



MICROCHIP

**START NOW with Small Flash
PIC® Microcontrollers**



Lots of options and the ability to easily migrate

START NOW with Microchip's easy-to-learn Baseline and Mid-Range Architectures

The Baseline and Mid-Range PIC® microcontroller's modified Harvard RISC instruction set provides an easy migration path from 6 to 80 pins and from 384 bytes to 128 Kbytes of program memory. With just over 30 instructions and seamless migration between product families, PIC microcontrollers are easy to use and are ideal for designs requiring flexibility and performance.

Baseline PIC Microcontroller Architecture includes the 8-bit Flash 6-pin PIC10F family and portions of the 8-pin PIC12 and the 14- to 28-pin PIC16 families. The concisely defined feature set of the Baseline Architecture with its 12-bit instruction set is an established choice for the most cost-effective product solutions. It offers a 2 level hardware stack and up to 2K instructions.

Mid-Range PIC Microcontroller Architecture includes members of the PIC12 and PIC16 families that feature a Flash program memory, 14-bit instruction set and are available with 8- to 64-pin package options. A deeper hardware stack, multiple A/D channels and EEPROM data memory are just a few of the additional features available in the Mid-Range PIC microcontrollers.



Embedded design engineers face new and continually changing obstacles when developing the next generation of products. Innovation can result in how a particular application is implemented or simply the methods used to minimize development and project costs. The engineers at Microchip Technology recognize the many challenges that must be overcome for successful project development—from maintaining a product launch schedule, meeting the technical product definition, or containing development costs.

Several new products have been introduced to overcome these obstacles. The newest members of the 8-bit Flash PIC microcontroller series, ranging in performance and pin count, add to an extensive portfolio of versatile, easy-to-use products. Two new programming and development tools work within Microchip's free MPLAB® Integrated Development Environment (IDE) to help embedded designers navigate through the difficult phases of their development life cycle while utilizing a common set of tools.

So don't wait until your design is off course, **START NOW** with small PIC microcontrollers and development tools and let us help you succeed.

A simple solution to complex application challenges. **PIC Microcontrollers are versatile building blocks.**

The primary role of an embedded designer is to develop the most appropriate solution to a specific problem. In most applications the solution can be implemented using a number of different methods which can vary significantly in cost and technical ease. Often the simplest implementation is best, whether it is controlling a motor, monitoring voltage and thermal conditions, or providing user feedback. PIC microcontrollers offer a simple solution to a multitude of complex application challenges by providing an easy-to-use development environment and a flexible platform to build the most technically feasible and cost-efficient embedded applications.

Microchip has long been a leader in the microcontroller market by continually providing new and innovative products to the engineering community. The newest PIC microcontrollers with increased performance and more packaging combinations do just that. These new PIC microcontrollers provide world-class Flash memory technology, a wide 2.0V-5.5V operating range and the industry's leading internal oscillator. Available in either Baseline or Mid-Range Architectures, with varying performance and peripheral options, small PIC microcontrollers provide the solutions to meet the diverse needs of our customers.

Ease of use and low total cost of ownership.

Engineers prefer Baseline PIC Microcontrollers.

Microchip's Baseline PIC microcontrollers have long been the 8-bit microcontroller preferred by engineers around the world for a wide variety of applications. Based upon Microchip's Baseline Architecture, these PIC microcontrollers provide appropriate features and options to minimize expenses and get the job done.

