

# PIC18 Microcontroller Family

The PIC18 microcontroller family provides PICmicro® devices in 18- to 80-pin packages, that are both socket and software upwardly compatible to the PIC16 family. The PIC18 family includes all the popular peripherals, such as MSSP, ESCI, CCP, flexible 8- and 16-bit timers, PSP, 10-bit ADC, WDT, POR and CAN 2.0B Active for the maximum flexible solution. Most PIC18 devices will provide FLASH program memory in sizes from 8 to 128 Kbytes and data RAM from 256 to 4 Kbytes; operating from 2.0 to 5.5 volts, at speeds from DC to 40 MHz. Optimized for high-level languages like ANSI C, the PIC18 family offers a highly flexible solution for complex embedded applications.

## High Performance RISC CPU:

- 77 instructions
- C-Language friendly architecture
- PIC16 source code compatible
- Linear program memory addressing to 2 Mbyte
- Linear data memory addressing up to 4 Kbytes
- Up to 10 MIPs operation:
  - DC - 40 MHz osc/clock input
  - 4 MHz - 10 MHz clock with PLL active
- 16-bit wide instructions, 8-bit wide data path
- Priority levels for interrupts
- 8 x 8 Single Cycle Hardware Multiplier

## Peripheral Features:

- High current sink/source 25 mA/25 mA
- Up to four external interrupt pins
- Up to three 16-bit timer/counters
- Up to two 8-bit timer/counters with 8-bit period register (time-base for PWM)
- Secondary LP oscillator clock option - Timer1
- Up to five Capture/Compare/PWM (CCP) modules  
CCP pins can be configured as:
  - Capture input: 16-bit, resolution 6.25 ns ( $T_{cy}/16$ )
  - Compare: 16-bit, max. resolution 100 ns ( $T_{cy}$ )
  - PWM output: PWM resolution is 1- to 10-bit  
Max. PWM frequency @: 8-bit resolution = 156 kHz  
10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module  
Two modes of operation:
  - 3-wire SPI™ (supports all 4 SPI modes)
  - I<sup>2</sup>C™ Master and Slave mode
- Up to 2 Addressable USART modules (ESCI)
  - Supports interrupt on Address bit
- Parallel Slave Port (PSP) module

## Analog Features:

- 10-bit Analog-to-Digital Converter module (A/D) with:
  - Fast sampling rate
  - Up to 16 channels input multiplexor
  - Conversion available during SLEEP
  - DNL = ±1 LSb, INL = ±1 LSb



## Analog Features (Continued):

- Programmable Low Voltage Detection (LVD) module
  - Supports interrupt-on-low voltage detection
- Programmable Brown-out Reset (BOR)
- Comparators

## Special Microcontroller Features:

- Power-on Reset (POR), Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code protection
- In-Circuit Serial Programming™ (ICSP™) via two pins

## CMOS Technology:

- Fully static design
- Wide operating voltage range (2.0V to 5.5V)
- Industrial and Extended temperature ranges

## Power Managed Features:

- Dynamically switch to secondary LP oscillator
- Internal RC oscillator for ADC operation during SLEEP
- SLEEP mode ( $I_{PD} < 1 \mu A$  typ.)
  - up to 23 individually selectable wake-up events
  - 3 edge selectable wake-up inputs
  - 4 state change wake-up inputs
- Internal RC oscillator for WDT (period wake-up)
- RAM retention mode ( $V_{DD}$  as low as 1.5V)
- Up to 6 more Power Managed modes available on selected models (PIC18F1320/2320/4320 and PIC18F1220/2220/4220)



