MICROCHIP

8-bit PIC® Microcontroller Solutions

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PIC® Microcontroller Solutions

Lead (Pb)-Free Packaging

Microchip has begun converting from tin-lead (SnPb)-plated product packaging to lead (Pb)-free product packaging across the entire portfolio of PIC® microcontrollers, dsPIC® digital signal controllers, serial EEPROMs, stand-alone analog and other devices. This enables our customers to achieve early compliance with new regulations around the world such as the European Union Restrictions on Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive.

Microchip Technology, a leading provider of microcontroller and analog semiconductors, offers complete embedded control solutions that combine time-to-market advantages with high performance and increased functionality. Microchip's broad family of 8-bit microcontrollers features a proprietary RISC-based architecture and is marketed under the PIC microcontroller brand name.

THE MICROCHIP ADVANTAGE

With more than 212 microcontrollers in the product portfolio, Microchip can provide solutions for the entire performance range of 8-bit microcontrollers. The PIC microcontroller solution features a powerful architecture, flexible memory technologies, comprehensive easy-to-use development tools, complete technical documentation and post design-in support through a worldwide sales and distribution network.

Microchip's proprietary PIC microcontrollers have quickly become a worldwide standard with more than three billion devices shipped and more than 300,000 development systems delivered since 1990. Microchip is recognized as the #1 supplier of 8-bit microcontrollers, based on worldwide unit shipments.*
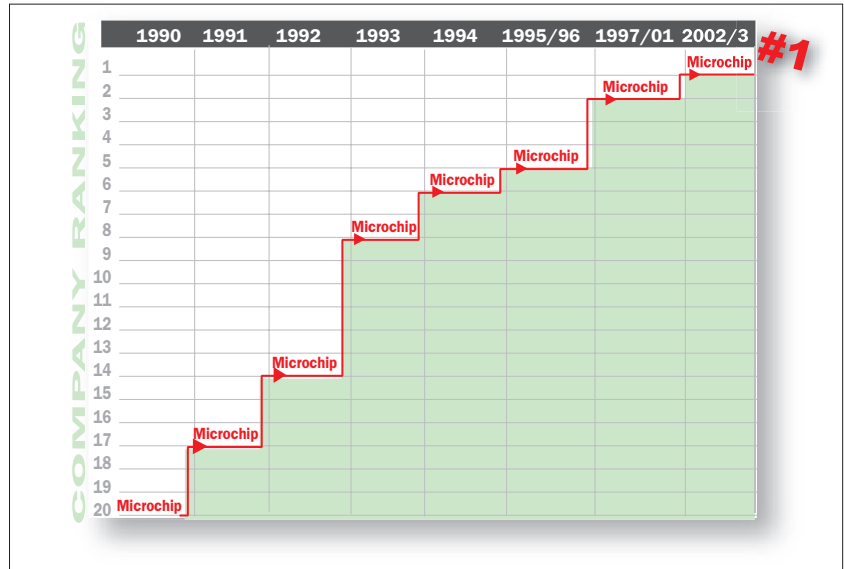
*Gartner Dataquest, 2003 Microcontroller Market Share & Unit Shipments, Tom Starnes, June 2003.

Low-Risk Product Development

PIC microcontrollers achieve low-risk product development by providing seamless program size expansion. Pin compatibility facilitates drop-in replacements of package types as well as variations of reprogrammable (Flash) and one-time programmable (OTP) program memories without having to completely re-write code.

Microchip's MPLAB® Integrated Development Environment (IDE), a simple yet powerful development environment, supports low-risk product development by providing a complete management solution for all development systems in one tool. Whether programming a 6- or 80-pin device, learn and utilize one environment for all PIC microcontroller design activities.

Faster Time to Market

Microchip's seamless migration path with standard pin schemes and code compatibility allows engineers to reuse verified code and a proven printed circuit board layout. Adding higher memory options, incremental I/O and analog peripherals can be accomplished without losing their software investment, reducing time to market.

Lower Total System Cost

A broad product porfolio allows Microchip to offer engineers an appropriate integration of both analog and digital peripherals, ranging from simple digital to sophisticated analog modules. These integrated peripherals minimize component count and thereby lower total system cost while increasing reliability. Microchip's flexible Flash and OTP memory options streamline product development and promote even greater cost savings.

Dependable Delivery and Quality

Microchip has a long history of providing dependable product delivery. The Company's quality systems for semiconductor products are ISO/TS-16949:2002 certified, and the quality system for development tools is designed, manufactured and certified to ISO-9001:2000.

Outstanding Support

Microchip offers outstanding technical support with hundreds of dedicated field applications engineers located in more than 34 sales offices and through authorized distributors worldwide. Standard code libraries, references designs, application notes and seminars are offered at various times, locations and online mediums. These options support the demands of a diversified customer base and wide range of end product applications.

Microchip's 8-bit PIC microcontrollers provide the performance required for 4-, 8- and 16-bit microcontroller applications. Microchip's PIC microcontrollers, available in 6- to 80-pin packages, offer the best price/performance ratio in the industry. Flexible memory technologies such as Flash, OTP, read-only memory (ROM) and ROM-less ensure an ideal PIC microcontroller for any application.
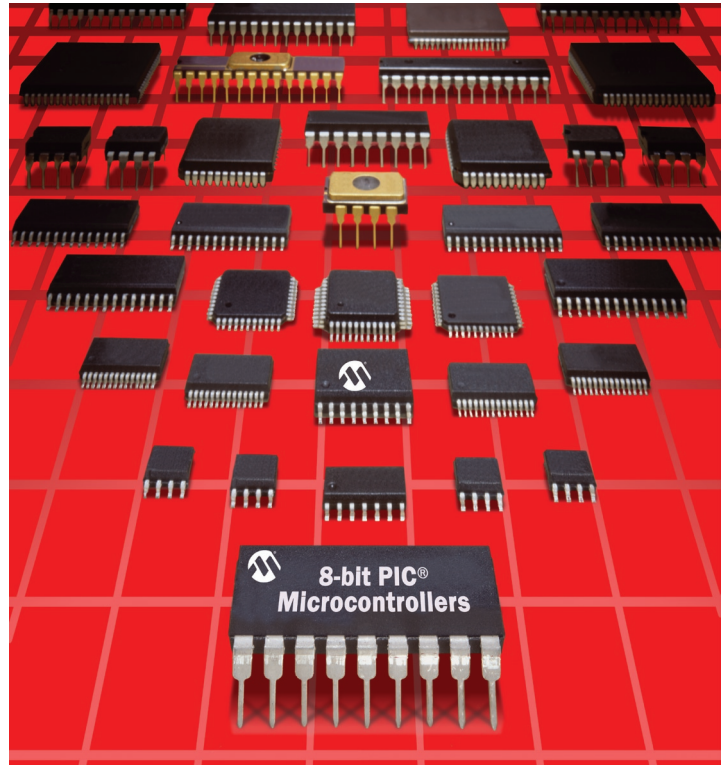
PIC® MICROCONTROLLER OVERVIEW

RISC-based Architecture

The PIC microcontroller architecture is based on a modified Harvard RISC instruction set that provides an easy migration path from 6 to 80 pins and from 384 bytes to 128K bytes of program memory.

By combining RISC features with a modified Harvard dual-bus architecture, Microchip's fast and flexible 10 MIPS PIC18F core is the most popular architecture for new microcontroller designs. A simple instruction set and seamless migration between product families makes PIC microcontrollers the logical choice for designs requiring flexibility and performance.

ADVANTAGES

■ 12-, 14- and 16-bit wide instructions are upward compatible and tailored to maximize processing efficiency and boost performance.

■ Instructions and data are transferred on separate buses, avoiding processing bottlenecks and increasing overall system performance.

■ Two-stage pipelining enables one instruction to be executed while the next instruction is fetched.

■ Single wide word instructions increase software code efficiency and reduce required program memory.

■ With only 33-79 instructions, programming and debugging tasks are easy to learn and perform.

■ Upward device compatibility allows designers to retain their capital investment in code development and development tool resources.

8-bit PIC® Microcontrollers

ON-CHIP PERIPHERAL SET

PIC microcontrollers offer a wide range of products with broad on-chip peripheral features including:

■ **Communications Peripherals and Protocols:**
 - RS232/RS458
 - SPI™
 - I2C™
 - CAN
 - USB
 - LIN
 - Radio Frequency
 - TCP/IP

■ **Control and Timing Peripherals:**
 - Capture/Compare
 - Pulse Width Modulators (PWMs)
 - Counters/timers
 - Watchdog timers

■ **Display Peripherals:**
 - LED Drivers
 - LCD Drivers

■ **Analog Peripherals:**
 - Up to 12-bit analog-to-digital (A/D) converters
 - Comparators and Op Amps
 - Brown-out detectors,
 - Low-voltage detectors
 - Temperature sensors
 - Oscillators
 - Voltage references
 - Digital-to-analog (D/A) converters

Flash memory is an ideal solution for engineers designing products for embedded systems — especially during the development stages of the product when the code frequently changes. Flash memory is also well suited throughout the life of the end product because of the advantages provided by field upgradability or when product inventory flexibility is required.

LEADERSHIP IN FLASH PERFORMANCE WITH PEEC TECHNOLOGY

Microchip has developed world-class Flash and data EEPROM memory with industry-leading endurance and retention specified over the entire operational temperature and voltage ranges for the device. With a minimized high voltage overhead and the ability to write or erase blocks of code simultaneously, Microchip's innovative PMOS Electrically Erasable Cell (PEEC) process technology for Flash reduces development cost, increases reliable operation and extends overall battery life.

These Flash microcontrollers specify world-class program memory endurance of 10,000 erase/write cycles over industrial temperature range (–40°C to +85°C). With retention of >40 years over industrial temperature range, any application can reliably implement nonvolatile memory.

Data memory is highly optimized for high endurance applications. Each memory location can withstand 100,000 erase/write cycles over industrial temperature range. This memory endurance is ideally suited for a wide range of applications that require frequent memory updates.

Circuit schematic symbol for the PEEC memory cell

Flash (Electrically Reprogrammable)

Flash PIC microcontrollers enable the designer to electrically erase and program/reprogram the microcontroller's program memory. This capability offers a highly flexible solution to today's ever-changing market demands, substantially reducing design cycles and ultimately time to market. Users can reprogram their systems late in the manufacturing process or update systems in the field allowing for easy code revisions, system parameterization or customer-specific options.

