MICROCHIP

Connectivity Solutions for Embedded Design

USB, Ethernet, Wi-Fi®, Bluetooth®, ZigBee®, MiWi™ Wireless Networking Protocol, CAN, LIN, IrDA® and RS-485 Protocols

www.microchip.com/connectivity

Embedded Wireless Solutions

Targeting the Need for Low Power Wireless Connectivity

Wireless communication technologies have been commonplace in homes and industry for many years. Recent Smart Grid initiatives have created a renewed demand for standardized, low power, wireless technology in metering, home, business and industrial automation markets. As a result, Microchip offers many IEEE 802.11™, IEEE 802.15.4™ and ZigBee® standard solutions along with our proprietary MiWi™ wireless networking protocol for both 2.4 GHz and Sub-GHz to address this need.

Wi-Fi® IEEE 802.11

Microchip has a broad portfolio of Wi-Fi products including complete agency-certified 802.11 b/g modules, 802.11 b/g Wi-Fi transceivers and RF chipset solutions that make adding Wi-Fi simple. Our modules include full TCP/IP stacks and networking services all in a compact surface mount component, saving you development time and testing cost.

- Low power for battery applications
- Regulatory agency-certified
- WEP, WPA1, WPA2, WPA-EAP Security
- SoftAP and Wi-Fi Direct Modes
- Supports WPS, FTP, HTTP, DHCP, Wi-Fi Direct and more
- Over-the-air firmware upgrade

RN Wi-Fi Series

RN171, RN131 Modules

- Full onboard TCP/IP stack and services (no external drivers required or royalties)
- Simple ASCII command interface
- Works with any microcontroller

MRF Wi-Fi Series

MRF24WB0MA/MB, MRF24WG0MA/MB

- Royalty-free TCP/IP stack and services on PIC® microcontroller
- Full service implementations for web server, email, FTP
- IPv4 and IPv6 support

To get started, purchase the RN-171-EK or Wi-Fi G Demo board development tools.

More information is available at: www.microchip.com/wifi.

Bluetooth®

- Bluetooth Classic 2.1 + EDR and 3.0 (audio only) compact surface mount modules
- Class 1 and Class 2 modules with an onboard stack, multiple embedded Bluetooth profiles, and a simple ASCII command interface
- Work seamlessly with Android™ and iPhone® devices

www.microchip.com/wireless

Data Communication

RN41/RN42 Modules

- Low power embedded modules
- Onboard embedded Bluetooth stack (no host processor required)
- Supports SPP, HID, HCI, iAP
- UART data connection hardware interface
- Auto-discovery/auto-connect requires no software configuration (instant cable replacement)

To get started, purchase the RN-42-EK development tool.

Streaming Audio/Data Communication

RN52 Module
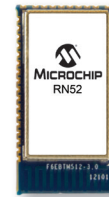
- Class 2 (30 meter range) audio module
- Software configurable through commands over UART console interface
- Embedded Bluetooth stack profiles: A2DP, HFP/HSP, AVRCP, SPP and iAP
- Analog and digital audio path
- Built-in amplifiers for speaker and microphone
- I²S and S/PDIF digital audio output
- UART for SPP, iAP and command mode

To get started, purchase the RN-52-EK development tool.

More information is available at: www.microchip.com/bluetooth.

## XBee® Compatible Wi-Fi and Bluetooth Socket Modules

Some designers want an easy way to migrate their 802.15.4 designs to either Wi-Fi or Bluetooth to make them accessible from smart phones and tablets or to add Internet connectivity. The RNXV series of Wi-Fi and Bluetooth socket modules provide agency-certified drop-in connectivity for any XBee socket. To simplify designs, the stacks are integrated on the module, configured via simple ASCII commands and can easily connect to any MCU via a serial interface.

Wi-Fi: RN171XV

- Direct internet connectivity
- Full 802.11 b/g data rate support
- Onboard TCP/IP stack
- SoftAP and infrastructure modes

Bluetooth: RN41XV/RN42XV
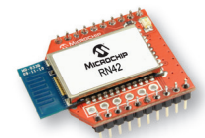
- Agency-certified Bluetooth module, supports version 2.1 + EDR
- UART (SPP) data connection interface
- Embedded Bluetooth stack profiles included: SPP, HID, HCI
- Multiple antenna options available: (RN41) Chip antenna, U.FL connector, (RN42) PCB trace, U.FL connector

Embedded Wireless Solutions
Targeting the Need for Low-Power Wireless Connectivity

ZigBee IEEE 802.15.4: (2.4 GHz)

MRF24XA, MRF24J40/MA/MB/MC Modules
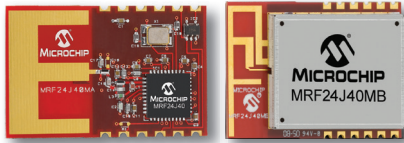
Microchip offers ZigBee certified compliant platforms for ZigBee PRO and ZigBee RF4CE protocol stacks ensuring interoperability and reliable communication.

- ZigBee PRO Stack
- Smart Energy Profile
- ZigBee RF4CE and ZRC Profile
- 2.4 GHz IEEE 802.15.4 compatible transceivers and modules
- FCC, IC and ETSI agency certified
- Supports ZigBee and MiWi wireless networking protocol development environment

More information is available at www.microchip.com/zigbee.

Sub-GHz Solutions: (433/868/915/950 MHz)

MRF49XA/MRF89XA/M8A/M9A Modules
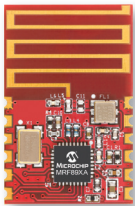
Microchip's Sub-GHz MRF modules are designed to bring simplicity to RF design along with regional regulatory certification. The modules target the lowest cost proprietary radio link market and offer industry leading characteristics including low power and large link budgets.

- 433/868/915/950 MHz transceiver and modules
- Low receive current = 3 mA
- Transmit power = +12.5 dBm
- Receiver sensitivity: −107 dBm FSK/−113 dBm OOK
- Integrated PCB antenna and matching circuit components
- FCC, IC and ETSI agency certified
- Surface-mountable PCB
- Supports MiWi wireless networking protocol development environment

Integrated MCU + RF

Low-power Sub-GHz transmitters with PIC MCUs in a single package for remote keyless entry, garage door openers, remote control and other one-way communication applications.

- PIC12F529T48A/39A
- PIC12LF1840T48A/39A
- PIC16LF1824T39A

More information is available at: www.microchip.com/security.

MiWi Wireless Networking Protocol Development Environment

MiWi Wireless Networking Procotol Development Environment is designed to provide a smaller footprint, lower resource communication protocol stack for peer-to-peer and mesh wireless networks. It is intended for customers who desire robust communication in a closed or private wireless network at either 2.4 GHz or Sub-GHz operation frequency.

- MiWi Wireless Networking Protocol P2P
- MiWi Wireless Networking Protocol
- MiWi Wireless Networking Protocol PRO

More information is available at: www.microchip.com/miwi.