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PICmicro® Microcontrollers

## Additional Information:

- Microchip's web site: [www.microchip.com](http://www.microchip.com)
- Microchip's PICmicro 18C MCU Reference Manual, Order No. DS39500
- Microchip's CD-ROMs available:
  - Technical Library, Order No. DS00161
- Microchip's Data Sheets available:
  - PIC18CXX2, Order No. DS39026
  - PIC18CXX8, Order No. DS30475
  - PIC18C601/801, Order No. DS39541
- Application Notes are available in:
  - Embedded Control Handbook, Order No. DS00092
  - Embedded Control Handbook, Volume 2, Math Library, Order No. DS00167
  - Embedded Control Handbook Update 2000, Order No. DS00711
- Microchip's Quality Systems and Customer Interface System, Order No. DS00169
- Demo Boards Available:
  - PICDEM™ 2 Demonstration Board
  - ROMless
  - CAN/LIN bus
- Third Party Tools Available:
  - C Compilers
    - HI-TECH - PICC™, [www.htsoft.com](http://www.htsoft.com)
    - IAR - EWB-PIC, [www.iar.com](http://www.iar.com)
    - CCS PIC18 C Compiler, [www.ccsinfo.com](http://www.ccsinfo.com)

## PIC18 Microcontroller Family

| Product    | Program Memory |         | Data Memory |              | I/O Ports | ADC 10-bit | MSSP                 | USART | Other    | CCP/PWM | Timers 8/16-bit | Packages             | Pins  |
|------------|----------------|---------|-------------|--------------|-----------|------------|----------------------|-------|----------|---------|-----------------|----------------------|-------|
|            | Type           | Bytes   | RAM Bytes   | EEPROM Bytes |           |            |                      |       |          |         |                 |                      |       |
| PIC18F1220 | FLASH          | 4K      | 256         | 256          | 16        | 7          | —                    | 1     | 6x PMM   | 1       | 1/3             | DIP, SOIC, SSOP, QFN | 18    |
| PIC18F1320 | FLASH          | 8K      | 256         | 256          | 16        | 7          | —                    | 1     | 6x PMM   | 1       | 1/3             | DIP, SOIC, SSOP, QFN | 18    |
| PIC18F2220 | FLASH          | 4K      | 512         | 256          | 23        | 10         | I <sup>2</sup> C/SPI | 1     | 6x PMM   | 2       | 1/3             | DIP, SOIC            | 28    |
| PIC18F2320 | FLASH          | 8K      | 512         | 256          | 23        | 10         | I <sup>2</sup> C/SPI | 1     | 6x PMM   | 2       | 1/3             | DIP, SOIC            | 28    |
| PIC18C242  | OTP            | 16K     | 512         | —            | 23        | 5          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, SOIC            | 28    |
| PIC18C252  | OTP            | 32K     | 1536        | —            | 23        | 5          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, SOIC            | 28    |
| PIC18F242  | FLASH          | 16K     | 512         | 256          | 23        | 5          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, SOIC, SSOP      | 28    |
| PIC18F252  | FLASH          | 32K     | 1536        | 256          | 23        | 5          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, SOIC, SSOP      | 28    |
| PIC18F258  | FLASH          | 32K     | 1536        | 256          | 22        | 5          | I <sup>2</sup> C/SPI | 1     | CAN 2.0B | 1       | 1/3             | DIP, SOIC            | 28    |
| PIC18F4220 | FLASH          | 4K      | 512         | 256          | 34        | 13         | I <sup>2</sup> C/SPI | 1     | 6x PMM   | 2       | 1/3             | DIP, TQFP, QFN       | 40/44 |
| PIC18F4320 | FLASH          | 8K      | 512         | 256          | 34        | 13         | I <sup>2</sup> C/SPI | 1     | 6x PMM   | 2       | 1/3             | DIP, TQFP, QFN       | 40/44 |
| PIC18C442  | OTP            | 16K     | 512         | —            | 34        | 8          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, PLCC, TQFP      | 40/44 |
| PIC18C452  | OTP            | 32K     | 1536        | —            | 34        | 8          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, PLCC, TQFP      | 40/44 |
| PIC18F442  | FLASH          | 16K     | 512         | 256          | 34        | 8          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, PLCC, TQFP      | 40/44 |
| PIC18F452  | FLASH          | 32K     | 1536        | 256          | 34        | 8          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | DIP, PLCC, TQFP      | 40/44 |
| PIC18F458  | FLASH          | 32K     | 1536        | 256          | 33        | 5          | I <sup>2</sup> C/SPI | 1     | CAN 2.0B | 1       | 1/3             | DIP, PLCC, TQFP      | 40/44 |
| PIC18C601  | —              | ROMless | 1536        | —            | 31        | 8          | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | PLCC, TQFP           | 64/68 |
| PIC18C658  | OTP            | 32K     | 1536        | —            | 52        | 12         | I <sup>2</sup> C/SPI | 1     | CAN 2.0B | 2       | 1/3             | PLCC, TQFP           | 64/68 |
| PIC18F6520 | FLASH          | 32K     | 2048        | 1024         | 52        | 12         | I <sup>2</sup> C/SPI | 2     | —        | 5       | 2/3             | TQFP                 | 64    |
| PIC18F6620 | FLASH          | 64K     | 3840        | 1024         | 52        | 12         | I <sup>2</sup> C/SPI | 2     | —        | 5       | 2/3             | TQFP                 | 64    |
| PIC18F6720 | FLASH          | 128K    | 3840        | 1024         | 52        | 12         | I <sup>2</sup> C/SPI | 2     | —        | 5       | 2/3             | TQFP                 | 64    |
| PIC18C801  | —              | ROMless | 1536        | —            | 42        | 12         | I <sup>2</sup> C/SPI | 1     | —        | 2       | 1/3             | PLCC, TQFP           | 80/84 |
| PIC18C858  | OTP            | 32K     | 1536        | —            | 68        | 16         | I <sup>2</sup> C/SPI | 1     | CAN 2.0B | 2       | 1/3             | PLCC, TQFP           | 80/84 |
| PIC18F8520 | FLASH          | 32K     | 2048        | 1024         | 68        | 16         | I <sup>2</sup> C/SPI | 2     | EMA      | 5       | 2/3             | TQFP                 | 80    |
| PIC18F8620 | FLASH          | 64K     | 3840        | 1024         | 68        | 16         | I <sup>2</sup> C/SPI | 2     | EMA      | 5       | 2/3             | TQFP                 | 80    |
| PIC18F8720 | FLASH          | 128K    | 3840        | 1024         | 68        | 16         | I <sup>2</sup> C/SPI | 2     | EMA      | 5       | 2/3             | TQFP                 | 80    |

