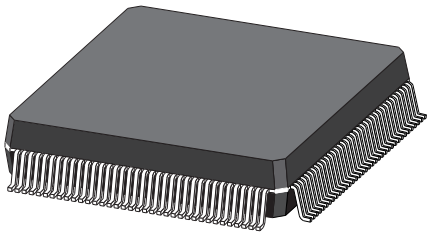
Digital Semiconductor

DECchip 21140 PCI Fast Ethernet LAN Controller

Product Brief

March 1995



Description

The DECchip 21140 PCI Fast Ethernet LAN Controller is a single-chip master, direct memory access (DMA), 100-Mb/s device with a direct interface to the PCI local bus. It is fully compliant with the IEEE 802.3 100BASE-T draft for Fast Ethernet. The DECchip 21140 is based on the DECchip 21040 PCI Ethernet LAN Controller architecture and is software compatible.

The DECchip 21140 supports both 10-Mb/s and 100-Mb/s operation. The integration of this chip provides a low-cost, 10-Mb/s and 100-Mb/s solution. It requires no external memory. The 100-Mb/s port contains the complete media independent interface (MII) to support voice grade (CAT3), data grade (CAT5), shielded twisted-pair (STP) and fiber cables. It also includes the scrambler and the physical coding sublayer (PCS) for CAT5 cable.

Features

- Offers a single-chip Fast Ethernet controller for PCI local bus:
  - Provides a direct interface to PCI bus
  - Supports 10-Mb/s and 100-Mb/s network ports
- Supports full-duplex operation on both 10-Mb/s and 100-Mb/s ports
- Contains large independent receive and transmit FIFOs, so it requires no additional onboard memory
- Provides standard 100-Mb/s MII to support CAT3, CAT5, STP and fiber cables
- Contains onchip scrambler and PCS for CAT5 to significantly reduce cost of 100BASE-T solutions
- Supports MII management functions
- Includes a powerful onchip DMA with programmable burst size, providing for low CPU utilization
- Implements unique, patent-pending intelligent arbitration between DMA channels to minimize underflow or overflow
- Supports PCI clock speed range from 25 to 33 MHz
- Supports either big- or little-endian byte ordering
- Implements JTAG-compatible test-access port with boundary-scan pins
- Supports IEEE 802.3 and ANSI 8802-3 standards
- Offers a unique, patented solution to Ethernet capture-effect problem
- Contains a variety of flexible address filtering modes:
  - 16 perfect addresses (normal or inverse filtering)
  - 512 hash-filtered addresses
  - 512 hash-filtered multicast addresses and one perfect address
  - Pass all multicast
  - Promiscuous
- Provides internal and external loopback capability on both ports
- Contains 8-bit, general-purpose programmable register and corresponding I/O pins
- Provides serial MicroWire EEPROM interface for Ethernet ID address and, optionally, other system parameters
- Provides LED support for various network activity indications
- Low power 3.3-V CMOS process technology
- Interfaces to 3.3-V or 5.0-V logic environments

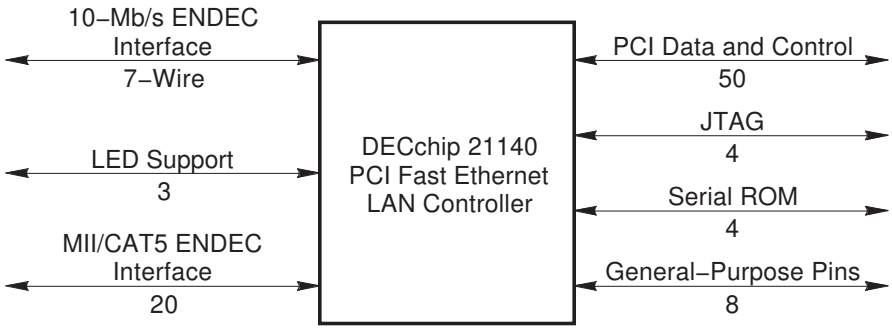
DECchip 21140 Microarchitecture

The DECchip 21140 has a direct interface to the PCI local bus. It communicates with the host processor using onchip command and status registers, and a shared host memory area. Most of the required setup and initialization is done after power-up. The DECchip 21140 software interface and data structures are optimized to minimize the host CPU load and to allow for maximum flexibility in the buffers' descriptor management. The DECchip 21140 comes with large onchip FIFOs, so no additional onboard memory is required. The two FIFOs and the internal microarchitecture provide complete support for full-duplex operation.

