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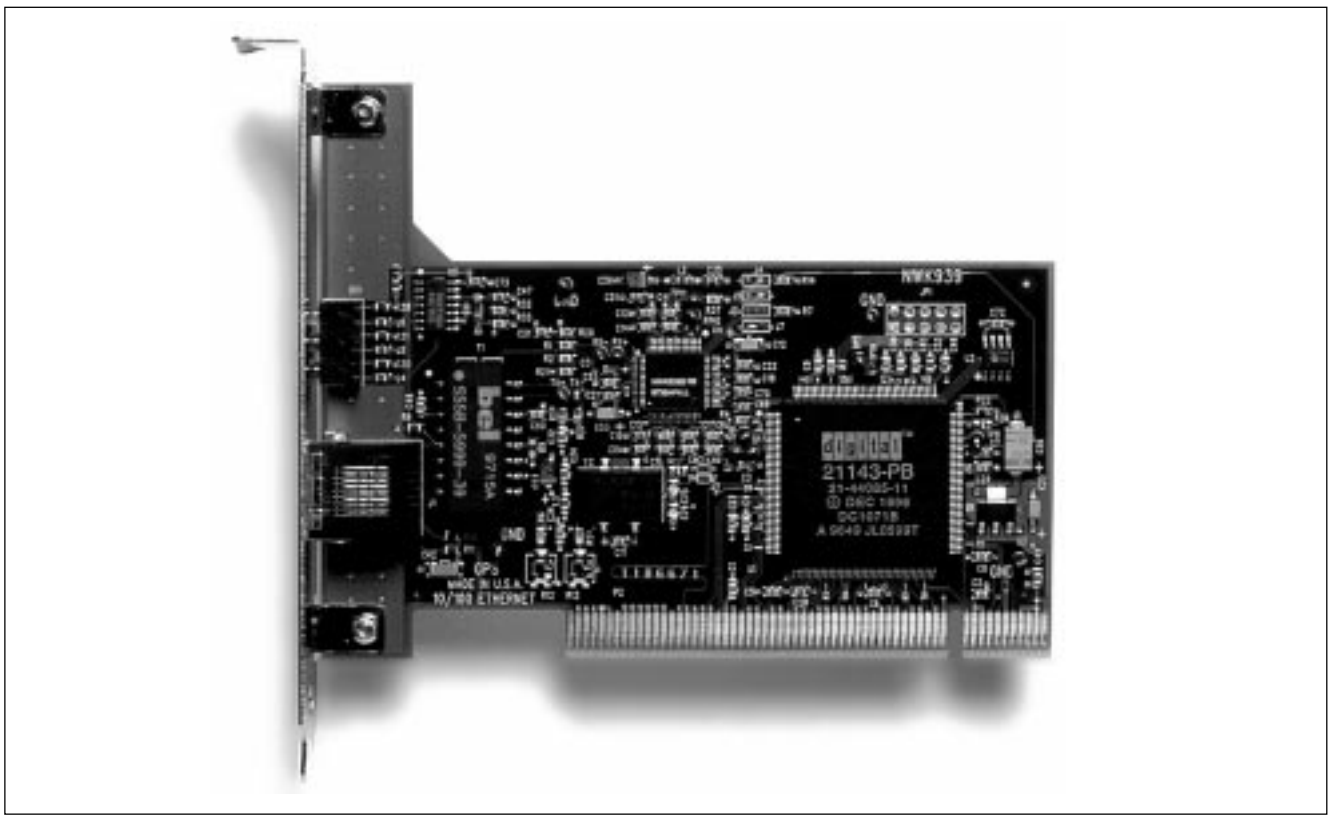
AN4883

NWK939/DEC21143 Evaluation Board

Preliminary Information

AN4885 - 1.0 March 1998



PRODUCT BRIEF

The NWK939 Evaluation Board is a 10BASE-T/ 100BASE-TX NIC (Network Interface Card) with a PCI Interface. Its purpose is to allow customers to easily evaluate critical signals of the NWK939 Physical Layer Device while operating in a live network environment. This document describes the functional design of the board and some simple steps needed to get the board operating as a network adapter.