Standard versus Enhanced Flash

Microchip offers Standard and Enhanced Flash memory. Standard Flash memory provides engineers with reprogrammable memory via an external tool. Enhanced Flash memory supports self programming and allows remote upgrades.
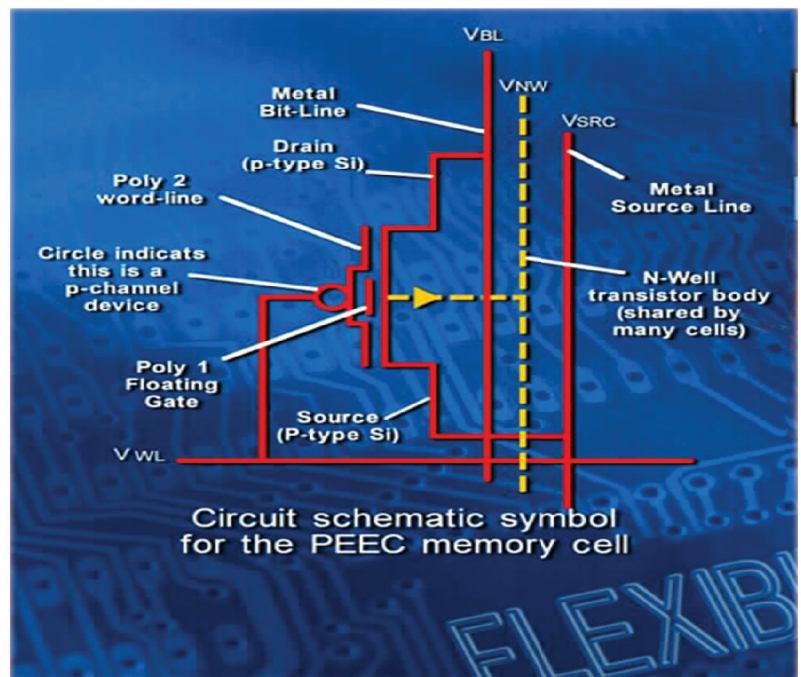
PEEC FLASH FEATURES

- Wide operation voltage: 2.0-5.5 volts

- Robust and reliable operation

- Endurance: 1 million erase/write cycles at 25° C

- Retention: >100 years at 25° C

- Ultra-low leakage

- Block programming

- 1-2 seconds typical programming time per device

- Erase/write over entire voltage and temperature ranges

Microchip offers flexible programming options that allow engineers to choose the most appropriate memory technology for their applications. These programming options address procurement issues by reducing and limiting work-in-process liability and facilitating finished goods code revisions. Microchip's worldwide distributors stock Flash and OTP device inventory, allowing designers to respond to immediate sales opportunities or accommodate engineering changes off the shelf.

FLEXIBLE PROGRAMMING OPTIONS
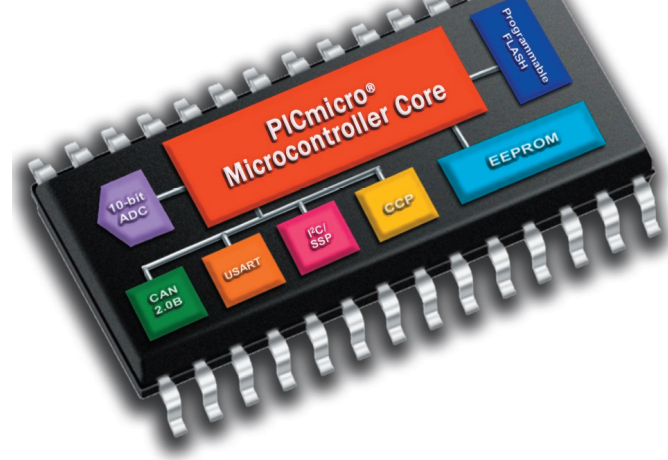
PRODUCTION PROGRAMMING OPTIONS

In-Circuit Serial Programming™ (ICSP™) Technology

Microchip's Flash and OTP PIC microcontrollers feature Microchip's proprietary ICSP capability. ICSP technology allows the microcontroller to be programmed after being placed on a circuit board, offering tremendous flexibility, reduced development time, increased manufacturing efficiency and improved time to market. This popular technology enables cost-reduced field upgrades, system calibration during manufacturing and the addition of unique identification codes to the system. Microchip offers the most non-intrusive programming methodology in the industry requiring only two I/O pins for most devices.

Self Programming

Microchip's Enhanced Flash microcontroller families feature a self-programming capability. Self programming enables remote upgrades to the Flash program memory and the end equipment through a variety of mediums, ranging from Internet and modem to RF and infrared. Microchip's Enhanced Flash with self-programming capability allows for easy code revisions in the end user's applications.

One-Time Programmable (OTP)

OTP PIC microcontrollers are manufactured in high volumes without specific software and can be shipped immediately for custom programming.

Quick-Turn Programming (QTP)

Microchip offers a QTP programming service for factory production orders. This service is ideal for designers who choose not to program devices in their own factories and whose production code patterns have stabilized.

Serialized Quick-Turn Programming (SQTPᴿ)

The SQTP service is a unique, flexible programming option that allows Microchip to program serialized, random or pseudo-random numbers into each device. Serial programming allows each device to have a unique number that can serve as an entry code, password or identification number.
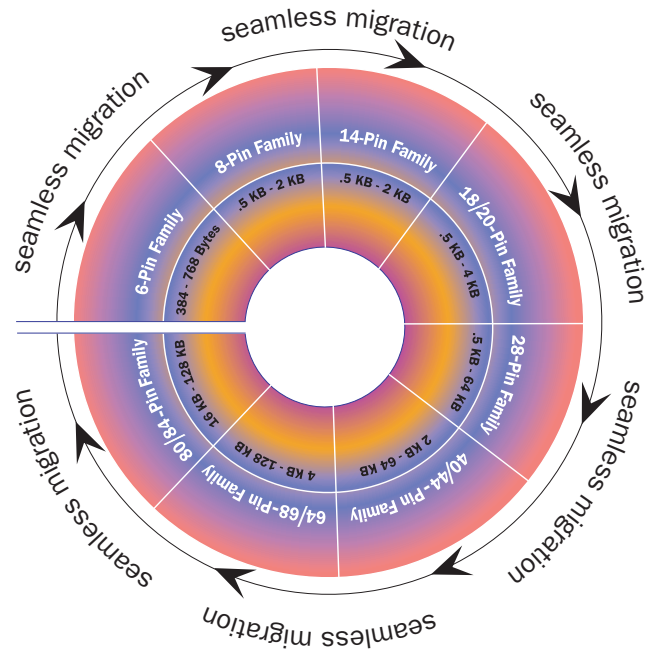
Read-Only Memory (ROM)

Microchip offers masked ROM versions of many of its most popular PIC microcontrollers, providing engineers with the lowest cost option for high-volume products with stable firmware.

Compatibility is key to re-using and re-inventing PIC microcontroller designs. The standardized pin schemes of the PIC microcontroller families support building a code library not traditionally available from other suppliers. This unique feature provides socket, software and peripheral compatibility, making it possible for new features to be added to existing applications. Each pin is capable of accommodating several peripheral functions, allowing designers to add or swap functionality without changing the printed circuit board, thus minimizing or eliminating costly re-design.
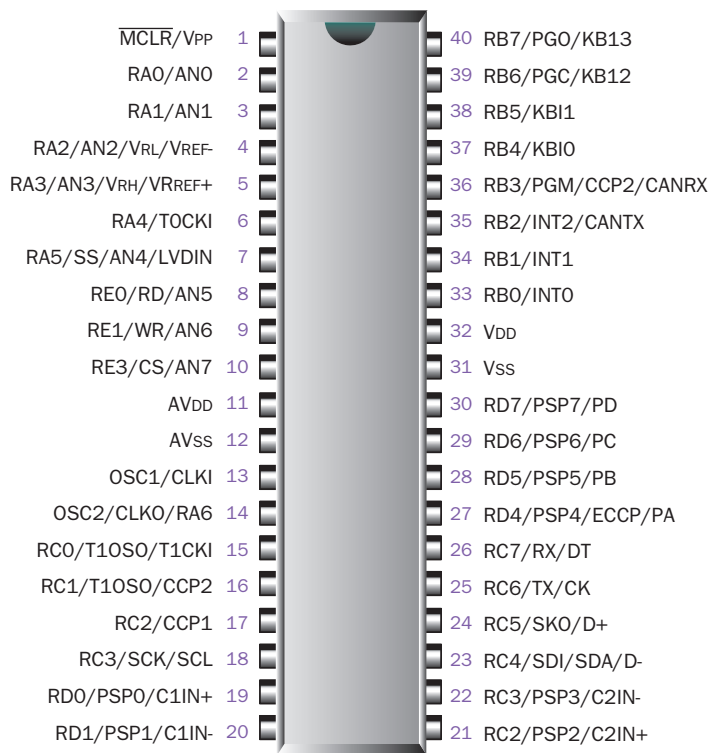
PIC® MICROCONTROLLER MIGRATION STRATEGY

As part of an inherent strategy to offer customers a low-risk development environment, the PIC microcontroller family offers easy migration within the complete range of products. Migration between the different PIC microcontrollers enables several advantages such as future cost reductions, feature enhancements and late development changes with minimal impact to the existing hardware, software and the engineering development environment.

The PIC microcontroller family is pin compatible within a given pin count as well as code compatible between the different architectures. This offers a seamless migration path between the different PIC microcontrollers that protects investments made in software development and design tools.

EXAMPLE OF PIC® MICROCONTROLLER MIGRATION

Pin	Left		Right	Pin
1	$\overline{MCLR}$/Vpp		RB7/PGO/KB13	40
2	RA0/AN0		RB6/PGC/KB12	39
3	RA1/AN1		RB5/KBI1	38
4	RA2/AN2/VRL/VREF-		RB4/KBI0	37
5	RA3/AN3/VRH/VRREF+		RB3/PGM/CCP2/CANRX	36
6	RA4/TOCKI		RB2/INT2/CANTX	35
7	RA5/SS/AN4/LVDIN		RB1/INT1	34
8	RE0/RD/AN5		RB0/INT0	33
9	RE1/WR/AN6		VDD	32
10	RE3/CS/AN7		VSS	31
11	AVDD		RD7/PSP7/PD	30
12	AVSS		RD6/PSP6/PC	29
13	OSC1/CLKI		RD5/PSP5/PB	28
14	OSC2/CLKO/RA6		RD4/PSP4/ECCP/PA	27
15	RC0/T1OSO/T1CKI		RC7/RX/DT	26
16	RC1/T1OSO/CCP2		RC6/TX/CK	25
17	RC2/CCP1		RC5/SKO/D+	24
18	RC3/SCK/SCL		RC4/SDI/SDA/D-	23
19	RD0/PSP0/C1IN+		RC3/PSP3/C2IN-	22
20	RD1/PSP1/C1IN-		RC2/PSP2/C2IN+	21

Example device list:

|	
PIC16CR65	PIC18C442
PIC16C65B	PIC18C452
PIC16C662	PIC18F4220
PIC16C67	PIC18F4320
PIC16C74B	PIC18F4331
PIC16C765	PIC18F4420
PIC16C77	PIC18F4431
PIC16C774	PIC16F4480
PIC16F74	PIC18F4520
PIC16F747	PIC18F4580
PIC16F77	
PIC16F777	
PIC16F871	
PIC16F874	
PIC16F874A	
PIC16F877	
PIC16F877A	
PIC16F914	
PIC16F917	

2 KB ROM

64 KB Flash

Pin and Code Compatibility also for 8-, 14-, 18-, 28-, 64- and 80/84-pin packages

See Microchip Technology's Product Selector Guide (DS00148) for similar microcontroller family migration paths.