Select Baseline 8-bit PIC® Microcontroller Family (12-bit Instruction Word)

Product	Flash Program Memory Bytes (Words)	RAM Bytes	I/O Pins	Packages	Analog		Digital
					ADC	Comp.	Timers/WDT
PIC10F200	384 (256)	16	4	60T, 8P	–	–	1-8 bit, 1-WDT
PIC10F202	768 (512)	24	4	60T, 8P	–	–	1-8 bit, 1-WDT
PIC10F204	384 (256)	16	4	60T, 8P	–	1	1-8 bit, 1-WDT
PIC10F206	768 (512)	24	4	60T, 8P	–	1	1-8 bit, 1-WDT
NEW PIC10F220	384 (256)	16	4	60T, 8P	3x8-bit	–	1-8 bit, 1-WDT
NEW PIC10F222	768 (512)	23	4	60T, 8P	3x8-bit	–	1-8 bit, 1-WDT
PIC12F508	768 (512)	25	6	8P, 8SN, 8MS	–	–	1-8 bit, 1-WDT
PIC12F509	1,536 (1,024)	41	6	8P, 8SN, 8MS	–	–	1-8 bit, 1-WDT
NEW PIC12F510	1,536 (1,024)	38	6	8P, 8SN, 8MS	3x8-bit	1	1-8 bit, 1-WDT
PIC16F505	1,536 (1,024)	72	12	14P, 14SL, 14ST	–	–	1-8 bit, 1-WDT
NEW PIC16F506	1,536 (1,024)	67	12	14P, 14SO, 14ST	3x8-bit	2	1-8 bit, 1-WDT
PIC16F54	768 (512)	25	12	18P, 18SO, 20SS	–	–	1-8 bit, 1-WDT
PIC16F57	3,072 (2,048)	72	20	28P, 28SO, 28SS	–	–	1-8 bit, 1-WDT
PIC16F59	3,072 (2,048)	134	32	40P, 44PT	–	–	1-8 bit, 1-WDT

The latest additions to the Baseline PIC microcontrollers bring a higher level of functionality to this portfolio and include the PIC10F220, PIC10F222, PIC12F510 and PIC16F506. The PIC10F220 and PIC10F222's 6-pin SOT-23 package complements the existing PIC10F family by providing an integrated 8-bit Analog-to-Digital (A/D) converter, an increased internal oscillator operating frequency of 8 MHz, as well as a shorter Device Reset Timer (DRT). With the addition of the PIC10F220 and PIC10F222, the PIC10F family now consists of six PIC microcontrollers with basic functions as well as comparators or A/D converters. The PIC10F microcontroller family remains the world's smallest 8-bit microcontroller.

The 8-pin PIC12F510 also provides an 8 MHz internal oscillator and the shorter DRT. The PIC12F510 features a single comparator as well as an 8-bit A/D converter. In comparison, the 14-pin PIC16F506 offers two comparators in addition to the 8-bit A/D converter.

These new members of the Baseline PIC microcontroller portfolio give engineers the opportunity to employ microcontrollers in embedded applications that typically have not used them. Low-cost Baseline PIC microcontrollers address space constraints with form factors that can be easily implemented into the smallest of embedded applications.

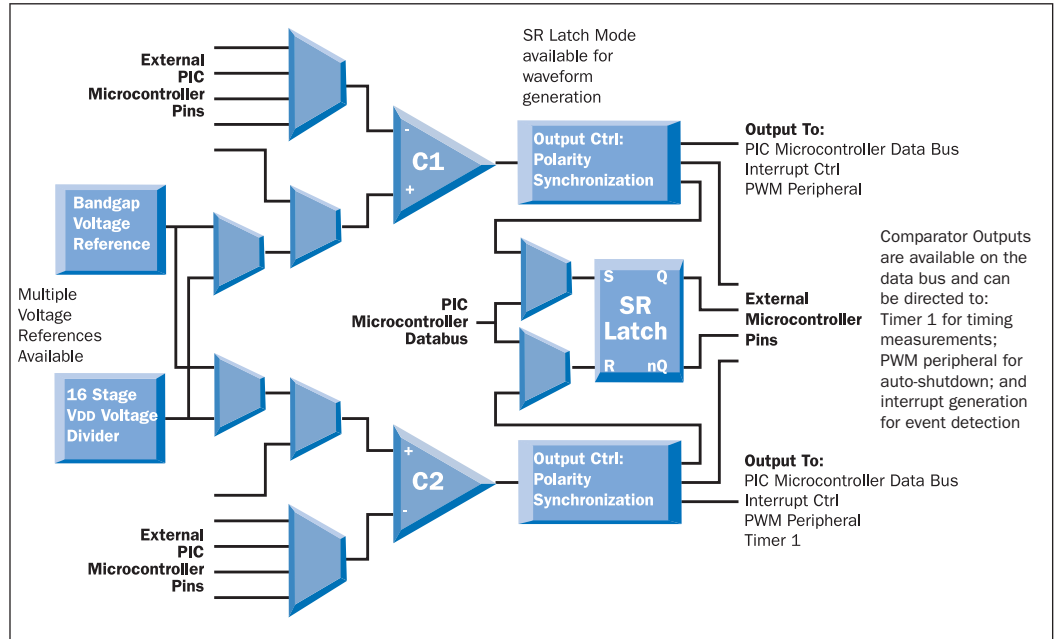
Increased level of performance and features.

