NetChip Technology, Inc.

NET2270

16-Bit USB 2.0 High-speed Programmable Peripheral Controller

Overview

16-Bit USB 2.0 Peripheral Controller (480 Mbps)

Ideal for Printer, Scanner and Mass Storage

Complete Development Kit on a PCI Card w/ Sample Drivers

NetChip's NET2270 16-bit USB 2.0 high-speed programmable peripheral controller is optimized for single or bi-directional data transfer devices such as printers, scanners, digital cameras, mass storage, and audio products. NET2270, the latest addition to our General Purpose USB Peripheral Controller family, complements our flagship, world's first NET2290 32-bit USB 2.0 high-speed peripheral controller.

NET2270 is designed for simplicity and flexibility while maintaining high performance. NET2270 comes with one control and three programmable endpoints to work with any combination of Control, Interrupt, Isochronous and Bulk transfers. It has many built-in functions to allow maximum flexibility such as user-selectable modes for endpoint FIFO assignments, direct or multiplexed register-addressing, and split DMA bus. To simplify and streamline firmware programming, we have incorporated several key traditional software functions into hardware, such as AutoRetry™ and Simulated Disconnect™.

NET2270 is a highly integrated peripheral controller. It includes an analog USB 2.0 transceiver, Serial Interface Engine (SIE), control endpoint 0, three programmable endpoints, two 1K-byte bi-directional FIFO RAM arrays, smart high speed configuration registers, built-in 30MHz PLL, and a generic local bus CPU interface. NET2270 is available in a 64-pin TQFP package.

Benefits & Features

BENEFITS	FEATURES
Maximum system throughput and USB data transfer	Full compliance with high speed USB 2.0 specifications (480Mbps) Optional split bus DMA support, with dedicated DMA and CPU access Two 1K bytes double-buffered, selectable FIFO IN/OUT memory arrays
Total design flexibility	Support both USB 1.1 (12Mbps) and USB 2.0 (480Mbps), with automatic detection and complete backward compatibility Multiple and selectable register-address modes for maximum and most efficient register access Three programmable endpoints, in addition to endpoint zero, for streamlined data transfer Programmable endpoints support either Isochronous, Bulk, or Interrupt data transfers Glueless interface to most 8 or 16 bit generic local CPU Built-in PLL to accept 30 Mhz crystal or oscillator
Simplified Software Development	Automatic retry, AutoRetry™, of failed packets Software disconnect, Simulated Disconnect™, allowing re-numeration Atomic operation to set and clear status bits
Low Power and management	0.35μm low power CMOS mixed signal technology 3.3V operation with 5V tolerant I/O Bus or self powered modes Software control of USB suspend and root port reset detection Software control of device remote and root port wakeup

USB

Applications

PC Peripherals

Scanner (flatbed, line, image)
Printer (inkjet, laser, plotter, thermal)
Mass Storage (CDRW, MO, HDD, DVD)

Industrial and Medical

Data acquisition, instrumentation, test and
   measurement
Medical instrument, diagnostic and monitor
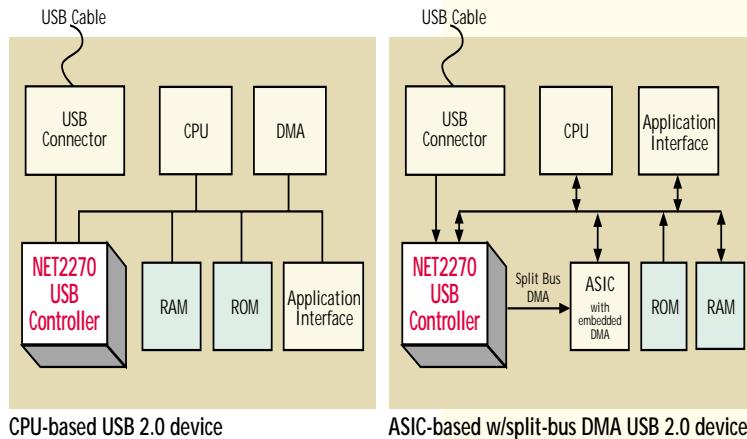Surveillance, fingerprint and security

Consumer and Entertainment

MP3 player
PDA, Pocket PC, ebook reader
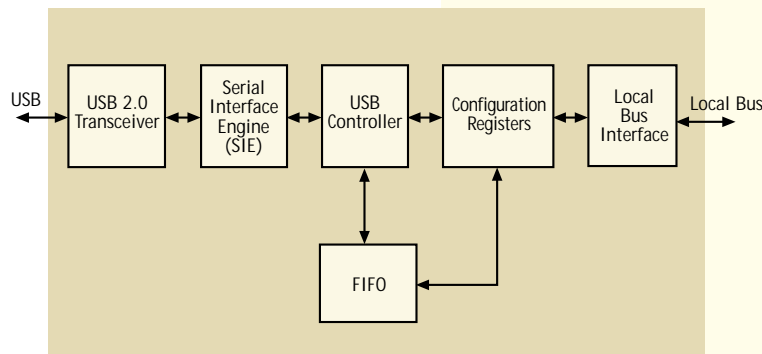Speakers, microphone
Multimedia codec, set top box

