Chipsmall

Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

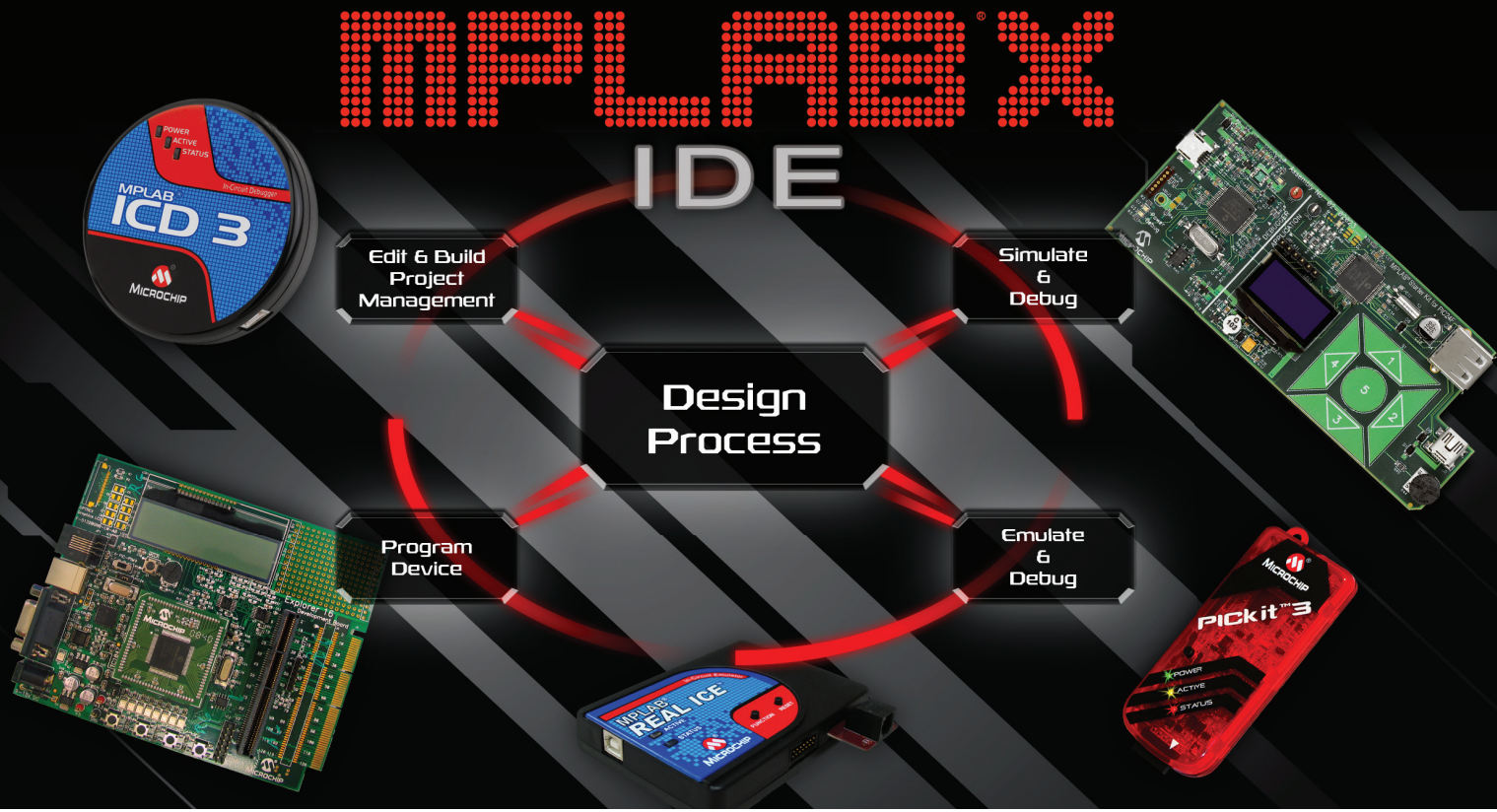Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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Quick Guide to Microchip Development Tools

Edit & Build
Project
Management

Simulate
&
Debug

Design
Process

Program
Device

Emulate
&
Debug

www.microchip.com/tools

MPLAB® X IDE and Software Tools

Introduction
Microchip produces approximately 900 different development tools, of which only a selection are featured in this document. For the full listing of Microchip's development tools, please visit the online Development Tool Selector at www.microchip.com/dts or visit our application sites on www.microchip.com.

MPLAB X IDE
MPLAB X IDE is the latest generation of Microchip's free integrated development environment. Incorporating a powerful and highly functional set of features, it allows you to easily develop applications for Microchip's PIC® microcontrollers and dsPIC® digital signal controllers. It is based on the NetBeans IDE from Oracle and runs on Windows®, Linux® and Mac OS X®. Its unified graphical user interface (GUI) helps to integrate software and hardware development tools from Microchip and third party sources to give you high-performance application development and extensive debugging capabilities.

The flexible and customizable interface allows you to have multiple debug tools connected to your computer at the same time. You can select any tool you desire for a specific project or configuration within a project. With complete project management, visual call graphs, a configurable watch window and a feature-rich editor that includes code-completion and hyperlink navigation, MPLAB X IDE is fully equipped to meet the needs of experienced users while remaining flexible and user-friendly for even those who are new to the IDE.

MPLAB X IDE Features

Feature-Rich Editor
- Color syntax highlighting
- Smart code completion makes suggestions and provides hints as you type
- Automatic code formatting based on user-defined rules
- Refactoring tools to intelligently restructure code
- Live parsing

User-Friendly, Customizable Interface
- Fully customizable interface: toolbars, toolbar buttons, windows, window placement, etc.
- Call graph window
- Plug-in feature extensions

Navigation Features
- Powerful navigation tools:
  - Go to file, Go to type, Go to symbol, Go to header, Go to declaration, hyperlinks using 'Ctrl + mouse over'
- Tasks navigator with user-defined bookmarks
  - e.g. `//TODO`, `//FIXME`
- Project-based workspaces:
  - Multiple projects, tools and configurations
  - Simultaneous debugging sessions

File History and Bug Tracking
- Local file history feature
  - NetBean plug-ins for revision control systems also available
- Built-in support for Bugzilla issue tracker
  - Integrated with editor for ease-of-navigation issues

MPLAB X IDE Plug-Ins
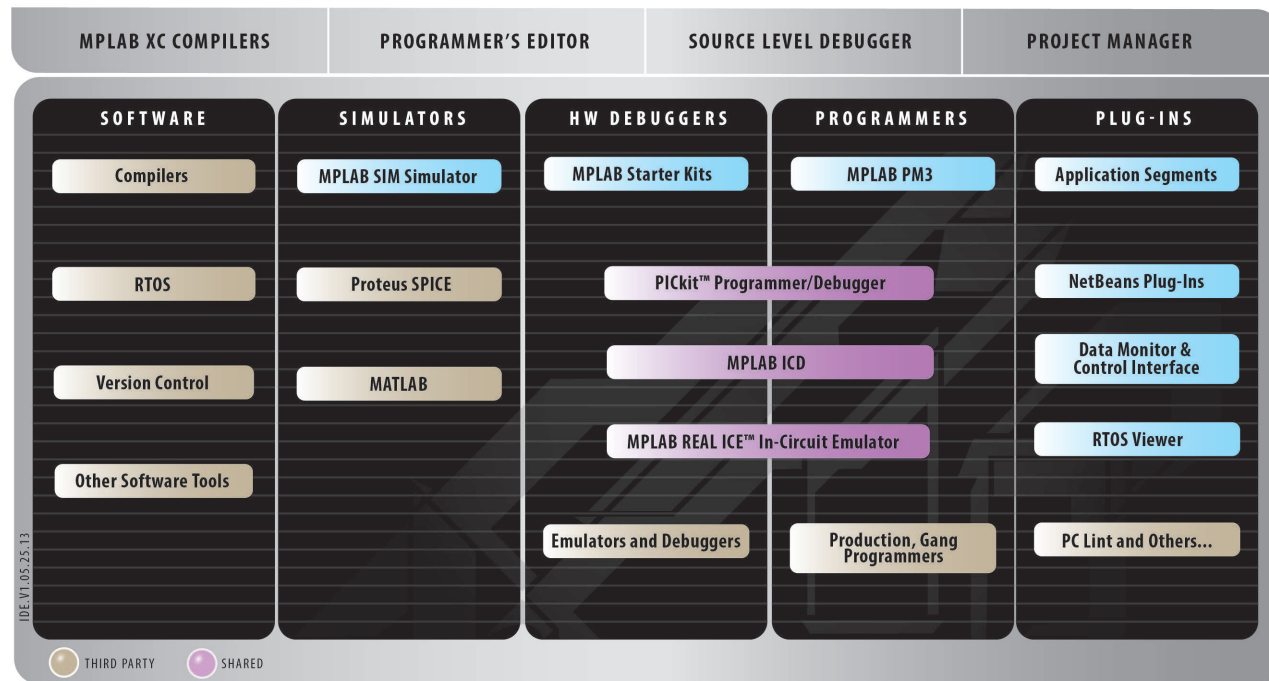
MPLAB Code Configurator
The MPLAB Code Configurator generates seamless, easy-to-understand C code that is inserted into your project. It enables, configures and utilizes peripherals across a select list of devices. It it integrated into MPLAB X IDE to provide a very powerful and extremely easy-to-use development platform.
- Faster time to market
  - Leverage drivers and graphical user interface to reduce development time
- Simple, clearly documented driver APIs in the form of code that can be easily modified and debugged
- Reliable, small footprint and efficient
  - Generated code is reliable and designed for efficient use of CPU and memory resources

Development Tools Selector
Microchip's Development Tools Selector (DTS) is an online/offline application that allows you to view development tools through a graphical user interface (GUI) with filter and search capabilities to easily find development tools associated with Microchip products. Just enter a development tool or Microchip device in the search box and the DTS quickly displays all related tools and devices. Updated after every MPLAB X IDE release, the DTS is available online and offline at: www.microchip.com/dts.

MPLAB® X IDE and Software Tools

MPLAB X INTEGRATED DEVELOPMENT ENVIRONMENT

MPLAB XC COMPILERS	PROGRAMMER'S EDITOR	SOURCE LEVEL DEBUGGER	PROJECT MANAGER

SOFTWARE	SIMULATORS	HW DEBUGGERS	PROGRAMMERS	PLUG-INS
Compilers	MPLAB SIM Simulator	MPLAB Starter Kits	MPLAB PM3	Application Segments
RTOS	Proteus SPICE	PICkit™ Programmer/Debugger		NetBeans Plug-Ins
Version Control	MATLAB	MPLAB ICD		Data Monitor & Control Interface
Other Software Tools		MPLAB REAL ICE™ In-Circuit Emulator		RTOS Viewer
		Emulators and Debuggers	Production, Gang Programmers	PC Lint and Others...