On the network side, the DECchip 21140 has separate 100-Mb/s and 10-Mb/s ports. It provides a direct interface to the external 100-Mb/s and 10-Mb/s front-end decoder (ENDEC), and it contains the complete MII interface. The DECchip 21140 includes an onchip PCS and scrambler to reduce the cost of 100BASE-T (CAT5 cabling) implementation.

Figure 1 shows the functional groups of DECchip 21140 interface pins.

Figure 1 DECchip 21140 Pin Interface



System Application Examples

The DECchip 21140 is optimized for PCI-based systems. It implements a direct interface to 100-Mb/s ENDEC for 100BASE-T (unshielded twisted-pair CAT5), and it ensures complete MII compliance. The DECchip 21140 also implements a direct interface to external 10-Mb/s ENDEC (AUI and 10BASE-T).

The DECchip 21140 is a high-performance, highly integrated solution for a variety of applications, such as:

- Cost-effective, high-performance PCI-to-Fast Ethernet adapter card
- PCI-based internetworking applications such as a Fast Ethernet switch or a Fast Ethernet router port
- Low-cost Fast Ethernet bridge

Figure 2 shows a 10-Mb/s and 100-Mb/s single-connector Ethernet/Fast Ethernet adapter using the DECchip 21140.

Figure 3 shows a PCI-based bridge and Ethernet switch using the DECchip 21140 for the Fast Ethernet connections.

Figure 4 shows the Fast Ethernet, 2-port bridge.

