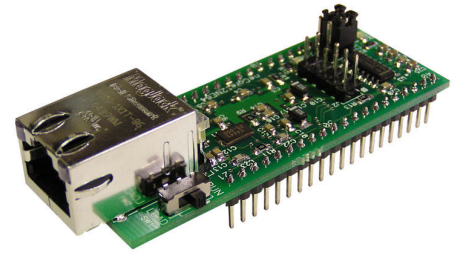




# neCore12M64™

## Network-enabled Microcontroller Board

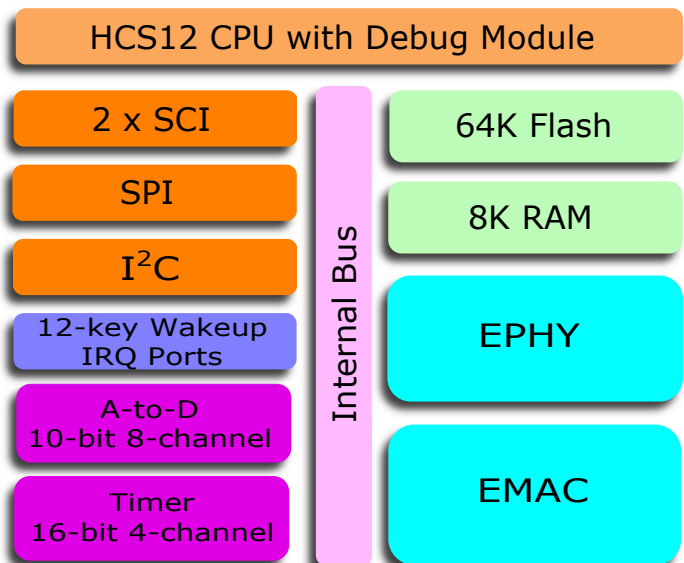


### MODULE FEATURES:

- based on the Freescale 9S12NE64 MCU (80-pin QFP version)
- 10/100 Mbps Ethernet with Integrated Modular RJ45 jack
- implements PLL loop filter circuit
- supports up to 50MHz operation (25 MHz bus speed)
- local 3.3 Volt LDO 500 mA regulator
- includes RS232 transceiver circuit
- on-chip Serial Monitor for easy code-loading and simple debug capability
- supports standalone operation
- 64K bytes Flash
- 8K bytes Ram
- eight 10-bit analog input or digital I/O port lines (Port AD)
- up to 4 digital I/O port lines (Port T)
- up to 4 Input Capture/Output Compare pins (Port T)
- 3 digital I/O port lines (Port G)
- 6 digital I/O port lines (Port J)
- 3 digital I/O port lines (Port H)
- up to 12 key wake-up interrupt pins (Port G, H and J)
- serial peripheral interface (SPI)
- two serial communications interfaces (SCI0 and SCI1)
- up to 30 digital I/O lines total + 2 interrupt inputs (IRQ\*, XIRQ\*)
- internal programmable pullup and pull-down resistors on most pins
- user access to MCU reset signal
- operates at 3.3V-- all input/output levels are 3.3V max.
- 40-pin wide DIP form-factor (0.900 inch row-to-row spacing)
- standard 0.025" square pins
- plugs into a solderless breadboard or single-row receptacles
- solderless experimenter platform available (neCore12 School Board)
- program in Assembler, BASIC, C, or Forth
- supports C source-level debugging with NoICE12 (via Serial Monitor or BDM pod)
- standard 6-pin BDM connector for full background debugging capabilities (via 3-Volt BDM pod)

**neCore12™** is a fully-integrated microcontroller with embedded 10/100 Ethernet media access controller (EMAC) and Ethernet physical layer (EPHY) in a low-cost DIP form-factor. Utilizing the advanced features of the Freescale MC9S12NE64 "networked embeddable" microcontroller, neCore12 demonstrates that ethernet isn't just for offices anymore. The MC9S12NE64 single-chip, Flash-based Ethernet solution meets the needs of design engineers working on applications such as networked appliances, security systems, industrial controls and Web radio. The neCore12 module's flexible design accommodates all facets of training, evaluation, development, prototyping-- and even volume production, bringing them within easy reach of engineers, students, and hobbyists. The module is ready to be embedded into your OEM product.

