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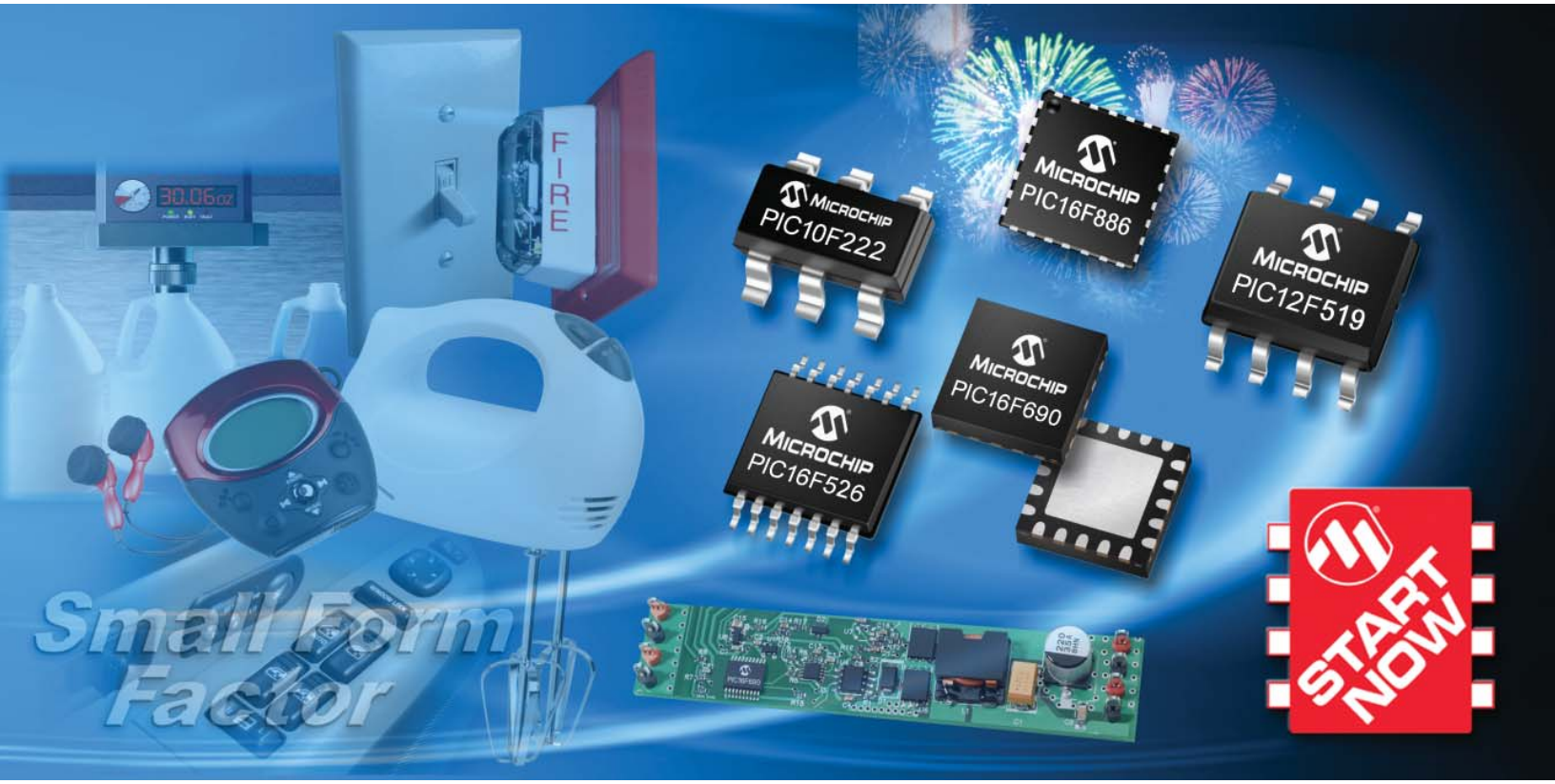
Start Now with Small Flash PIC® Microcontrollers