Mid-Range PIC Microcontrollers offer more.

Sometimes an application requires a little more power and a few more features than what is offered in the Baseline PIC microcontrollers. Microchip's peripheral-rich Mid-Range Flash PIC microcontrollers can meet the needs of demanding applications that require a higher level of embedded control.

The recently introduced PIC16F685, PIC16F687, PIC16F689 and PIC16F690 microcontrollers provide engineers with enhanced features such as steering-capable pulse-width modulation (PWM) and I²C™, while offering additional program and data memory. Several on-board peripherals are enhanced to provide greater flexibility and ease of use. These enhancements include a new

PIC16F690 Comparator Block Diagram Example of peripheral enhancement



comparator module with more internal and external connections and an A/D converter with up to 12 channels. The enhanced Capture/Compare/PWM module incorporates PWM steering, allowing output to multiple pins under software control – a feature that provides greater layout flexibility for motor control and power supply applications. In addition, the software-enabled Brownout Reset enables designers to significantly reduce standby current consumption while in Sleep mode.

With the most versatile combination of peripherals and performance levels, Mid-Range PIC microcontrollers can provide the custom solution to almost any functional application challenge.

Squeezing your application into ever-smaller spaces.

4x4 mm QFN packages are up to 70% smaller than SOIC or SSOP.

Mid-Range PIC microcontrollers are now offered in 4x4 mm QFN packaging. These new packages are available in 8-, 14- and 20-pin variations. With this new package option, Mid-Range PIC microcontrollers can be implemented into designs that must minimize board and space usage.

Select Mid-Range 8-bit PIC® Microcontroller Family (14-bit Instruction Word)									
Product	Flash Program Memory Bytes (Words)	EEPROM Data Memory Bytes	RAM Bytes	I/O Pins	Packages	Analog		Digital	
						ADC Ch	Comp.	Timers/WDT	
PIC12F629	1,792 (1,024)	128	64	6	8P, 8SN, 8MF, 8MD	—	1	1-8 bit, 1-16 bit, 1-WDT	
PIC12F675	1,792 (1,024)	128	64	6	8P, 8SN, 8MF, 8MD	4x10-bit	1	1-8 bit, 1-16 bit, 1-WDT	
PIC12F683	3,584 (2,048)	256	128	6	8P, 8SN, 8MF, 8MD	4x10-bit	1	1-16 bit, 2-8 bit, 1-WDT	
PIC12F635	1,792 (1,024)	128	64	6	8P, 8SN, 8MF, 8MD	—	1	1-8 bit, 1-16 bit, 1-WDT	
PIC16F630	1,792 (1,024)	128	64	12	14P, 14SL, 14ST, 14ML	—	1	1-8 bit, 1-16 bit, 1-WDT	
PIC16F676	1,792 (1,024)	128	64	12	14P, 14SL, 14ST, 14ML	8x10-bit	1	1-8 bit, 1-16 bit, 1-WDT	
PIC16F684	3,584 (2,048)	256	128	12	14P, 14SL, 14ST, 14ML	8x10-bit	2	1-16 bit, 2-8 bit, 1-WDT	
PIC16F636	3,584 (2,048)	256	128	12	14P, 14SL, 14ST, 14ML	—	2	1-8 bit, 1-16 bit, 1-WDT	
PIC16F688	7,168 (4,096)	256	256	12	14P, 14SL, 14ST, 14ML	8x10-bit	2	1-8 bit, 1-16 bit, 1-WDT	
NEW PIC16F785	3,584 (2,048)	256	128	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 2-8 bit, 1-WDT	
NEW PIC16F685	7,168 (4,096)	256	256	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 2-8 bit, 1-WDT	
NEW PIC16F687	3,584 (2,048)	256	128	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 1-8 bit, 1-WDT	
NEW PIC16F689	7,168 (4,096)	256	256	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 1-8 bit, 1-WDT	
NEW PIC16F690	7,168 (4,096)	256	256	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 2-8 bit, 1-WDT	