**Abbreviation:** ADC = Analog-to-Digital Converter    CCP = Capture/Compare/PWM    I<sup>2</sup>C = Inter-Integrated Circuit Bus    PMM = Power Managed Mode  
 PWM = Pulse Width Modulation    SPI = Serial Peripheral Interface    USART = Universal Synchronous/Asynchronous Receiver/Transmitter

## Development Tools from Microchip

## Resale Price\*

|                                 |  |                     |
|---------------------------------|--|---------------------|
| MPLAB® IDE                      | Integrated Development Environment (IDE)                                     | FREE                |
| MPASM™ Assembler                | Universal PICmicro Macro-Assembler   | FREE                |
| MPLINK™ Linker/MPLIB™ Librarian | Linker/Librarian   | FREE                |
| MPLAB® SIM                      | Software Simulator   | FREE                |
| MPLAB® ICE 2000/4000            | Full Featured Modular In-Circuit Emulator                                    | Starting at \$2,045 |
| MPLAB® ICD 2                    | In-Circuit Debugger  | Starting at \$159   |
| C compiler                      | Microchip MPLAB® C18 or supported by third-party vendors (HI-TECH, IAR, CCS) | Contact Vendor      |
| PRO MATE® II Device Programmer  | Full Featured Modular Device Programmer                                      | Starting at \$854   |
| PICSTART® Plus Programmer       | Entry Level Development Kit with Programmer                                  | \$199               |

\*All prices are manufacturer's suggested resale for North America.

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