The Wireless Development Studio (WDS)

The WDS is a Java-based Graphic User Interface (GUI) which allows quick and easy development of wireless applications based on the MiWi wireless networking protocols. It features a MiWi wireless networking protocol sniffer for monitoring, debugging and gathering information and a configurator with a GUI to enable simple customization and configuration of wireless networks.

Development Tools

Remote Control Demo Board (DM240315-2)

This board integrates graphics, mTouch™ technology, USB and RF4CE into a single demo. It features the PIC24FJ256DA210 MCU, a 3.5" Graphical TFT LCD with resistive touch screen, capacitive touch keys with plastic overlay, MRF24J40 2.4 GHz transceiver and ZENA™ wireless adapter.

www.microchip.com/wireless

USB Connectivity Solutions

Scalable Integrated USB Solutions

The consumers' desire for more engaging, easy-to-use and upgradeable products is driving embedded designers to add USB capabilities to their designs.

Microchip provides designers with a scalable choice of integrated USB solutions across 8-, 16- and 32-bit PIC microcontrollers ranging from space-saving 14-pin devices to feature-rich 100-pin USB On-the-Go (OTG) products. This allows simple, compact designs to easily expand to offer more capabilities as requirements demand.

In addition, Microchip offers highly configurable stand-alone USB converters, hubs, transceivers, switches, bridges and security controllers ideal for applications like smart phones, Flash media controllers, power delivery and charging, cameras, GPS, gaming, medical, networking and set-top boxes.

Microchip provides free source code for USB software stacks and class drivers to shorten development time for USB applications, including thumb drive boot loaders and printer support. Supported classes include: audio, CDC, HID, MSD, printer and custom. Microchip's free USB host stack, device stack and class drivers are available at: www.microchip.com/usb.

PIC16F and PIC18F Family

- Full-speed USB Device mode
- 8–128 KB Flash, 512B–4 KB of RAM,
- Up to 16 MIPS 8-bit devices
- Up to 4 UARTs, 2 I²C™/SPI ports
- Available in 14 to 100-pin packages

PIC24 Family

- Full-speed USB Device, Host and OTG modes
- 32–512 KB Flash, 8–96 KB RAM
- 16 to 70 MIPS 16-bit devices
- Up to 4 UARTs, 3 I²C and 4 SPI ports
- DMA interface for data RAM access, display drivers
- Available in 28/44/64/80/100/144-pin packages
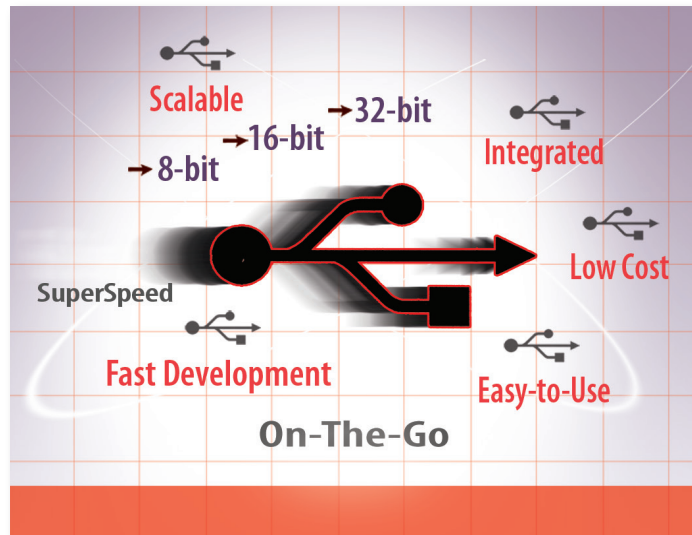
PIC32 Family

- Full-speed USB Device, Host and OTG modes with dedicated DMA Channels
- 16–512 KB Flash, 4–128 KB RAM, 40 or 80 MHz MIPS® M4K® Core
- Up to 6 UARTs, 5 I²C and 4 SPI ports, up to 8 general purpose DMA channels
- Available in 28/36/44/64/100-pin packages

dsPIC33E Family

- Full-speed USB Device, Host and OTG modes
- 256–512 KB Flash, 32–52 KB RAM, 70 MIPS 16-bit devices
- 4 UARTs, 2 I²C and 4 SPI ports with motor control and digital power peripherals
- Available in 64/100/144-pin packages

Stand-alone USB Converters

- MCP2200 (USB to UART) and MCP2210 (USB to SPI) bridge devices allow for an easy and cost-effective way to add USB to existing designs. These highly-configurable products support full speed, on board EEPROM and up to nine GPIOs.

www.microchip.com/usb

USB Connectivity Solutions

Stand-alone & Integrated USB Solutions from Low-Cost Devices to Complex SuperSpeed USB

USB technology can be found in practically all applications and markets—from consumer to industrial to automotive segments. The extreme proliferation of USB has even led to the adoption of the technology as a high-bandwidth embedded chip-to-chip interface. Microchip enables seamless USB connectivity by delivering integrated value rich solutions such as USB hub controllers, power delivery and charging, transceivers/switches, Flash media controllers, and security solutions.

USB Hub Controllers
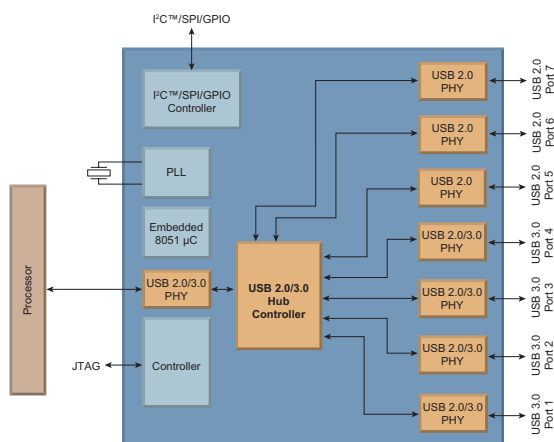
USB24XX/USB25XX/USB350X/USB380X/USB3X13/USB553X Families

- USB-IF compliant Hi-Speed USB 2.0 and SuperSpeed USB 3.0 solutions
- Integrated controller providing flexible ease-of-use and programmability
- Small, highly-integrated and low-power hub solutions offered specifically for mobile applications
- Multi-port solutions with battery charger detection
- Unique system optimization features including PHYBoost, VariSense™, and flexConnect

USB Power Delivery and Battery Charging
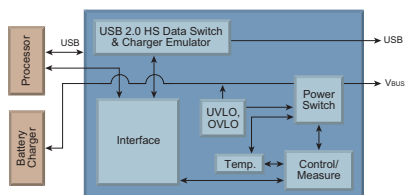
UCS100X Family

- Port power switch capable of supporting up to 2.5A for continuous current
- Up to 9 preloaded charger emulation profiles with full programmability to customize profiles
- Integrated current sensor to optimize charging experience and algorithms
- Extremely low-power sleep mode
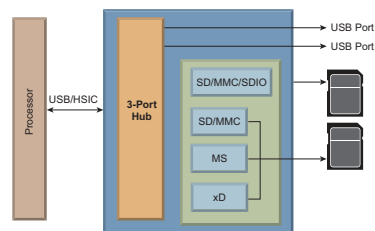
Note: UCS1002 may require an NDA.