Reduce costly investment in time, money and engineering resources.

START NOW and save with Microchip's low-cost tools and common development environment.

World-class, easy-to-use development tools allow 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. Design cycles and time to market are shortened by the ability to rapidly evaluate and develop with PIC microcontrollers. Microchip's development tools operate under the free MPLAB Integrated Development Environment. MPLAB IDE can be used to edit source files, compile code and download to PIC emulator and simulator tools. Debugging is supported for source files, absolute listing files or machine code.

START NOW programming with the PICKit™ 2 Flash Starter Kit.

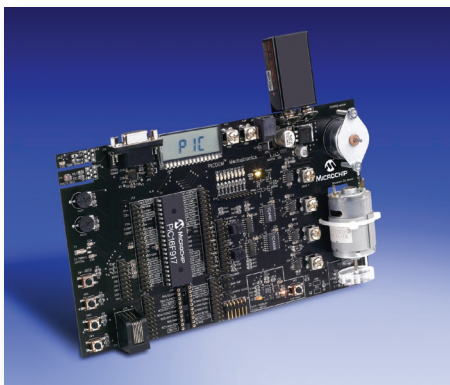
Based upon the simplicity of PICKit 1, the new PICKit 2 is a quick and inexpensive way to program any of Microchip's small PIC microcontrollers. A large product portfolio and easy-to-use development environment lets engineers quickly develop applications powered by PIC microcontrollers. With the introduction of the PICKit 2 Starter Kit, programming and development has never been easier. **START NOW** with this easy-to-use development tool and realize the extensive power held within small PIC microcontrollers.



A step-by-step guide to adding intelligence to a mechanical design.

It's easy to learn how to use PIC microcontrollers to enhance or replace a mechanical design.

The PICDEM™ Mechatronics Demonstration Board is an easy-to-use development and demonstration platform. This kit offers a hands-on approach to learning about mechatronics—



demonstrating how to add intelligence to a mechanical design or replace mechanical designs with an intelligent electronic solution.

The PICDEM™ Mechatronics Kit includes jumper wires which allow the PIC microcontroller to be connected to various

components on the board. These components include sensors, LEDs, LCDs and motor drivers. The board comes with nine example projects with firmware, connection diagrams and schematics.

Endless Applications

The small Flash PIC microcontrollers are ideally suited for a wide variety of applications which require both analog and digital functionality. Exceptional performance and a range of features bring more versatility to typical applications.

Related Application Notes and Technical Briefs

- AN216 DC/DC Converter Controller Using a PICmicro® Microcontroller
- AN234 Hardware Techniques for PICmicro Microcontrollers
- AN538 Using PWM to Generate Analog Output
- AN594 Using the CCP Modules
- AN734 Using the PICmicro SSP for Slave I²C™ Communication
- AN736 An I²C Network Protocol for Environmental Monitoring
- AN847 RC Model Aircraft Motor Control
- AN874 Buck Configuration High-Power LED Driver
- AN879 Using the Microchip Ultra Low-Power Wake-Up Module
- AN892 Fail-Safe Monitoring and Clock Frequency Switching Using the PIC16F684
- AN893 Low-Cost Bidirectional Brushed DC Motor Control Using the PIC16F684
- AN906 Stepper Motor Control Using the PIC16F684
- AN944 Using the EUSART on the PIC16F688
- AN964 Software PID Control of an Inverted Pendulum Using the PIC16F684
- TB081 Soft-Start Controller for Switching Power Supplies
- TB083 Detecting Multiple Voltages Using the PIC10F204/206 Comparator
- TB085 A Simple Circuit for Driving Microcontroller Friendly PWM Generators

