

# PICmicro® MCU Power Managed PIC16F Family

## Featuring nanoWatt Technology

The Power Managed PIC16F818/819 and PIC16F87/88 MCU family merges the FLASH-based PIC16F architecture that is easy-to-program, with only 35 single word instructions, with new low power features that are ideal for battery management applications. New power managed features can include new oscillator sources, a new low current Watchdog Timer, Two-Speed Start-up, Fail-Safe Clock Monitor and up to three new Power Managed modes. These devices provide low cost solutions for intelligent small systems that require extended battery life and energy efficient operation. This PICmicro MCU family features data EEPROM, Self-programming, a 10-bit ADC with up to 7 analog input channels, one 16-bit Timer and two 8-bit Timers, and ICD capability, all packed into an 18-pin package. The low power features make the devices ideal for battery powered and power consumption critical applications, including instrumentation and monitoring, data acquisition, power conditioning, environmental monitoring and sensor applications.

### High Performance RISC CPU:

- 35 single word instructions
- FLASH program memory up to 4K x 14 words
- 256 bytes of backup EEPROM data memory
- Up to 5 MIPS operation:
  - DC - 20 MHz clock input

### Power Managed Features:

- Power Managed modes:
  - Primary RUN XT, RC oscillator, 87  $\mu$ A, 1 MHz, 2V (PIC16F87/88 only)
  - RC\_RUN 7  $\mu$ A, 31.25 kHz, 2V (PIC16F87/88 only)
  - SEC\_RUN 14  $\mu$ A, 32 kHz, 2V (PIC16F87/88 only)
  - SLEEP 0.2  $\mu$ A, 2V
- Timer1 Oscillator 1.3  $\mu$ A, 32 kHz, 2V
- Watchdog Timer 0.7  $\mu$ A, 2V
- Two-Speed Oscillator Start-up (PIC16F87/88 only)
- Fail-Safe Clock Monitor

### Peripheral Features:

- High current sink/source: 25 mA
- Timer0 module: 8-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- One Capture/Compare/PWM (CCP) module
- Synchronous Serial Port (SSP) module with two modes of operation:
  - 3-wire SPI™ (supports all 4 SPI modes)
  - I<sup>2</sup>C™ Slave modes
- Addressable USART module supports interrupt-on-address bit (PIC16F87/88 only)



### Advanced Analog Features:

- 10-bit, up to 7-channel Analog-to-Digital Converter A/D (not available on PIC16F87)
- Analog Comparator module (PIC16F87/88 only) with:
  - Two analog comparators
  - Programmable on-chip voltage reference
  - Programmable input multiplexing from device inputs and internal voltage reference
  - Comparator outputs are externally accessible

### Special Microcontroller Features:

- 100,000 erase/write cycle Enhanced FLASH program memory
- 1,000,000 erase/write cycle Data EEPROM memory
- Data EEPROM retention > 40 years
- Self-reprogrammable under software control
- Selectable oscillator options including:
  - Internal oscillator block:
    - Frequency range of 125 kHz to 8 MHz
  - Internal RC oscillator of 31.25
- Multiple Low Power modes:
  - CPU in various operational states
- Clock failure recovery mechanism ensures robust operation
- Enhanced low current Watchdog Timer (WDT)
- Programmable code protection
- Power saving SLEEP mode
- In-Circuit Serial Programming™ (ICSP™) via two pins
- MPLAB® In-Circuit Debug (ICD) via two pins

### CMOS Technology:

- Low power, high speed FLASH technology
- Fully static design
- Wide operating voltage range (2.0V to 5.5V)
- Industrial temperature range



## Additional Information:

- Microchip's web site: [www.microchip.com](http://www.microchip.com)
- Microchip's *Technical Library* CD-ROM, Order No. DS00161
- Application Notes are available in:
  - *Embedded Control Handbook*, Order No. DS00092
  - *Embedded Control Handbook Update 2000*, Order No. DS00711
- Microchip's *Overview, Quality Systems and Customer Interface System*, Order No. DS00169

### PIC16F81X/8X Microcontroller Family

Device	FLASH Program Memory Bytes	Data RAM Bytes	Program Memory Type	EEPROM Data	I/O Pins	ADC Channels (10-Bits)	Serial I/O	Comp.	CCP	Timers	ICSP	Pins
PIC16F818	1792	128	FLASH	128	16	5	I <sup>2</sup> C/SPI	N/A	1	2-8 bit, 1-16 bit, 1-WDT	Yes	18L PDIP, 18L SOIC, 20L SSOP, 28L QFN
PIC16F819	3584	256	FLASH	256	16	5	I <sup>2</sup> C/SPI	N/A	1	2-8 bit, 1-16 bit, 1-WDT	Yes	18L PDIP, 18L SOIC, 20L SSOP, 28L QFN
PIC16F87	7168	368	FLASH	256	16	N/A	AUSART/I <sup>2</sup> C/SPI	2	1	2-8 bit, 1-16 bit, 1-WDT	Yes	18L PDIP, 18L SOIC, 20L SSOP, 28L QFN
PIC16F88	7168	368	FLASH	256	16	7	AUSART/I <sup>2</sup> C/SPI	2	1	2-8 bit, 1-16 bit, 1-WDT	Yes	18L PDIP, 18L SOIC, 20L SSOP, 28L QFN
<b>Abbreviations:</b>	ADC = Analog-to-Digital Converter PWM = Pulse Width Modulator SPI = Serial Peripheral Interface					AUSART = Addressable Universal Synchronous/Asynchronous Receiver/Transmitter QFN = Quad Flat No Leads WDT = Watchdog Timer						

### Development Tools from Microchip

MPLAB® IDE	Integrated Development Environment (Hardware/Software Project Manager)
MPASM™ Assembler	Universal PICmicro® Macro-Assembler Software
MPLINK™ Object Linker/ MPLIB™ Object Librarian	Linker/Librarian Software
MPLAB® SIM	Simulator Software
MPLAB® ICD 2	In-Circuit Debugger
MPLAB® ICE 2000	Full featured, modular In-Circuit Emulator
PRO MATE® II	Full featured, modular Device Programmer

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 Detroit (248) 538-2250  
 Kokomo (765) 864-8360  
 Los Angeles (949) 263-1888  
 San Jose (408) 436-7950  
 Toronto (905) 673-0699

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 China - Shanghai 86-21-6275-5700  
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