NetChip
Technology, Inc.

NET2290
32-Bit USB 2.0 Programmable Peripheral Controller

Overview

NetChip's NET2290 USB 2.0 programmable peripheral controller continues to set the standard as the highest performance device chip on the market. NET2290 provides significant feature enhancements to NetChip's current USB 1.1 NET2890 peripheral controller and its General Purpose Universal Serial Bus (USB) Device design standard. Advanced flexibility functions including a special Dual Mode function that supports connections either with USB 1.1 or USB 2.0 host systems, a high-speed "glueless" interface to many 16 or 32 bit microprocessors, and features that simplify software development enabling system designers to quickly migrate to USB 2.0.

With the increased bandwidth to 480 Mbps speed, which is 40 times faster than USB 1.1, a broad range of PC peripheral applications can take advantage of the benefits of USB. These peripherals include high-end networking devices, digital video cameras, next generation scanners, high-end printers, and fast storage devices.

The architecture of NET2290 is designed to simplify software development thereby reducing time to market. The NET2290, housed in a 128 pin TQFP package, includes a high speed Serial Interface Engine, transceiver, USB 2.0 bus interface, Dual Channel DMA interface, PLL, 7 configurable endpoints, dual 4Kbyte double-buffered FIFO memory arrays, local bus interface and Configuration Registers.

Benefits & Features

BENEFITS	FEATURES
Maximum system throughput and USB data transfer	Full compliance to High Speed USB 2.0 specifications (480Mbps) Read/Write cycle times >=20ns (up to 133Mbytes/sec burst data rate) Two 4KB FIFO IN/OUT memory arrays Dual-channel DMA interface
Total design flexibility	Support both USB 1.1 (12Mbps) and/or USB 2.0 (480Mbps), with automatic detection Six configurable endpoints, in addition to endpoint 0 Each endpoint configurable with various FIFO sizes, from 64 - 4K bytes 8, 16, or 32 bit local bus CPU interface Special synchronous CPU interface to Motorola MPC and Hitachi SH General purpose Intel CPU Asynchronous interface Built-in PLL to accept 12 Mhz crystal or oscillator
Simplified Software Development	Auto-Enumerate™ modes Automatic retry, AutoRetry™, of failed packets Diagnostic register allowing forced USB errors Software disconnect, Simulated Disconnect™, allowing re-numeration Atomic operation setting and clearing status bits Automatic or user-programmable FIFO allocations for endpoints Big or little Endian support
Power Management	Self powered mode 0.35µm CMOS high performance, low power technology 3.3V operation 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)
Digital still, PC camera and video conferencing
External Storage (HDD, CDRW, DVD, FDD, MO)
Printer, plotter, POS

Consumer Entertainment

PDA, Pocket PC, eBook readers
MP3 player, TV tuner, set top boxes
Digital stereo and audio systems

Legacy Conversion Adapters

SCSI, PCI, IDE, 100BaseT

Communication

Broadband: xDSL, cable, and satellite
   modems
Home network: phoneline, powerline, USB
   host to host, wireless (Bluetooth, IEEE
   802.11)
ISDN TA, T1/E1, ATM, Ethernet

Industrial and Medical

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

System Block Diagram

Chip Block Diagram
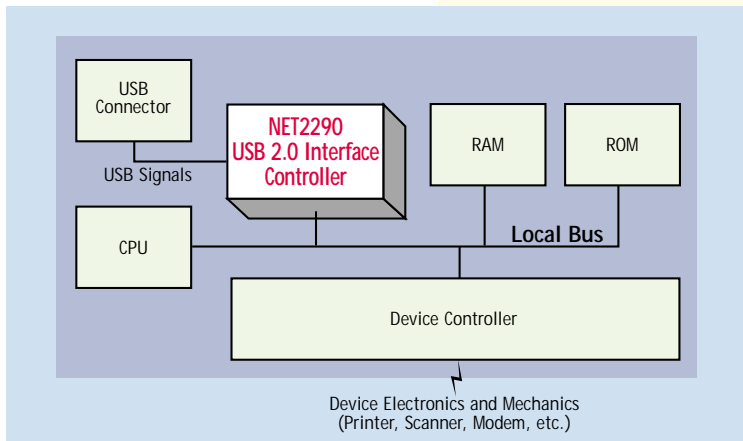
USB Transceiver:

- 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
- Automatic programmable response to Standard Requests during enumeration
- Up to 6 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 controlled device remote wakeup
- Software control of root port wakeup

Endpoint FIFOs:

- 4 Kbytes available for IN endpoints
- 4 Kbytes available for OUT endpoints
- Separate 256 byte FIFO for Endpoint 0
- Configurable FIFO sizes: 64, 128, 256, 512, 1K, 2K, 4K bytes
- Automatic or manual FIFO memory allocation
- Programmable almost empty and almost full thresholds
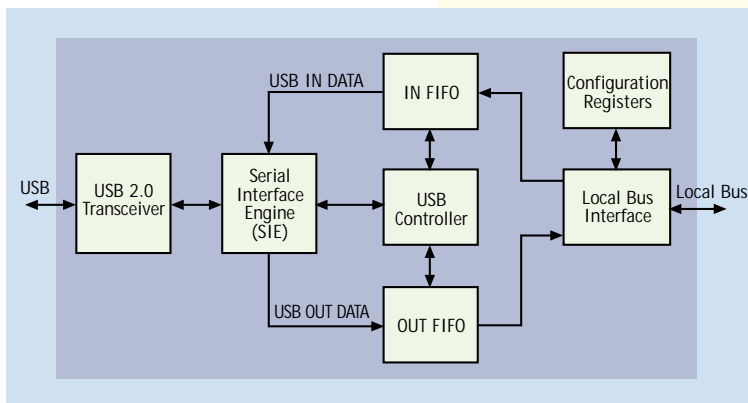
Local Bus Interface:

- Interface to FIFOs
- Local CPU slave interface
- Local DMA slave interface
- Selectable local bus protocols and bus width
- Byte swapping/gathering
- Interrupts

Configuration Registers:

- All registers are directly accessible for fast access
- Registers are accessible only from the local bus
- Main registers for common functions
- Control registers for each of the 7 endpoints
- USB Registers for the USB Protocol Controller Module
- Indexed registers for infrequently accessed functions

NET2290 PCI - RDK
## Development Kit on a PCI card

NET2290

The PCI-RDK is a development kit for NetChip's NET2290 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 NET2290 in conjunction with hardware development. The development kit comes with a PCI board with the NET2290 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 codes. 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 NET2290 USB controller in a development platform

• Evaluate and work with all features of the NET2290 without building any hardware

• Eliminate the need for expensive emulators

• Speed driver development prior to hardware completion means faster time to market

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

System Overview
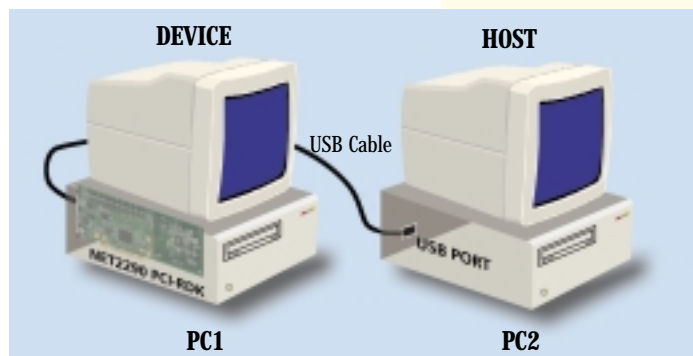
This illustration shows a typical system setup for the NET2290 PCI-RDK. PC1 emulates the USB Device when the NET2290 PCI-RDK board is configured and loaded with NetChip drivers. PC2 is the USB Host that runs the host driver and host application provided by NetChip.

NET2290 PCI-RDK
Conceptual View
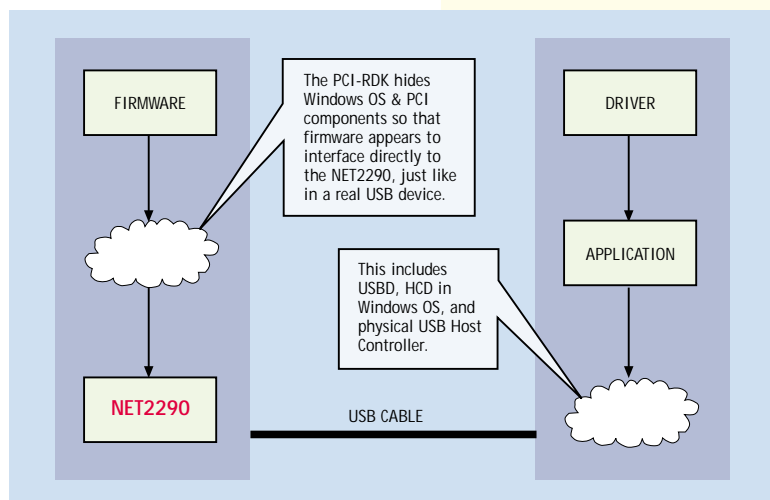
This diagram shows several components that are vital to the USB device: Firmware, NET2290, Host Application, and Host Driver. NetChip provides sample code for all these components.

The NET2290 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.

Background

NetChip Technology Inc. is a leading supplier of high-performance seminconductors and subsystems 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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