Other Design Resources

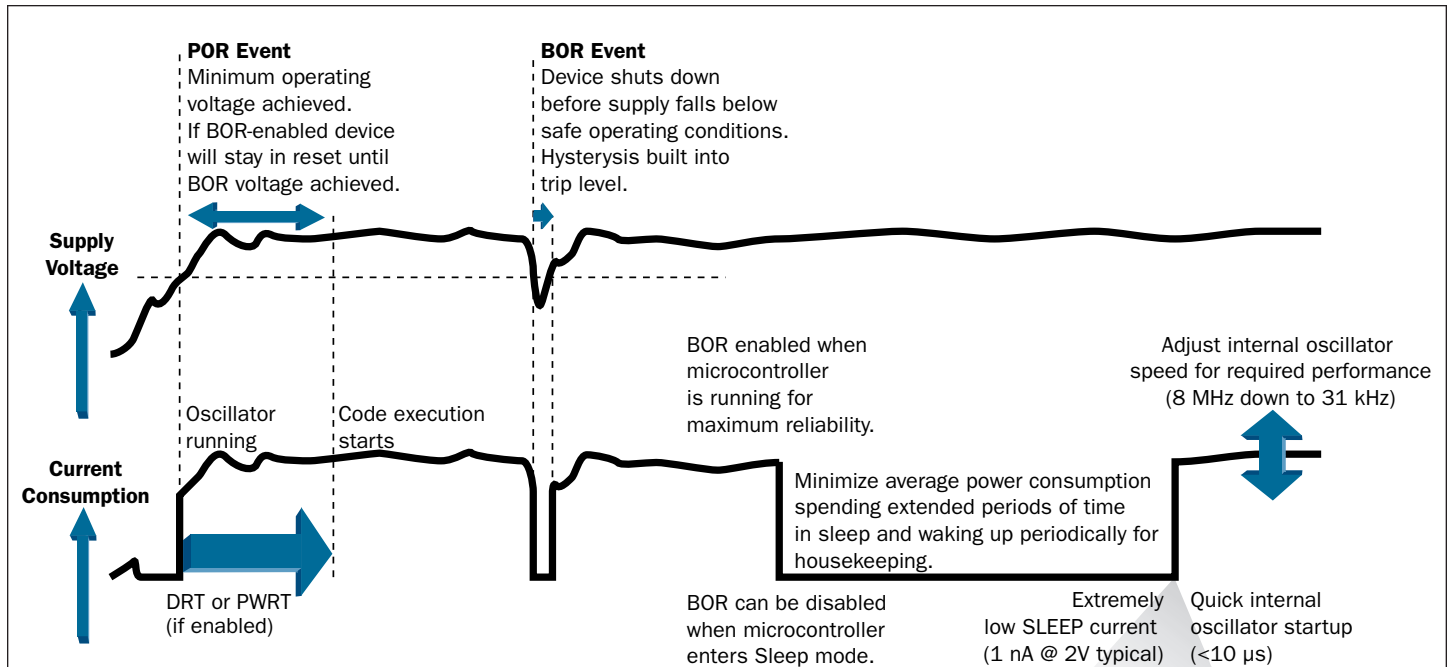
- DS40040 Tips 'N Tricks 8-Pin Flash
- DS41200 Tips 'N Tricks Power Management
- DS41214 Tips 'N Tricks CCP and ECCP
- DS41215 Tips 'N Tricks Comparators

Visit www.microchip.com/startnow for additional information.