USB Transceivers and Switches
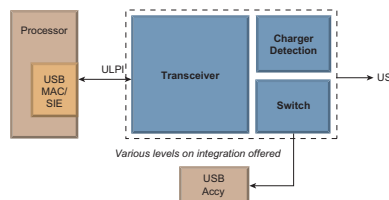
USB333X/USB334X/USB374X/USB375X Families

- ULPI standard interface to transceivers
- Compliant Hi-Speed USB 2.0 switch technology for USB port sharing
- Battery charger detection integrated
- Smallest package option available, ideal for mobile applications

USB Flash Media Controllers

USB22XX/USB26XX/USB46XX Families

- Secure Digital (SD™)/microSD™, Embedded MultiMediaCard (eMMC™)/MultiMediaCard™ (MMC), Memory Stick® (MS)/MS Pro™/MS Pro-HG™, xD-Picture Card™ (xD)
- Card speed technology for maximum data throughput
- Integrated USB hub ports for highest integration
- Flexible interfaces to processor supported including USB and HSIC

USB Security
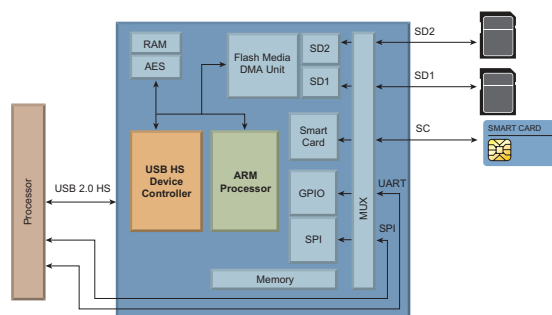
SEC11XX/SEC12XX/SEC24XX/SEC44XX Families

- Multiple standard smart card interfaces including ISO/IEC7816
- Flexible host interfaces supported including USB, SPI and UART
- Hardware level key management and AES encryption
- Extremely fast and optimized secure data transfers with no firmware intervention

www.microchip.com/usb

USB Development Tools and Software Support

Supporting USB Development from Concept to Prototype

Microchip's support for USB applications includes MPLAB® X Integrated Development Environment (IDE) tools for all USB PIC MCUs, peripheral applications for the 8-bit PIC16F, PIC18F family, and device, embedded host and OTG applications for the 16-bit PIC24F, PIC24E and dsPIC33E and 32-bit PIC32 families. Designers can use Microchip's free USB stacks—including class drivers, 16- and 32-bit file system drivers and SCSI interface drivers—which are provided in source code form. More information is available at: www.microchip.com/usb.

Additional software support includes full C and RTOS development environments. Also available are TCP/IP stacks, graphics libraries and ZigBee software stacks, which allow USB functionality to be combined with other capabilities to support a variety of designs. More information is available at: www.microchip.com/mla.

USB Starter Kits

These development kits provide an easy, low-cost way to evaluate the functionality of Microchip's 8-, 16- and 32-bit USB microcontrollers. Each all-inclusive kit contains the hardware, software and code examples necessary to take your next USB design from concept to prototype.

Low Pin Count USB Development Kit with PICkit™ 2 (DV164126)

This kit features the PIC18F14K50 and PIC18F13K50 20-pin USB MCUs. Hardware, software and code examples are included, as well as self-directed course and lab materials.

PIC18 Starter Kit (DM180021)

This kit features a PIC18F46J50 MCU and includes on-board debugger/programming capability as well as USB communication, a capacitive touch pad, potentiometer, acceleration sensor, MicroSD memory card and an OLED display. The board can function as a USB mouse, joystick or mass storage device (thumb drive) all using the on-board capacitive touch sense pads.

MPLAB Starter Kit for PIC24F (DM240011)

This kit provides an inexpensive way to evaluate the 16 MIPs PIC24FJ256GB110 with USB-OTG. Application demonstrations include mTouch capacitive sensing, driving an OLED display and USB-OTG to store data to a thumb drive.

PIC32 USB Starter Kit II (DM320003-2)
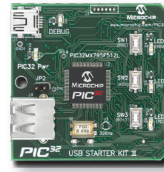
This kit provides the easiest and lowest cost method to experience the USB and CAN functionality of the PIC32 microcontrollers. Users can develop CAN applications using PIC32 expansion boards. The board contains everything need to develop USB embedded Host/Device/OTG applications when combined with Microchip's free USB software.

## FS USB Plug-In Module (PIM) Demo Boards

These full-speed USB demonstration and development boards feature the PIC18FXXJ50 8-bit MCUs. The boards can be operated either stand-alone or as a PIM plugged into the PICDEM™ PIC18 Explorer board (DM183032).

PIC18F46J50 FS USB PIM Demo Board (MA180024)
PIC18F47J53 FS USB PIM Demo Board (MA180029)
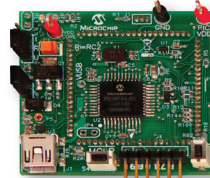
The PIC18F46J50 and PIC18F47J53 FS USB PIM demo boards are full speed USB demonstration and development boards featuring the PIC18F46J50 and PIC18F47J53 respectively.

PIC18F87J94 FS USB Demo Board (MA180033)
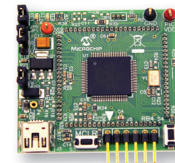
The PIC18F87J94 FS USB PIM demo board is a full speed USB demonstration and development board featuring the PIC18F87J94.

Explorer 16 Development Platform

Combine the Explorer 16, low-cost modular development board with the USB PICtail™ Plus daughter board for easy USB development with 16- and 32-bit MCUs. Several different PIMs are available to allow development with a variety of MCU platforms.

Explorer 16 Development Board (DM240001)
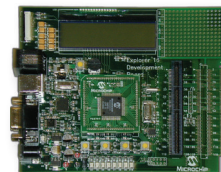
Use this efficient, low-cost development board to evaluate the features and performance of Microchip's 16-bit PIC24F and PIC24H MCU, dsPIC33 DSC and 32-bit PIC32MX families. Interface with the MPLAB ICD 3 In-Circuit Debugger or MPLAB REAL ICE™ In-Circuit Emulator to speed evaluation and prototyping of application circuitry.