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THIRD PARTY   SHARED

In-Circuit Emulators and Debuggers

In-Circuit Emulators and Debuggers

Feature	PICkit™ 3	MPLAB® ICD 3	MPLAB REAL ICE™ In-Circuit Emulator
USB Speed	Full Only	High and Full	High and Full
USB Driver	HID	Microchip	Microchip
USB Powered	Yes	Yes	Yes
Programmable V_{PP}	Yes	Yes	Yes
Power to Target	Yes	Yes	No
Programmable V_{DD}	Yes	Yes	Yes
V_{DD} Drain from Target	20 mA	< 1 mA	< 1 mA
Over Voltage/Current Protection	Yes, SW	Yes, HW	Yes, HW
Emulation Support	Full Speed	Full Speed	Full Speed
Breakpoints	Simple	Complex	Complex
Software Breakpoints	Yes	Yes	Yes
Program Memory Image Size	512 Kbytes	No	No
Serialized USB	Yes	Yes	Yes
Trace, Native	No	No	Yes
Trace, Other (SPI, PORT, Inst)	No	No	Yes
Data Capture	No	No	Yes
Logic/Probe Triggers	No	No	Yes
High Speed Performance PAK (LVDS)	No	No	Yes
Production Programmer	No	Yes	Yes

In-Circuit Emulators and Debuggers

Microchip offers three universal debuggers. They share design platforms, support all microcontroller and DSC families, are USB-powered and are fully integrated with MPLAB X IDE. MPLAB ICD 3 offers debugging and hardware features sufficient for the needs of most users. PICkit™ 3 Debugger/Programmer is the economical choice for basic debugging functions. MPLAB REAL ICE™ In-Circuit Emulator offers advanced features—like data capture, trace, logic triggers and high-speed debugging up to 10 feet—usually available only on expensive and high-end emulators. Both MPLAB REAL ICE In-Circuit Emulator and MPLAB ICD 3 can be used as programmers in a production environment.

MPLAB ICD 3 Debugger/Programmer (DV164035)

MPLAB ICD 3 In-Circuit Debugger System is our most cost-effective high-speed hardware debugger/programmer. It debugs and programs PIC Flash microcontrollers and dsPIC DSCs with the powerful, yet easy-to-use, graphical user interface of MPLAB Integrated Development Environment (IDE). The MPLAB ICD 3 In-Circuit Debugger probe connects to a PC using a high-speed USB 2.0 interface and connects to the target with a connector compatible with the MPLAB REAL ICE In-Circuit Emulator systems (RJ-11).

- MPLAB ICD 3 In-Circuit Debugger is designed to support high-speed processors running at maximum speeds, allowing you to debug applications on your own hardware in real time.
- Protection circuitries are added to the probe drivers to guard the probe kit from power surges from the target. V_{DD} and V_{PP} voltage monitors protect against over-voltage conditions, and all lines have over-current protection. The unit can provide power to a target (up to 100 ma).
- Housed in a small (3.7" × .8") and attractive enclosure, the MPLAB ICD 3 In-Circuit Debugger is powered by the USB port so an external power adapter is not required. MPLAB ICD 3 In-Circuit Debugger is CE and RoHS-compliant.
- Fast programming allows both quick firmware reload for fast debugging and for in-circuit re-programming. Programming times are improved up to 15× over MPLAB ICD 2.
- MPLAB ICD 3 supports target supply voltages from 2.0–5.5V.
- A test module is included with every MPLAB ICD 3 to test I/O lines and confirm the unit is working properly.
- Adding new device support and advanced features to MPLAB ICD 3 In-Circuit Debugger is as simple as installing later versions of the MPLAB X IDE, downloadable for free. MPLAB ICD 3 In-Circuit Debugger is field-upgradeable through a firmware download from MPLAB X IDE.
- MPLAB ICD 3 allows debugging with MPLAB X IDE, supporting multiple breakpoints, stopwatch, source code file debugging in the MPLAB X IDE editor for quick program modification/debug.

PICkit 3 In-Circuit Debugger (PG164130)

The PICkit 3 Debug Express allows debugging and programming of PIC Flash microcontrollers and dsPIC DSCs using the powerful graphical user interface of MPLAB X IDE.

- USB (Full speed 12 Mbits/s interface to host PC)
- Real-time execution
- Firmware upgradeable from PC/web download
- Totally enclosed
- Supports low voltage to 2.0V (2.0–6.0V range)
- Diagnostic LEDs (power, busy, error)
- Read/write program and data memory of microcontroller
- Erase of program memory space with verification
- Freeze-peripherals at breakpoint

MPLAB REAL ICE In-Circuit Emulator (DV244005)

MPLAB REAL ICE In-Circuit Emulator System is our next generation high-speed emulator for our Flash DSC and MCU devices. It debugs and programs PIC and dsPIC Flash microcontrollers with the easy-to-use but powerful graphical user interface of MPLAB X IDE included with each kit. The MPLAB REAL ICE In-Circuit Emulator probe connects to a PC using a high-speed USB 2.0 interface and connects to the target with either a connector compatible with the popular MPLAB ICD 3 system (RJ11) or with the high-speed, noise-tolerant, low-voltage differential signal (LVDS) interconnection (CAT5).

MPLAB REAL ICE In-Circuit Emulator is field-upgradeable through future firmware downloads in MPLAB X IDE. In upcoming releases of MPLAB X IDE, new devices will be supported and new features added.

- Real-time execution and real-time trace collection
- Stopwatch
- Real-time watch
- Full hardware debugging: breakpoints, single-step, variable inspect/modify
- Logic probe inputs/outputs (8)
- I/O Port trace and SPI trace options for high-speed upload of trace data
- High-speed/LVDS communication via the MPLAB REAL ICE In-Circuit Emulator Performance Pak (AC244002)
- Debugging of low-pincount devices and devices without debugging capabilities via various MPLAB REAL ICE In-Circuit Emulator Processor Extension Paks
- Emulation of high-voltage AC applications via the MPLAB REAL ICE In-Circuit Emulator Isolator (AC244005)
- PIC32 4-wire JTAG connectivity via the MPLAB REAL ICE In-Circuit Emulator JTAG Adapter (AC244007)
- Power measurement and power profiling via the MPLAB REAL ICE In-Circuit Emulator Power Monitor (AC244008)

Microchip MPLAB XC Compilers

MPLAB XC Compilers

MPLAB® XC8 PIC10/12/16/18	MPLAB XC16 PIC24 and dsPIC® DSCs

MPLAB XC32/XC32++ PIC32

Optimizations

MPLAB XC Compilers produce highly optimized code. The PRO edition has the most features and produces the best code optimization. A low-cost option of the compiler is also available as the Standard Edition. MPLAB XC licenses are also available as Free editions and have the option of a 60-day PRO evaluation trial.

Microchip now offers Free and PRO Editions of the MPLAB XC32++ Compiler, which adds the flexibilty to develop and reuse C++ projects and components.

The Free editions support all devices and commands of the PRO edition. They have no time or memory restrictions and offer an unrestricted-use license with optimization sufficient for most uses.

An evaluation key is available to enable full use of the PRO edition features and optimizations of the compilers when applied. After the 60-day evaluation period, the compiler will revert back to the Free edition functionality.

The Free edition is available for download from:
www.microchip.com/free.

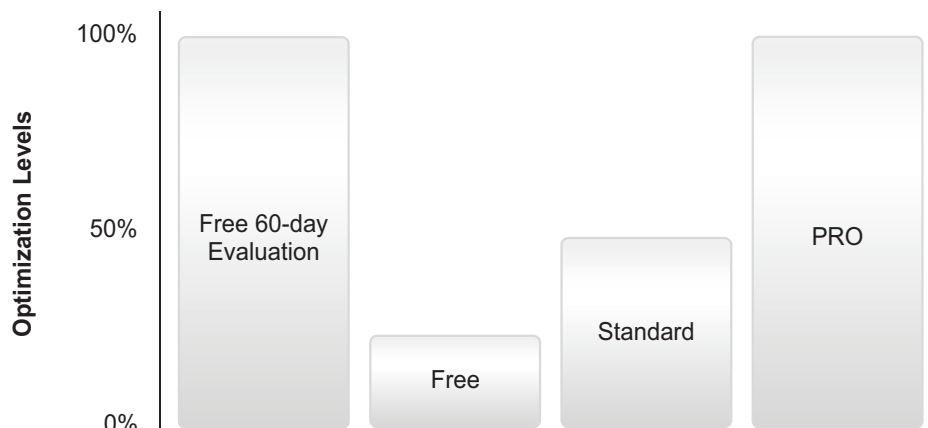| Awards for MPLAB® X IDE	Awards for MPLAB XC Compilers
ECN Readers Choice TECH AWARDS 2011 / EDN 2012 HOT 100 / Elektra 2011 European Electronics Industry Awards WINNER	EDN 2012 HOT 100 / ACE Products of the Year EE Times China

Features

- ANSI Compliant
- Extensive libraries including Microchip peripheral libraries
- Runs on Windows, Linux or Mac OS X
- Integrates with MPLAB X IDE to provide a full, graphical front end
  - Editing errors and breakpoints match the corresponding lines in source code
  - Single step through C and C++ source code to inspect variables and structures at critical points
  - Data structures with defined data types, including floating point, display in watch windows

License Types

- *Single-user licenses*: Workstation licenses
- *Network Server Licenses*: Can be run from a server and shared between multiple machines in different locations
  - These licenses are restricted to one compile at a time. When a user compiles, another user cannot compile for one hour.
- *High Priority Access (HPA)*: 12-month maintenance and support contract:
  - Priority technical support
  - New part support
  - New architecture support
  - New compiler patch-level updates

Bar chart titled "Optimization Levels" (y-axis 0% to 100%): Free 60-day Evaluation ~100%, Free ~20%, Standard ~45%, PRO ~100%

# MPLAB Harmony Integrated Software Framework

Summary

MPLAB Harmony is a flexible, abstracted, fully integrated firmware development environment for PIC32 MCUs. It enables robust framework development of interoperable RTOS-friendly libraries with quick and extensive Microchip support for third party software integration.

MPLAB Harmony includes a set of peripheral libraries, drivers and system services that are readily accessible for application development. The code development format allows for maximum re-use and reduces time to market.

