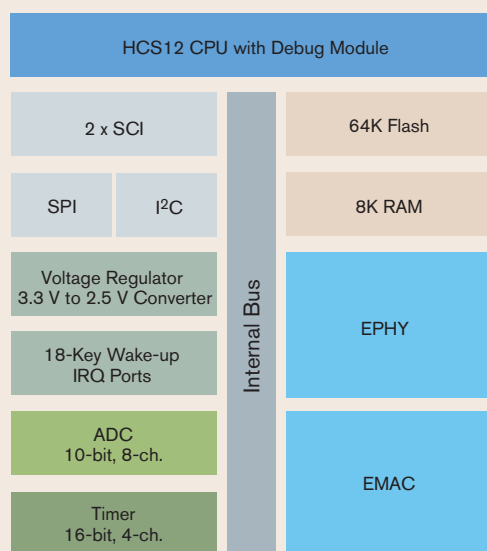
- > Industrial Controls
- > Network Appliances
- > Remote Equipment
- > Ethernet-Enabled Games
- > Ethernet Bridge
- > Automotive Meter Reading
- > Vending Machines
- > Home/Office Automation

The HCS12 family of microcontrollers is the next generation of the highly successful 68HC12 architecture. Using Freescale Semiconductor's 0.25 $\mu$  Flash, the MC9S12NE64 provides an upward migration path from the 68HC08, 68HC11 and 68HC12 architectures for applications that need larger memory, more peripherals and higher performance.

The MC9S12NE64 provides a total Ethernet connectivity solution in one microcontroller unit (MCU) with its integrated Ethernet Media Access Controller (EMAC), 10/100 Ethernet physical layer (EPHY) and on-chip Flash memory.

Other features include two serial communications interfaces (SCIs), a four-channel timer, a serial peripheral interface (SPI), an inter-integrated circuit (I<sup>2</sup>C) and a 10-bit analog to digital converter (ADC).

## BLOCK DIAGRAM



## Features

### High-Performance 16-bit HCS12 CPU Core

- > 25 MHz operation at 3.3 V for 40 nsec minimum instruction cycle time

### On-Chip Debug Interface

- > Single-wire background debug mode
- > On-chip trace buffer with nine flexible trigger modes and multiple hardware breakpoints
- > Nonintrusive emulation

### Integrated Third-Generation Flash Memory

- > In-application reprogrammable
- > Self-timed, fast programming
  - Fast Flash page erase—20  $\mu$ s (512 bytes)
  - Can program 16 bits in 20  $\mu$ s while in burst mode
- > Internal program/erase voltage generation
- > Flash granularity—512 byte Flash erase/ 2 byte Flash program
- > Flexible block protection and security

### 10/100 Mbps Ethernet Media Access Controller

- > IEEE® 802.3-compliant MAC
- > Standard Media Independent Interface (MII) and MII management interface
- > Address recognition and filtering
- > Programmable MAC buffers: two receive and one transmit
- > Hardware address and Ethernet protocol filtering

### 10/100 Mbps Ethernet Physical Transceiver

- > IEEE 802.3-compliant
- > Half- and full-duplex operation
- > Autonegotiation with next page ability
- > Digital adaptive equalization
- > Integrated wave-shaping circuitry
- > Loop back modes

## Benefits

- > Object code compatible with the 68HC11 and 68HC12
- > C-optimized architecture produces extremely compact code

- > Real-time emulation of MCU functions at full operating voltage and frequency range without the limitations of traditional emulators
- > Real-time in-circuit emulation and debug without expensive and cumbersome "box" emulators
- > Read/write memory and registers while running at full speed
- > Bus state analysis without the expense of a traditional emulator

- > Flexibility to change code in the field
- > Efficient end-of-line programming
- > Total program time for 64K code is less than five seconds
- > Reduces production programming cost through ultrafast programming
- > No external high voltage or charge pump required
- > Virtual EEPROM implementation, Flash array usable for EE emulation

- > Industry standard
- > Improved interoperability
- > Enhancement of CPU bandwidth with filtering
- > Full duplex and flow control

- > Self-diagnostic capabilities
- > Auto detection of link capabilities
- > Enhanced interoperability