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USB Development Tools and Software Support

Supporting USB Development from Concept to Prototype

USB PICtail Plus Daughter Board (AC164131)

This module enables USB hardware connectivity when using an Explorer 16 and USB-capable PIM. Provides support for USB Device, Host and OTG development.
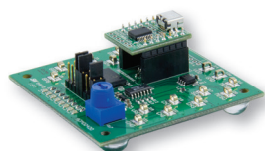
Plug-in Modules

Various PIMs are available for use with the Explorer 16 development board. Individual PIMs feature different PIC24F, PIC24E and PIC32 microcontrollers and dsPIC33E digital signal controllers with USB modules.
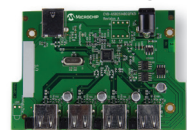
USB Evaluation Boards

MCP2210 Evaluation Kit (ADM00421)

The MCP2210 Evaluation Kit is a development and evaluation platform for the MCP2210 USB-to-SPI stand-alone device.

USB Hub Controller Evaluation Boards

USB2514B Hi-Speed USB 2.0 Multi-TT 4-Port Hub with Battery Charging Support (EVB-USB2514BC)

USB2514B MultiTRAK™ Hub Controller is a low-power, full-featured, OEM configurable Hi-Speed USB 2.0 compliant hub with four downstream ports. Each of these downstream ports in the USB2514B device is capable of supporting battery charging per the USB battery charging specification.

USB3503 HSIC to USB 2.0 3-Port Hub for Portable Applications (EVB-USB3503)

The EVB-USB3503 is used to evaluate our extremely small size USB3503 hub, which is ideal for mobile and portable applications. Many processors serving the mobile market have adopted HSIC as a standard interface, and this solution allows for both external USB 2.0 connectivity as well as an embedded interface in these mobile products.

USB3803 Hi-Speed USB 2.0 3-Port Hub for Portable Applications (EVB-USB3803)

The EVB-USB3803 is used to evaluate our extremely small size USB3803 hub, which is ideal for mobile and portable applications. The USB3803 is similar to the USB3503 with the excetion that this device has a USB 2.0 upstream interface instead of HSIC. Some system architects prefer to use USB 2.0, and this solution provides an adaptable equivalent.

### USB553X SuperSpeed USB 3.0 7-Port Hub Controller (EVB-USB5537)
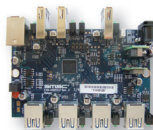
The EVB-USB5537 is used to evaluate the USB553X family of SuperSpeed USB 3.0 Hub controllers. This solution is offered in different port configurations and provides some unique features such as PHYBoost and VariSense to optimize USB system design. It also incorporates battery charging detection on all downstream USB ports.

Power Delivery and Battery Charging Evaluation Boards

USB Port Power Controller with Charger Emulation (EVB-UCS1002)
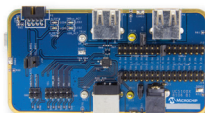
The EVB-UCS1002 is used to evaluate our UCS100X USB Port Power Controller solutions. USB ports are used for not only USB data, but also USB battery charging. The UCS100X provides up to nine preloaded and one programmable charger emulation profiles, an integrated current sensor and a power switch. It it capable of up to 2.5A of continuous current.

Note: The UCS1002 may require an NDA.

Transceiver/Switch Evaluation Boards

USB3330 Hi-Speed USB 2.0 Transceiver with ULPI Interface in Smallest Package (EVB-USB3330)

The EVB-USB3330 is used to evaluate our USB333X family of small, highly-integrated USB 2.0 transceivers with ULPI interface. The small WLCSP package makes the USB333X family an ideal solution for mobile and portable applications. It features multi-frequency reference clocks to adapt and share any common system reference clocks, and includes key features like RapidCharge Anywhere™, PHYBoost and VariSense for system optimization.

www.microchip.com/usb

USB Development Tools and Software Support

## Supporting USB Development from Concept to Prototype

USB3340 Hi-Speed USB 2.0 Transceiver with ULPI Interface (EVB-USB3340)

The EVB-USB3340 is used to evaluate our USB334X family of highly integrated USB 2.0 transceivers with ULPI interface. The features and functions are identical to the USB333X family except the USB334X comes in a convenient, widely-used 32-pin QFN package.

USB3740 Hi-Speed USB 2.0 2-Port Switch (EVB-USB3740)
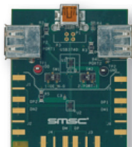
The EVB-USB3740 is used to evaluate our USB3740 USB 2.0 compliant 2-port switch. Some applications require a single USB port to be shared with other functions. The USB3740 is a small and simple 2-port switch providing system design flexibility.

USB375X Hi-Speed USB2.0 Port Protection with Integrated Switch and Charger Detection (EVB-USB3750)

The EVB-USB3750 is used to evaluate our USB375X family of Integrated USB 2.0 Port Protection devices. The USB375X integrates a high level of ESD protection to the USB port, which is typically exposed to the harsh environment of the outside world. It also incorporates our Hi-Speed USB 2.0 switch as well as battery charger detection, all in a conveniently-small package.

Flash Media Controller Evaluation Boards

USB2250 Ultra Fast Hi-Speed USB 2.0 Multi-Slot Flash Media Controller Eval Board (EVB-USB2250)

EVB-USB2250 is an Ultra-Fast USB 2.0 Multi-Slot Flash Media Controller Evaluation Board. It is used to demonstrate the features of the USB2250, a stand-alone Hi-Speed Mass Storage Class Peripheral Controller intended for reading and writing to more than 24 popular Flash media formats from the CompactFlash® (CF), SmartMedia™ (SM), xD-Picture Card (xD), Memory Stick (MS), Secure Digital (SD), and MultiMediaCard (MMC) families.

USB2640 USB 2.0 Port Hub with Ultra Fast Flash Media Controller Evaluation Board (EVB-USB2640)

The USB2640 is an Ultra Fast USB 2.0 Hub, Flash media controller, and protocol bridge combo. The EVB-USB2640 Evaluation Board demonstrates a stand-alone application for developers of applications such as Flash media card reader/writer, printers, desktop and mobile PCs, consumer A/V, and flat panel displays.

USB4640 HSIC 1.0 to USB 2.0 2-Port Hub with Ultra Fast Flash Media Controller Evaluation Board (EVB-USB4640)

The EVB-USB4640 Evaluation Board is for the USB4640 Hi-Speed HSIC USB hub and card reader combo solution. It has an upstream port compliant to HSIC 1.0 using dual UFL connectors, a supplement to the USB 2.0 specification.

Security Evaluation Boards

Smart Card Controllers with Flexible Interface Support (EVB-SEC1210)

The EVB-SEC1210 is used to evaluate our SEC11XX/SEC12XX family of security products. These solutions flexible host interface options including USB, SPI or UART, and provide either single or dual smart card interfaces to ISO/IEC7816 specifications.