Benefits

- Faster time to market
  - Production-ready libraries provide seamless system integration
  - Integrated single platform enables shorter development time
  - Tested and debugged libraries give you more time for application development
- Improved code interoperability
  - Modular architecture allows drivers and libraries to work together with minimal effort
  - Application software can be easily scaled to different end-systems
- Simplified support
  - Common software platform with standard interface ensures efficient Microchip support
- Improved 32-bit scalability
  - MPLAB Harmony allows for easier PIC32 part-to-part portability
- Enhanced third party software integration
  - Smooth integration of third party solutions (RTOS, middleware, drivers) to the software network
  - Direct re-sell and front-line support provided by Microchip for select third party solutions
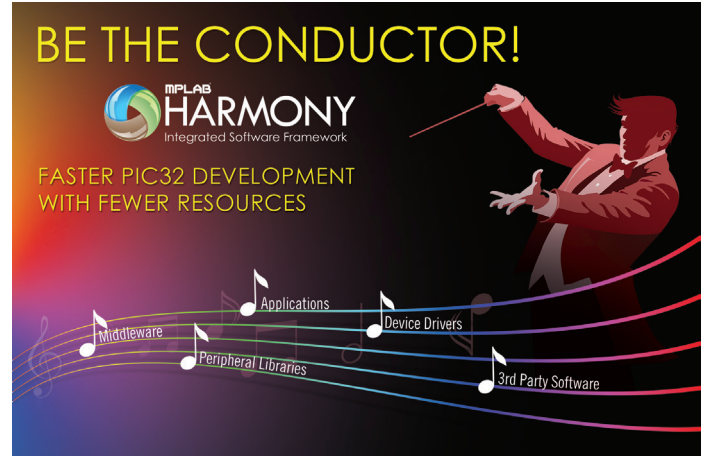
MPLAB Harmony v1.0 Features

- MPLAB Harmony Configurator (Beta)
- Complete PIC32MX and PIC32MZ support
- Additional features and demonstrations
  - USB and graphics
- Enhanced documentation – continuous improvements
- Several new RTOS demonstrations, including more multi-stack demonstrations
- Complete driver compatibility improvements with RTOS OSAL and System Services
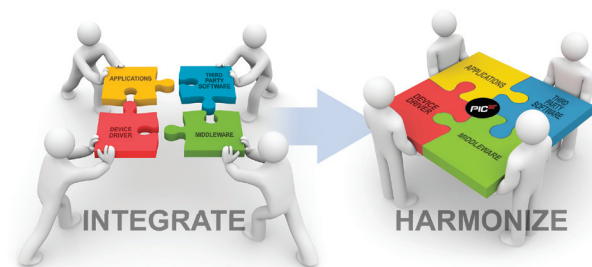

PIC32 Software Development Tools Available with MPLAB Harmony

Applications	Operating System Abstract Layer (OSAL)	Middleware/ Software Libraries	Device Drivers	Development Software	Third Party Software
■ Graphics applications ■ TCP/IP applications and utilities ■ USB applications ■ Hundreds of applications demonstrating all of MPLAB Harmony's components, including third party	■ Support for: • Bare metal • FreeRTOS • OPENRTOS • µC/OS-III • embOS* • ThreadX* *coming soon	■ Graphics ■ TCP/IP ■ USB ■ Cryptographic libraries ■ File systems ■ System services ■ Bluetooth® ■ DSP libraries	■ ADC ■ Ethernet media access controller ■ Ethernet PHY interface ■ Controllerless graphics ■ Epson LCD controller ■ Non-volatile memory ■ SPI, USART, high-speed USB ■ Timer, parallel master port ■ Optimized drivers for all PIC32 peripherals	■ MPLAB® X IDE ■ MPLAB XC32++	■ FreeRTOS* ■ OpenRTOS* ■ TCP/IP* ■ SSL/TLS libraries

Additional software components planned
*Sold and front-line support provided directly by Microchip

MPLAB Harmony Integrated Software Framework

MPLAB Harmony Block Diagram
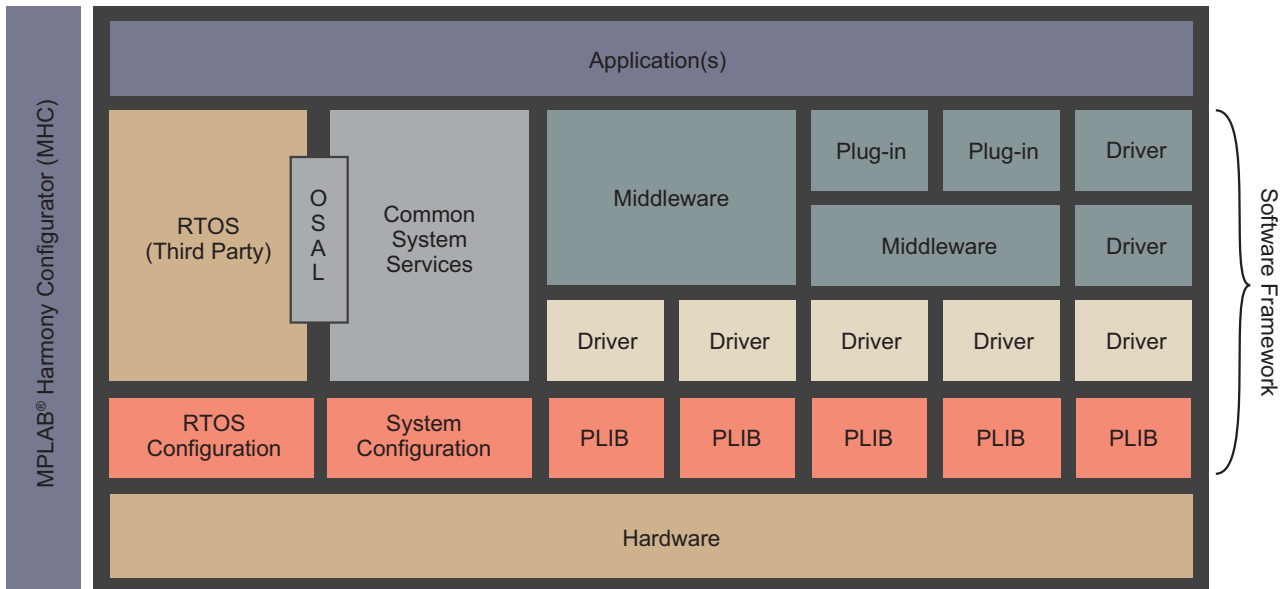
Application Layer
- Implements desired overall behavior
- Abstracted hardware access
- Allows for easy port across PIC32 parts

Common System Services
- Provides common functionality to avoid duplication and conflicts
- Eliminates complex interactions and interdependencies between modules
- OSAL provides OS compatibility and interface
- Manages shared resources
- Supports low-level configuration and board support package

Middleware Layer
- Implements complex libraries and protocols (USB, TCP/IP, file systems, graphics)
- Provides a highly abstracted application program interface
- Libraries are thread safe and RTOS ready
- Built on drivers, PLIBS, system services
- Supports third party library integration

Device Driver Layer
- Provides highly abstracted interface to peripheral
- Controls access to the peripheral
- Manages multiple hardware instances and software clients with select drivers
- Manages peripheral state and multiple peripheral instances
- Accesses hardware via PLIB
- Supports blocking or non-blocking code

Peripheral Libraries (PLIB) Layer
- Provides functional interface for Microchip PIC32 scalability
- Implements part-specific features

MPLAB Harmony Configurator
MPLAB Harmony Configurator will support all features that are present in MPLAB Code Configurator.

MPLAB Harmony Configurator Features
- Create: MPLAB Harmony project
- Graphically select and configure: MPLAB Harmony components
- Initialize: middleware state machines
- Generated project can be compiled and executed
- Third party solutions can be added and configured without updates to MPLAB Harmony Configurator

MPLAB Harmony Configurator Design
- Java and Linux technologies
- Easily scalable
  - Add MCUs
  - Add features
- Low support and maintenance
- Enables third party solutions
- Linux look and feel

Getting Started

Starter Kits

Starter Kits are complete, affordable, turnkey solutions consisting of the hardware and software sufficient for exploring specific applications or the features of the device family they represent. Most kits include an on-board or separate debugger and tutorials. To get started, simply install and start MPLAB X IDE, connect the hardware and step through the easy-to-follow tutorials.

F1 Evaluation Kit (DV164132)

This kit is a demonstration/development tool for Enhanced Mid-Range PIC microcontrollers (PIC12F1XXX/PIC16F1XXX) and includes the PICkit 3 for quick programming and development. Populated with a PIC16LF1937 featuring XLP technology, this platform consists of a 44-pin development board with prototyping space, 3V LCD glass, support for the Motor Control add-on and support for PICkit 3 and PICkit Serial Analyzer. It provides a platform for general-purpose development and includes demonstrations focusing on low power, LCD and motor control.

MPLAB Starter Kit for PIC18 MCU (DM180021)

This kit includes an on-board debugger/programming capability as well as USB communication, 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.

PIC18 Development Kit (DV164136)

This kit includes a PIC18 Explorer board, PICkit 3 Debugger/Programmer, a USB cable and a 9V universal power supply. The PIC18 Explorer board includes both the PIC18F8722 and PIC18F87J11 microcontrollers and supports dozens of general-purpose PIC18 families using various processor Plug-in Modules (PIMs). PICtail™ daughter boards enable many different accessory boards to connect to the PIC18 Explorer.

PICkit 3 Starter Kit (DV164130)

This kit contains one assembled board with area for prototyping circuits. The assembled board is populated with the PIC16F1829-I/P. It also ships with a sample PIC18F14K22-I/P (20-pin) MCU.

PICkit 3 Debug Express (DV164131)

The PICkit 3 Debug Express combines a 44-pin demo board with a PIC18F45K20 microcontroller and a PICkit 3 debugger/programmer.

MPLAB Starter Kit for PIC24F MCUs (DM240011)

This kit includes an integrated in-circuit debugger and programmer, USB device and host connectors, a tri-color LED, a capacitive touch pad and an OLED display. Menu-driven demonstration software supports data logging, thumb drive and graphics applications to test the PIC24F MCU.

Explorer 16 Starter Kit (DV164037)

This kit is a complete set of tools for application development supporting our PIC24 and dsPIC33 16-bit digital signal controllers and PIC32 32-bit microcontrollers. It includes a MPLAB ICD 3 In-Circuit Debugger, an Explorer 16 Development Board, a 9V universal power supply for use with either the Explorer 16 board or the MPLAB ICD, a serial cable and both a PIC24FJ128GA010 and a dsPIC33F256GP710 device mounted on plug-in modules for quick replacement.

MPLAB Starter Kit for PIC24F Intelligent Integrated Analog (DM240015)

The MPLAB Starter Kit for PIC24F Intelligent Integrated Analog is a stand-alone board showcasing the advantages of lower BOM cost, faster throughput and lower noise analog. It features an on-board programmer/debugger.

PIC24E (DM240012) and dsPIC33E USB Starter Kits (DM330012)

These starter kits provide a low-cost method for the development and testing of USB devices, embedded host and On-The-Go applications using the PIC24E MCU and dsPIC33E DSC families. Included on each board are three user-programmable LEDs, three push button switches and an expansion header compatible with the Multimedia Expansion Board (DM320005) and I/O Expansion Board (DM320002). The starter kits come preloaded with basic Communication Device Class (CDC) demonstration software.

Microsticks for 3V and 5V PIC24F K-Series (DM240013-1/DM240013-2)

Microsticks for 3V and 5V PIC24F K-series (DM240013-1 and DM240013-2) are flexible, USB-powered development platforms. These low-cost solutions provide everything and are perfect if you are looking to get started with our low-cost 16-bit microcontroller families. The DM240013-1 supports the 3V PIC24F "KL", "KM" and "KA" devices while the DM240013-2 supports the 5V PIC24FV "KM" and "KA" for extremely cost-sensitive consumer, medical and industrial applications. Both Microsticks include an integrated programmer/debugger and can work as standalone development boards or be plugged into a prototyping board.

MPLAB Starter Kit for Digital Power (DM330017)

The MPLAB Starter Kit for Digital Power allows you to easily explore the capabilities and features of the dsPIC33F GS Digital Power Conversion family. It is a digitally controlled power supply board that consists of one independent DC/DC synchronous Buck converter and one independent DC/DC Boost converter. Each power stage includes a MOSFET-controlled 5W resistive load. The kit features an on-board programmer/debugger, an LCD display and an on-board temperature sensor.