Microchip's 8-bit PIC microcontrollers fall into three product architecture categories providing a variety of options for any application requirement:

- **Baseline 8-bit Architecture: 12-bit program word**
- **Mid-Range 8-bit Architecture: 14-bit program word**
- **High Performance 8-bit Architecture: 16-bit program word**

PIC® MICROCONTROLLER PRODUCT ARCHITECTURES
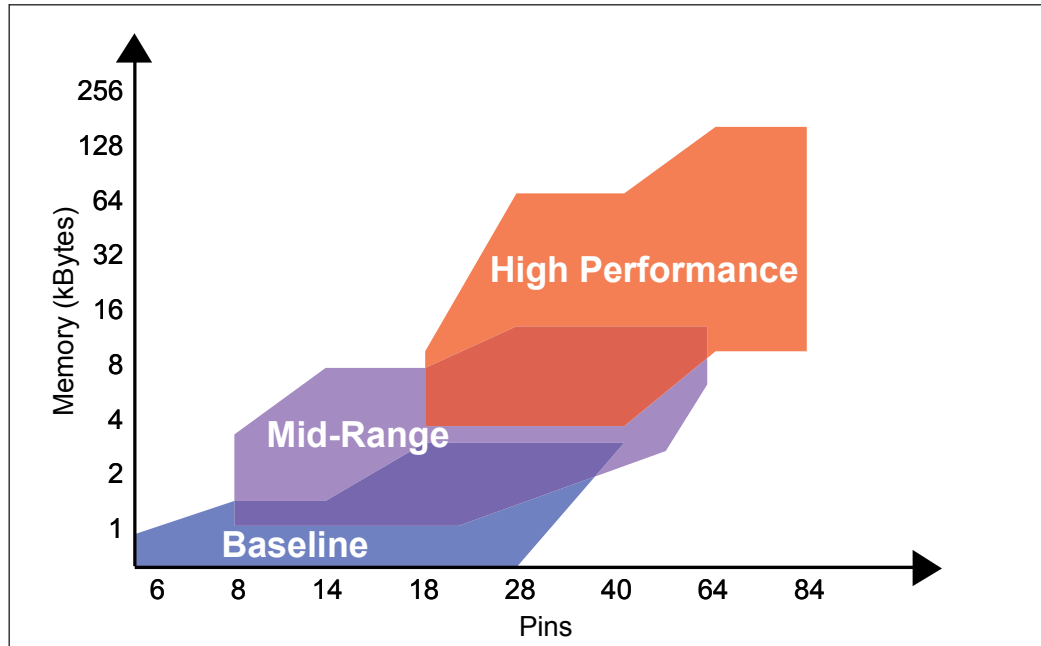
BASELINE ARCHITECTURE

The Baseline Architecture includes the PIC10F family and portions of the PIC12 and PIC16 families. These devices utilize a 12-bit program word architecture with 6- to 28-pin package options. The concisely defined feature set of the Baseline Architecture enables the most cost-effective product solutions. A range of low operating voltages makes this architecture ideal for battery-operated applications.

The PIC10F family is Microchip's latest addition to the product portfolio. The PIC10F200 series provides another industry first, an inexpensive 8-bit Flash microcontroller in a 6-pin package. With only six pins, they are extremely easy to use and have a short learning curve for anyone not experienced in designing with microcontrollers. In addition, they can be used for a number of design challenges not traditionally solved by a microcontroller.

The PIC12 family packs Microchip's powerful RISC-based PIC microcontroller 12-bit program word architecture into 8-pin DIP or SOIC packages with Flash or OTP program memory options.

The PIC16C5X and PIC16F5X are well-established Baseline products, offered in 14-pin, 18-pin, 20-pin and 28-pin SOIC and SSOP packages.

Baseline Product Features

- Low pin-count and small form factor
- Flexible Flash program memory
- Low power capability
- Cost sensitive
- Ease of use
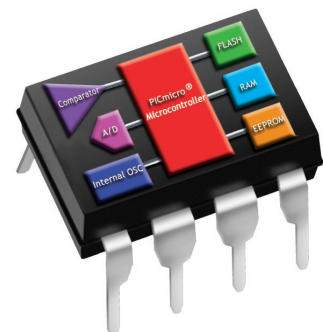
MID-RANGE ARCHITECTURE

The Mid-Range Architecture includes members of the PIC12 and PIC16 families that feature a 14-bit program word architecture. These families are available with 8- to 64-pin package options.

The PIC microcontrollers featuring Microchip's Mid-Range 14-bit program word architecture are available in higher pin-count packages with Flash and OTP program memory options. The Flash products offer an operating voltage range of 2.0V to 5.5V, small package footprints, interrupt handling, a deeper hardware stack, multiple A/D channels and EEPROM data memory. All of these features provide the Mid-Range microcontrollers with an intelligence level not previously available because of cost or size considerations.

The Mid-Range PIC16 devices offer a wide-range of package options, as well as low-to-high levels of peripheral integration. These PIC16 devices feature various serial analog and digital peripherals, such as USB, SPI™, I^{2}C™, USART, LCD and Analog-to-Digital converters. The Mid-Range PIC16 microcontrollers have interrupt handling capability with an 8-level hardware stack.

Mid-Range Product Features

- ■ Expansive package offerings — 8 to 64 pins
- ■ Flexible Flash program memory
- ■ Low power capability
- ■ Rich peripheral set
- ■ 5 MIPS operating performance
- ■ Optimal cost-to-performance ratio
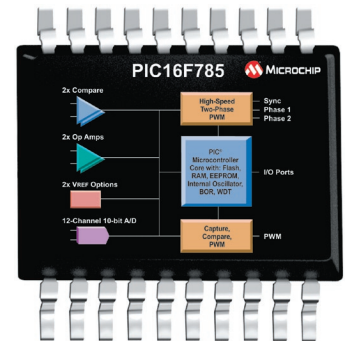
HIGH PERFORMANCE ARCHITECTURE

Microchip's High Performance Architecture encompasses the PIC18 family of devices. These microcontrollers utilize a 16-bit program word architecture with 18- to 80-pin package options.

The PIC18 devices are high performance microcontrollers with integrated A/D converters. All PIC18 microcontrollers incorporate an advanced RISC architecture that supports Flash and OTP devices. The PIC18 has enhanced core features, 32 level-deep stack and multiple internal and external interrupts. The separate instruction and data buses of the Harvard architecture allow a 16-bit instruction word with separate 8-bit data. The two-stage instruction pipeline allows all instructions to execute in a single cycle, except for program branches, which require two cycles. A total of 79 instructions (reduced instruction set) are available. The PIC18 family has special features to reduce external components, thus minimizing cost, enhancing system reliability and reducing power consumption. The PIC18 family builds on the foundation established by the other 8-bit PIC microcontrollers and provides engineers with a smooth, easy migration to these higher levels of performance and feature sets.

High Performance Product Features

- ■ Expansive package offerings — 18 to 80 pins
- ■ Flexible Flash program memory
- ■ Low power capability
- ■ Linear program memory space up to 2M bytes
- ■ 10 MIPS operating performance
- ■ Hardware 8 x 8 multiplier
- ■ Advanced communication peripherals and protocols (CAN, USB, ZigBee™ and TCP/IP)

To meet the increasing demand for integrated features coupled with processing capabilities in battery-powered products, Microchip's family of low power microcontrollers provides extensive power management options. These devices provide a cost-effective solution for intelligent systems that require extended battery life and energy-efficient operation.

nanoWatt Technology

LOW POWER nanoWATT TECHNOLOGY

Microchip's nanoWatt Technology

Take control of overall system power consumption with Microchip's Power-Managed PIC microcontrollers featuring nanoWatt Technology.
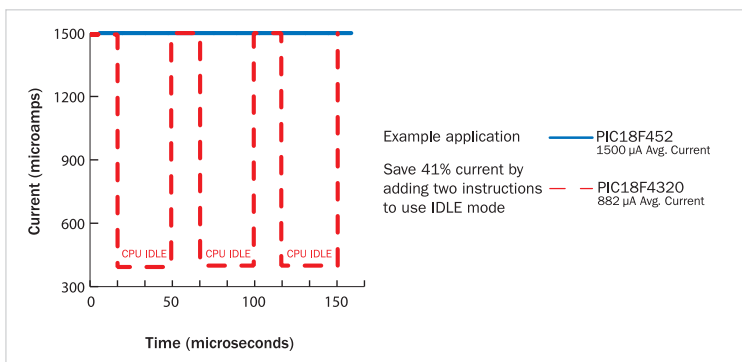
Microchip's proprietary nanoWatt Technology provides industry-leading low-power operating voltage ranges and flexible power-managed technology from DC up to 40 MHz.

What is nanoWatt Technology?

nanoWatt Technology is the lowest power, widest operating voltage range in the industry and the most flexible power-managed technology available today. Designers have the flexibility of switching between six new power-managed modes and incorporating power-saving ideas in their application's design. Microchip's 8-bit microcontrollers with nanoWatt Technology also feature on-chip peripherals that include up to nine selectable oscillator options including four crystal modes, two external clock modes, two external RC oscillator modes, and an internal oscillator block that provides multiple clock frequencies under software control. Given the many oscillator options, users can gain tighter control of their system power consumption, adapt to changes on the fly, and reduce external components, resulting in dynamic speed control and reduced system cost.

Microchip's nanoWatt Technology is based on the PMOS Electrically Erasable Cell (PEEC) process technology for its Flash memory, new circuit design techniques, enhanced manufacturing techniques and optimal field support.

Complementing a broad portfolio of nanoWatt Technology PIC microcontrollers, Microchip also offers a wide range of low-power analog devices, enabling engineers to select a complete system power consumption solution from one source.