Reliable Low Power Operation with PIC® Microcontrollers

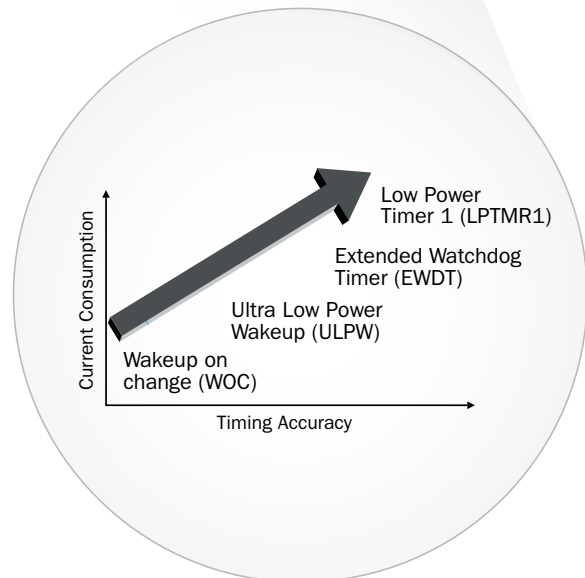
The need to reduce overall power consumption plays a major role within many embedded applications. Whether the intent is to extend the life of a battery supply or meet government regulations, such as Energy Star, low power and dependable operation are important considerations in an embedded application. Microchip offers many small PIC microcontrollers to accommodate these concerns and

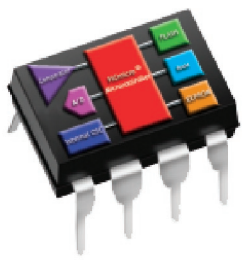
maximize the life of any embedded design. Microchip's proprietary nanoWatt technology was developed specifically for low power and provides multiple methods to minimize overall current draw and reduce power consumption. This, in conjunction with system voltage monitoring, provides the most robust design achievable.



Terminology

1. **IntOsc** – Microchip's industry-leading internal oscillator calibrated from the factory at +/-1%. Adjustable performance from 8 MHz down to 31 kHz with unprecedented stability over voltage and temperature.
2. **SLEEP** – Minimizes average power consumption by putting the PIC microcontroller to sleep during inactive periods and wake-up only when necessary to perform a particular task.
3. **WOC** (Wake On Change) – While in Sleep, the PIC microcontroller will only wake-up when the status on the I/O pins change or an interrupt occurs.
4. **WDT** or **EWDT** (Watch Dog Timer or Extended Watch Dog Timer) – Internal timer capable of running during active or Sleep modes. Allows periods of up to 256 seconds before a wake-up from Sleep occurs or predetermined event during active mode.
5. **POR** (Power On Reset) – Internal circuitry that ensures that V_{DD} has achieved a minimum good voltage level before releasing the DRT.
6. **DRT** (Device Reset Timer) or **PWRT** (Power-up Reset Timer) – Internal timer that holds the PIC microcontroller in RESET and allows enough time for both V_{DD} and IntOsc to stabilize.
7. **IST** (IntOsc Start-up Timer) – Internal timer that holds the PIC microcontroller in RESET and allows enough time for IntOsc to stabilize after a wake-up from Sleep occurs.
8. **ULPW** (Ultra Low Power Wake-up) – Allows the PIC microcontroller to slowly discharge an external capacitor and wake-up from Sleep at a specific voltage level.
9. **LPTMR1** (Low Power Timer 1) – Allows the use of a 32 kHz crystal to very accurately wake-up from Sleep in a specific time period.
10. **BOR** (Brown Out Reset) – Ensures reliable operation by resetting the PIC microcontroller when V_{DD} spikes below normal operating voltage.





Worldwide Sales & Service

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 global network of experienced field application engineers and technical support personnel are ready to provide product and system assistance to help you further streamline your design, prototype and production activities.

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2355 West Chandler Boulevard • Chandler, Arizona 85224-6199 • (480) 792-7200

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