NWK939 Product Features

- Small Packaging (52 pin PQFPand TQFP)
- Compatible with IEEE 802.3 Standards
- Excellent Long Cable Performance

Evaluation Board Features

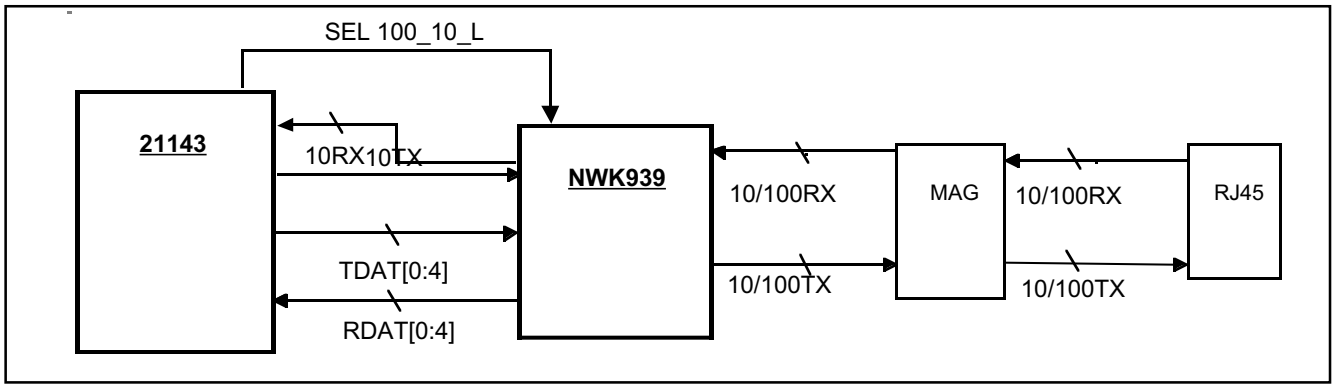
- Low Power
- Test Points for Ease of Evaluation
- Auto-Negotiation

System Requirements

- Open PCI Bus Slot
- Category 5 (100Mb/s) Twisted Pair Cabling
- Single +5V Supply
- DEC21143 Compatible SW Driver (Included)

Kit Contents

- PCI NIC
- Software Driver Diskette
- Schematics
- BOM



NWK939/DEC21143 NIC Functional Block Diagram

FUNCTIONAL OVERVIEW

The NWK939 Evaluation Board uses two main components for 10/100Mb operation. The NWK939 Physical Layer Device (PHY) and the DEC21143 Media Controller/PCI Interface.

Transmit Overview

The NWK939 transmits either 10Mbps or 100Mbps data depending on the state of the N10/100 input pin. When in 10 Megabit mode (N10/100 = Low), the transmit data is presented to the NWK939 at the TP_TDP input. Only the positive portion of the 10Mb Transmit data is required. The NWK939 internally generates the negative polarity portion of the signal as well as the pre-distortion and waveshaping necessary for a compliant 10BASE-T signal, prior to sending the data onto the wire. This creates a very simple and cost effective 10Mb transmit path. When in 100Mb mode (N10/100 = High), the NWK939 receives data to be transmitted from the DEC21143 via the TDAT[0:4] inputs. The appropriate MLT3 signal is then transmitted to the network. If the launch voltage of the either the 10BASE-T or the 100BASE-TX data should need adjusting, this can be accomplished by adjusting the resistor value connected to the TXREF10/100 pins. For added flexibility in a variety of solutions, the NWK939 provides individual TXREF current adjustments for 10BASE-T and 100BASE-TX modes. For more information on TXREF adjustments, refer to the NWK939 data sheet.

Transmit 10Mb

The DEC21143 incorporates an internal 10Mb Encoder/Decoder which provides the 10Mb Transmit data. Pulse shaping and filtering of the data is done internally on the NWK939. The 10Mb data is transmitted onto the wire through a simple 1:1 ratio transformer producing a 802.3 compliant 10BASE-T signal. This Transmit path is used for transmitting data onto the network for both 10BASE-T and 100BASE-TX modes.

Transmit 100Mb

The NWK939 receives the 5 bit parallel data to be transmitted via the TDAT[0:4] lines from the DEC21143. The data is converted to a MLT3 encoded serial data stream and transmitted onto the network. It then passes through a simple 1:1 ratio transformer (same path as 10Mb TX data) where the desired 100BASE-TX level (2.0V diff peak to peak) is presented onto the wire via the RJ45 connector. In addition to the cost savings, being able to use a 1:1 transformer also helps minimize other technical issues such as Return Loss.

Receive Overview

All received data, 10BASE-T or the 100BASE-TX, enter the board via the RJ45 connector. The data is coupled through a 1:1 ratio isolation transformer. A single receive path is provided for both 10BASE-T and 100BASE-TX data types. Based on the logic value of the N10/100 input pin, the appropriate data is presented onto the TP_RDP/M lines (for 10BASE-T) or onto the RDAT[0:4] pins (for 100BASE-TX). The NWK939 incorporates an internal switch for 10BASE-T and 100BASE-TX modes. This creates a more reliable cost effective solution by removing any Relays or switches.