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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 Flash program memory and a 14-bit instruction set. 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 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. A host of 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 2.0-5.5V 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)	Data EEPROM Bytes	RAM Bytes	I/O Pins	Packages	Analog		Digital
							ADC	Comp	Timers/WDT
	PIC10F200	384 (256)	–	16	4	6OT, 8P, 8MC	–	–	1-8 bit, 1-WDT
	PIC10F202	768 (512)	–	24	4	6OT, 8P, 8MC	–	–	1-8 bit, 1-WDT
	PIC10F204	384 (256)	–	16	4	6OT, 8P, 8MC	–	1	1-8 bit, 1-WDT
	PIC10F206	768 (512)	–	24	4	6OT, 8P, 8MC	–	1	1-8 bit, 1-WDT
	PIC10F220	384 (256)	–	16	4	6OT, 8P, 8MC	3x8-bit	–	1-8 bit, 1-WDT
	PIC10F222	768 (512)	–	23	4	6OT, 8P, 8MC	3x8-bit	–	1-8 bit, 1-WDT
	PIC12F508	768 (512)	–	25	6	8P, 8SN, 8MS, 8MC	–	–	1-8 bit, 1-WDT
	PIC12F509	1.5K (1K)	–	41	6	8P, 8SN, 8MS, 8MC	–	–	1-8 bit, 1-WDT
NEW	PIC12F519	1.5K (1K)	64	41	6	8P, 8SN, 8MS, 8MC	–	–	1-8 bit, 1-WDT
	PIC12F510	1.5K (1K)	–	38	6	8P, 8SN, 8MS, 8MC	3x8-bit	1	1-8 bit, 1-WDT
	PIC16F505	1.5K (1K)	–	72	12	14P, 14SL, 14ST	–	–	1-8 bit, 1-WDT
	PIC16F506	1.5K (1K)	–	67	12	14P, 14SO, 14ST	3x8-bit	2	1-8 bit, 1-WDT
NEW	PIC16F526	1.5K (1K)	64	67	12	14P, 14SO, 14ST	3x8-bit	2	1-8 bit, 1-WDT

Package Key: MC = 2x3 DFN, MS = MSOP, OT = SOT-23, P = PDIP, SL = 16-lead SOIC, SN = SOIC, SO = SOIC, ST = TSSOP

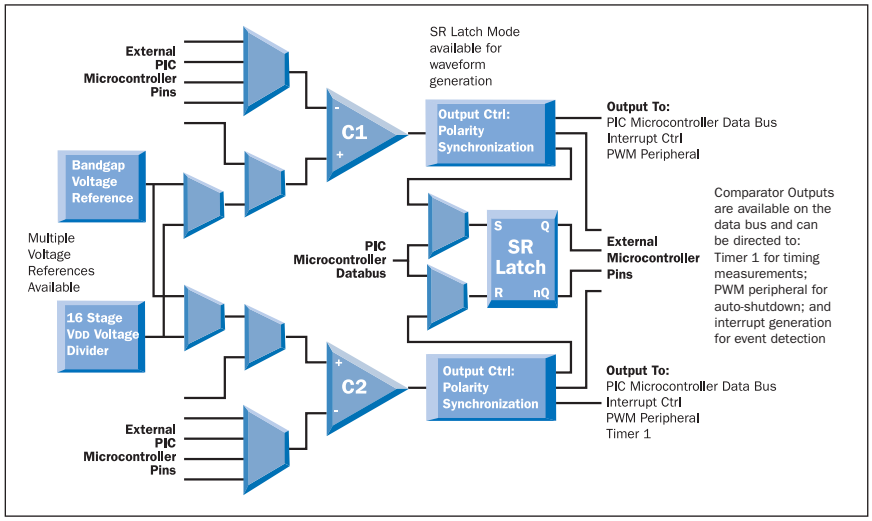
The latest additions to the Baseline PIC microcontrollers bring a higher level of functionality to this portfolio and include the PIC10F220, PIC10F222, PIC12F519 and PIC16F526. The PIC10F220 and PIC10F222's 6-pin SOT-23 package complements the existing PIC10F family by providing an integrated 8-bit Analog-to-Digital (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 PIC12F519 also provides an 8 MHz internal oscillator and the shorter DRT. The PIC12F519 features a single comparator as well as an 8-bit A/D converter. In comparison, the 14-pin PIC16F526 offers two comparators in addition to the 8-bit A/D converter. Both devices feature 64 bytes of Flash data memory.

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.

PIC16F690 Comparator Block Diagram

Example of peripheral enhancement



Increased performance and features.

Mid-Range PIC Microcontrollers Offer More

As applications evolve, they begin to require more capability from their control architectures. Microchip's Mid-Range PIC Microcontrollers are designed to meet the demand for more performance, larger code and data space, and the ability to interface with other environments within an embedded system.

The recently introduced PIC16F882/883/884/886/887 microcontrollers provide engineers with enhanced features that can be found on found on our latest Mid-Range architecture products; such as steering-capable Pulse Width Modulation (PWM) and I²C™ address masking, while offering additional program and data memory.

Several on-board peripherals have been designed to provide greater flexibility and ease of use for designers. These include a comparator module with more internal and external connections, an internal reference voltage, and an S/R Latch mode that can be used to emulate 555 timers and many analog peripherals. 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.