Hi-Speed USB 2.0 Flash Media Controller with AEC Encryption and Integrated Smart Card Reader (EVB-SEC2410-SSD)

The EVB-SEC2410-SSD is used to evaluate our SEC24XX/SEC44XX family of Flash Media Controller Security products. Hardware level key management and AES encryption are fundamental features of these solutions, as well as the high performance, hardware controller flash media data transfers which require no firmware intervention.

www.microchip.com/usb

Ethernet Connectivity Solutions

Complete Portfolio of Ethernet Products for Flexibility of Design

A wide range of remote communication features are possible when Ethernet connectivity is added to embedded designs. For example, systems can be remotely monitored using a web browser or email notification can be sent, triggered by service alerts or low product inventory. End users benefit from cost and time savings since they can centrally monitor, control and service their embedded systems over the internet instead of being physically present.

The Microchip Ethernet portfolio includes 10/100 Mbps and 10/100/1000 Mbps transceivers as well as 2 and 3 port switches and integrated Ethernet controllers. These new Ethernet products include enhanced features such as Energy Efficient Ethernet (IEEE 802.3az), Wake-on-LAN and cable diagnostics to bring high performance connectivity to all your embedded designs.

Microchip's Ethernet solutions address the growing demand for embedded Ethernet products, enabling easy network connectivity for cost-sensitive embedded designs.

- Free and robust TCP/IP stack optimized for the PIC18, PIC24 and PIC32 microcontroller and dsPIC® digital signal controller families
- Supported protocols include: HTTP, SMTP, SNMP, FTP, SNTP, SSL, TCP, UDP, IP, DHCP, DDNS, ICMP and ARP

PIC18F97J60 Ethernet PIC Microcontroller

- PIC18F microcontroller with built-in Ethernet MAC and 10Base-T PHY
- 8 KB dedicated Ethernet Buffer RAM
- Up to 128 KB Flash
- Advanced analog and communication peripherals
- Available in 64-, 80- and 100-pin TQFP packages

PIC32MX6XX, PIC32MX7XX Ethernet PIC Microcontroller

- Integrated 10/100 Mbit Ethernet MAC
- Dedicated DMA interface for direct access to the entire system RAM
- Industry standard RMII/ MII interface to PHY
- Pre-programmed MAC address
- 80 MHz, up to 512 KB Flash, up to 128 KB RAM
- Available in 64-pin (TQFP, QFN) and 100-pin (TQFP, BGA) packages
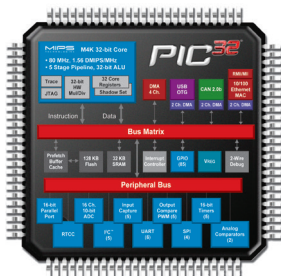
ENC624J600, ENC424J600 Embedded Ethernet Controllers

- Integrated MAC and 10/100Base-T PHY
- 24 KB transmit/ receive buffer SRAM
- MCU Interface supported: SPI and 8/16-bit parallel
- Cryptographic Security Engines
- Pre-programmed unique MAC address
- Available in 44-pin (TQFP, QFN) and 64-pin (TQFP) packages
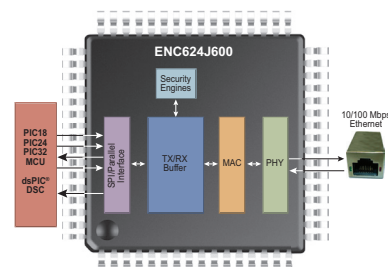
ENC28J60 Embedded Ethernet Controller

- Integrated MAC and 10Base-T PHY
- 8 KB transmit/ receive buffer SRAM
- MCU Interface Supported: SPI
- Available in 28-pin SPDIP, SSOP, SOIC and QFN packages
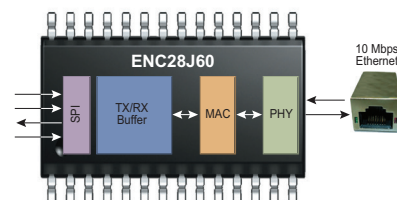
MAC Address Chips

- Pre-programmed EUI-48™ and EUI-64™ node address
- Up to 1.5 Kb Serial EEPROM functionality
SPI: 25AA02E48
I²C: 24AA02E48
UNI/O® : 11AA02E48
www.microchip.com/MAC
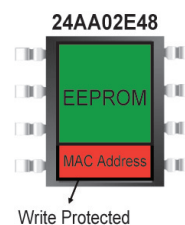
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Ethernet Connectivity Solutions

Complete Portfolio of Ethernet Products for Flexibility of Design

Ethernet devices have become ubiquitous in communications and networking products servicing a wide variety of applications across multiple market segments. This well understood technology provides a robust link to ensure reliable communication between devices in a network. Microchip has a broad portfolio of reliable, high-quality, and high-performance Ethernet solutions. From Ethernet switches, controllers, bridges, and PHYs to a variety of standard interfaces serving consumer, industrial and automotive applications, Microchip can provide a solution to address your varied application needs and offers you the support needed to reduce your time-to-market.

Ethernet Switches
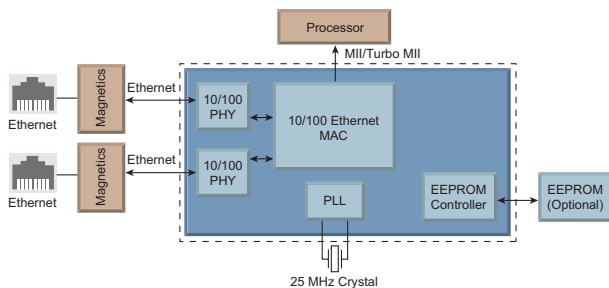
LAN93XX Family

- High-performance, full-featured 3-port switches with per-port 802.1Q VLAN support (up to 16 VLAN groups)
- Excellent ESD protection (+-8 kV/15 kV) per port
- IGMP v1/v2 monitoring for multicast packet filtering
- Up to 200 Mbps network speed via Turbo MII interface
- Virtual PHY feature simplifies software development by mimicking multiple switch ports as a single port PHY

Ethernet Controllers
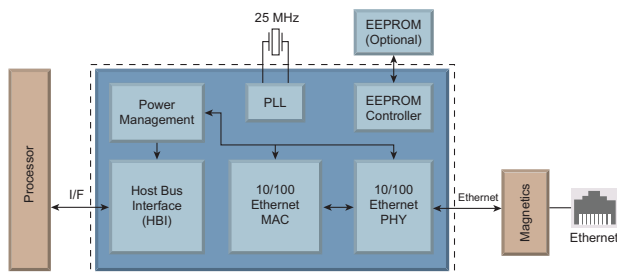
LAN92XX/LAN94XX and ENC Families

- Single-chip Ethernet controllers with integrated MAC and PHY
- Flexible interfaces supported (16/32-bit local bus, PCI, MII, high speed SPI, parallel)
- Efficient architecture to minimize CPU overhead
- Integrated checksum offload engine
- Conforms with 802.3/802.3u industry standards
- HP Auto-MDIX support

