

# NET2890

## Programmable & Turbo Performance USB Peripheral Controller IC

### Overview

NET2890 continues NetChip's tradition of turbo performance in USB peripheral controller IC. NET2890 provides system designers the maximum flexibility in both hardware and software, and still has the maximum system throughput. NET2890 includes the industry's fastest I/O ports, a turbo speed USB Serial Interface Engine, a microprocessor independent interface, a DMA interface, five programmable endpoints, and dedicated FIFO's for each endpoint.

The five endpoints are completely programmable and allow you to customize data transfer schemes and/or meet Class driver specifications from Microsoft Windows OS. To speed up data transfer, each programmable data endpoint comes with a built-in 128B FIFO memory, which allows multiple full-size data packets to simultaneously pre-load and unload.

NET2890 includes NetChip's proprietary Hardware Automatic Retry (AutoRetry™). This eliminates cumbersome firmware development resulting in improved performance.

NET2890 comes in the industry's smallest quarter-inch sized 48-pin TQFP package. Also, NET2890 is pin-compatible to TurboUSB (NET2888). If you are using our TurboUSB controller today, you can upgrade to NET2890 without changing PCB and hardware designs.

### Benefits & Features

#### BENEFITS

#### FEATURES

Fastest Available System Throughput	Industry's fastest Read/Write cycle time of <67ns (~12MB/s burst data transfer) Deliver up to the limits of USB throughput – 12Mb/s Processor Independent Interface External DMA Interface Five programmable endpoints to streamline data transfers Dedicated 128Byte FIFO to each endpoint to allow multiple full-size data packets transfer Hardware automatic retries (AutoRetry™) to reduce host CPU and firmware overhead
Able to meet Windows Class and/or customize drivers	All five endpoints are completely firmware programmable to fit various applications Able to program vendor ID and product descriptors Supports all Interrupt, Control, Bulk and Isochronous transfers
Total Design Flexibility	Generic Local Bus CPU Interface Glueless design with many popular CPUs Dual Voltage 3.3/5V I/O interface Self or Bus powered modes Simulated Disconnect™ to allow reenumeration
Low Power Consumption	.45µm high-performance low-power CMOS Technology – 3v operation
Small Footprint	48 pin TQFP Package – 81mm <sup>2</sup> (0.12 in <sup>2</sup> )
Drop-in upgrade from NET2888	Pin compatible to NET2888
Quick Time to Market	Complete development kit available to jump start your system design Available software drivers and source code for references All software codes are written in C and work with most C compilers Reference designs available for many popular applications
Full USB Compatibility	Meet USB specifications 1.0 and 1.1 Meet both UHCI and OHCI specifications



## Applications

## PC Peripherals

Scanner (flatbed, line, image, 2D barcode)  
Digital still camera, PC camera, video conferencing  
Printer, POS, plotter  
Zip drive, external floppy and hard disk drive, CDRW, MO

## Consumer Entertainment

MP3 player  
Force feedback joystick, touchpad  
Digital stereo, PC speakers, microphone  
PDA, eBook readers

## Communication

Broadband: xDSL, satellite & cable modems  
Home networks: phone, powerline, RF, USB host to host  
ISDN TA, T1/E1, ATM, Ethernet

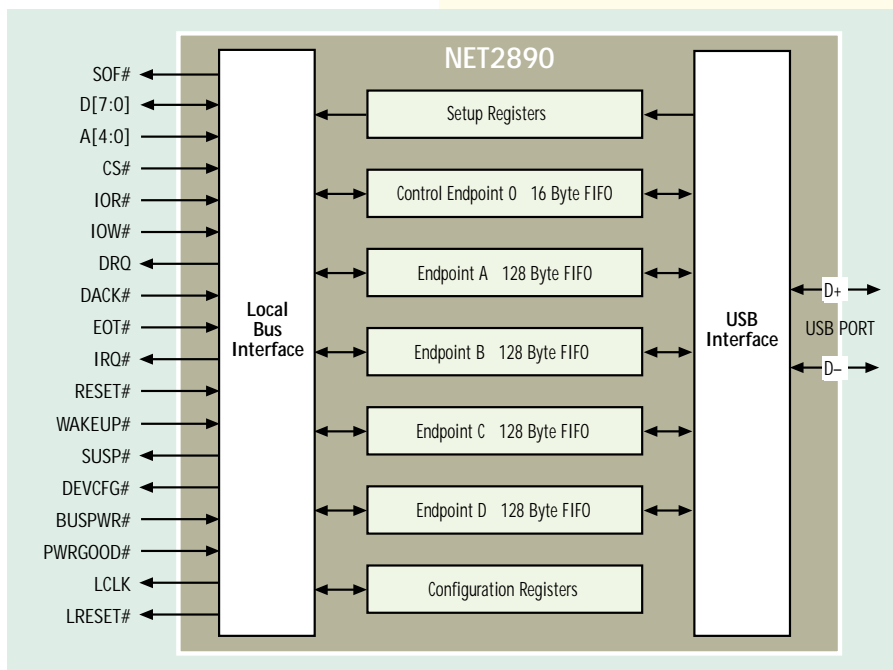
## Industrial Control

Surveillance, security, fingerprinting  
Smart terminal, docking station  
Instrumentation, data acquisition, analyzer, test & measurement  
Medical instruments, diagnostics