The MC9S12NE64 is a 16-bit microcontroller that can be matched with a third-party TCP/IP stack of your choice to achieve a low-cost end-node Ethernet solution. The MC9S12NE64 is based on the powerful HCS12 core, which integrates third-generation Flash technology. Its rich offering of Ethernet connectivity features makes the MC9S12NE64 a favorite to replace noisy multi-chip solutions with full-featured Ethernet connectivity.



**MC9S12NE64 Block Diagram**

The capability of operating at 3 Volts brings a whole new world of interfacing to SD cards, MP3 decoder chips, GPS modules, etc. that much closer.

A resident Serial Monitor facilitates quick and easy code-loading and simple debugging using any Windows PC. The Serial Monitor is supported by many third-party vendors, such as Metrowerks CodeWarrior C development suite and the NoICE12 debugger. Advanced loading and debugging can also be accomplished via the standard Background Debug Mode (BDM) interface, included.

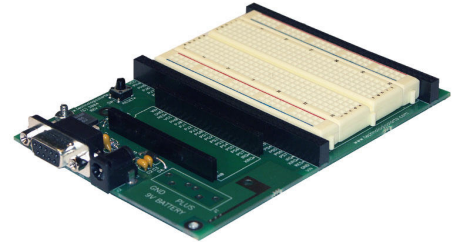
## PRODUCT CONFIGURATION

**neCore12** includes all the essential support circuitry that 90% of applications use (e.g. crystal, voltage regulator, RS232 interface, embedded magnetics and RJ45 jack with built-in traffic indicator LEDs), without tying up port pins with costly interface circuits that most users may not need (e.g. clock/calendar chip, serial EEPROM). The wide DIP form-factor and standard 0.025" square pins enable it to be plugged directly into a solderless breadboard-- just like a big chip. The footprint is equivalent to a 40-pin DIP, and has a similar pin-numbering sequence. Plug it in, wire up your application circuit, and then load your firmware for testing and debugging. It can be unplugged and replaced, and the program memory can be erased and re-programmed in seconds, right in place (via the serial port). From MCU evaluation, training, product development, hobby or school projects, and semi-custom solutions all the way to being embedded right into a commercial product or system, neCore12 is a very cost-effective product.

## USING NECORE12 WITH THE SCHOOL BOARD

The School Board includes a solderless breadboard section, socket strips to accept the neCore12 module, and a 3.3V regulator. A couple of user LEDs are included for quick demo and operational testing. A 9-pin D-sub connector provides access to the RS232 interface for use with the serial monitor or the application code.

The neCore12 module plugs easily into the socket receptacles, and the 80-pin dual-row receptacles adjacent to each side of the breadboarding area, provide easy access to all of the I/O signals. Each signal is brought out to two adjacent pins on each side of the breadboard, for a total of four available connections, making wiring more convenient. To build your circuit, it's just a matter of plugging lengths of ordinary #22 hookup wire between the signals on the receptacles and the components on your breadboard.



## RESIDENT DEBUG/MONITOR

Residing in a 2K protected block of on-chip flash memory is Freescale's versatile Serial Monitor program. When used with uBug12 (a free Windows application created by Technological Arts), you can display and edit memory and registers, erase and program flash, set breakpoints, and do instruction tracing. The Serial Monitor is also supported by the popular NoICE12 Debugger and Metrowerks CodeWarrior Integrated Development Environment C and Assembler), and the free SynCode GNU C Compiler and IDE package from [www.feaser.com](http://www.feaser.com).

The Serial Monitor has two modes: Run and Load. It determines the mode immediately after reset by checking the position of the Mode switch. Flip the switch to Run mode, and your program runs automatically from Flash, following reset or powerup (assuming you have included a user reset vector in your program). By the way, the monitor resides in a protected block of flash, so there's no way to accidentally erase it.

## COMMUNICATIONS

An RS-232C serial interface is included on the neCore12 module, and a convenient serial port connector (9-pin D-sub) is included on the School Board, enabling communication with a PC com port, or any other device which has an RS-232 serial port, by use of a standard 9-pin serial port extension cable. The RS-232 channel is implemented via the SCI of the MCU, and when the board is reset in Load mode, the resident Serial Monitor uses this port to communicate with an appropriate program running on your PC (e.g. UBug12, CodeWarrior, or NoICE12). In Run mode, the RS-232 port is available for your application. A convenient breadboard-pluggable serial cable (#SC9SB36) is also offered, for those not using the School Board.