Ethernet Bridges (USB to Ethernet)
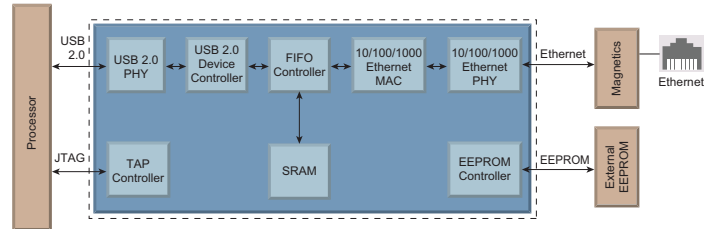
LAN7500 and LAN95XX/97XX Families

- USB 2.0 to 10/100 and 10/100/1000 Ethernet products
- Flexible interfaces supported (USB 2.0, HSIC)
- Integrated USB and Ethernet MAC and PHY for lowest BOM cost and size
- Multi-port support for USB port expansion
- Supports numerous power management features including Wake-on-LAN, Magic Packet™, and Link Status Change
- Software compatibility-transparent to USB software stack and device drivers

Ethernet PHYs
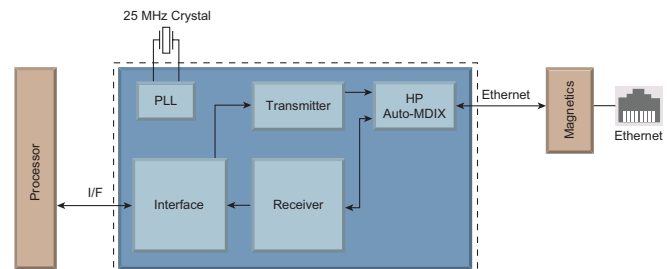
LAN87XX and LAN88XX Families

- 10/100 and 10/100/1000 tranceivers with support of all industry standard interfaces (MII, RMII, GMII, RGMII)
- Comprehensive flexPWR® technology to provide flexible options to minimize power consumption
- Energy Efficient Ethernet (802.3az) support
- Deterministic latency to provide the most reliable and predictable link
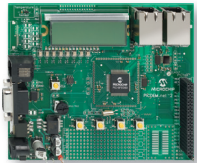- Wake-on-LAN support

www.microchip.com/ethernet

Ethernet Development Tools

## Supporting Ethernet Development from Concept to Prototype

Development Tools Support

PICDEM.net™ 2 Development Board (DM163024)

This Ethernet development board supports both the ENC28J60 controller and the PIC18F97J60 MCU. With this board and Microchip's free TCP/IP stack, a web server can be developed showcasing the capability to remotely monitor and control embedded applications over the Internet.

PIC32 Ethernet Starter Kit (DM320004)
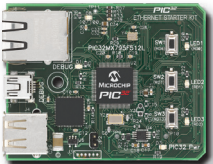
Contains everything needed to develop Ethernet or USB peripheral/Host/OTG applications using the PIC32. The kit contains free Microchip TCP/IP software and the necessary cables. There is an integrated debugger/programmer on the board as well as an expansion connector.

Fast 100 Mbps Ethernet PICtail Plus Daughter Board (AC164132)
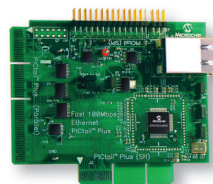
Populated with the ENC624J600, this Ethernet board interfaces to the RJ-45 connector. It can be plugged into the Explorer 16 development board (DM240001) and the PIC18 Explorer board (DM183032) allowing connection to any of Microchip's 8-, 16- and 32-bit products.

Ethernet PICtail Plus Daughter Board (AC164123)

This board is populated with the 28-pin ENC28J60 Ethernet controller which interfaces to the RJ-45 connector. It can be plugged into the Explorer 16 development board (DM240001), allowing connection to any of Microchip's 16- and 32-bit products when used in conjunction with the free Microchip TCP/IP stack.

Ethernet Controller Evaluation Boards

LAN921X High Performance 10/100 Ethernet Controller (EVB-LAN9218I-MINI)

The EVB-LAN9218I-MINI is used to evaluate our LAN921X family of high performance 10/100 Ethernet Controllers. These solutions are designed to provide optimal performance and minimized CPU overhead. This evaluation board comes with our LAN9218 which has a full 32-bit interface.

LAN922X High Performance 10/100 Ethernet Controller with Variable Voltage I/O (EVB-LAN9221-MINI)

The EVB-LAN9221-MINI is used to evaluate our LAN922X family of high performance 10/100 Ethernet Controllers. Similar to the LAN921X family, this solution features a high performance architecture and minimizes CPU overhead, but also provides a variable voltage I/O feature which allows it to interface with processors requiring a lower I/O voltage.

Ethernet Switches Evaluation Boards

LAN9303/LAN9303M 10/100 Managed 3-Port Ethernet Switch (EVB9303/EVB9303M)

The EVB9303/EVB9303M is used to evaluate our LAN9303 or LAN9303M solutions. Both products are 10/100 3-Port Managed Ethernet Switches which support MII/RMII/Turbo MII interfaces. The solutions can be adapted to support different system architectures.

LAN931X 10/100 3-Port Ethernet Switch with Flexible interfaces (EVB-LAN9313M)

The EVB-LAN9313M is used to evaluate our LAN931X family of 10/100 3-Port Ethernet Switches which support various host interfaces. The solutions can be adapted to support different system architectures.
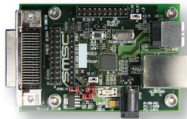
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Ethernet Development Tools

Supporting Ethernet Development from Concept to Prototype

Ethernet Bridge Evaluation Boards

LAN9500A Hi-Speed USB 2.0 to 10/100 Ethernet Bridge Controller (EVB-LAN9500A-MII/EVB-LAN9500A-LC)

The EVB-LAN9500A-MII is used to evaluate our LAN9500A Hi-Speed USB 2.0 to Fast Ethernet Bridge Controller solution. Using an existing USB port with our LAN9500A allows designers to add Ethernet connectivity to their system architectures.

LAN7500 Hi-Speed USB 2.0 to Gigabit Ethernet Bridge Controller (EVB-LAN7500)

The EVB-LAN7500 is used to evaluate our LAN7500 Hi-Speed USB 2.0 to Gigabit Ethernet Bridge Controller solution. System architectures requiring Ethernet connectivity can utilize an existing USB port with our LAN7500 to achieve this requirement. A USB dongle version is also available (EVB-LAN7500-LC).

LAN9512/LAN9514 Hi-Speed USB 2.0 to 10/100 Ethernet Hub Customer Evaluation Board (EVB9514)

The EVB9514 is an evaluation board that utilizes the LAN9514 to provide a four port USB 2.0 hub with an integrated 10/100 Ethernet controller. The EVB9514 provides USB connectivity via one type B upstream USB connector and four type A downstream USB connectors. The EVB9512 is also available for evaluation of the LAN9512.