PIC Microcontrollers with nanoWatt Technology:		
PIC12F635	PIC18F1220	PIC18F4510
PIC12F683	PIC18F1320	PIC18F4515
PIC16F639	PIC18F2220	PIC18F4520
PIC16F677	PIC18F2320	PIC18F4525
PIC16F684	PIC18F2331	PIC18F4550
PIC16F685	PIC18F2410	PIC18F4580
PIC16F687	PIC18F2420	PIC18F4585
PIC16F688	PIC18F2431	PIC18F4610
PIC16F689	PIC18F2480	PIC18F4620
PIC16F737	PIC18F2510	PIC18F4680
PIC16F747	PIC18F2515	PIC18F6310
PIC16F767	PIC18F2520	PIC18F6390
PIC16F777	PIC18F2525	PIC18F6410
PIC16F785	PIC18F2550	PIC18F6490
PIC16F818	PIC18F2580	PIC18F6522
PIC16F819	PIC18F2585	PIC18F6527
PIC16F87	PIC18F2610	PIC18F6622
PIC16F88	PIC18F2620	PIC18F6722
PIC16F913	PIC18F2680	PIC18F8310
PIC16F914	PIC18F4220	PIC18F8390
PIC16F916	PIC18F4320	PIC18F8410
PIC16F917	PIC18F4331	PIC18F8490
	PIC18F4410	PIC18F8522
	PIC18F4420	PIC18F8527
	PIC18F4431	PIC18F8622
	PIC18F4455	PIC18F8627
	PIC18F4480	PIC18F8622

Power-Saving Application Example

Example application — PIC18F452
1500 µA Avg. Current

Save 41% current by adding two instructions to use IDLE mode — PIC18F4320
882 µA Avg. Current

APPLICATIONS

Consumer	Communications	Industrial	Automotive	Appliance
Motion Detector	Telephone Handset	Utility Metering	Light Dimmer	Refrigerator Control Unit
Thermostat	Microphone Control	Portable Instruments	Intelligent Sensor	Smart Relay
Remote Control	UART Replacement	Data Acquisition	Proximity Detector	Delay Timer
Battery Management	Handset Display	Motor Control	Keyless Entry	Temperature Sensor
			Tire Pressure Monitor	

POWER-MANAGED MODES

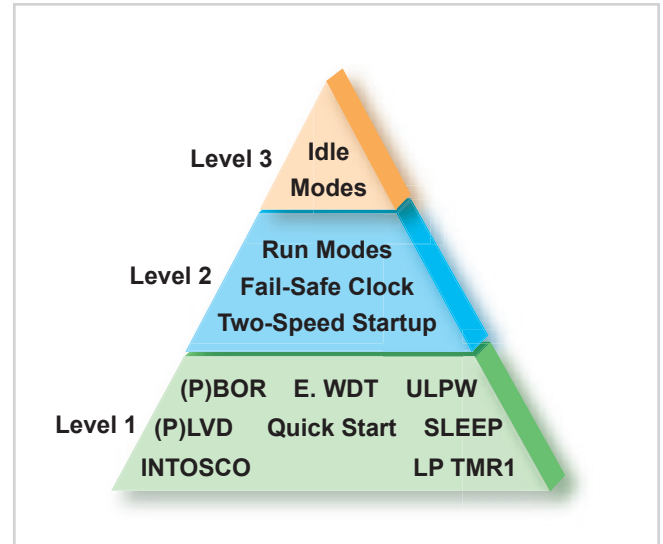| Power-Managed Modes	CPU Clock Source	WDT Time-Out Causes A:	Peripheral Clock Source	Clock Source During Wake-Up (while primary becomes ready)
IDLE modes	Not clocked	Wake-Up	Primary, Secondary or INTOSC multiplexor	Unchanged from IDLE mode
RUN modes	Primary/Secondary or INTOSC multiplexor	RESET	Primary/Secondary or INTOSC multiplexor	Unchanged from RUN mode
SLEEP	Not clocked	Wake-Up	Not clocked	• None • INTOSC multiplexor • Two-Speed Start-up • Fail-Safe Clock Monitor

Three Levels of Power-Managed Modes:

Level 3:

Includes all the functions of Level 1 and Level 2 and incorporates additional Clock Switching modes for maximum nanoWatt feature implementation.

Level 2:

Includes all the functions of Level 1 and adds increased flexibility with oscillators management options.

Level 1:

Various low-power Sleep modes with a combination of peripherals that improve reliability while maintaining low power and high performance.

Level 3 — Idle Modes

Level 2 — Run Modes / Fail-Safe Clock / Two-Speed Startup

Level 1 — (P)BOR E. WDT ULPW (P)LVD Quick Start SLEEP INTOSCO LP TMR1

FEATURED DEVELOPMENT TOOLS

PICDEM™ Low Power Solutions Demonstration Board

The PICDEM™ Low Power Solutions Demonstration Board (DM163026) gives designers a convenient and fun way to explore the nanoWatt technology features of PIC microcontrollers within a functional ultrasonic range-finder application using the PIC18F4620.

This tool is ideal for learning nanoWatt technology features and implementing system power reduction techniques. The Low Power Solutions Demonstration Board is part of the *Workshop-in-a-Box 2*, a complete nanoWatt technology training kit designed for self-paced and instructor-led training.

The Low Power Solutions Demonstration Board CD ROM includes three self-paced, step-by-step lab exercises, using the PIC18F4620, which illustrate the following concepts:

- ■ nanoWatt technology features to reduce power consumption
- ■ Improving system power consumption
- ■ Improving board performance

PICDEM™ 4 Demonstration Board

The PICDEM™ 4 Demonstration Board provides a simple, low-cost learning tool for evaluating Microchip's power-managed PIC microcontrollers. The board supports PIC12F, PIC16F and PIC18F Flash microcontrollers in 8-pin, 14-pin and 18-pin packages.
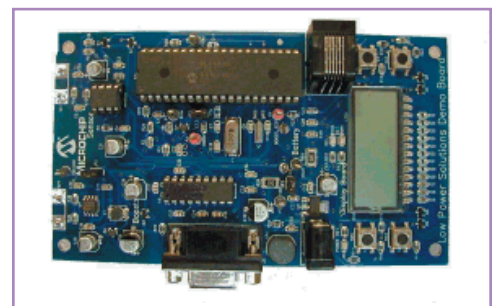
HIGH PIN-COUNT, HIGH-DENSITY MEMORY

The high pin count, high-density memory Flash PIC18F microcontroller family continues to expand, offering larger memory sizes, higher pin-count packages, the flexibility of self-programmability and an industry-leading peripheral set. Based on a High Performance architecture the PIC18F family provides economical embedded solutions which address all market segments, such as automotive, industrial controls, security systems, motor control, POS terminals, instrumentation and monitoring, power conditioning, thermostats and consumer audio/video. These devices also feature socket, software and peripheral compatibility, providing scalability for complex embedded designs.

The PIC18F family is ideally suited for applications requiring large memory and higher pin counts and offer designers added I/Os, timers, a feature-rich peripheral set and the flexibility of field self-programmability. In addition, they contain Microchip's PEEC process technology, which provides best-in-class Erase/Write endurance, retention and reliability for both program and on-chip data EEPROM memory.

The PIC18F microcontrollers can serve as cost-efficient solutions for general-purpose applications and for applications that are written in C, require an RTOS or use a complex communications protocol stack, such as TCP/IP, DeviceNet™ or ZigBee™ protocols.

The high pin count, high-density memory PIC18F family supports:

- LCD displays: up to 200 segments
- USB interfaces: speeds up to 12 Mbits/s
- CAN interfaces: CAN 2.0B Active
- LIN interfaces: LIN 1.2
- ZigBee capable: PIC18F > 16K Word

High Pin Count, High-Density Memory Microcontroller Features

- Up to four serial interfaces (2x EUSART, 2x MI^{2}C/SPI)
- Up to five timers/counters
- Up to five Capture/Compare/PWM (CCP) modules
- nanoWatt Power Management
- Hardware 8 x 8 multiplier
- 40 MHz operation
- Flash program memory: up to 128K bytes
- EEPROM memory: up to 1K bytes
- RAM memory: up to 4K bytes
- I/O Pins: range from 25 to 68
- Wide operating voltage range

APPLICATIONS

Consumer	Medical	Industrial	Automotive	Appliance
Exercise Equipment	Defibrilators	Motion Control	Rain Sensors	White Goods
Universal Remote Controls	Blood Pressure Monitors	Uninterruptible Power Supplies	Windows/Locks/Doors	Robotic Controls
Toys/Games	Glucose Monitors	HVAC	Immobilizers	Kitchen Electrics
Security/Alarms	Diagnostic Equipment	Power Meters	Power Steering	Thermostats
Computer Peripherals	Biometrics	Factory Automation	Tire Pressure Monitors	Sensors
Battery Chargers	Thermometers	Security	Wiper Motor Control	Motor Control
Spa Controls		Dataloggers	Compass	

A Complete High Pin Count, High-Density Memory Solution
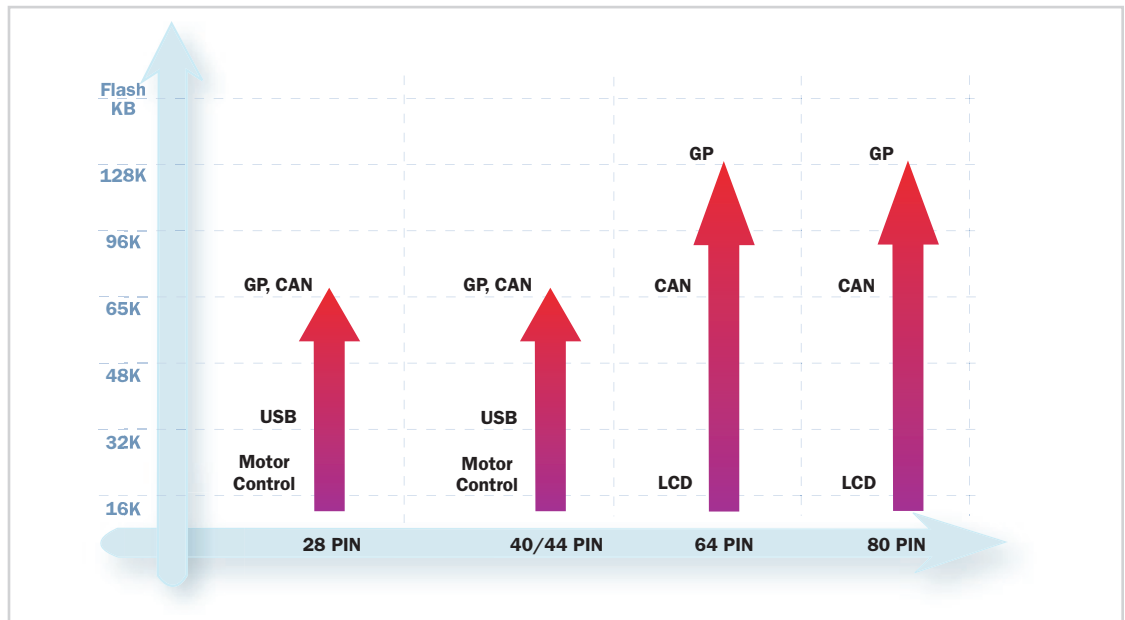
FEATURED DEVELOPMENT TOOLS

PICDEM™ HPC Explorer Board (DM183022)

The PICDEM™ HPC Explorer Board is a low-cost tool ideally suited for evaluating the performance of Microchip's high memory and high pin-count PIC18F 8-bit microcontrollers.