Legacy Conversion Adapters

PCI, SCSI, ATAPI/IDE, 100baseT, IEEE802.11

System Block Diagram

CPU-based USB 2.0 device

ASIC-based w/split-bus DMA USB 2.0 device

Chip Block Diagram

USB Transceiver:
- Supports Full Speed (12 MHz) or High Speed (480MHz) operation
- Serial data transmitter and receiver
- Parallel data interface to SIE
- Single parallel data clock output with on-chip PLL to generate higher speed serial data clocks
- Data and clock recovery from USB serial data stream
- SYNC/EOP generation and checking
- Bit stuffing/unstuffing; bit stuff error detection
- Logic to facilitate Resume signaling
- Logic to facilitate Wake Up and Suspend detection
- Ability to switch between FS and HS terminations/signaling

Serial Interface Engine (SIE):
- Interface between FIFOs and USB transceiver
- CRC generator and checker
- Packet identifier (PID) decoder
- Forced error conditions
- USB 2.0 Test Modes

USB Protocol Controller:
- Host to device communication
- USB bit level protocol (Serial Interface Engine)
- Automatic retry of failed packets
- Up to 3 Isochronous, Bulk or Interrupt endpoints, each with a configurable FIFO
- Configurable Control Endpoint 0
- Interface to FIFOs
- Simulated disconnect signaling allows device controlled enumeration
- Software control of USB suspend and root port reset detection
- Software control of device remote wakeup
- Software control of root port wakeup

Endpoint FIFOs:
- 4 Choices of preset configurations
- 2 Kbytes of configurable FIFO memory for endpoints
- Supports max packet size up to 1K bytes, double buffered

Local Bus Interface:
- Provides slave interfaces to 8-bit or 16-bit CPU
- Provides access to internal Transmit and Receive FIFOs
- Supports Split DMA transactions (DMA and CPU on separate data bus
- Local interface supports both DMA and interrupt transfers
- Supports optional multiplexed Address/Data bus using ALE for low pin count applications
- Supports indirect addressing, allowing access to all registers with only a single address bit
- Supports 5V tolerant I/O

Configuration Registers:
- Internal registers are accessible from the local bus
- Main registers for common functions
- Control registers for each endpoint
- USB registers for the USB Interface Module

NET2270 PCI-RDK
Development Kit on a PCI card
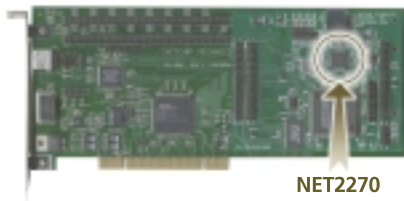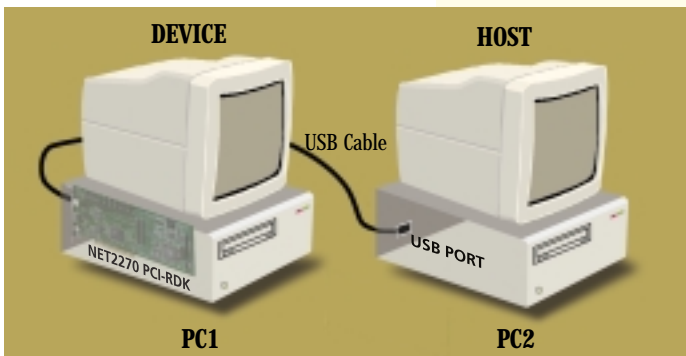
NET2270

The PCI-RDK is a development kit for NetChip's NET2270 USB Programmable Interface Controller IC. The PCI-RDK is the first USB peripheral development kit on a PCI card and takes advantage of the high speed interface standard on any PC systems. It provides a quick and efficient way for software programmers to develop software drivers and firmware for the NET2270 in conjunction with hardware development. The development kit comes with a PCI board with the NET2270 mounted on a daughter card. Once this card is plugged into a PCI slot of a PC system, the PC now emulates a USB device. Software programmers are able to start working on firmware, host drivers, and host application before the actual device is fully functional.