The MCU also supports Serial Peripheral Interface (SPI), which is commonly used for interfacing serial memory (e.g. EEPROM, Flash), SD cards, GPS modules, temperature controllers, clock/calendar chips, DACs, MP3 decoders, etc.

## 3-VOLT OPERATION

The module operates at 3.3V, so there are a few precautions that should be noted. The logic pins are **not** 5V-tolerant, so you will need to take the necessary steps to prevent damage to the I/O pins of the MCU. Also, the maximum VRH voltage is limited to 3.3V, so any external voltage or precision voltage reference you supply should be scaled accordingly.

## PLL

While the supplied crystal is 25MHz, the MCU is capable of running as fast as 50 MHz. The phase-locked loop feature of the MCU allows you to boost/reduce the bus speed by an integer multiple/divisor of the crystal frequency, so by enabling the PLL, you can actually run the MCU at 50Mhz or as low as 156KHz. The necessary support components for the PLL circuit are included on the board.

## USING A BDM POD

If you have a BDM pod, you can erase the resident monitor program completely. This will free up all the MCU resources for your program (most importantly, the SCIs). Without the monitor in place, the RAM will be at the default location following reset, so make sure to use the correct compiler/linker settings. Also, the PLL won't be enabled, so the bus speed will be 25 Mhz. Since neCore12 runs at 3.3V, you'll need a low-voltage BDM pod (such as our MicroBDM12LX).

## APPLICATIONS

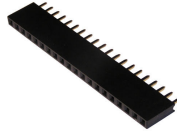
Serving up webpages which change dynamically to reflect input values and allow a remote user to control outputs over the internet is just one possibility. But perhaps a more practical function is to take advantage of the universal graphical user interface known as a web browser. No longer is it necessary to design and implement custom application interfaces for electronic equipment, as was the custom with RS232 and RS485 interfaces. Now a laptop or LAN can be easily used to interact with the equipment, or a network of many different pieces of equipment. That way it is not necessary to create a custom user interface for every piece of equipment in the field or factory. A demo of the CMX Micro-Net software is included on the website and product CD to demonstrate such a possibility. Additionally, the popular uIP application has been ported over to the ne64, and the relevant files and documents are included on the website and product CD. Interfacing to an SD memory card via SPI is rather straightforward. Adding a breakout board containing an SD card socket and DOSonCHIP FAT16/32 file management system (<http://chipdos.com/modules.htm>) make the implementation of mass storage much simpler.