The PIC18F8722 contains a superset of all of the memory and peripherals available in the entire 64- and 80-pin PIC18F family and can be used to demonstrate the following devices:
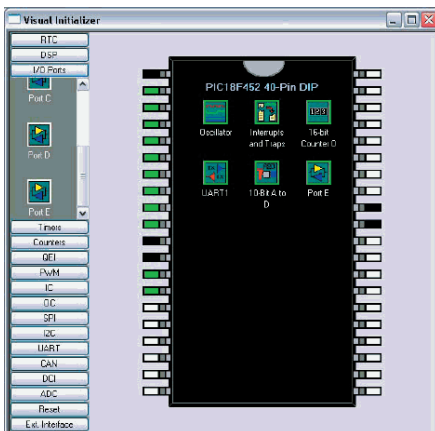
PIC18F8722   PIC18F8627   PIC18F8622
PIC18F6722   PIC18F6627   PIC18F6622

This board can be used to demonstrate the following devices (sharing a compatible pin-out):

PIC18F8680   PIC18F8621   PIC18F8585   PIC18F8720   PIC18F8620   PIC18F8520
PIC18F6680   PIC18F6621   PIC18F6585   PIC18F6720   PIC18F6620   PIC18F6520
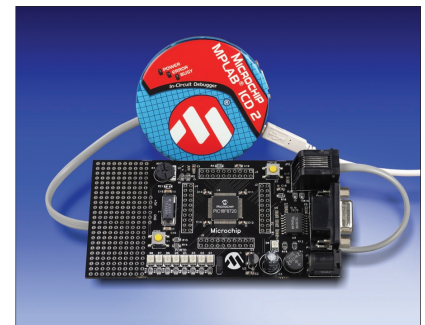
MPLAB® Visual Device Initializer

Configuring a powerful PIC18F microcontroller can be a complex and challenging task. MPLAB® Visual Device Initializer (VDI) makes this task as easy as dropping icons onto the chip diagram and setting up operational parameters in a dialog box. VDI graphically configures the microprocessor and peripherals, and when complete, a mouse click generates code usable in assembly language or C programs.

MPLAB Visual Device Initializer does extensive error checking on assignments and settings, and generates an error message if there are conflicts on any resources:

- Pins
- Memory
- Interrupts
- Operating Parameters

The generated code files are integrated with the rest of the application code through the MPLAB Project Manager. The detailed report on resource assignment and configuration simplifies project documentation.

MPLAB VDI is a component of MPLAB and can be selected to be installed from the current MPLAB IDE installation software.

Low pin-count microcontrollers have emerged as one of the fundamental building blocks for any electronic application. Kitchen appliances, smoke detectors, toys, power supplies, security systems, PC motherboards or almost any other electronic device which people take for granted in their everyday lives can use a microcontroller as a primary building block in the design.

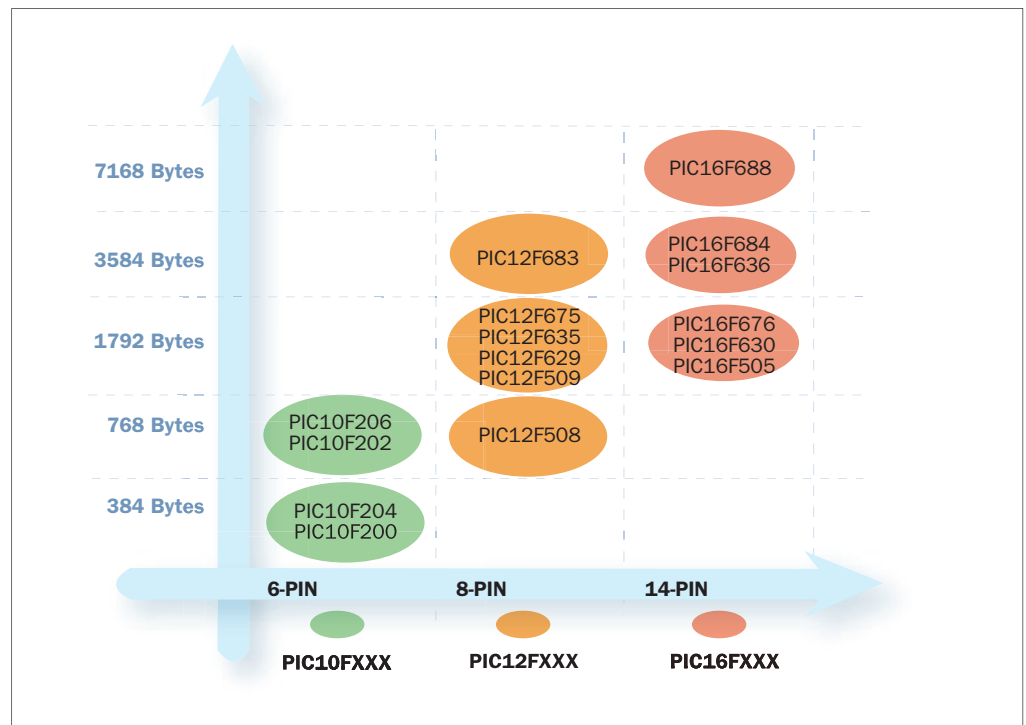# LOW PIN-COUNT AND SPACE-CONSTRAINED

Microchip offers the most complete family of low pin count Flash microcontrollers available. These microcontrollers range from easy-to-use 6-pin microcontrollers which can replace discrete logic functions, to 20-pin microcontrollers with advanced analog and communications peripherals that can serve as the central processor in an application.

The 8-bit PIC microcontroller architecture is easy to learn, and users can easily move from the Baseline (x12) Architecture to the Mid-Range (x14) or High Performance (x16) Architectures as their design changes or as additional features that these architectures support are required, such as interrupts, additional memory or interfacing to advanced hardware peripherals.

A Complete Low Pin-Count Solution

Low Pin Count PIC® Microcontroller Features

- ■ Enhanced Capture/Compare/ PWM (ECCP) module
- ■ EUSART module
- ■ Comparators
- ■ Timers
- ■ A/D converter
- ■ Integrated oscillators
- ■ Glue Logic

APPLICATIONS

Consumer	Communications	Industrial	Automotive	Appliance
Motion Detector	Telephone Handset	Utility Metering	Light Dimmer	Refrigerator Control Unit
Thermostat	Microphone Control	Portable Instruments	Intelligent Sensors	Smart Relay
Remote Control	UART Replacement	Data Acquisition	Proximity Detector	Delay Timer
Battery Management	Handset Display	Motor Control:	Keyless Entry	Temperature Sensor
CO/Smoke Detectors		stepper, fan	Tire Pressure Monitor	
Toys		control, brushless DC, AC	Dash Controller	
		induction, switch reluctance	Seat Controller	

6-Pin PIC® Microcontrollers — The World's Smallest Microcontrollers

Microchip continues to push the limits of the 8-bit microcontroller with the PIC10F family of 6-pin microcontrollers. The family currently consists of four members (PIC10F200, PIC10F202, PIC10F204 and PIC10F206) that offer 384 bytes to 768 bytes of Standard Flash program memory and 16 bytes to 24 bytes of data RAM memory.

While the PIC10F family is ideal for any space-constrained application, its combination of small form factor, high performance and extremely low cost is creating new applications for the PIC10F that are not traditionally served by microcontrollers:

"Electronic Glue"
Design in a PIC10F microcontroller from the start to accommodate bug fixes and last-minute changes. This can avoid costly and time-consuming silicon revisions or board changes.

Logic Control
Optimize board space and cost by incorporating a PIC10F microcontroller for logic control. A PIC10F allows implementation of a more complex solution and can take the place of passive discrete logic functions such as delays, smart gates, signal conditioning, simple state machines, encoders/decoders, etc.
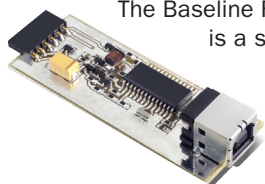
Intelligent Disposable Electronics
Given the small form factor and economical cost, the PIC10F family is ideal for many emerging "disposable" applications incorporating electronics intelligence, such as pregnancy testers, dialysis monitoring (blood sugar), drug testers and much more.

Waveform Generation
A PIC10F microcontroller can replace traditional 555 timers, PWMs, remote control encoders, pulse generation, programmable frequency source, resistor programmable oscillators and much more.

"Mechatronics"/Mechanical Functions
Replace traditional mechanical functions, such as smart switches, mode selectors, remote I/Os, timers, LED flashers and any other form of mechanical timers and switches with a PIC10F microcontroller, which provides the power and flexibility advantages of a microcontroller solution.

FEATURED DEVELOPMENT TOOLS

PIC10F Development Tools

Utilize the same MPLAB integrated development environment (IDE) and a PICkit™ 1 Flash Starter Kit, PICSTART® Plus, PRO MATE® II or for robust programming of the PIC10F along with an adapter. Or try one of the new tools specific to the PIC10F family.
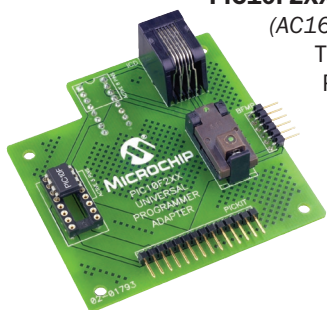
Baseline Flash Microcontroller Programmer *(PG164101)*
The Baseline Flash Microcontroller Programmer (BFMP) is a simple and easy-to-use ICSP™ programmer for the PIC10F microcontrollers. The BFMP provides a 6-pin linear ICSP header for standard ICSP support, as well as stand-alone programming support for the PIC10F family when paired with the PIC10F2XX Programmer Adapter, providing the least expensive method of programming. The BFMP utilizes USB and does not require an external power supply. The included Graphical User Interface (GUI) allows users to read, write, and verify the microcontroller to be programmed.

Shown here are several of the easy-to-learn programming tools available from Microchip to get you started on your PIC10F application.

PIC10F2XX Universal Programmer Adapter *(AC163020)*
The PIC10F2XX Universal Programmer Adapter provides PIC10F socket support for both the SOT-23 and DIP-8 packages. It allows interfacing to Microchip's low cost family of programmers: PICkit 1, MPLAB ICD2, PICSTART Plus, and the BFMP.