Figure 2 10-Mb/s and 100-Mb/s Fast Ethernet PCI Adapter

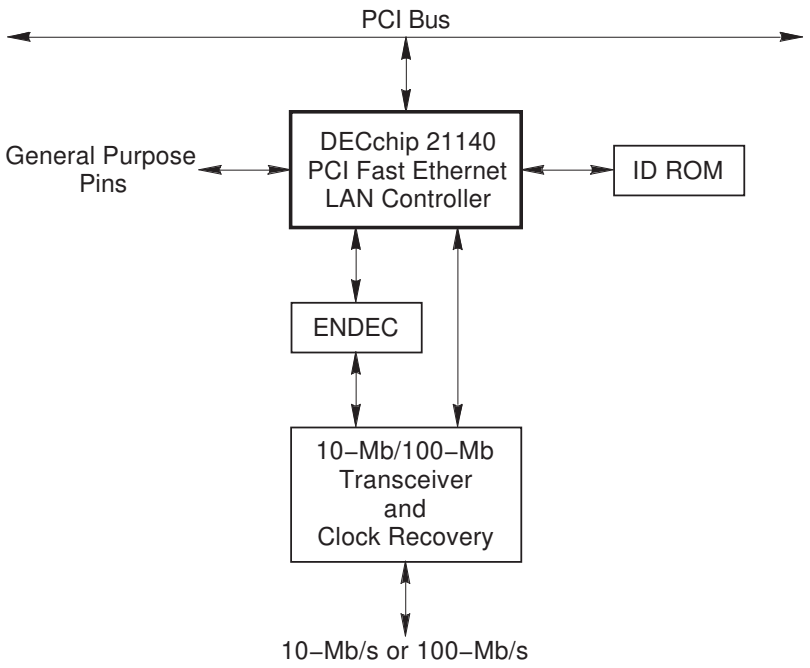


Figure 3 PCI-Based Bridge and Switch

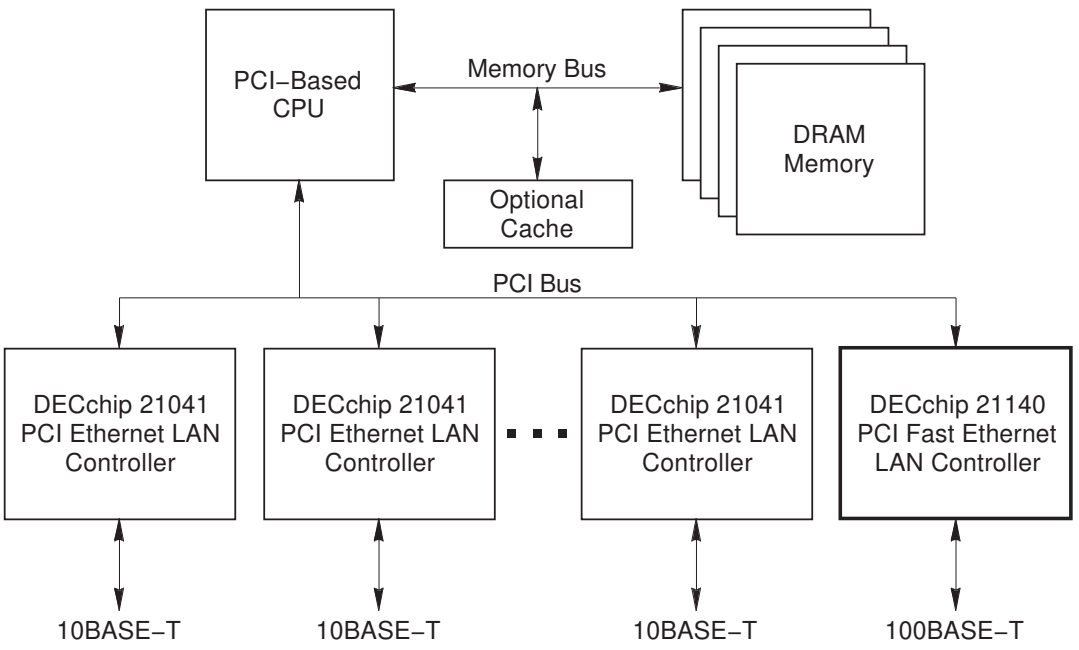
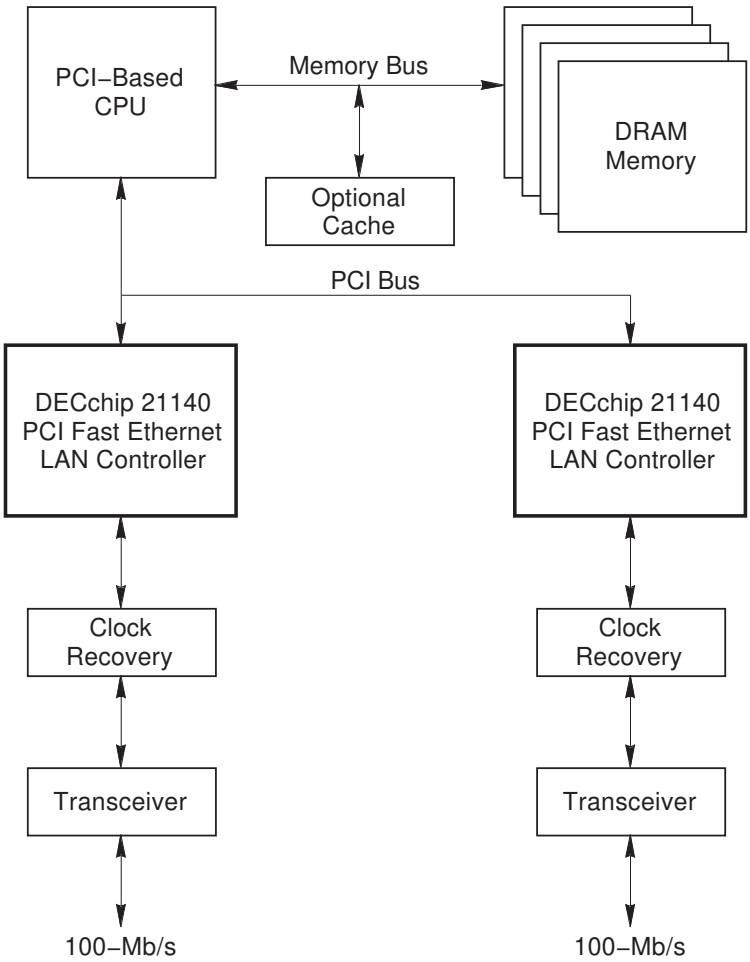


Figure 4 Fast Ethernet 2-Port Bridge



Complete Solution

A DECchip 21140 evaluation board kit provides all the tools necessary for hardware engineers to design a PCI Fast Ethernet Controller board for a variety of products.

The kit includes a PCI evaluation board with both 100BASE-TX and 10BASE-T connections. It also includes software drivers, documentation, schematics, and gerber files.

Software drivers for network operation will be provided for NetWare, PATHWORKS, SCO UNIX, and Microsoft's LAN Manager, Windows NT, Windows 95, and Windows for Workgroups.

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Characteristics	
Characteristic	**Specification**
Power supply	Vdd = 3.3 V Vdd_Clamp = 5 V or 3.3 V
Operating temperature	0°C to 70°C
Storage temperature range	–55°C to +125°C
Power dissipation @ Vdd = 3.3 V and PCI clock frequency = 33 MHz	0.5 W
Package	144-pin PQFP

For More Information

To learn more about the availability of the DECchip 21140 and evaluation board kit, contact your local semiconductor distributor. To learn more about Digital Semiconductor's product portfolio, contact the Digital Semiconductor Information Line:

1-800-332-2717
1-800-332-2515 (TTY)

Outside North America, call:

+1-508-568-6868

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