Getting Started

Motor Control Starter Kit (DM330015)

This Motor Control Starter Kit includes a BLDC motor, a three-phase inverter, an on-board debugger/programmer, a user-configurable switch, a two-channel mTouch® sensing slider with LED indictors for motor speed display and a 9V power supply. This compact starter kit is an easy and inexpensive way to evaluate the capabilities of the dsPIC33 family for motor control applications.

Microstick II (DM330013-2)

Microstick II delivers a complete development hardware platform for Microchip's 16-bit and 32-bit microcontrollers and digital signal controllers. It's the perfect solution if you are looking for a low-cost, easy-to-use development platform and supports all 3.3V PIC24FJ, PIC24H, dsPIC33, and PIC32 SPDIP packaged devices.

PICDEM™ PIC18 Explorer Board (DM183032)

This low-cost demo board features a PIC18F8722 MCU which is the superset of the traditional PIC18 general-purpose 5V family. It also comes with the PIC18F87J11 processor PIM which is the superset of the PIC18 J-series of 3V MCUs for cost-sensitive applications. This single development board supports dozens of general-purpose PIC18 families using various processor PIMs.

MPLAB Starter Kit for dsPIC DSCs (DM330011)

This kit introduces you to the dsPIC Digital Signal Controller device using its speech and audio processing capabilities. It is USB-powered, has on-board debug circuitry and a 24-bit codec for high-quality audio applications. The board also contains reconfigurable switches, potentiometers, a temperature sensor and a 4 Mb serial EEPROM to store data such as audio samples.

PIC32 Starter Kit (DM320001)

With over 35 source code examples as well as a "Getting Started" project, this kit includes everything needed to write, program, debug and execute code on a high-performance PIC32 microcontroller.

PIC32MX1/MX2 Starter Kit (DM320013)

The PIC32MX1/MX2 Starter kit is a complete solution for exploring the low-cost, high-performance PIC32MX1/MX2 devices. This kit is perfect for providing an introduction to basic user interfaces with mTouch sensing solutions buttons and high-quality audio.

PIC32 Bluetooth® Starter Kit (DM320018)

This low-cost Bluetooth development platform features the PIC32MX270F256D MCU. This kit features a HCI-based Bluetooth radio, push buttons, a CREE high-output multi-color LED, standard single-color LEDs, an accelerometer, a temperature sensor and GPIO for rapid development of Bluetooth Serial Port Profile (SPP), USB and general-purpose applications.

PIC32MZ Embedded Connectivity (EC) Starter Kit with Crypto Engine (DM320006-C)

This kit provides the easiest and lowest-cost method to experience the high performance and advanced peripherals integrated in the PIC32MZ Embedded Connectivity MCUs. It features a PIC32MZ2048ECM144 with on-board crypto engine that reduces the software overhead of actions such as encryption, decryption and authentication. This starter kit features a socket that can accommodate various 10/100 Ethernet transceiver (RJ-45) plug-in connectors for prototyping and development.

PIC32 Ethernet Starter Kit (DM320004)

This kit provides the easiest and lowest-cost method to experience 10/100 Ethernet development with PIC32 MCUs. when combined with our free TCP/IP software, this kit gets your project running quickly. The PIC32 MCU has an available CAN2.0b peripheral and USB host/device/OTG.

PIC32 Ethernet Starter Kit II (DM320004-2)

This kit provides the easiest and lowest-cost method to experience 10/100 Ethernet development with PIC32 microcontrollers. When combined with our free TCP/IP software, this kit gets your project running quickly. The PIC32 microcontroller has an available CAN 2 .0b peripheral and USB host/device/OTG . This starter kit features a socket that can accommodate various 10/100 Ethernet PHY Daughter Boards for prototyping and development.

PIC32 USB Starter Kit III (DM320003-3)

This kit provides you with an easy and cost-effective option to experience the USB and SPI/I²S™ functionality of the new PIC32MX3/MX4 microcontrollers. The board comes equipped with everything that is needed including our free USB software to develop USB embedded host/device/OTG applications.

PIC32 I/O Expansion Board (DM320002)

If you use a PIC32 starter board (DM320001, DM320003), this I/O expansion board will provide you with full access to MCU signals, JTAG debugging and ICSP™ development and enables the connection of PICtail Plus daughter cards.

MPLAB Starter Kit for Serial Memory Products (DV243003)

This kit includes everything necessary to quickly develop a robust and reliable Serial EEPROM design, greatly reducing the time required for system integration and hardware/software fine-tuning. Supports the Microchip UNI/O bus, I²C™, SPI and Microwire Serial EEPROMs.

# Application-Specific Development Tools

Bluetooth

RN42 Bluetooth Evaluation Kit (RN-42-EK)

The RN-42-EK is a fully certified Class 2 Bluetooth evaluation kit for the RN42-I/RM module. It has the flexibility to connect directly to a PC via a standard USB interface or to embedded processors through the TTL UART interface. The status LEDs, switches and signal headers enable rapid prototyping and integration into existing systems.

RN52 Audio Bluetooth Evaluation Kit (RN-52-EK)
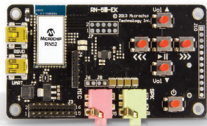
The RN-52-EK is an evaluation kit for the RN52, a fully certified Bluetooth version 3.0 audio module which is fully compatible with Bluetooth version 2.1+EDR. This kit demonstrates the key features of the RN52 allowing you to quickly and easily evaluate and develop prototypes. The RN-52-EK can pair with any smartphone, stream music, and take hands-free calls. It also supports multiple Bluetooth profiles and codecs. The RN-52-EK includes an RN52 evaluation board, a USB cable, two stereo mini-speakers and a microphone.

PIC32 Bluetooth Audio Development Kit (DV320032)

The PIC32 Bluetooth Audio Development Kit with PIC32MX470F512L on board offers an excellent means for designing and developing a low-cost Bluetooth audio system. The features include Bluetooth audio streaming with low-cost HCI radio module, compatibility with Bluetooth-enabled smartphones and portable music players, USB memory stick support, 2 inch color LCD display, high-quality 24-bit display and 192 kHz audio conversion for line or headphones.

Multimedia Expansion Board II (DM320005-2)

The Multimedia Expansion Board II (MEB-II) is a highly-integrated, compact and flexible development platform which works with the PIC32MZ Starter Kit. The MEB-II kit features a 4.3" WQVGA PCAP touch display daughter board.

Bluetooth Low Energy PICtail/PICtail Pus (RN-4020-PICTAIL)

The RN4020 PICtail/PICtail Plus is a development tool for prototyping new designs using our fully certified RN4020 Bluetooth Low Energy Module. The RN4020 PICtail has an on-board PIC18 to provide USB serial communications, allowing it to connect directly to a PC for simple demonstrations using RN4020 scripting capabilities. The RN4020 PICtail can also be plugged into an Explorer 16 Development Board (DM240001) to develop feature-rich applications using the PIC16, PIC18, and PIC32 family of microcontrollers.

Ethernet

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 our 16- and 32-bit products when used in conjunction with our free TCP/IP stack.

Fast 100 Mbps Ethernet PICtail Plus Daughter Board (AC164132)

This board is populated with a 64-pin ENC624J600 Ethernet controller and 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 our 8, 16- and 32-bit products.

PICDEM.net™ 2 Development Board (DM163024)

This Internet/Ethernet development board supports both the ENC28J60 Ethernet controller and the single-chip Ethernet PIC18F97J60 MCU. Using this board with our free TCIP/IP stack, you can develop a web server to demonstrate the ability to remotely monitor and control embedded applications over the Internet.

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 you to add Ethernet connectivity to your system architecture.

Application-Specific Development Tools

eXtreme Low Power

nanoWatt XLP 16-bit Development Board (DM240311)

This development board provides a low-cost, highly configurable development system for our line of extreme low power 16-bit PIC24F microcontrollers featuring sleep currents down to 20 nA. The board supports development on PIC24F16KA102, PIC24FJ64GA102 and PIC24F64GB002 families of MCUs. This board can be powered by more than five sources including batteries and energy harvesting modules, and it supports a variety of common components that can be selectively enabled.

XLP 8-Bit Development Board (DM240313)

This development board is a true platform for low-power development, enabling designs with sleep currents as low as 20 nA. The board has connections for in-circuit programming and debugging and a USB interface for power and PC communication. The board comes with the PIC18F87K22 installed along with a PIC16LF1947 Plug-in Module, and it can be powered by six different sources.

General Purpose

PIC10(L)F32X Development Board (AC103011)

The PIC10(L)F32X Development Board will help you learn about designing with PIC microcontrollers and developing applications using the Configurable Logic Cell, Complimentary Waveform Generator and Numerically Controlled Oscillator peripherals.

PICDEM Lab Development Kit (DM163045)
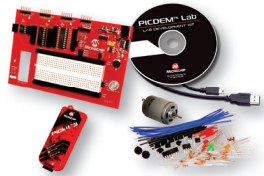
The PICDEM Lab Development Kit provides a comprehensive development and learning platform for virtually all of our Flash-based 6-, 8-, 14-, 18-, and 20-pin, 8-bit PIC microcontrollers. Geared toward first-time PIC microcontroller users and university students, the PICDEM Lab Development Kit is supplied with five of our most popular 8-bit PIC microcontrollers and a host of discrete components used to create a number of commonly used circuits. Expansion headers provide complete access/connectivity to all pins on the connected PIC microcontrollers and all mounted components. This kit includes a PICkit 3 In-Circuit Debugger.

Graphics and LCD

Remote Control Demo Board (DM240315-2)

This board integrates graphics, mTouch, USB and RF4CE into a single demonstration platform. The board demonstrates a remote populated with a PIC24FJ256DA210 MCU, a 3.5" graphical TFT LCD with resistive touch screen, capacitive touch keys with plastic overlay, an MRF24J40 2.4 GHz transceiver and a ZENA™ wireless adapter.

PIC24FJ256DA210 Development Board (DM240312)

The PIC24FJ256DA210 Development Board is a low-cost and efficient development board to evaluate the features and performance of the PIC24FJ256DA210 with integrated graphics, mTouch technology and USB. This board is an ideal platform for developing graphical human interface applications.

VGA Camera Sensor (VCS) PICtail Plus Board (AC164150)

This board brings basic vision and surveillance to PIC32 MCU-based systems. It contains a 640 × 480 VGA color CMOS sensor. This board interfaces to the I/O expansion board with a PIC32 Starter Kit, an Epson graphics development board and a VGA display.

Application-Specific Development Tools

Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board (AC164144)

The Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board enables development of graphics solutions without an external graphics controller, thus reducing system BOM cost for many applications. The board is designed to attach to a PIC32 Starter Kit (DM320001, DM320003-2, DM320004) or an Explorer 16 Development Board (DM240001).

For more advanced graphics or larger display sizes, there are several boards using external graphics controllers which can be used with the Explorer 16 or a PIC32 Starter Kit:

- Solomon Systech SSD1926 Graphics Board (AC164127-5)
- Epson S1D13517 Graphics Board (AC164127-7)

The graphics development boards above can be used with these flexible graphical display boards, which range in size from 3.2" to 7".