PIC10F2XX SOT-23 to DIP-8 programmer adapter *(AC163021)*
This is a kit consisting of five PIC10F206 SOT-23, five-pin scramble boards, and DIP pins. Once assembled, this will make the SOT-23 look like a standard 8-pin DIP and can be used directly in standard development tool sockets. Note that the PIC10F 8-pin DIP pin-out is family specific and differs from the standard 8-pin DIP pin-out. This kit is NOT intended for production applications and should be used only as a method of early evaluation.

PIC® MICROCONTROLLER WITH INTEGRATED LCD MODULE

LCD PIC® Microcontrollers:
High Performance:
PIC18F8490
PIC18F8390
PIC18F6490
PIC18F6390
Mid-Range:
PIC16F913
PIC16F914
PIC16F916
PIC16F917

Microchip's new series of PIC microcontrollers with on-chip LCD driver control consist of the PIC16F913/914/916/917 and the PIC18F6390/6490/8390/8490. These new Flash-based, power-managed devices add to an existing LCD microcontroller family. The breadth of LCD segment drivers, package sizes and integrated features for embedded control applications gives the designer flexibility to create different solutions based on the demand of varying market segments all from a single design.

High Performance LCD Solutions

The PIC18F6390/6490/8390/8490 LCD microcontrollers offer greater memory density and higher pin counts to meet the demands of more complex LCD applications.

The PIC18F6390/6490/8390/8490 feature set includes:

- 128-192 LCD segments
- 8/16 Kbytes Flash program memory
- Low-power nanoWatt Technology
- Advanced instruction set optimized for code efficiency and performance
- 32 kHz to 32 MHz internal oscillator for flexible clock system, fail-safe clock
- Integrated analog peripherals such as A/D converters and comparators
- I^{2}C/SPI/AUSART/EUSART serial communications
- 64- and 80-pin package options

Mid-Range LCD Solutions

The PIC16F913/914/916/917 LCD devices provide a strong balance between price and LCD pixel count.
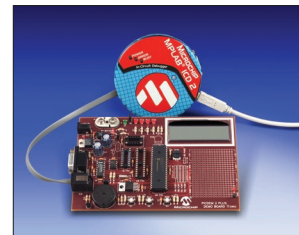
The PIC16F913/914/916/917 feature set includes:

- 60-96 LCD segments
- 7/14 Kbytes Flash program memory
- 256 Bytes EEPROM data memory
- Low-power nanoWatt Technology
- 35 easy-to-learn instructions
- 32 kHz to 8 MHz internal oscillator for flexible clock system, fail safe clock
- Integrated analog peripherals such as A/D converters and comparators
- I^{2}C /SPI/AUSART serial communications

FEATURED DEVELOPMENT TOOLS

PICDEM LCD Demonstration Board

The PICDEM™ LCD board (DM163028) demonstrates the main features of the 28-, 40-, 64- and 80-pin LCD Flash PIC microcontrollers. It is populated with the PIC18F8490. Other devices are supported via a transition socket. A sample LCD glass display is included for custom prototyping.


APPLICATIONS

Consumer	Medical	Industrial	Automotive	Appliance
Thermostat	Temperature Reader	Utility Meter	Dashboard	Refrigerator
Battery Management	Fertility Computer	Portable Instruments	Tire Pressure Sensor	Stove/Oven
Sprinkler Controller	Drug Injector	Data Acquisition	Battery Vehicle Display	Microwave
Security System	Nurse Call System	Gasoline Pump	Audio System	Coffee Maker
Exercise Equipment	Medical Pump	Air Conditioner		Bread Maker
Baby Aarm		Payment System		Washing Machine
Lawnmower		Gas Detection		Clothes Dryer
Clock Radio		Solor Power Measurement		

Microchip's Full-Speed USB PIC microcontroller family can perform as the sole controller in embedded applications thanks to the performance of its powerful 12 MIPS RISC core, self-programmable Flash memory and the power-saving features of nanoWatt Technology.

PIC® MICROCONTROLLERS WITH INTEGRATED USB
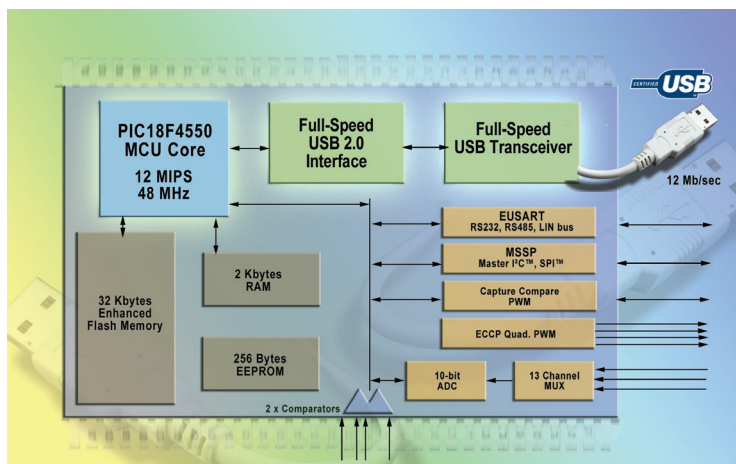
USB PIC Microcontrollers:	
Full-speed	**Low-speed:**
PIC18F4550	PIC16C745
PIC18F4455	PIC16C765
PIC18F2550	
PIC18F2455	

Microchip offers USB solutions capable of Full-speed USB operation (up to 12 Mbits/s) in a new PIC18F family of devices, as well as Low-speed operation (1 Mbits/s) in PIC16C devices.

Full-Speed USB 2.0: PIC18F4X5X, PIC18F2X5X

The majority of USB-capable microcontrollers are optimized exclusively for applications in the personal computing (PC) peripherals and consumer markets, leaving a real void for embedded engineers. Microchip's new Full-speed USB PIC microcontrollers, PIC18F2550/2455/4550/4455, make the benefits of Full-speed USB available to a broader range of embedded applications that operate in harsh environments and only occasionally connect to PCs.

Based on Enhanced Flash technology (100,000 E/W cycles, 40 years retention) they are ideal for operations in harsh environments and applications that only occasionally connect to personal computers.

The PIC18F4550 family of microcontrollers offer:

- Performance: 12 MIPS
- Memory: 32K bytes Enhanced Flash
- Data EEPROM: 256 bytes
- Analog features:
  - 10-bit A/D converter
  - Two analog comparators
  - Low voltage Detector (LVD)
  - Brown-out Reset (BOR)

Low-Speed USB: PIC16C745/765

Microchip also offers CMOS OTP-based 8-bit microcontrollers in 28- and 40-pin packages that are certified for the Low-Speed USB standard.
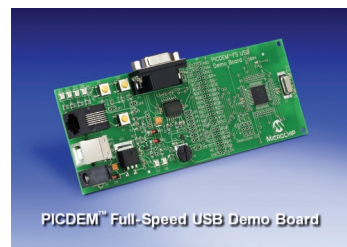
The PIC16C745/765 also offer:

- 5 channel, 8-bit A/D converters
- Universal Asynchronous Receiver Transmitter (USART) (also known as the Serial Communication Interface
- Easily adapted for PC-related peripherals, as well as UPS, joysticks and medical applications

FEATURED DEVELOPMENT TOOLS

PICDEM™ Full-Speed USB Demonstration board

The PICDEM™ FS-USB (DM163025) is a demonstration and evaluation board for the PIC18F4550 family of Flash microcontrollers with full speed USB 2.0 interface. The board contains a PIC18F4550 microcontroller in a 44-pin TQFP package, representing the superset of the entire family of devices.

Additional software resources are also available for the PIC18F4550 family of devices (download Free at www.microchip.com/USB).

PICDEM™ Full-Speed USB Demo Board

APPLICATIONS

Consumer	Medical	Industrial	Automotive	Battery Powered
Business Card Scanner White-board Digitizer Voice Recorder Uninterruptable Power Supply System MP3 Player Fire Alarm Security-system Programmer	Voice-activated Application Advanced Wheel Chair Research Equipment Automation	Manufacturing Tools Data Loggers Smart Display Micro Fuel Cell Gambling-machine Peripheral RFID Reader Robot Controller Industrial Timer Gas-flow Analyzer	Vehicle Network Bus Diagnostic Tool Vehicle Trace Recorder Ultrasonic Sensor	Handheld Tool Sensors Security Application Remote Control Home Automation

KEELOQ technology utilizes an industry-proven code hopping encoding methodology. The code will change or "hop" when the encoder device is activated, and the code is securely transmitted. The hop is equivalent to changing the mechanical key on a door each time it is locked or unlocked.

PIC® MICROCONTROLLERS WITH KEELOQ® CRYPTOGRAPHIC PERIPHERALS

Optimized for Battery-Powered Applications

The PIC12F635 and PIC16F636 microcontrollers feature a combination of a new KEELOQ® peripheral, low power consumption via nanoWatt Technology and reliable battery-powered operation to provide a total solution for secure data transmission and authentication applications.

Secure Data Transmission and Authentication Applications

KEELOQ technology is based on a proprietary, non-linear encryption algorithm that creates a unique transmission In every use, rendering code capture and resend schemes useless. The new devices now feature this encryption algorithm as an integrated hardware peripheral to the PIC microcontroller core.
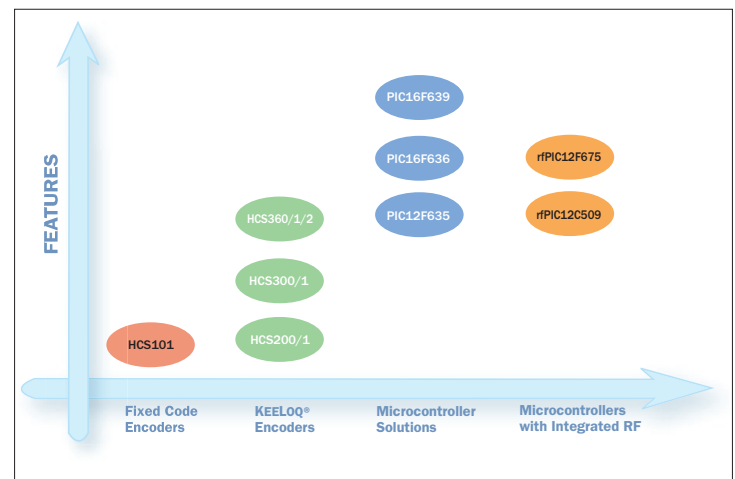
Designers of remotely controlled security systems and authentication products are encountering the need for an integrated solution that provides control of system power consumption and ensures reliable battery-powered operation. The new PIC12F635 and PIC16F636 microcontrollers meet these needs by providing engineers with the KEELOQ cryptographic

peripheral, nanoWatt Technology power management, and reliable battery reset and detect features, including:

- Programmable Low Voltage Detect (PLVD)
- Wake-up Reset (WUR) function
- Software-controlled Brownout Reset (BOR)
- Extended Watchdog Timer (EWDT)

KEELOQ secure algorithm, used worldwide by leading automotive manufacturers, can now be used for battery authentication in portable applications. This technology adds a low-cost safety layer in portable electronics, such as a cell phone, "to identify" if the battery pack in a charger or system is "friend" (factory authorized) or "foe" (counterfeit), a concept known as IFF.