Select Mid-Range 8-bit PIC® Microcontroller Family (14-bit Instruction Word)

Product	Flash Program Memory Bytes (Words)	Data EEPROM Bytes	RAM Bytes	I/O Pins	Packages	Analog		Digital
						ADC	Comp	Timers/WDT
NEW PIC12F609 HV	1.75K (1K)	–	64	6	8P, 8SN, 8MS, 8MD	–	1	1-16 bit, 1-8 bit, 1-WDT
NEW PIC12F615 HV	1.75K (1K)	–	64	6	8P, 8SN, 8MS, 8MD	4x10-bit	1	1-16 bit, 2-8 bit, 1-WDT
NEW PIC16F610 HV	1.75K (1K)	–	64	12	14P, 14SL, 14ST, 16MD	–	2	1-16 bit, 1-8 bit, 1-WDT
NEW PIC16F616 HV	3.5K (2K)	–	128	12	14P, 14SL, 14ST, 16MD	8x10-bit	2	1-16 bit, 2-8 bit, 1-WDT
PIC16F785 HV	3.5K (2K)	256	128	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 2-8 bit, 1-WDT
NEW PIC16F631	1.75K (1K)	128	64	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 1-8 bit, 1-EWDT
NEW PIC16F677	3.5K (2K)	256	128	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 1-8 bit, 1-EWDT
PIC16F685	7K (4K)	256	256	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 2-8 bit, 1-WDT
PIC16F687	3.5K (2K)	256	128	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 1-8 bit, 1-WDT
PIC16F689	7K (4K)	256	256	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 1-8 bit, 1-WDT
PIC16F690	7K (4K)	256	256	18	20P, 20SO, 20SS, 20ML	12x10-bit	2	1-16 bit, 2-8 bit, 1-WDT
NEW PIC16F882	3.5K (2K)	128	128	25	28SP, 28SO, 28SS, 28ML	11x10b	2	1-16 bit, 2-8 bit, 1-EWDT
NEW PIC16F883	7K (4K)	256	256	25	28SP, 28SO, 28SS, 28ML	11x10b	2	1-16 bit, 2-8 bit, 1-EWDT
NEW PIC16F886	14K (8K)	256	368	25	28SP, 28SO, 28SS, 28ML	11x10b	2	1-16 bit, 2-8 bit, 1-EWDT
NEW PIC16F884	7K (4K)	256	256	36	40P, 44PT, 44ML	14x10b	2	1-16 bit, 2-8 bit, 1-EWDT
NEW PIC16F887	14K (8K)	256	368	36	40P, 44PT, 44ML	14x10b	2	1-16 bit, 2-8 bit, 1-EWDT

HV High Voltage option available

Package Key: MD = 4x4 QFN, ML = QFN, MS = MSOP, P = PDIP, PT = TQFP, SL = 16-lead SOIC, SN = SOIC, SO = SOIC, SP = Skinny PDIP, SS =SSOP, ST = TSSOP

Squeezing your application into ever-smaller spaces.

Miniaturized packages are available across the pin count spectrum.

Small PIC Microcontrollers are available in a range of packages targeted at applications that must minimize board and space usage. 6 and 8-pin products are available in our new 2x3 mm DFN package, while the more fully featured 8/14 and 20-pin Mid-Range PIC microcontrollers can be purchased in our tiny 4x4 mm QFN packaging. Additionally, our 28 and 40-pin microcontrollers are also available in space-saving 6x6 mm and 8x8 mm packaging.

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 MCU emulator and simulator tools. Debugging is supported for source files, absolute listing files or machine code.

START NOW Program and Debug with the new PICkit™ 2 Debug Express!

Microchip has expanded the functionality of its popular PICkit 2 programmer to include debug capability when used with several of our most popular midrange devices! As always, the PICkit 2 Debug Express remains a quick, easy, and inexpensive way to program any of our Flash-based microcontrollers. With a large portfolio of devices and a full suite of easy-to-use development tools, Microchip can help you take your design from concept to production quicker than ever before. START NOW and finish ahead of schedule!

A step-by-step guide to eliminating legacy devices to reduce cost.

PICDEM System Management makes it easy to learn how to consolidate functionality!

As the PC industry matures, it continues to spawn an entirely new genre of products that share a similar architectural layout. Rack servers, set-top boxes, phone systems, and industrial control systems often utilize a main applications processor; but are also surrounded by a host of "system management" silicon. Separate clock chips, off-board EEPROMs, thermal management, and communications interfaces were once a necessary but costly part of these applications. The PICDEM System Management Board can show you how to consolidate this functionality onto a single, low-cost PIC microcontroller.