- QVGA 3.2" Graphics Display Truly 320 × 240 Board (AC164127-4)
- WQVGA 4.3" Graphics Display Powertip 480 × 272 Board (AC164127-6)
- VGA 5.7" Graphics Display Truly 640 × 480 Board (AC164127-8)
- WVGA 7" Graphics Display Truly 800 × 480 Board (AC164127-9)

LCD Explorer Development Board (DM240314)

The LCD Explorer Development Board supports our 100-pin microcontrollers with ×8 common segment LCD drivers. The LCD Explorer provides an ideal platform for you to evaluate an MCU with a common LCD driver on a 38 segment ×8 common LCD display. PICtail Plus connections allow you to evaluate the selected MCU in a complex system by adding one of our PICtail Plus daughter boards.

Lighting

Lighting Communication Development Platform (DM160214)

The Lighting Communications Development Platform provides a universal lighting development platform for the creation of communications-enabled lighting applications.

The platform consists of a main board and various communications interface adapters to support in the development of DALI, DMX512A as well as future protocols.

Machine-to-Machine

Machine-to-Machine (M2M) PICtail Daughter Board (AC320011)

The M2M PICtail Daughter Board, which is based upon u-blox GPS and GSM/GPRS modules, makes it easy to create low-cost M2M applications with location-awareness capabilities. The daughter board can be interfaced with a PIC32 Multimedia Expansion Board and a PIC32 Starter Kit to provide a turnkey platform to help you develop remote monitoring applications with texting and GPS capabilities

Motor Control and Power Conversion

F1 PSMC 28-pin Evaluation Platform (DM164130-10)

This development board is designed for individuals who already have a set of PIC microcontroller development tools and wish to evaluate PIC16F178X device capabilities.

F1 LV Evaluation Platform (DM164130-5)

The F1 Low Voltage Evaluation Platform is a development tool for Enhanced Mid-range PIC microcontrollers (PIC12F1XXX/PIC16F1XXX). Populated with a PIC16LF1947—featuring XLP technology—and an MCP1624 for low-voltage single-cell battery support, it provides a platform for general-purpose and low-voltage development and allows you to develop code for any PIC12F1XXX/PIC16F1XXX microcontroller. The integrated functionality includes a prototyping area, LCD control, system current monitoring, temperature sensing, Real-Time Clock, LED drive, button control, USB interface, various power sources and BLDC/BDC/Unipolar/Bipolar stepper motor control.

Application-Specific Development Tools

dsPICDEM™ MCLV-2 Development Board (DM330021-2)
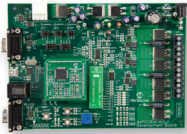
The dsPICDEM MCLV-2 Development Board provides a cost-effective method for evaluating and developing sensored or sensorless Brushless DC (BLDC) and Permanent Magnet Synchronous motor control applications. The board supports our 28-pin SOIC versions of our dsPIC33F/E digital signal controllers as well as a variety of Plug-In Modules (PIMs). Either the internal, on chip op amps or the external op amps on the MCLV-2 board can be used, and we provide PIMs for both options. The MCLV-2 is fully backwards-compatible with the original MCLV and all PIMs. The board is capable of controlling motors rated up to 48V and 15 Amps. It is designed to work with the 24V BLDC Motor (AC300020) and the 24V Motor Power Supply (AC002013) to create a complete 24V BLDC development kit. It also supports multiple communications channels such as USB, CAN, LIN and RS-232.

dsPICDEM MCHV-2 Development System (DM330023-2)

The dsPICDEM MCHV-2 Development System enables rapid development of a wide variety of high-voltage motor control applications using a dsPIC DSC, including Brushless DC (BLDC) motors, Permanent Magnet Synchronous Motors (PMSM), and AC Induction Motors (ACIM), in sensor or sensorless operation. The MCHV-2 outputs up to 1000W at 400V from 85–285 VAC input and has an integrated power factor correction stage. The MCHV-2 supports the dsPIC33F/E Motor Control device families and offers a mounting option to connect either a 28-pin SOIC device or a generic 100-pin Plug-in Module PIM. The MCHV-2 allows either the internal, on-chip op amps found on certain dsPIC DSC devices or the external op amps on the MCHV-2 board to be used. We provide PIMs for using either the internal or external op amps.

## Low-Voltage Motor Control Development Bundle (DV330100)

This Low-Voltage Motor Control Development Bundle provides a cost-effective method of evaluating and developing a dual/single motor control power stage targeted to drive two Brushless DC (BLDC) motors or Permanent Magnet Synchronous Motors (PMSM) concurrently. The bundle comes with a dsPIC DSC Signal Board, a Motor Control 10–24V Driver Board and a dsPIC33EP512GM710 Dual-Motor Control PIM. This bundle provides a platform for building and evaluating embedded motor control application software with the dsPIC33EP family.

Buck/Boost Converter PICtail Plus Card (AC164133)

A low-cost development platform for dsPIC33F GS SMPS devices, the Buck/Boost Converter PICtail Plus Card has two buck stage outputs and one boost stage output. This board can be used with the Explorer 16 board or with the 16-bit 28-pin starter board and the dsPIC33F GS SMPS and digital power conversion devices.

Security

Wireless Security Remote Control Development Kit (DM182017-1/2/3/4)
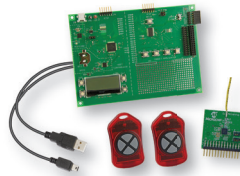
The Wireless Security Remote Control Development Kit is a demonstration and development platform for wireless security remote control applications. DM182017-1/2/3 demonstrates two security protocols; KEELOQ® Classic protocol and KEELOQ Advanced (AES-128) protocol. DM182017-4 demonstrates Ultimate KEELOQ and KEELOQ Classic protocols. Each kit contains a four-button key fob transmitter based on the PIC12LF1840T39A, which is programmed to the MHz corresponding to the specific kit as shown below. The kits also contain a receiver PICtail daughterboard and the Embedded Security Development Board.

- DM182017-1   433.92 MHz
- DM182017-2   868 MHz
- DM182017-3   915 MHz
- DM182017-4   433.92 MHz

Application-Specific Development Tools

Touch Sensing Technology

Enhanced mTouch Capacitive Touch Evaluation Kit (DM183026-2)
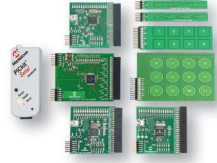
The enhanced mTouch Capacitive Touch Evaluation Kit provides a simple platform for developing a variety of capactive touch sense applications using PIC16F, PIC24F and PIC32 microcontrollers.

Metal Over Cap Accessory Kit (AC183026)
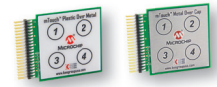
The Metal Over Cap Accessory Kit contains two daughter boards showcasing metal over cap technology. One board has a stainless steel cover and the other board has a plastic cover. This kit provides an easy way to evaluate our unique technology when used in conjunction with the mTouch Capacitive Touch Evaluation Kit (DM183026-2).

mTouch AR1000 Development Kit (DV102011)

This kit provides everything you need to get started using the AR1000 resistive controller to create a turnkey, cost-effective solution. The kit includes the AR1000 development board, a 7" four-wire resistive touch screen, a PICkit Serial Analyzer and all necessary interface cables, as well as a CD containing technical documentation and all necessary software.

mTouch AR1100 Development Kit (DV102012)

The mTouch AR1100 Development Kit provides everything you need to get started using the AR1100 resistive controller to create a turnkey, cost-effective USB solution.

PIC32 GUI Development Board with Projected Capacitive Touch (DM320015)
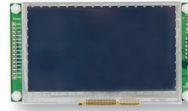
This board enables development of cost-effective multi-touch graphical user interfaces. It is based on the PIC32MX795F512H and the MTCH6301 projected capacitive touch controller. The board provides USB host and device connectivity and supports I/O connections via through-hole pads for custom board attachment.

MGC3130 Single Zone "Hillstar" Evaluation Kit (DM160218)
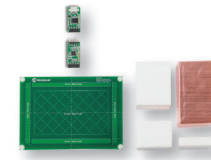
This kit builds a complete MGC3130 reference system consisting of the MGC3130 module, I^{2}C to USB bridge module and a 4-layer reference electrode 95 × 60 mm sensitive area. The Hillstar package includes an artificial hand for parameterization and performance evaluation of the sensor. With the MGC3130 software package including Aurea graphical user interface and GestIC® technology library, the MGC3130 Software Development Kit (SDK) and a set of electrode reference designs the Hillstar Development Kit is prepared for an easy design-in of MGC3130.

USB

PIC32 I/O Expansion Board (DM320002)

If you use a PIC32 starter board (DM320001, DM320003), this I/O expansion board will provide you with full access to MCU signals, JTAG debugging and ICSP development and enables the connection of PICtail Plus daughter cards.

PICDEM FS USB Demonstration Board (DM163025-1)

The PICDEM FS USB Demonstration Kit is an easy-to-use evaluation platform for our PIC18F2X/4XK50 family of USB MCUs. These devices support full-speed USB communication without the need for an external crystal, which allows significant cost savings and reduced design effort. The demo kit provides all of the hardware needed to demonstrate and develop a complete USB communication solution. Additional software is available for free at from our online software libraries.

Application-Specific Development Tools

USB PICtail Plus Daughter Board (AC164131)

This daughter board enables USB connectivity when using a PIC24 or PIC32 USB PIM in conjunction with the Explorer 16 board.

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

This board will help you evaluate the USB2514B MultiTRAK™ Hub Controller, which is a low-power, full-featured, OEM-configurable Hi-Speed USB hub with four downstream ports. Each of these downstream ports can be enabled to support battery charging according to the USB Battery Charging Specification.

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

The USB2640 is a USB 2.0 hub, ultra-fast Flash media controller, and protocol bridge combo. The EVB-USB2640 Evaluation Board provides an evaluation playform for applications such as Flash media card readers/writers, printers, desktop and mobile PCs, consumer A/V and flat panel displays.

Wi-Fi

RN171 Wi-Fi Evaluation Kit (RN-171-EK)

The RN-171-EK is an 802.11 b/g Wi-Fi evaluation kit for the RN171 module. It can be used to quickly add Wi-Fi connectivity to embedded applications. It has the flexibility to connect directly to a PC via a standard USB interface or to embedded processors through the TTL/UART interface. The board includes two convenient push buttons for controlling both SoftAP and WPS mode without software configuration. The status LEDs and jumpers enable rapid prototyping and integration into existing systems.

Wi-Fi G Demo Board (DV102412)

The Wi-Fi G Demo Board is a compact demonstration platform allowing you to easily evaluate and configure the fully certified MRF24WG0MA 802.11 b/g Wi-Fi module. The demo board is a fully functional stand-alone web server powered by two AAA batteries. It comes with the MRF24WG0MA Wi-Fi module connected to a PIC32 MCU. The TCP/IP stack is pre-configured to serve web pages and show SoftAP, Wi-Fi Direct client and WPS functions.

MiWi™ Wireless Networking Protocol to Wi-Fi Wireless Demo Kit (DM182018)
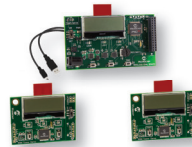
The MiWi Wireless Networking Protocol to Wi-Fi Wireless Demo Kit allows you to evaluate and experiment with MiWi wireless networking protocol to Wi-Fi gateway solutions. The kit includes a wireless evaluation board with both MiWi wireless networking protocol and Wi-Fi transceivers. It also includes two MiWi wireless networking protocol demo boards to create a three-node MiWi wireless networking protocol network. The MiWi Wireless Networking Protocol to Wi-Fi Demo Kit is pre-programmed with a wireless demo program, which demonstrates how to commission and control the MiWi wireless networking protocol P2P network from a web browser.