Microchip's KEELOQ cryptographic technology is a proprietary encryption and decryption algorithm. This technology enables the host system or charger to determine if a battery provides optimum performance and safety to the user. The KEELOQ cryptographic algorithm can be integrated into any of Microchip's microcontrollers and many of Microchip's battery fuel gauge integrated circuits. These components are then integrated within the battery pack and host system to provide one of the industry's most secure authentication solutions for battery-operated devices.

| APPLICATIONS			
Consumer	**Medical**	**Industrial**	**Automotive**
Garage Door Opener Burglar Alarm System Remote Control "Pay as you go" System General Purpose Application	Remote Sensors and their Intercommunication Property and Identity Authentication	Security Systems Pseudo Random Number Generation (such as in electronic dice)	Remote Keyless Entry Passive Entry Alarm System Auto Immobilizer Radio Theft Protection

Microchip provides world-class, easy-to-use development tools, allowing engineers to design quickly and efficiently with PIC microcontrollers. Because the silicon and tools have been produced by the same source, technical problems resulting from tool and silicon incompatibility are eliminated, and the technical support offered is maximized. The demonstration tools in particular allow design engineers the opportunity to have hands-on demonstrations of the emerging technologies with which they will be working. As a result,

design cycles and time to market are shortened because of the ability to rapidly evaluate and learn a particular technology. Microchip has shipped more than 300,000 development tools in the past decade, representing one of the largest installed base of tools in the entire semiconductor industry. In addition, more than 110 third-party companies provide their own development tools supporting PIC microcontrollers.

MICROCONTROLLER DEVELOPMENT SYSTEMS

SOFTWARE DEVELOPMENT TOOLS

MPLAB Integrated Development Environment (IDE)
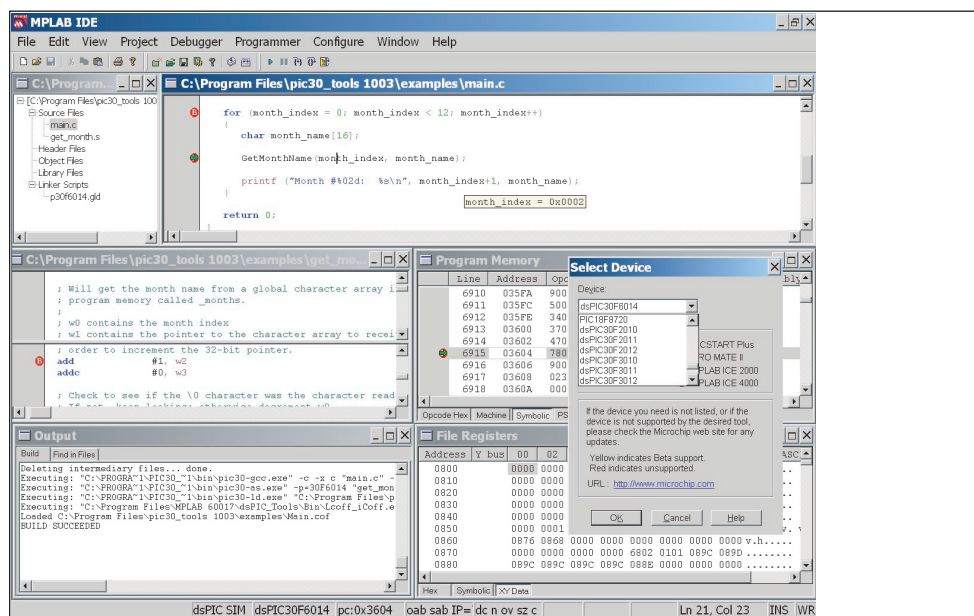
The MPLAB Integrated Development Environment (IDE) is a single platform for running all of Microchip's PIC microcontroller development tools. Available at no cost to users (and downloadable from the Microchip web site), MPLAB IDE is a seamless, integrated software development environment that includes the MPASM™ macro assembler, MPLAB SIM software simulator with symbolic debugger, color-coded source editor, project manager with high-level language debugging and concurrent support for development tools, including low-cost in-circuit debuggers, full-featured real-time emulators and programmers. The consistent and easy-to-use graphical user interface of the MPLAB IDE desktop allows for rapid switching between development, debugging and programming modes within a project. With its rich feature set, extensive on-line help and intuitive graphical user interface, MPLAB IDE significantly reduces a designer's learning curve and product development cycle.

MPLAB C18 C Compiler

The MPLAB C18 C Compiler is a full-featured ANSI-compliant C compiler for PIC microcontrollers. The MPLAB C18 tool is fully compatible with Microchip's MPLAB IDE, allowing source-level debugging with the MPLAB ICE In-Circuit Emulator, the MPLAB ICD 2 In-Circuit Debugger and the MPLAB SIM simulator.

MPLAB ICD 2 In-Circuit Debugger

The MPLAB ICD 2 In-Circuit Debugger is a low-cost, real-time debugger and programmer. Using Microchip's proprietary In-Circuit Debug functions, programs can be downloaded, executed in real time and examined in detail. Watch variables and breakpoints can be set from symbolic labels in C or assembly source code and single stepping can be done through C source line, assembly code level or from a mixed C source and generated assembly level listing. The MPLAB ICD 2 can also be used as a low-cost development programmer.

MPLAB PM3 Universal Device Programmer

Easy-to-use device programmer that operates with a PIC microcontroller or stand-alone unit and programs Microchip's entire line of PIC microcontrollers. The MPLAB PM3 features a large and bright LCD unit (128x64 pixels) to display easy-to-use menus, programming statistics and status information.

When connected to a PC-host system either via a serial or USB port, the MPLAB PM3 Programmer is seamlessly integrated with the MPLAB IDE and includes a full-featured macro assembler, powerful software simulator with symbolic debugger, color-coded programmer's editor, project manager, high-level language debugging and support for Microchip and selected third-party development tools, including compilers, in-circuit debuggers and full-featured in-circuit emulators.
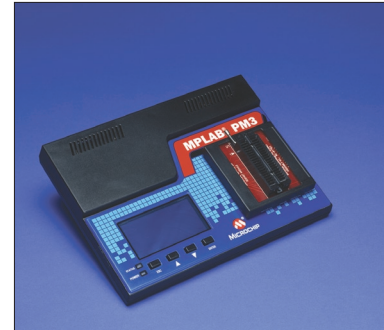
## MPLAB ICE 2000 Universal In-Circuit Emulator

The MPLAB ICE 2000 Universal In-Circuit Emulator is intended to provide the product development engineer with a complete microcontroller design tool set for PIC microcontrollers. MPLAB IDE provides software control of the emulator for editing, building, downloading and source debugging from a single environment. This full-featured emulator system has full speed (up to 25 MHz) emulation, low voltage operation, 32K by 128-bit trace, up to 65,535 breakpoints and a small form factor. The system can be easily configured to emulate different processors using the interchangeable processor modules. This modular system consists of an emulator pod, a processor module, a device adapter and a transition socket.

Complex triggering of the MPLAB ICE 2000 provides sophisticated trace analysis and precision breakpoints. The trace analyzer captures real-time execution addresses, opcodes and read/writes of external data. It also traces all file register RAM usage showing internal addresses and data values, as well as all accesses to special function registers, including I/Os, timers and peripherals.

MPLAB ICE 4000 In-Circuit Emulator

The MPLAB ICE 4000 In-Circuit Emulator is a premium emulator system providing the features of the MPLAB ICE 2000, but with increased emulation memory and high speed performance for PIC18XXXX devices. Its advanced emulator features include complex triggering and timing, up to 2M bytes of emulation memory and the ability to view variables in real time. The MPLAB ICE 4000 In-Circuit Emulator system has been designed as a real-time emulation system with advanced features that are typically found on more expensive development tools.
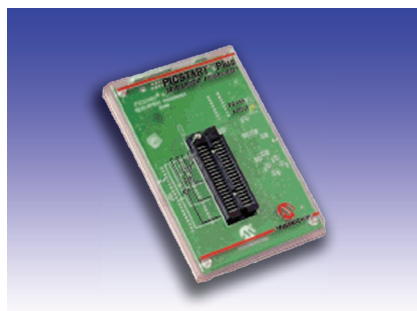
PICSTART® Plus

The PICSTART® Plus is Microchip's low cost, development programmer. It connects via the serial RS-232 port to your PC and is operated with MPLAB IDE which is included with the programmer at no charge. The programmer supports most of the DIP-packaged microcontrollers available from Microchip. Also included is a free copy of the PICC Lite Compiler and a sample PIC16F84 microcontroller.

With the PICSTART® Plus Flash Upgrade Module, new device support can be added by reprogramming the PICSTART Plus firmware directly from MPLAB IDE.

MICROCONTROLLER DEVELOPMENT SYSTEMS

EVALUATION SYSTEMS, DEMONSTRATION BOARDS, FIRMWARE MODULES

PICkit™ 1 Flash Starter Kit

The PICkit™ 1 Flash Starter Kit is a low-cost development kit with an easy-to-use interface for programming Microchip's 8-/14-pin Flash family of microcontrollers. This starter kit is designed to help the user get up to speed quickly using PIC microcontrollers. The Kit provides everything needed to program, evaluate and develop applications using Microchip's powerful 8-/14-pin Flash family of microcontrollers. Instructions are provided in a series of seven tutorials that cover I/Os, interrupts, A/D converters, comparators, data tables and timers. All source code files for the tutorials are furnished.

The **Signal Analysis PICtail™ Daughter Board** works as an extension to the PICkit 1 Flash Starter Kit. When combined with PICkit 1 firmware version 2.0.0 or later and the signal-analysis PC program, the Signal Analysis PICtail Daughter Board can perform signal-analysis capabilities such as: real-time strip chart, oscilloscope, Fast Fourier Transformation (FFT), histogram and programming. The Signal Analysis PICtail Daughter Board comes populated with a PIC16F684 and two 25LC640 SPI™ compatible serial EEPROM memory devices. PICtail daughter boards are also available to demonstrate capabilities of various analog devices.