## Legacy Conversion Adapters

Serial/USB, parallel/USB, SCSI/USB

## Chip Block Diagram



**Local Bus I/F:** The local bus I/F interfaces NET2890 to a generic local bus. The two main components of the Local Bus I/F are the Processor interface and the DMA.

- Processor Interface
  1. Provide interrupt and DMA services to local CPU
  2. Allow CPU to configure and interact with endpoints including access to FIFOs and configuration registers
  3. Provides Endpoint 0, USB default pipe and requests to CPU for full response flexibility
  4. Handle FIFO status including almost full and almost empty registers
  5. Provide local CPU access to USB frame
- “Program-n-forget” DMA  
NET2890's DMA interface can be programmed to receive or transmit multiple packet data streams without processor intervention. The “Program-n-forget” feature eliminates the need for CPU intervention at a packet level. The addition of DMA is ideal in systems where the CPU is unable to keep up with the USB bandwidth.

**Endpoints:** NET2890 has five endpoints, one CONTROL required by USB specification and four Flex endpoints. The CONTROL endpoint (endpoint 0) is managed by the local CPU for full flexibility in meeting USB Class specifications or other design requirements. Each of the four Flex endpoints can be defined to either receive or transmit over BULK, ISOCRONOUS, or INTERRUPT modes. The Auto-Retry feature further reduces CPU intervention for bus recovery.

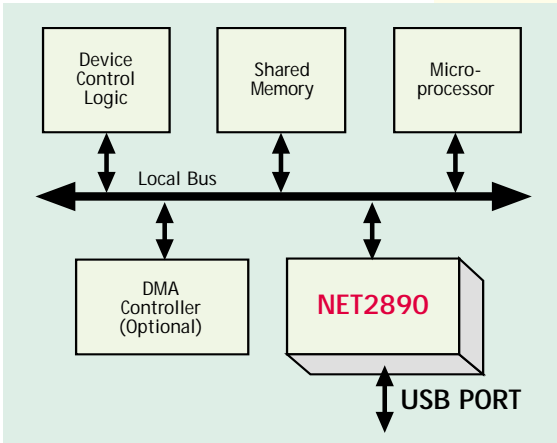
- Endpoint 0  
This endpoint is required under USB specification to respond to standard requests from the Host PC. USB Class specifications define additional requests for Endpoint 0. NET2890 is designed to support class-based designs by providing the local CPU with complete control over responses to Endpoint 0 requests. A 16-byte bi-directional FIFO is able to handle the data portion of Receive and Transmit requests.
- Four Programmable Endpoints  
Each of the four programmable Endpoints is fully configurable to receive or transmit BULK, ISOCRONOUS, or INTERRUPT data. A 128-byte FIFO connected to each endpoint can store two maximum-size Bulk or Interrupt packets for higher performance.

**USB Controller and SIE:** The USB Controller and Serial Interface Engine (SIE) serve to translate local CPU data into serial USB signals on NET2890. The USB Controller handles higher-level packet information while the SIE manages the bit level USB information.

- USB Controller
  1. Mediates traffic between all Endpoints and the SIE
  2. Handles USB retry protocol to recover from USB bus errors without CPU intervention

3. Transfer-level intelligence automatically manages multiple packets in a USB data transfer
  4. Handles Suspend and Resume functions
  5. Manages proper handshake packets between local device and host
- SIE
    1. Translates bit level USB data into bytes for the local bus interface
    2. Manages clock recovery, packet boundaries, bit stuffing, and CRC
    3. Provides diagnostics to simulate USB signaling errors (bit stuff and CRC)

## System Diagram



**Microprocessor:** NET2890 easily interfaces with any generic processor. This eliminates the need for multiple CPU's and software maintenance. The engineer can choose a CPU which best matches the peripheral's requirements.

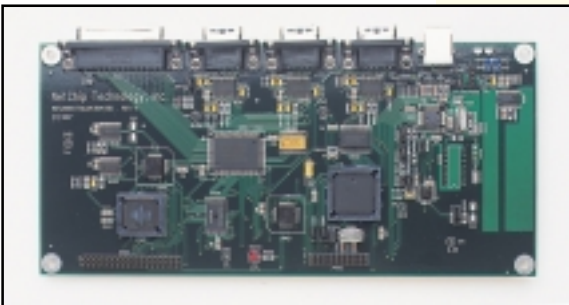
**Shared Memory:** Many peripherals may include EPROM or RAM. The NET2890 does not require any external memory.