Analog Development Tools

Analog-to-Digital Converters

MCP3421 Weight Scale Demo Board (MCP3421DM-WS)
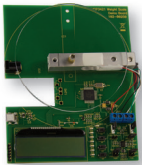
The MCP3421 Weight Scale Demo Board allows you to evaluate the performance of the low-power consumption, 18-bit ADC in an electronic weight scale design. Next to the MCP3421 there is a low-noise, auto-zero MCP6V07 op amp. This can be used to investigate the impact of extra gain added before the ADC for performance improvement. The PIC18F4550 controls the LCD and the USB communication with the PC. The GUI is used to indicate the performance parameters of the design and for calibration of the weight scale.

### MCP3421 Battery Fuel Gauge Demo Board (MCP3421DM-BFG)

The MCP3421 Battery Fuel Gauge Demo Board demonstrates how to measure the battery voltage and discharging current using the MCP3421. The MCU algorithm calculates the battery fuel being used. The demo board displays the following parameters:
(a) Measured battery voltage
(b) Measured battery discharging current
(c) Battery fuel used (calculated)

Although the MCP3421 Battery Fuel Gauge Demo Board can charge a single-cell 4.2V Li-Ion battery, this feature is disabled by firmware since the demo kit is shipped with a non-rechargeable 1.5V AAA battery.

MCP3910 ADC Evaluation Board for 16-bit MCUs (ADM00425)
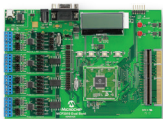
The MCP3910 ADC Evaluation Board for 16-bit MCUs allows you to evaluate the performance of the MCP3910 dual-channel ADCs in a multiple-device, isolated system. It comes with four MCP3910s, three of which are isolated and operate in 2-wire Serial Interface Mode. It also provides a development platform for 16-bit PIC microcontroller-based applications, using existing 100-pin PIM systems compatible with the Explorer 16 and other high pin count PIC MCU demo boards. The system comes with programmed PIC24FJ256GA110 PIM modules that communicate with the PC software for viewing data samples sent from the board.

CAN and LIN Interface Products

MCP2515 PICtail Plus Daughter Board (MCP2515DM-PTPLS)

This daughter board is a simple Controller Area Network (CAN) board designed to be used with boards containing the PICtail Plus connector. The board also has the PICkit Serial connector for interfacing to the PICkit Serial Analyzer tool. The CAN node consists of the MCP2515 stand-alone CAN controller and MCP2551 CAN transceiver. The PICkit Plus and PICkit Serial connectors allow the board to be interfaced to a variety of PIC MCUs to allow you to develop a CAN node.

MCP2515 CAN Bus Monitor Demo Board (MCP2515DM-BM)

The MCP2515 CAN Bus Monitor Demo Board kit contains two identical boards which can be connected together to create a simple two-node CAN bus. These boards which can be controlled and/or monitored via the included PC interface. The board(s) can also be connected to an existing CAN bus.

Digital Potentiometers

MCP401X Evaluation Board (MCP401XEV)

The MCP401XEV Evaluation Board allows you to quickly evaluate the operation of the MCP40D18 Digital Potentiometer. This device is similar to the MCP40D17, MCP40D19, MCP4017, MCP4018 and MCP4019. The board uses the SC70EV generic PCB and has been populated for the MCP40D18. The 6-pin header (PICkit Serial) has been jumpered to the MCP40D18's appropriate pins. This allows the PICkit Serial to communicate with the device. The User's Guide includes demonstrations of the PICkit Serial controlling the MCP40D18 device. Additional blank PCBs may be ordered by using the order number SC70EV. Each SC70EV kit contains five PCBs.

MCP43XX Evaluation Board (MCP43XXEV)

The MCP43XX Evaluation Board allows you to quickly evaluate the operation of the MCP4361 Digital Potentiometer. The board uses the TSSOP20EV Generic PCB and has been populated for the MCP4361. The 6-pin header (PICkit Serial) has been jumpered to the MCP4361's appropriate pins. This allows the PICkit Serial Analyzer to communicate with the device.

Analog Development Tools

Digital-to-Analog Converters

MCP4725 SOT-23-6 Evaluation Board (MCP4725EV)

The MCP4725 SOT-23-6 Evaluation Board is a quick and easy evaluation tool for the MCP4725 12-bit DAC device. It works with our popular PICkit Serial Analyzer or independently with your applications board. The PICkit Serial Analzyer is sold separately.

MCP4728 Evaluation Board (MCP4728EV)

This evaluation board allows quick and easy evaluation of the MCP4728 4-channel 12-bit DAC device. It contains the MCP4728 device and connection pins for the PICkit Serial Analyzer. When the MCP4728 evaluation board is connected to the PICkit Serial Analyzer and the DAC input data is entered into the PC Graphical User Interface program, the serial analyzer automatically sends your data to the DAC device.

Power Monitoring

### MCP39F501 Power Monitor PICtail Evaluation Board (ADM00509)

The MCP39F501 Power Monitor PICtail Evaluation Board serves as a fully functional single-phase power monitor and development platform. This low-cost design does not use any transformers and requires few external components. The device calculates active power, reactive power, RMS current, RMS voltage, power factor, line frequency and other typical power quantities as defined in the MCP39F501 data sheet. The MCP39F501 Power Monitor Utility software is used to calibrate and monitor the system and can be used to create custom calibration setups. Only a single point of calibration may be needed for some accuracy requirements.

I/O Expanders

MCP23X17 16-bit GPIO Expander Evaluation Board (MCP23X17EV)
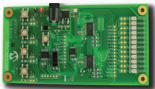
This board demonstrates the simple input/output functionality of the MCP23017 (I^2C interface) and the MCP23S17 (SPI interface). The system demonstrates the simplicity of monitoring four pins configured as inputs and applying a predetermined pattern on LEDs connected to the remaining 12 pins configured as outputs.

LED Drivers

21-Watt Universal AC LED Driver Demonstration Board with Accurate Average-Mode Constant Current Control (HV9961DB1)

The HV9961 demonstration board is a high-brightness LED driver employing the average-mode constant current control scheme. The power conversion stage of the HV9961DB1 consists of a diode bridge rectifier followed by a buck converter operating with fixed off-time of 20 µs.

The HV9961DB1 LED driver features tight regulation of the LED current within a few milliamps over the entire range of the input AC line and the output LED string voltage. The LED current accuracy is almost insensitive to the passive component tolerances, such as the output filter inductance or the timing resistor. The accuracy of the LED current is mainly determined by the internal 275 mV ± 3% reference voltage of the HV9961 control IC and by the external current sense resistor tolerance. The output current can be adjusted down to 60 mA using an on-board potentiometer. However, the accurate current control is only achieved with continuous conduction of the filter inductor, i.e. when the LED current is greater than the inductor ripple current amplitude.

Universal Off-Line, High-Brightness 350 mA LED Driver Demonstration Board (HV9910BDB2)

The HV9910BDB2 demonstration board is a high-brightness LED power driver to supply a string of LEDs using the HV9910B IC from a universal AC input. The HV9910BDB2 can supply a maximum output current of 350 mA to drive 10–40V LED strings from a wide input voltage of –90 to 265 VAC, 50/60 Hz. The power conversion stage of the HV9910BDB2 consists of a diode bridge rectifier, followed by a current-controlled buck converter operating at a switching frequency of 50 kHz. The nominal output current of the demonstration board can be adjusted to any value between 30 and 350 mA using the on-board trimming potentiometer. PWM dimming can be achieved by applying a pulse-width-modulated square wave signal between the PWMD and GND pins. Zero output current can be obtained only by PWM dimming.

Operational Amplifiers

### MCP6N11 and MCP6V2X Wheatstone Bridge Reference Design (ARD00354)
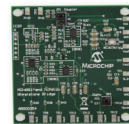
This board demonstrates the performance of the MCP6N11 instrumentation amplifier (INA) and a traditional three op amp INA using the MCP6V26 and MCP6V27 auto-zeroed op amps. The input signal comes from an RTD temperature sensor in a Wheatstone bridge. Real-world interference is added to the bridge's output to provide realistic performance comparisons. Data is gathered and displayed on a PC for ease of use. The USB microcontroller and included Graphical User Interface (GUI) allow you to configure the board and collect sample data.

Analog Development Tools

MCP6V01 Thermocouple Auto-Zeroed Reference Design Board (MCP6V01RD-TCPL)
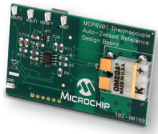
The MCP6V01 Design Board demonstrates how to use a difference amplifier system to measure Electromotive Force (EMF) voltage at the cold junction of thermocouple in order to accurately measure temperature of the thermocouple bead. The MCP6V01 auto-zeroed op amp, with its ultra low-offset voltage (V_{OS}) and high Common Mode Rejection Ratio (CMRR), provides a way to capture this measurement.

MCP661 Low-Driver Demonstration Board (MCP661DM-LD)
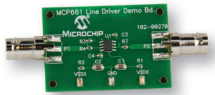
This demonstration board uses the MCP661 in a very basic application for high-speed op amps: a 50Ω line (coax) driver. It gives a 30 MHz solution, high-speed PCB layout techniques and a means to test AC response, step response and distortion. Both the input and the output are connected to lab equipment with 50Ω BNC cables. There are 50Ω terminating resistors and transmission lines on the board. The op amp is set to a gain of 2V/V to overcome the loss at its output caused by the 50Ω resistor at that point. Three surface mount test points make it simple to connect lab supplies to the board.

Motor Drivers

MTS2916A Dual Full-Bridge Stepper Motor Driver Evaluation Board (ADM00308)

The MTS2916A Dual Full-Bridge Stepper Motor Driver Evaluation Board demonstrates how the MTS2916A controls both windings of a bipolar stepper motor. The board also demonstrates the capabilities of the MTS62C19A, which has the same functionality but different pin assignments. A PIC16F883 is utilized for motor control processing. Push button switches and a variable-speed input potentiometer can be used to exercise a stepper motor in Full-Step, Half-Step, Modified Half-Step and Microstepping modes. LEDs indicate a binary representation of which mode has been selected. The evaluation board and the stepper motor can be powered from a single power input J1 (7 VDC to 12 VDC) with jumper JP2 installed. For higher motor voltages, make sure JP2 is not installed, and connect VLOAD at J4. Numerous test points have been designed into the board to allow easy access.

MCP8025 TQFP BLDC Motor Driver Evaluation Board (ADM00600)

The MCP8025 TQFP BLDC Motor Driver Evaluation Board demonstrates the MCP8025 3-Phase Brushless DC (BLDC) Motor Gate Driver with Power Module used in a BLDC motor drive application. When used in conjunction with a microcontroller, the MCP8025 will provide the necessary signals to drive a 3-phase BLDC motor. The MCP8025 contains the high-side and low-side drivers for external N-channel MOSFETs. A dsPIC33EP256MC504 processor is used to supply the PWM inputs to the MCP8025 as well as handle the high-speed ADC required for 50 kHz PWM operation. The MCP8025 UART interface is used to configure the MCP8025 device and to send fault information to the dsPIC DSC. The evaluation board firmware uses a 6-step trapezoidal drive control algorithm to demonstrate the MCP8025's capabilities.