The PICDEM System Management Board (DM164123) is a demonstration tool and training aid that provides a blueprint for eliminating costly legacy silicon from your application. The board features a PIC16F886 microcontroller performing fan control, data memory storage and serial communications functionality. The kit also includes our low-cost PICkit Serial Analyzer tool for debugging standard serial interfaces from the comfort of your workstation.

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 PIC® Microcontroller
AN234	Hardware Techniques for PIC Microcontrollers
AN538	Using PWM to Generate Analog Output
AN594	Using the CCP Modules
AN734	Using the PIC Microcontroller 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

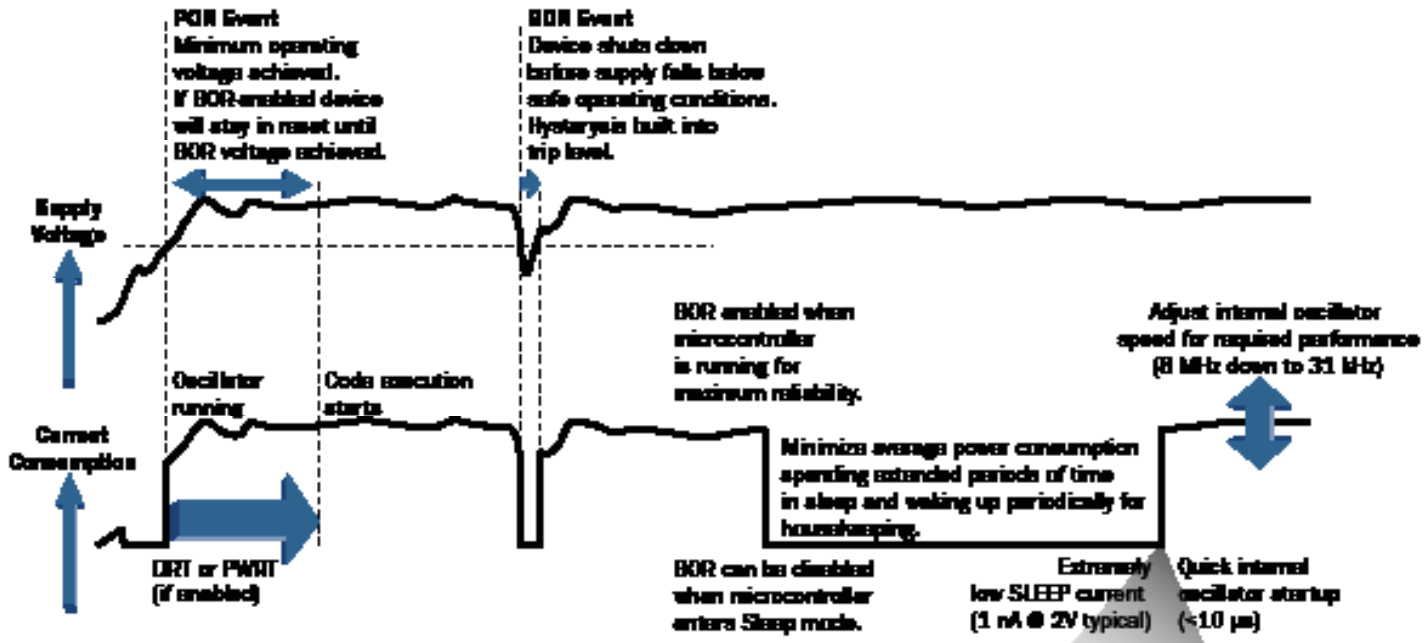
Other Design Resources

DS01146	Tips 'N Tricks Compiled Booklet

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

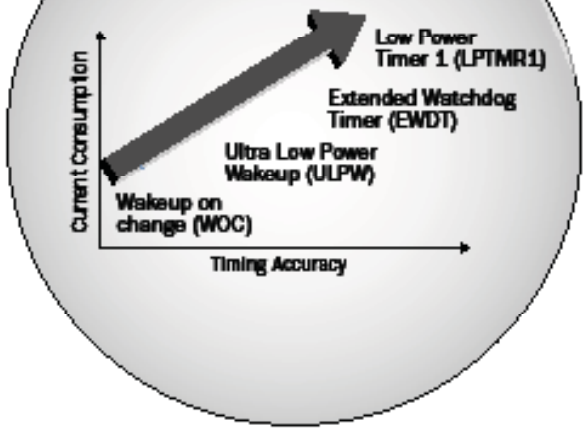
Reliable Low Power Operation with PIC® Microcontrollers

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.



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.

- Regional Training Centers: www.microchip.com/rtc
- MASTERs Conferences: www.microchip.com/masters
- Worldwide Seminars: www.microchip.com/seminars
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