With the PCI-RDK, you can code your device firmware at the user mode level. You can use PC tools like Microsoft Visual C++ to edit, compile, and debug firmware. There is no need for a hardware emulator.
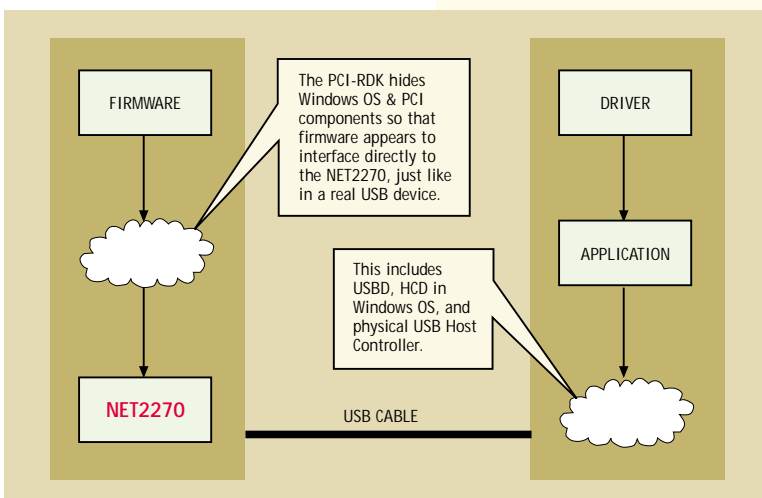
Features and Benefits

• USB peripheral device emulation and development on a PCI card

• Develop USB hardware and software drivers concurrently

• Maximize performance of the NET2270 USB controller in a development platform

• Evaluate and work with all features of the NET2270 without building any hardware

• Eliminate the need for expensive emulators

• Speed driver development, surpassing hardware completion means faster time to market

• Jumpstart driver software development with complete reference drivers and source codes

System Overview

DEVICE

HOST

USB Cable

NET2270 PCI-RDK

USB PORT

PC1

PC2

This illustration shows a typical system setup for the NET2270 PCI-RDK. PC1 emulates the USB Device when the NET2270 PCI-RDK board is configured and loaded with NetChip drivers. PC2 is the USB Host that runs the host driver and host application provided by NetChip.

NET2270 PCI-RDK
Conceptual View

FIRMWARE

The PCI-RDK hides Windows OS & PCI components so that firmware appears to interface directly to the NET2270, just like in a real USB device.

DRIVER

This includes USBD, HCD in Windows OS, and physical USB Host Controller.

APPLICATION

NET2270

USB CABLE

This diagram shows several components that are vital to the USB device: Firmware, NET2270, Host Application, and Host Driver. NetChip provides sample code for all these components.

The NET2270 is a fully programmable integrated USB interface controller chip. It takes care of many low level, but tedious USB protocols such as chirp, packet identification, data encoding/ decoding, CRC checking, and packet retries. This allows the firmware to focus on higher level application oriented issues.

Support

NetChip prides itself on immediate and responsive customer support to achieve complete customer satisfaction. A special email hotline, support@netchip.com is available for you to submit technical questions or support issues. Engineers are assigned to monitor the emails and provide immediate assistance.

Actual Size
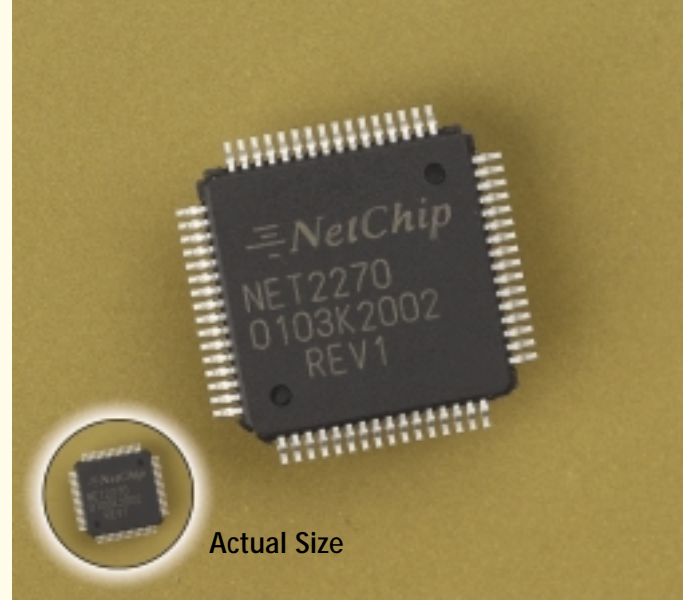
Background

NetChip Technology Inc. is a leading supplier of high-performance seminconductors and sub-systems based on USB and other leading edge, emerging technologies. NetChip is the first company to be featured as the USB 2.0 technology demo at keynote addresses during various conferences around the world hosted by Intel and Microsoft since February 2000. The company's innovative product designs, unparalleled level of customer support, and high level of product expertise have earned NetChip a solid reputation with peripheral device design engineers and business managers alike. You can find NetChip's products in many popular printers, scanners, storage devices, digital cameras, multimedia devices, broadband modems, business and home networking equipment.

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