Power Management

MCP19111 Evaluation Board (ADM00397)

The MCP19111 Evaluation Board demonstrates how the MCP19111 device operates in a synchronous buck topology over a wide input voltage and load range. Nearly all operational and control system parameters are programmable by utilizing the integrated PIC microcontroller core. MPLAB X IDE can be used in conjunction with a Graphical User Interface (GUI) plug-in to easily configure the MCP19111. Alternatively, you can program the MCP19111 using your own firmware, tailoring it to your application. The evaluation board contains headers for In-Circuit Serial Programming™ (ICSP) as well as I²C communication, pull-up and pull-down resistor pads and test point pads on each GPIO pin, and two push buttons for system development.

MCP19035 300 kHz Synchronous Buck Controller Evaluation Board (ADM00434)

The MCP19035 300 kHz Synchronous Buck Controller Evaluation Board provides a compact, low-cost and highly efficient step-down conversion for low- to medium-output currents.

Analog Development Tools

MCP16251 and MCP1640B Synchronous Boost Converters Evaluation Board (ADM00458)

The MCP16251 and MCP1640B Synchronous Boost Converters Evaluation Board is used to evaluate and demonstrate the MCP16251 and MCP1640B in two boost-converter applications with multiple output voltages. It can be used to evaluate both package options (SOT-23-6 and 2 × 3 mm 8-pin (T)DFN). Three common output voltages can be selected: 2.0V, 3.3V and 5.0V. The output voltage can be changed with a mini-dip switch that changes the external resistor divider. A switch connected to the EN pin is used to enable and disable the converters. When enabled, the MCP16251/MCP1640B will regulate the output voltage; when disabled, the MCP16251/MCP1640B disconnects the path from input to output for "true-disconnect".

## MCP16331 Buck Converter Evaluation Board (ADM00519)

The MCP16331 Buck Converter Evaluation Board is used to evaluate and demonstrate the MCP16331 in the SOT-23 package. This board demonstrates the MCP16331 in a buck converter application with two selectable output voltages. Test points are provided for the input and output, allowing the board to be connected directly to a system. Additional test points provide access to the EN pin to modify the state of the converter and access to the software pin to view the switching waveform.

MCP19114 Flyback Stand-alone Evaluation Board (ADM00578)
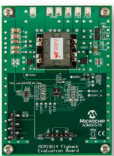
The MCP19114 Flyback Stand-alone Evaluation Board and GUI demonstrate the MCP19114's performance in a synchronous Flyback topology. It is configured to regulate load current and is well suited to drive LED loads. Nearly all operational and control system parameters are programmable through the integrated PIC MCU core. The MCP19114 evaluation board comes preprogrammed with firmware designed to operate with the GUI interface. MPLAB X IDE can be used to develop and program user-defined firmware, customizing it for the specific application. The evaluation board contains headers for ICSP as well as I^{2}C communication. Several test points have been designed into the PWB for easy access and development purposes. The MCP19114-Flyback Stand-alone Evaluation Board also demonstrates an optimized PCB layout that minimizes parasitic inductance, while increasing efficiency and power density. Proper PCB layout is critical to achieving optimum MCP19114 operation as well as power train efficiency and noise minimization.

Thermal Management

MCP9700 Thermistor Demo Board (MCP9700DM-TH1)

This demo board contains analog circuitry to measure temperature. The board uses BC Components' 232264055103 NTC thermistor to convert temperature to resistance. The thermistor is placed in a voltage divider which converts resistance to voltage. This voltage is filtered and placed at the MCP6S22 Programmable Gain Amplifier's (PGA) CH0 input. The PGA gains and buffers the thermistor.

MCP9800 Temperature Sensor Demonstration Board (MCP9800DM-TS1)

The MCP9800 Temperature Sensor Demonstration Board can be connected to a PC using the USB interface to allow you to evaluate the sensor's performance. The 7-Segment LED displays temperature in degrees Celsius or degrees Fahrenheit. The temperature alert feature can be set using the on-board potentiometer. An alert LED is used to indicate an over-temperature condition. Temperature can also be datalogged using the Thermal Management Software GUI. The sensor registers can also be programmed using the GUI.

USB Peripherals

MCP22XX Family of USB Bridge Breakout Modules (MCP2200 = ADM00393; MCP2210 = ADM00419; MCP2221 = ADM00559)

These breakout modules and supporting software demonstrate USB Bridge capabilities and allow the development of custom software.

UCS1002 USB Charging Controller – SMBus (ADM00497)

The UCS1001 USB port power controller provides a single USB port power switch capable of up to 2.5 amps of continuous current as well as a USB 2.0 compliant data switch. When a portable device is plugged in, it can auto-cycle through up to seven preloaded charger emulation profiles until charging commences. The embedded profiles are compatible with BC1.2 CDP, DCP, YD/T-1591 as well as most Apple® and RIM® portable devices. It also allows portable device charging when an application or host is in standby or in a sleep state.

UCS81003 Evaluation Board (ADM00561)

The UCS81003 Evaluation Board allows you to evaluate the features of the UCS81003 Automotive USB Port Power Controller with Charger Emulation. The board allows the UCS81003 to be tested in different configurations by populating jumpers on specific header locations.

Third Party Tools

chipKIT™ Development Platform Tools

The chipKIT Development Platform, powered by Microchip's 32-bit microcontrollers, is an open-source, Arduino™-compatible solution for the beginner to advanced explorer of embedded systems. The platform inspires creativity to build robotics, human interfaces and other intelligent electronics applications. Flexible enough to grow with you, it doesn't assume any prior knowledge of embedded systems, yet it is professional enough to provide a migration path into industry-recognized tools.

Features include:

- High-performance processors (40–200 MHz) to solve complex problems quickly
- A large memory footprint accommodating bigger sketches (with complex protocol stacks/libraries)
- Integrated peripherals that ease development of advanced applications including USB, graphics, audio, and much more
- Simple code development with the FREE Multi-Platform IDE (MPIDE) compatible with core Arduino functions and libraries
- A massive repository of existing tutorials, application examples and courseware
- All chipKIT boards are also compatible with MPLAB X IDE and MPLAB XC32

chipKIT Uno32™ Development Board (TDGL002)

This development board includes a PIC32MX320F128H processor, 128K Flash, 16K RAM and an operating speed up to 80 MHz. There are 42 available I/O lines. The board can be USB or externally powered. A USB cable is required for programming.

chipKIT Max32™ Development Board (TDGL003)

This development board includes a PIC32MX795F512L processor, 512K Flash, 128K RAM and an operating speed up to 80 MHz. The board also has a USB 2.0 On-The-Go (OTG) controller, 10/100 Ethernet MAC and dual CAN controllers. There are 83 available I/O lines. The board can be USB or externally powered. A USB cable is required for programming.

chipKIT Basic I/O Shield (TDGL005)
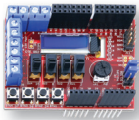
The chipKIT Basic I/O Shield adds a variety of useful I/O devices to the chipKIT Uno32 or the chipKIT Max32. It provides simple I/O such as buttons, switches and LEDs, as well as more complex devices such as an I^{2}C EEPROM, an I^{2}C temperature sensor and a 128 × 32 pixel organic LED graphic display.

chipKIT Network Shield (TDGL006)

The chipKIT Network Shield expands the capabilities of the chipKIT Max32 to take advantage of all the advanced features of the PIC32MX795 MCU. It adds 10/100 Ethernet, USB and CAN communications plus additional features.

chipKIT Wi-Fi Shield (TDGL016)

The chipKIT Wi-Fi Shield by Digilent adds Wi-Fi capability to the chipKIT Uno32, Max32, or uC32. Based on the Microchip MRF24WG0MA Wi-Fi radio transceiver module, the Wi-Fi Shield also includes a microSD card connector and four LEDs.

chipKIT Motor Shield (TDGL020)

The chipKIT Motor Shield is an expansion board for use with the chipKIT Uno32 and chipKIT uC32. It provides additional circuitry and connectors to drive DC motors, servo motors, and stepper motors. It also provides additional I/O via an I^{2}C I/O extender.

chipKIT WF32 Wi-Fi Development Board (TDGL021)

The WF32 includes several peripherals on the board, including Wi-Fi radio module, USB OTG (host or device) interface, microSD card slot, buttons, LEDs, potentiometer and lots of extra I/Os. A full-featured HTML server application is available by download. This board can be powered by USB or an external power supply.

chipKIT Wi-FIRE Development Board (TDGL021-2)

This board enables rapid prototyping with Microchip's latest PIC32MZ architecture and Imagination Technologies, FlowCloud™ Internet connectivity development software.

chipKIT Pi Development Board (TCHIP020)

chipKIT Pi (designed for Raspberry Pi®) is an Arduino-compatible chipKIT platform from Microchip and element14. It features a 32-bit PIC32 microcontroller in a prototyping-friendly, low pin count SPDIP package. The board is supported by the free chipKIT Multi-Platform IDE (MPIDE) that can be hosted on the Raspberry Pi.

chipKIT Fubarino® SD Development Board (TCHIP010)

The chipKIT Fubarino SD board brings affordable, breadboard-compatible high-speed computing power to the Arduino-compatible chipKIT/MPIDE platform. It is able to run almost all Arduino sketches right out of the box, and includes more memory, speed and I/O pins than a typical Arduino or clone. It includes a microSD card slot for easy sketch access to large file storage.

chipKIT Fubarino Mini Development Board (TCHIP011)

The chipKIT Fubarino Mini is a prototyping-friendly platform for developing Arduino-compatible 32-bit applications. The compact size (5.1 × 1.9 cm) and low cost allow the Mini to fit almost anywhere. The board includes a USB bootloader that works with the chipKIT/MPIDE platform. Connect directly to your application using solder pads or add the male expansion headers and plug into a breadboard.

Third Party Tools

Connectivity

EZ Web Lynx

EZ Web Lynx products enable you to quickly add Ethernet or wireless monitoring and control capability to any application. Compact modules feature digital I/O and analog inputs, I²C and serial interfaces, PWM and timer channels for sensing and control. EZ Web Lynx serves dynamic web pages and can also send email notification of event-driven alarms and/or daily status. The modules are programmed in HTML, using a full-featured IDE with HTML-aware editor and simulator to speed up development and testing. Modules and starter kits are available for 3.3V and 5V systems. For a listing of products, please visit: www.microchip.com/ccs.

openPicus

openPicus offers a line of open-source development boards and kits to facilitate the development of Internet-connected devices, especially in the realm of the Internet of Things (IoT) and Machine-to-Machine (M2M) applications. Their IDEpro software helps speed the development of projects, while the free RTOS-based framework manages the communication stack and the application. With an on-board bootloader, it eliminates the need for a programmer, yet it is flexible enough to allow programming via Microchip tools and MPLAB X IDE. These products provide endless possibilities for developing applications such as integrated web servers, TCP/UDP clients, FTP Clients, FOTA applications, and more. For a listing of products, please visit: www.microchip.com/openpicus.