LAN9730 Hi-Speed USB 2.0 HSIC to 10/100 Ethernet Bridge Controller (EVB-LAN9730-MII)

The EVB-LAN9730-MII is used to evaluate our LAN9730 Hi-Speed USB 2.0 HSIC interface to Fast Ethernet Bridge Controller solution. Some system architects prefer to use their HSIC ports in order to reduce power consumption. The LAN9730 adds Ethernet functionality via the HSIC port.

Ethernet Transceiver/PHY Evaluation Boards

LAN874X 10/100 Ethernet Transceiver with EEE and Wake-On-LAN (EVB8740)

The EVB8740 is a PHY evaluation board for our LAN874X family which integrates Energy Efficient Ethernet and Wake-on-LAN features. It interfaces to a MAC controller via a standard MII or RMII interface.

Third Party Development Tools

WIZnet W5200 Ethernet PICtail Board (TWIZ5200)

WIZnet's W5200 Ethernet PICtail Plus board provides 10/100 Mbps, half/full duplex Ethernet connectivity by onboard WIZnet W5200 Ethernet controller, which has a hardwired TCP/IP processing engine. It works with Explorer 16, PIC32 I/O Expansion Board, PICDEM.net 2, PIC18 Explorer and others. It supports both Microchip's software TCP/IP Stack and WIZnet's hardwired TCP/IP Stack on PIC18, PIC24, PIC32 MCU and dsPIC DSC platforms.

Serial Gateway to Ethernet P801 (10/100Base-T) (TIPL801)

The IPACK P-801 Gateway from IPLogika is a powerful Serial-to-Ethernet gateway that adds quick, effortless and full 10/100Base-T Ethernet connectivity to client applications. It has all the necessary physical and logical levels for Ethernet connections, making integration with the host computer very convenient and easy.

www.microchip.com/ethernet

LIN Bus Solutions

Scalability and Integration for the Low-Cost Communications Network

Local Interconnect Network (LIN)

LIN/J2602 is a communication standard designed to address low-cost networking within vehicles. LIN enables a cost-effective communication network for lower speed switch, smart sensor and actuator applications within the vehicle where the bandwidth and versatility of CAN is not required. LIN can be implemented on any PIC microcontroller (MCU) with a UART or USART interface. Microchip also offers a robust physical layer interface, data link layer implementation, LIN compliant drivers and a variety of development resources.

Stand-alone LIN Transceivers

The MCP2003/4(A) family offers stand-alone LIN transceiver options. Both parts meet LIN bus specification versions 1.3, 2.0 and 2.1 and SAE J2602. The transceivers' EMC/ESD performance is among the best in the industry and meets all automotive requirements. The MCP2003A is available in an industry-standard 8-pin SOIC package. The MCP2004A offers a TXE/Fault pin which allows users the ability to disable the transmitter in addition to providing data related to a fault condition.

LIN Transceivers With Integrated Voltage Regulator

The MCP2021A/2A and MCP2025 integrate a LIN transceiver and a 3.3V or 5V internal voltage regulator with a maximum output current of 70 mA. The devices support the LIN bus specification versions 1.3, 2.0 and 2.1 and SAE J2602 and are designed to meet the stringent EMC/ESD requirements of the world's auto makers.

Microchip also offers the MCP2050 LIN Transceiver with Voltage regulator, windowed watchdog timer and ratio metric V_{BAT} pin that allows for monitoring battery levels using a MCU A/D converter.

Integrated Microcontroller with LIN Transceiver and Voltage Regulator

The PIC16F1829LIN is a small footprint, MCU + V_{REG} + LIN Transceiver in a single package. Combining the flexible PIC16F1829 microcontroller with the powerful MCP2021A LIN transceiver enables a complete solution for LIN nodes and endpoints, compatible with LIN Specification versions 1.3, 2.0, 2.1, and SAEJ2602.

LIN Software Library

LIN Data Link Layer firmware can be downloaded free-of-charge from Microchip's web site. Many third party companies also offer LIN Data Link Layer firmware, providing additional design options.
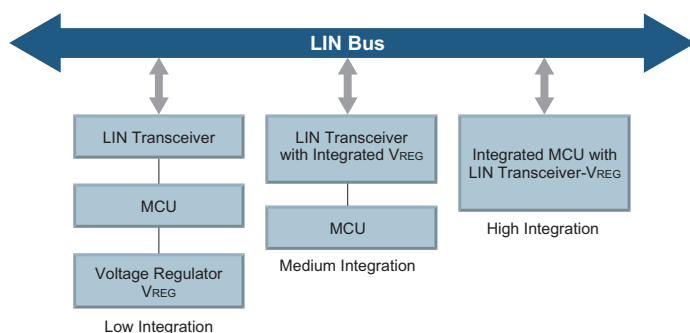
LIN Development Tools

LIN Serial Analyzer Development System (APGDT001)

The LIN analyzer development tool enables a PC to communicate with the LIN bus. The PC program uses a graphical user interface to enter and display message frames occurring on the target bus, allowing for easy debug. It can also be used as an active node on a bus to send and receive messages, therefore reducing the application development time.

CAN/LIN PICtail Plus Daughter Board (AC164130-2)

This daughter board can be used with the Explorer 16 Development board and various PIMs featuring 16- and 32-bit MCUs with CAN peripherals, or the PIC18 Explorer board with the PIC18F66K80 PIM to facilitate rapid implementation and evaluation of CAN and LIN applications.

PICkit 28-pin LIN Demonstration Board (DM164130-3)
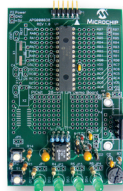
The PICkit 28-pin LIN demo board enables a quick start in developing and debugging applications with the LIN drivers. The kit includes a 28-pin socket which supports various PIC16F devices, a LIN transceiver, plus a generous prototype area with various indicator LEDs and buttons to support testing and debugging of an application.

PICDEM CAN-LIN 3 Demonstration Board (DM163015)
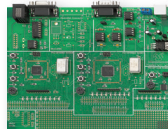
The PICDEM CAN-LIN 3 demo board is an easy way to discover the power of Microchip's CAN and LIN products. The board demonstrates the main features of the 64-pin TQFP PIC18F6680 and 80-pin TQFP PIC18F8680 devices, including those features of the integrated CAN module. In addition, the board employs a LIN sub-network using Microchip's 20-pin SSOP PIC18F1320 and MCP201 LIN Bus.

www.microchip.com/lin

CAN Bus Solutions

Taking Communication and Connectivity in Deeply-Embedded Designs to the Next Level

Controller Area Network (CAN)

CAN is a serial communication protocol used extensively for high-speed embedded applications where noise immunity and robustness is necessary. CAN protocol supports speeds up to 1 Mbps and is highly fault-tolerant, making it ideal for safety-critical applications.

Microchip offers a complete line of products to meet the needs of high-performance embedded applications using the CAN protocol, including 8-, 16- and 32-bit microcontrollers and 16-bit digital signal controllers with integrated CAN, stand-alone CAN controllers, I/O expanders and CAN transceivers.