Application Maestro™ Software

The Microchip Application Maestro™ Software is a stand-alone software tool to configure and incorporate a range of pre-written firmware modules into your applications. Its heart is a collection of modules developed by Microchip for use with PIC microcontrollers. Starting from a graphic interface, select one or more available modules, then configure the parameters listed. When this is complete, the Application Maestro Software generates code that can be incorporated into the application project, using MPLAB IDE or any compatible development environment.

PICDEM™ 2 Plus Demonstration Board

The PICDEM™ 2 Plus Demonstration Board is a simple and cost-effective solution to learning the PIC16F877 and the PIC18F4520 devices. All of the microcontroller port pins are terminated at a connector header, and there is ample room provided in the generous prototyping area for project development work.
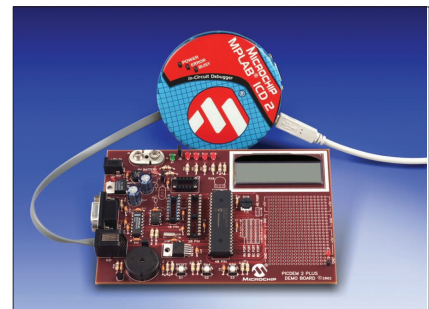
PICDEM™ Z Plus Demonstration Board

The PICDEM™ Z demonstration kit is an easy-to-use ZigBee™ Technology wireless communication protocol development and demonstration platform. The demonstration kit includes the ZigBee protocol stack and two PICDEM Z boards, each with an RF daughter card. The demonstration board is also equipped with a 6-pin modular connector to interface directly with Microchip's MPLAB ICD 2 in-circuit debugger (DV164005). With MPLAB ICD 2, the developer can reprogram or modify the PIC18 microcontroller Flash memory and develop and debug application code all on the same platform.

PICDEM.net™ Internet/Ethernet Demonstration Board

The PICDEM.net™ demonstration board is an Internet/Ethernet demonstration board using the PIC18F4520 microcontroller and TCP/IP firmware. The board supports any 40-pin DIP device that conforms to the standard pin-out used by the PIC16F877 or PIC18F4520.
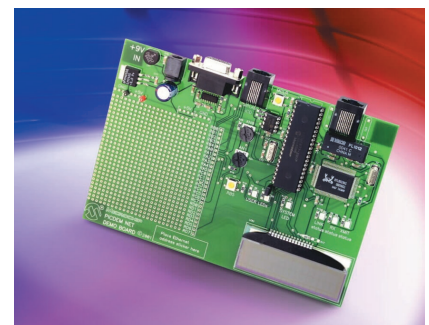
COMPLETE EMBEDDED CONTROL SOLUTIONS
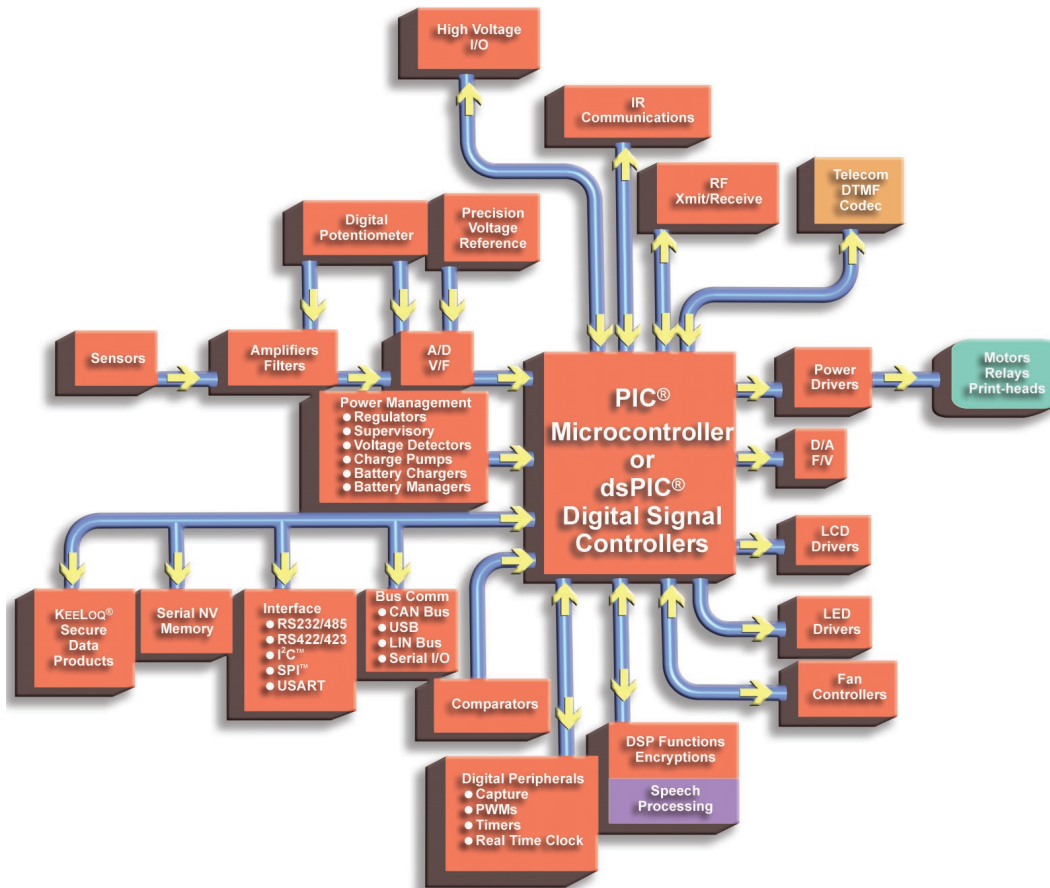
MICROCHIP TECHNOLOGY'S PRODUCT PORTFOLIO

- 8-bit PIC Microcontrollers
- 16-bit dsPIC® Digital Signal Controllers
- Battery Management ICs
- Thermal Management ICs
- Power Management ICs
- Linear ICs
- Mixed-Signal ICs
- Interface Devices
- Radio Frequency Products
- KEELOQ Security Devices
- Serial EEPROMs
- MPLAB Development Tools

16-bit dsPIC® Digital Signal Controllers

For additional power and performance, consider Microchip's new dsPIC 16-bit digital signal controllers (DSC). A DSC is a single chip, embedded controller that seamlessly integrates the control attributes of a microcontroller with the computation and throughput capabilities of a digital signal processor

The dsPIC family features a fully implemented DSP engine, 30 MIPS non-pipelined performance, C compiler friendly design and a familiar microcontroller architecture and design environment. The dsPIC30F family of 16-bit Flash microcontrollers targets motor control and power conversion, sensor control, automotive, speech, audio and general purpose applications.

Analog and Interface Products

Microchip is a leader in low power analog solutions with a growing portfolio of stand-alone analog and interface products that complement our broad microcontroller product lines.

Thermal Management
- Temperature Sensors
- Fan Speed Controllers / Fan Fault Detectors

Power Management
- LDO & Switching Regulators
- Charge Pump DC/DC Converters
- Power MOSFET Drivers
- PWM Controllers
- System Supervisors
- Voltage Detectors
- Voltage References

Battery Management
- Li-Ion/Li-Polymer Battery Chargers
- Smart Battery Managers

Interface
- CAN Peripherals
- Infrared Peripherals
- LIN Transceivers
- Serial Peripherals

Mixed Signal
- A/D Converter Families
- Digital Potentiometers
- System D/A Converters
- V/F and F/V Converters

Linear
- Op Amps
- Programmable Gain Amplifiers
- Comparators
- Linear Integrated Devices

Memory Products

128-bit to 1 Mbit Serial EEPROMs

Microchip offers a broad portfolio of high performance serial EEPROMs in extremely small package sizes, including a new 2x3 millimeter DFN (dual flat no leads) package option, across the entire product line of I^2C™ and Microwire serial EEPROMs. With the new 64-Kbit I^2C and 16-Kbit Microwire serial EEPROMs now featured in this tiny DFN package, Microchip offers the highest-density memory serial EEPROMs in the smallest standard package available today. Specialty/ID EEPROMs for PC monitors, DIMM modules and riser cards, as well as serial EEPROM development tools that include the new SEEVAL® 32 Serial EEPROM Evaluation Kit (DV243002) and Total Endurance™ Model software version 4.0 are also available.

OUTSTANDING TECHNICAL SUPPORT

Microchip offers outstanding technical support before and after the sale. Hundreds of dedicated field applications engineers are located in more than 29 sales offices and through authorized distributors worldwide. These professionals are fully trained on PIC microcontrollers and ready to help solve your embedded design challenges.

The Microchip web site offers a significant amount of current product data sheets, application notes, reference designs and much more.

Microchip also provides a free engineering support program to help you select the appropriate PIC microcontroller products for your application, write efficient code, debug a design, convert a current design to a Microchip product and provide valuable feedback. Support inquiries are addressed in a timely manner for any embedded application, regardless of volume. Contact the applications for Technical Support at: http://support.microchip.com

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Microchip's new, user-friendly e-commerce site offers:

- Special offers on silicon and development systems
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At Microchip, we understand that it takes more than product specifications to create loyal customers. In addition to a broad product portfolio, we understand the value of a complete design solution. That's why we maintain a worldwide network of sales and support. Our technical support is unmatched with a global network of experienced field application engineers and technical support personnel ready to provide product and system assistance to help you further streamline your design, prototype and production activities.

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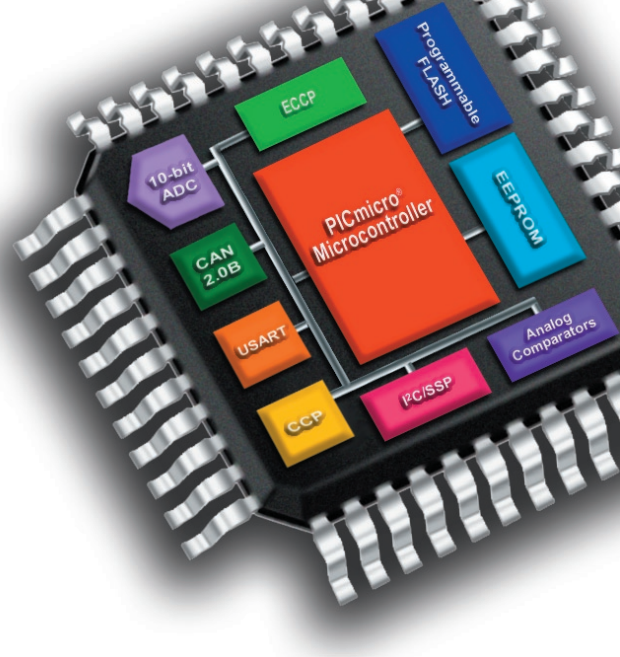
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