Programmers and Accessories

CCS Load-n-Go Handheld In-Circuit Programmer (TPG1LG01)

This programmer is a low-cost, handheld in-circuit programmer that supports PIC10, PIC12, PIC14, PIC16, PIC18, PIC24 MCU families and dsPIC DSC families. Running on four AA batteries, this mobile programmer can go where no PC or laptop could go before. The simple user interface seamlessly allows for quick field programming of targets with up to four firmware images. The Load-n-Go programmer can also be powered via USB or with a 9V AC adapter and used as a regular ICD/ICSP with the CCS IDE compilers.

SEGGER J-Link Debug Probe (TSEG-JLINK)

The J-Link BASE Debug Probe is a USB-powered in-circuit debugger supporting PIC32 devices. Based on a 32-bit RISC CPU, it can communicate at high speed with supported target devices. J-Link is a great tool for Flash programming and debugging in development and production environments. Note: J-Link is fully supported in MPLAB X IDE v2.15.

Tag-Connect Starter Kit (TC2030-STK)

Tag-Connect provides a simple means for connecting debuggers/programmers or test equipment to PCBs, while lowering board costs and facilitating efficient production programming. A special connector with spring-pins makes a secure connection to a small special footprint of pads and holes on your PCB with no header or mating connector required. This kit includes two Tag-Connect cables, a sample PCB with footprints for demonstration and a clip board for debugging with a no-legs cable.

EETools

EETools provides solutions for cost-effective programming of PIC MCUs. PC-driven or stand-alone, their universal programmers are socket-based. They also offer gang-style programmers. They provide all possible programming adapters for non-standard devices in stock, and all of their products are manufactured and supported in the USA. For a listing of products, please visit: www.microchip.com/eetools.

Softlog

Softlog Systems specializes in In-Circuit Serial Programming (ICSP) for Microchip microcontrollers. Their product line includes several high-speed, production-grade in-circuit programmers, gang programmers, and even security software that can protect intellectual property. Their programmers can be used stand alone, with a host PC or integrated with automated test equipment. For a listing of products, please visit: www.microchip.com/softlog.

Development Boards and Multimedia Boards

ChipCAD Microstick Plus Development Board (TCAD001)

The Microstick Plus by ChipCAD is an expansion board for the popular Microstick (DM330013) and Microstick II (DM330013-2) Development Boards. It provides 11 different peripherals and is suitable for beginners as well as advanced users. This is a cost-effective and versatile platform for education and development.

Digilent Universal Development Board (TDGL022)

The Universal Development Board (UDB) was made with flexibility in mind, so it accommodates a wide variety of PIC microcontrollers. Right out of the box, you can start developing with the on-board PIC32MX360F512L microcontroller. This board also supports a wide selection of 3.3V, 8-, 16- and 32-bit devices via Microchip PIMs or on-board DIP sockets. The UDB is also compatible with the Explorer 16 Development Board via the PICtail Plus connector.

Third Party Tools

MikroElektronika

MikroElektronika provides a line of general-purpose development boards, compact expansion modules, and multimedia boards with touch-screen interface. The EasyPIC v7 supports hundreds of 8-bit MCUs in DIP packages from 8 to 40 pins and comes with a PIC18F45K22 installed. It features amazing connectivity, with four different connectors for each port, along with pull up/down resistors, buttons and LEDs on every I/O line. The EasyPIC Fusion v7 supports 16-bit and 32-bit MCUs with advanced peripherals including 320 × 240 TFT display with touchpanel, four USB ports, Ethernet, stereo codec, Serial Flash (SPI), serial EEPROM (I^{2}C) and microSD card slot. The PIC Clicker and Click expansion boards provide a remarkable range of connectivity and sensor options in compact packages. For a listing of products, please visit: www.microchip.com/mikroe.

Protocol Analyzers

Total Phase

Total Phase produces a line of serial protocol analyzers and host adapters that are remarkably powerful, but easy to use. These tools monitor bus activity with USB, SPI, I^{2}C or CAN communications, and can also generate scripted transactions from a host system. The Data Center software runs on Windows or Linux, and can record bus transactions for analysis, editing and playback. With USB Power applications, these units can accurately measure V$_{BUS}$ current and voltage and correlate that data with protocol-level activity.

Compilers and IDEs

Arriba™ IDE

The Arriba IDE product family from Viosoft® Corporation provides a complete development environment based on the popular open-source Eclipse IDE. Users are guaranteed the same core experience found with MPLAB X IDE since Arriba simply provides the Eclipse GUI front end while remaining fully integrated with Microchip's compilers and debug tools. Compatible with Windows, Linux and Mac OS X, it is available as an Enterprise Edition perfect for commercial/professional environments (with support for all devices and no tool limitations), a Community Edition for students or hobbyists (with support for all devices, PICkit 3 and simulator) and a Plug-in Edition for existing Eclipse installations (in Enterprise mode or Community mode). Arriba IDE currently supports only our 32-bit devices. Support for our 8- and 16-bit devices is expected to be available in December 2014. For more information please visit: www.microchip.com/arriba.

CCS

CCS provides a line of full-featured C compilers for 8-bit and 16-bit MCUs. The compilers include a generous library of built-in functions, pre-processor commands and ready-to-run example programs to quickly jump-start any project. Several versions are available, depending on which MCU families you plan to use, and whether you prefer a command-line tool or a full-featured IDE. The CCS IDE provides several advanced features, including a unique Profiler Tool to track time and usage information for use on functions, code blocks as well as receiving live data from running programs. CCS compilers are compatible with MPLAB X IDE and MPLAB programmer/debuggers. For a listing of products, please visit: www.microchip.com/ccs.

MikroElektronika

MikroElektronika provides a line of optimizing C, Basic, and Pascal compilers for 8-bit, 16-bit, and 32-bit MCUs. Each compiler features an intuitive IDE, advanced optimizations, lots of hardware and software libraries, and additional tools that will help you in your work. A comprehensive Help file is included with ready-to-use examples designed to jump start your projects. The compiler license includes free upgrades and product lifetime tech support, and it can be used on multiple computers (USB dongle included.) Object files created with MikroElektronika compilers can be imported into MPLAB X IDE if desired. For a listing of products, please visit: www.microchip.com/mikroe.

Networking Software

Interniche

Interniche provides embedded operating systems and networking software for embedded Internet devices. Their embedded protocols are perfect for deployment in automotive communications systems, cell phones, medical equipment, consumer electronics, wireless devices, industrial process control, DSL modems, routers, satellite applications and many others. For a listing of products, please visit: www.microchip.com/iniche.

Development Software

### Matrix Technology Solutions
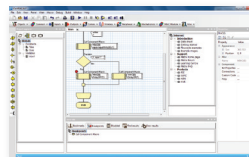
Matrix Technology Solutions provides teaching and learning services in numerous fields including mathematics, science, electronics and PIC MCU programming. Their Flowcode software is an advanced graphical programming language for microcontrollers allowing those with little to no programming experience to create complex electronic systems in minutes. Flowcode is available in multiple languages and supports PIC MCUs and dsPIC DSCs. For a listing of products, please visit: www.microchip.com/matrixtech.

Third Party Tools

Equalis
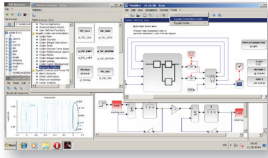
Equalis provides an open-source-based software for mathematical modeling, numerical analysis, visualization and simulation for engineers and scientists. Their products provide more functionality and flexibility at a fraction of the cost of other solutions for applications such as optimization, signal processing, control systems, embedded systems, test and measurement and much more. Their features and services meet the production needs of industries such as aerospace, automotive, electronics, energy, manufacturing, semiconductor and others. For a listing of products, please visit: www.microchip.com/equalis.

MikroElektronika Visual TFT (SW500189)

Visual TFT is a Windows application for rapid development of graphical user interfaces on TFT displays. It generates source code for all MikroElektronika compilers—mikroC, mikroBasic and mikroPascal—for all supported MCU architectures, including PIC MCUs and dsPIC30/33 DSCs. This fast, intuitive environment with many drag-and-drop components makes building applications easy and fast. Visual TFT runs on Windows computers and supports all multimedia boards from MikroElektronika, as well as ten TFT controllers and five different display sizes.

Virtual Graphics Display Designer (SW500190)

Visual Graphics Display Designer (VGDD) lets you easily draw complex user interfaces for your embedded project based on Microchip's Graphics Object Library. Supports PIC24 and PIC32 MCU families and dsPIC DSC families.

Real-Time Operating System (RTOS)

Express Logic

Express Logic is a leading provider of royalty-free RTOS, middleware and development tools for small-memory-footprint, high-volume devices. Companies producing high-volume SoCs and electronic devices in today's competitive market for consumer electronics, industrial automation, and medical equipment will find Express Logic's royalty-free, full source code and professional support combination valuable. ThreadX is available for both the PIC32MX and PIC32MZ MCU families in both Single Product License and Product Family License formats. For a listing of products, please visit: www.microchip.com/expresslogic.

WITTENSTEIN High Integrity Systems

WITTENSTEIN High Integrity Systems is a safety systems company that produces and supplies RTOS and platform solutions to the medical, aerospace, transportation, defense and industrial industries, increasing application development efficiency while reducing risk through third party certification. Their product OPENRTOS is the commercial license for the FreeRTOS embedded real-time operating system. Available for the PIC32MX and PIC32MZ MCU families, it is offered in both Single Product License and Platform License formats. For a listing of products, please visit: www.microchip.com/wittensteinhighintegritysystems.

Books

Using the FreeRTOS Real-Time Kernel, PIC32 Edition (BK0007)

This is a concise, hands-on guide that describes both general multitasking concepts and FreeRTOS specifics. It presents and explains numerous examples that are written using the FreeRTOS API. The PIC32 edition includes sixteen examples written specifically for the PIC32 MCU using the free MPLAB XC Compiler.

Beginner's Guide to Programming the PIC24/dsPIC33 (BK0012)

Learn to program 16-bit MCUs with a beginner's guide by Thomas Kibalo. In this book he presents a clear step-by-step introduction to programming PIC24H MCUs and dsPIC33 DSCs. Code examples utilize the Microstick II Development Board and the free MPLAB XC Compiler. Hardware examples use a simple breadboard setup so a beginners can build along with very few extra components needed.

Beginner's Guide to Programming the PIC32 (BK0015)

Learn to program the PIC32 MCU with a beginner's guide by Thomas Kibalo. Using the low-cost Microstick II Development Board and the free MPLAB XC32 Compiler, Kibalo makes learning the PIC32 MCU architecture easy. Code examples demonstrate common operations that many applications require. Hardware is shown in simple breadboard setup so beginners can build along with very few extra components needed.

Graphics, Touch, Sound and USB (BK0017)

This book by Lucio Di Jasio offers a hands-on learning experience, guiding you through projects which help you explore the multimedia capabilities of MikroElektronika's mikromedia for PIC24 board, use 16- and 32-bit microcontrollers and learn how to get the most out of the Microchip Libraries of Applications (MLA).

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 and Other Resources: www.microchip.com/training
- MASTERs Conferences: www.microchip.com/masters
- Worldwide Seminars: www.microchip.com/seminars
- eLearning: www.microchip.com/webseminars

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