CAN MCUs and DSCs

The 8-bit PIC18F66K80 family offers the industry's best Sleep current of less than 20 nA, a wide operating voltage range of 1.8 to 5.5V and an advanced touch sensing interface. The 16-bit PIC24 and dsPIC33 families offer higher-density Flash memories and high-temperature operation of up to 150°C ambient. The 32-bit PIC32 family offers higher performance and better peripheral integration like Ethernet and USB.

At the heart of Microchip's CAN offering is the enhanced CAN module offered on many Microchip microcontrollers. Key features include:
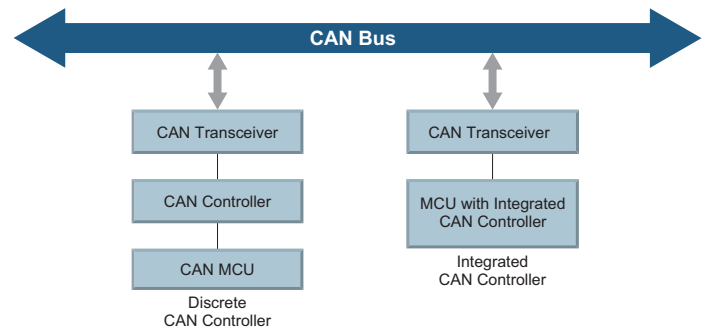
- CAN 1.2, CAN 2.0A and CAN 2.0B support
- 32 buffers for TX/RX
- 32 acceptance filters
- 4 acceptance mask filters
- Time stamping
- DMA support in 16-bit PIC24H and PIC32 microcontrollers and dsPIC33F digital signal controllers
- DeviceNet™ support
- Legacy mode

Stand-alone CAN Controller

Microchip Technology's MCP2515 is a stand-alone Controller Area Network (CAN) controller that implements the CAN specification, version 2.0B. It is capable of transmitting and receiving both standard and extended data and remote frames. The MCP2515 interfaces with MCUs via an industry-standard Serial Peripheral Interface (SPI) and can be used as an easy method to implement CAN in an existing system.

CAN Transceivers

The MCP2561/2 are high-speed CAN transceivers that serve as an interface between a CAN controller and the physical bus. The MCP2561 is a SPLIT Option for common mode stabilization and the MCP2562 is a VIO Option for digital I/O level shifting from 1.8V to 5.5V. Both parts meet ISO and CAN specifications in addition to global automotive EMC hardware requirements.

CAN Bus

CAN Transceiver — CAN Transceiver

CAN Controller — MCU with Integrated CAN Controller

CAN MCU

Discrete CAN Controller — Integrated CAN Controller

## CAN Development Tools

CAN Bus Analyzer (APGDT002)

The CAN bus analyzer development tool enables a PC to communicate with the CAN bus. The PC program uses a graphical user interface to enter and display message frames occurring on the target bus, allowing for easy debugging. It can also be used as an active node on a bus to send and receive messages, reducing the application development time.

CAN/LIN PICtail Plus Daughter Board (AC164130-2)
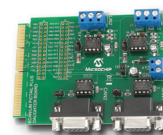
This daughter board can be used with the Explorer 16 Development board and various PIMs featuring 16- and 32-bit MCUs with CAN peripherals, or the PIC18 Explorer board with the PIC18F66K80 PIM to facilitate rapid implementation and evaluation of CAN and LIN applications.

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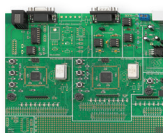
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Additional Connectivity Protocols

Providing Comprehensive System Solutions
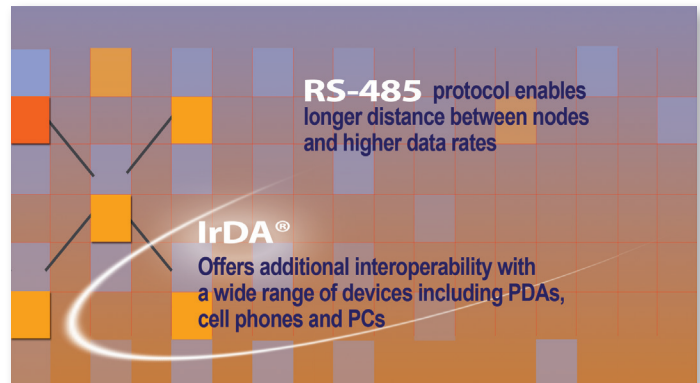
Other Connectivity Options

While the most sophisticated protocols and interfaces tend to garner a significant amount of attention, a number of simpler connectivity options are and will remain the embedded interconnects of choice for many deeply-embedded applications. Microchip's focus on the embedded market ensures an ongoing commitment to support all of the connectivity solutions utilized by leading designers including the microcontroller peripherals, application notes and software necessary to implement robust, highly-reliable embedded networks.

RS-485 Protocol

The RS-485 protocol is typically used as a more feature-rich alternative to RS-232. The protocol enables longer distance between nodes and higher data rates. Any PIC microcontroller with an on-board UART can support RS-485 communication. Many PIC microcontrollers include enhanced peripherals with an RS-485 mode.

IrDA® Protocol

The IrDA protocol provides many portable devices with an affordable, short distance optical data communications link. IrDA can be implemented on many Microchip MCUs using Microchip's free-of-charge IrDA software stack. In addition, Microchip offers UART to IrDA protocol converter products (MCP2140A, MCP2150) to enable any system to easily add IrDA wireless connectivity.

RS-485 protocol enables longer distance between nodes and higher data rates

IrDA® Offers additional interoperability with a wide range of devices including PDAs, cell phones and PCs

IrDA PICtail Plus Daughter Board (AC164124)

Enables IrDA connectivity when used with the Explorer 16 development board (DM240001).

MCP2140 Wireless Temperature Sensor Demonstration Board (MCP2140DM-TMPSNS)

Demonstrates the communication of temperature data to a primary device (PDA or PC with IR port) via IrDA.

www.microchip.com/connectivity

Support

Microchip is committed to supporting its customers in developing products faster and more efficiently. We maintain a worldwide network of field applications engineers and technical support ready to provide product and system assistance. In addition, the following service areas are available at www.microchip.com:

- **Support** link provides a way to get questions answered fast: http://support.microchip.com
- **Sample** link offers evaluation samples of any Microchip device: http://sample.microchip.com
- **Forum** link provides access to knowledge base and peer help: http://forum.microchip.com
- **Buy** link provides locations of Microchip Sales Channel Partners: www.microchip.com/sales

Training

If additional training interests you, then Microchip can help. We continue to expand our technical training options, offering a growing list of courses and in-depth curriculum locally, as well as significant online resources – whenever you want to use them.

- Technical Training Centers: www.microchip.com/training
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Электронная почта: sales@st-electron.ru

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