**Optional DMA:** NET2890 supports a connection to an external DMA. The addition of external DMA can help the system achieve maximum USB throughput. DMA is ideal for applications requiring large packet ISOCHRONOUS or high bandwidth BULK transfers.

**Data Bus:** NET2890 interfaces to a generic asynchronous 8 bit local bus. Integrating the NET2890 with the peripheral system is simplified.

**Controller:** The controller is specific to each peripheral, for example, a printer engine or camera electronics.

## Development Kits NET2890-EB



The Development Kit for NET2890, NET2890-EB, serves as an excellent design reference for starting an USB peripheral design. The kit can serve as a reference design for a generic peripheral application. The bus-powered evaluation board has an external 8051 to drive the NET2890. Drivers and source code are provided as reference with the NET2890-EB to cut design time to a minimum.

The NET2890-EB is also ideal for debugging test systems or learning about USB. Users can interface with the evaluation board by connecting to either the on-board Parallel/RS-232 ports or directly to the test headers, which can in turn connect to almost any test system.

Software drivers and source code are provided with the kit. Programmers can use the software as a reference and jumpstart the firmware and driver development. All source codes are available in C and are highly portable. Loopback programs are included to allow the users to monitor USB traffic with ease.

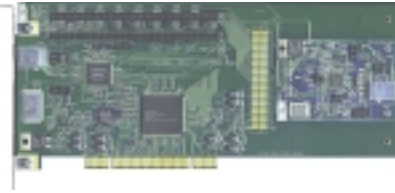
A COM Port emulation program is included on the development kit to facilitate designers to connect current serial devices to the RS-232 port and transfer data to the USB host via NET2890. This program allows easy migration from RS-232 to USB.

## The NET2890 CDK Includes:

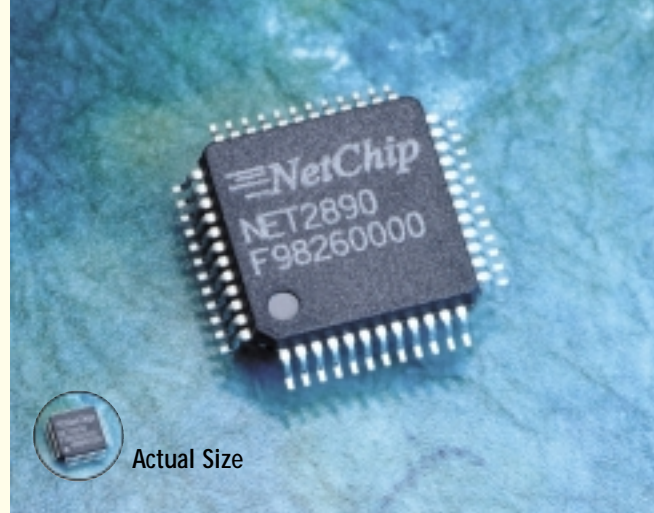
HARDWARE	SOFTWARE
Bus powered board with NET2890	HOSTMON.EXE – Console application, allows users to access board from the host PC
Working Firmware	NCUSB.SYS – USB system driver for evaluation board
USB Cable	NCUSB.INF – Allows plug and play feature
Floppy Disc with software drivers	COM Port emulation program
Users Manual	
Board Schematics	
Bill of Materials	

The necessary test environment for the NET2890-EB would include a USB Host PC and Windows 98 or development platform supporting WDM. Also helpful, but not necessary would be a USB analyzer. Please contact NetChip for additional information on setting up your test system.

## NET2890 PCI - RDK Development Kit on a PCI card



The PCI-RDK is a development kit for NetChip's NET2890 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 NET2890 in conjunction with hardware development. The development kit comes with a PCI board with the NET2890 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 NET2890 USB controller in a development platform
- Evaluate and work with all features of the NET2890 without building any hardware
- Eliminate the need for expensive emulators
- Speed driver development, surpassing hardware completion means faster time to market
- Jumpstart driver software developments with complete reference drivers and source codes

## Support

NetChip prides itself on immediate and responsive customer support to achieve complete customer satisfaction. A special email hotline, [support@netchip.com](mailto: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 turbo performance Universal Serial Bus (USB) semiconductors and subsystems. NetChip also has a comprehensive network of sales representatives and distributors worldwide.

At NetChip, we are committed to helping manufacturers develop USB peripheral products in the most cost-effective way, at the maximum available system performance, and with the least amount of time.

To contact NetChip, please email us at: [sales@netchip.com](mailto:sales@netchip.com)

Visit our website at [www.netchip.com](http://www.netchip.com)

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