Regulated 6V Power Supply



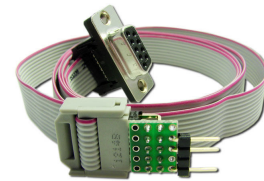
**ORDER CODE:** DC6VRBP

20-position Receptacle Strip

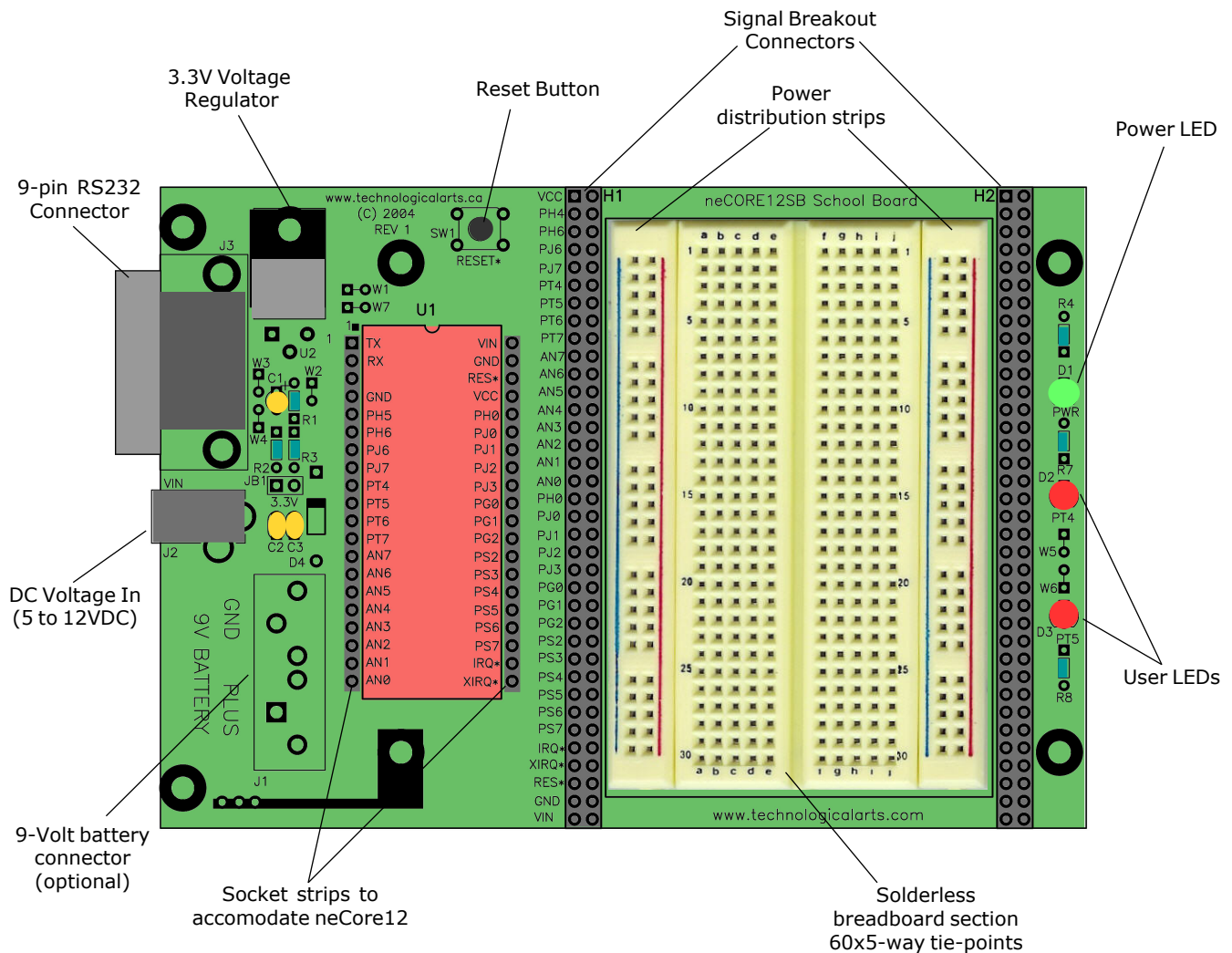


**ORDER CODE:** HSSF20

Serial Cable for Solderless Breadboard



**ORDER CODE:** SC9SB36



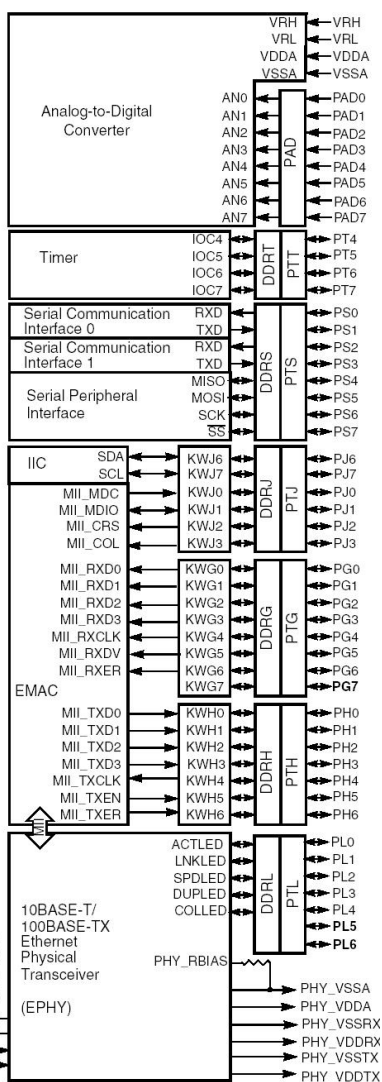
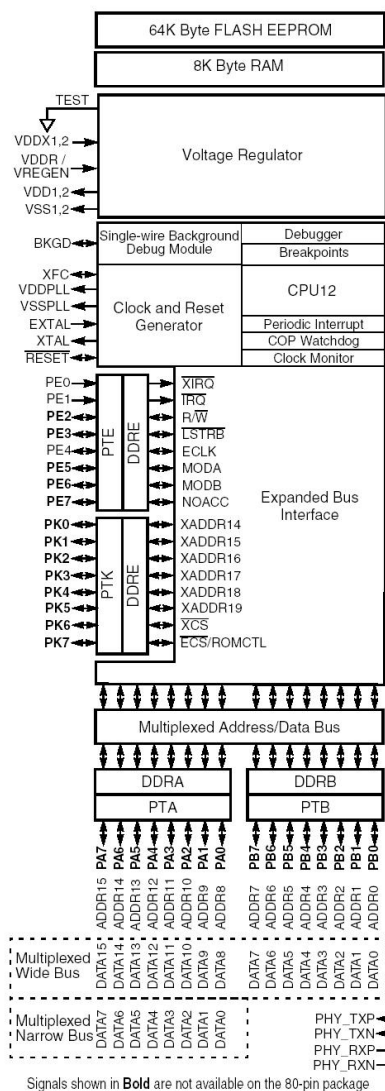
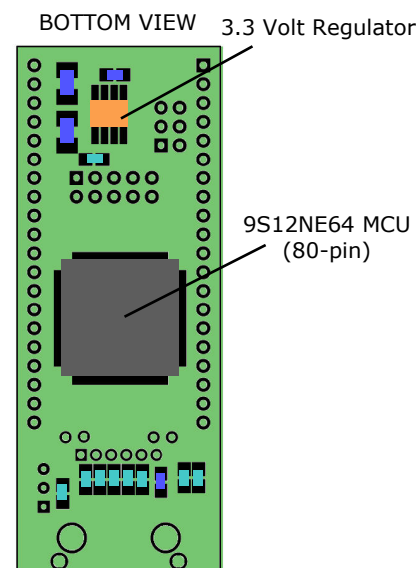
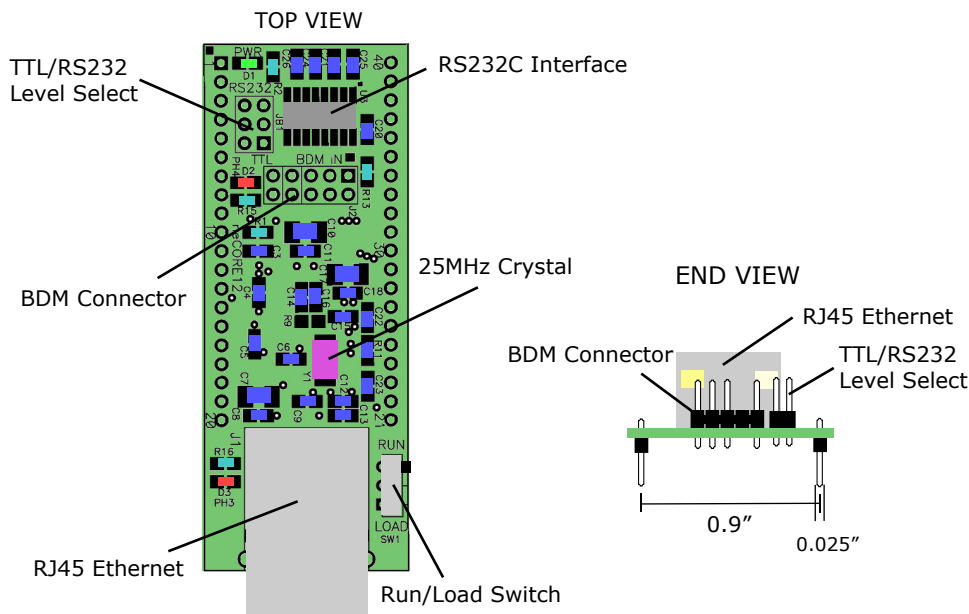
## **NeCore12 School Board**

**ORDER CODE:** NEC12SB

[www.technologicalarts.com](http://www.technologicalarts.com)

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# neCore12 Module Features and Pinout



1	TX	VIN	40
2	RX	VSS	39
3	NC	RE5	38
4	VSS	VCC	37
5	PH5	PH0	36
6	PH6	PJ0	35
7	PJ6	PJ1	34
8	PJ7	PJ2	33
9	PT4	PJ3	32
10	PT5	PG0	31
11	PT6	PG1	30
12	PT7	PG2	29
13	AN7	PS2	28
14	AN6	PS3	27
15	AN5	PS4	26
16	AN4	PS5	25
17	AN3	PS6	24
18	AN2	PS7	23
19	AN1	IRQ*	22
20	AN0	XIRQ*	21

## PINOUT (top view)

NC = No Connection

**ORDER CODE: NEC12M64**