## Features

## Benefits

### 10-bit Analog to Digital Converter

- > 8-channel ADC
- > 7  $\mu$ s, 10-bit single conversion time; scan mode available
- > Configurable external trigger capability
- > Fast, easy conversion from analog inputs, such as temperature, pressure and fluid levels, to digital values for CPU processing

### Clock and Reset Generator Module

- > Phase-Lock Loop (PLL)
- > Programmable clock frequency with 1,024 options ranging from divide by 16 to multiply by 64 from base oscillator
- > Real-time interrupt
- > Watchdog
- > Clock monitor with self-clock mode in case there is no external clock
- > Reliable, robust operation
- > Provides high performance using cost-effective reference crystals
- > Low noise generation
- > Low power consumption

### Timer

- > Four-channel, 16-bit
- > Programmable input capture or output compare
- > Gated time accumulation
- > Flexible, programmable timer system

### Two Serial Communications Interfaces

- > Programmable baud rate with prescaler
- > Infrared mode
- > Asynchronous communication between the MCU and a terminal, a computer or a network of microcontrollers
- > Exact baud rate matching

### Serial Peripheral Interface

- > Up to 6.25 Mbps
- > High-speed synchronous communication between multiple MCUs or between an MCU and serial peripherals

### Inter-Integrated Circuit 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

### 8K Static RAM

- > On-chip RAM for EMAC buffers and system stack
- > Programmable buffer size
- > Promote scalability between system stack and Ethernet performance

### Up to 70 Input/Output Lines

- > Programmable pull-ups/pull-downs
- > Dual drive capability
- > Reduce system cost
- > Able to tailor application for minimum EMC or high current loads

## DOCUMENTATION

### Data Sheet

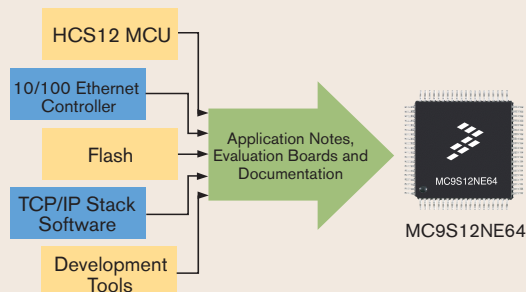
- > MC9S12NE64V1

### Application Notes/Engineering Bulletins

- > AN2692: MC9S12NE64 Integrated Ethernet Controller
- > AN2759: Implementing an Ethernet Interface with the MC9S12NE64
- > AN2700: Basic Web Server Development with MC9S12NE64 and CMX-MicroNet™ TCP/IP Stack
- > AN2624: Basic Web Server Development with the CMX-MicroNet\_TCP/IP Stack
- > AN2304: Implementation of a UDP/IP Stack on HCS12 Microcontrollers
- > AN2120: Connecting an M68HC08 Family Microcontroller to an Internet Service Provider (ISP)

**Learn More:** For current information about Freescale products and documentation, please visit [www.freescale.com](http://www.freescale.com).

## A FULL AND INTEGRATED ETHERNET CONNECTIVITY SOLUTION



## Development Tools

### DEMO9S12NE64

MC9S12NE64 demonstration board in an enclosed plastic case with 10/100 Base-T Ethernet port, serial port, switches, LEDs, potentiometer and demo software including application code

### EVB9S12NE64

MC9S12NE64 evaluation board with 10/100 Base-T Ethernet port, dual serial ports, switches, LEDs, potentiometer, LCD port, keyboard port and demo software including application code

### USBMULTILINK12

Universal HC12/HCS12 in-circuit emulator, debugger and Flash programming through BDM interface

### M68CYCLONEPRO

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

### CWX-H12-SE

CodeWarrior™ Development Studio for HCS12 with Processor Expert™ autocode generator, full-chip simulation, assembler, linker and C compiler (code size limited—compiler upgrades available)

TCP/IP stack software is available through various third-party providers. Visit our Web site mentioned at the bottom of this page for more information.

## PACKAGE OPTIONS

Part Number	Package	Temp Range
MC9S12NE64VTU	80 Lead TQFP-EP	-40°C to +105°C
MC9S12NE64CPV	112 Lead LQFP	-40°C to +85°C