Receive 10Mb

The 10BASE-T receive data enters the NWK939 via the RXIP/N pins. The data is filtered and then output to the DEC21143 via the TP_RDP/M pins.

Receive 100Mb

The 100BASE-TX receive data enters the NWK939 via the RXIP/N pins. The amplitude of the 100Mb data is reduced by a resistor network prior to entering the NWK939. The values of these resistors are critical to the overall performance of the receiver and may need to be adjusted based on the applications components and the pcb layout.

Evaluating the NWK939

The NWK939 evaluation board has been designed to allow users to evaluate the NWK939 Physical Layer Device. While it is intended to be used for evaluation purposes, the card is a fully functional Network Interface Card. Due to the numerous variety of installation methods some choices had to be made regarding which software to use. We have chosen to provide both Client and Server software drivers for Novell versions 3.1 and 4.x. If your network testing is done using other types of network operating systems, additional drivers are available from the Digital Semiconductor Web site at:

http://ftp.digital.com/pub/Digital/info/semiconductor/networks-and communications/software/dsc-software-nc.html

Other Requirements

The following is a quick list of requirements which are needed to begin evaluating the NWK939. Refer to the Readme.txt file on the software driver floppy for more detailed hardware and software requirements.

- An IBM-compatible personal computer with 80486 or higher microprocessor and an open PCI slot
- One other node capable of 10BASE-T and/or 100BASE-TX. This could be a Server, Client or Hub
- Cable to connect the two pieces of equipment. CAT 5 for 10/100Mb and CAT3 for 10Mb
  This cable must have RX and TX crossed over if connecting two NICs together point to point
- Network software
  Many version of software are provided on the enclosed diskette

Installation and Network Connection

The user should be familiar with software driver installation and configuration procedures to ensure the evaluation board is properly configured. The example shown below describes a Novel Client installation. The basic steps are:

1. With the power off, install the Evaluation NIC into an open PCI slot.
2. Copy the drivers to a user specified directory:
   Copy a:\NETWARE\client*.*
3. Copy the necessary files provided to a user specified directory:
   LSL.COM
   IPXODI.COM
   NETX.COM or VLM.EXE
4. Edit the NET.CFG file if necessary
5. To connect to a Server, use the following loading sequence:
   LSL
   DC21x4
   IPXODI
   NETX or VLM
   LOGIN
6. The NIC is now available to run any suitable network application software.

Standard Networking Test Software can be useful to run system level evaluation on the NWK939/DEC21143 Evaluation NIC. Some examples are Novell's Perform3 and Endurnce tests. Another widely used program is Netbench. While this software is not included on our Evaluation Software diskette, it can be downloaded from the Internet.

Test Points

Once the software is installed and the Evaluation unit is connected to another node, the user may wish to view critical signals while the board is in operation. Numerous test points are installed to allow you to easily connect your scope probes to these critical signals. The following table describes the signal test points.

Trouble

If you have problems using the NWK939/DEC21143, please refer to the readhelp.exe file included with the driver software. If you cannot resolve the, please call your Mitel Semiconductor Sales Representative.

TEST POINTS	SIGNAL	DESCRIPTION
Test Point 1	**RXIN**	Neg. 10/100Mb signal prior to entering the NWK939 cable-side
Test Point 2	**RXIP**	Pos. 10/100Mb signal prior to entering the NWK939 cable-side
Test Point 3	**TXOP**	Pos. 10/100Mb signal driven from the NWK939 to the cable
Test Point 4	**TXON**	Neg. 10/100Mb signal driven from the NWK939 to the cable
Test Point 5	**RECCLK**	Clock re-generated by NWK939 from RX data stream
Test Point 6	**TP_RDP**	Pos. 10Mb signal prior to entering the DEC21143
Test Point 7	**TP_RDM**	Neg. 10Mb signal prior to entering the DEC21143
Test Point 9	**TP_TDP**	Pos. 10Mb signal prior to entering the NWK939 (from MAC)
Test Point 10	**TXCLK**	Clock generated by NWK939 to clock in TDAT[0:4] from MAC
Test Point 13	**GND**	Ground test point for scope probes
Test Point 14	**GND**	Ground test point for scope probes
Test Point 15	**GND**	Ground test point for scope probes
Test Point 16	**GND**	Ground test point for scope probes

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