

Introduction to PIC[®]

(Peripheral Interface Controller)

By BiPOM Electronics, Inc.

2010

PIC[®] History

- Originally designed in the 80's based on General Instruments design
- It started as a peripheral device for the 16-bit CP1600
- Microchip introduced PIC16C84 in 1993 as the first Microchip CPU with on-board EEPROM.
- Microchip announced on February 2008 the shipment of its six billionth PIC processor

PIC[®] Features

- Some 8-bit, some 32-bit
- PIC10, PIC12, PIC16, PIC17, PIC18, PIC24, dsPIC, PIC32
- Harvard Architecture for 8-bit devices: Separate code and data space
- Small number of fixed length instructions
- Typically internal memory
- Speed-to-cost ratio maximized
- Limitations: Single accumulator, small instruction set, register bank switching required

Why PIC[®] ?

- Competitors: 8051, AVR, MSP430, ARM
- Pros:
 - Low-cost
 - High-speed
 - Small size
 - Wealth of peripherals minimizes external circuitry
(High current I/O, watchdog, brownout, internal oscillator)
 - Wealth of development tools
 - Variety of application notes and example codes
 - Large user base
 - Advanced debugging
- Cons:
 - 8-bit performance compared to ARM
 - Lack of operating system options
 - Limited memory

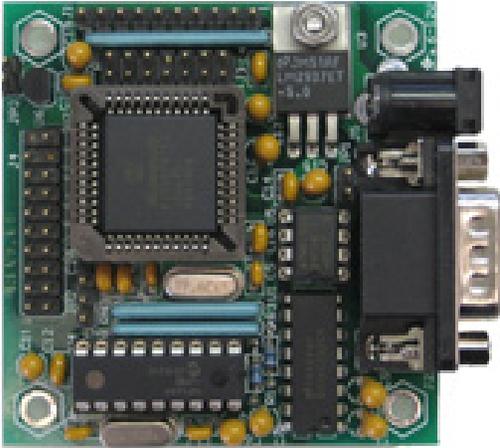
Frequently Asked Questions

- Can PIC[®] run an operating system ?
 - Insufficient memory to run an OS.
- Why trademark logo after every PIC[®] word ?
 - Microchip is pic[®] ky about its trademarks.
- Does BiPOM offer PIC[®] design services ?
 - Yes, we are a Microchip Authorized Design Partner.

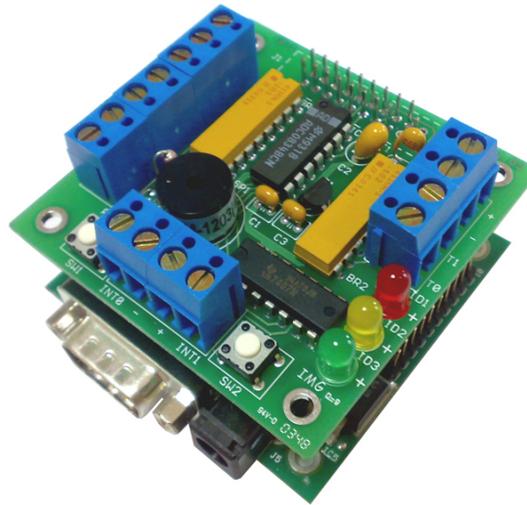


**MICROCHIP
AUTHORIZED
DESIGN
PARTNER**

BiPOM PIC[®] Support



MINI-MAX/P18
Low power,
PIC18F458



MINI-MAX/P18
Set I & Set II



MicroTRAK/P18 Starter
&
MicroTRAK/P18 Complete
Development & Training Kits

PIC[®] Software Development Options

Integrated Development Environment (IDE)

Assemblers

C Compilers

BASIC Compilers

Flowcode

Simulators

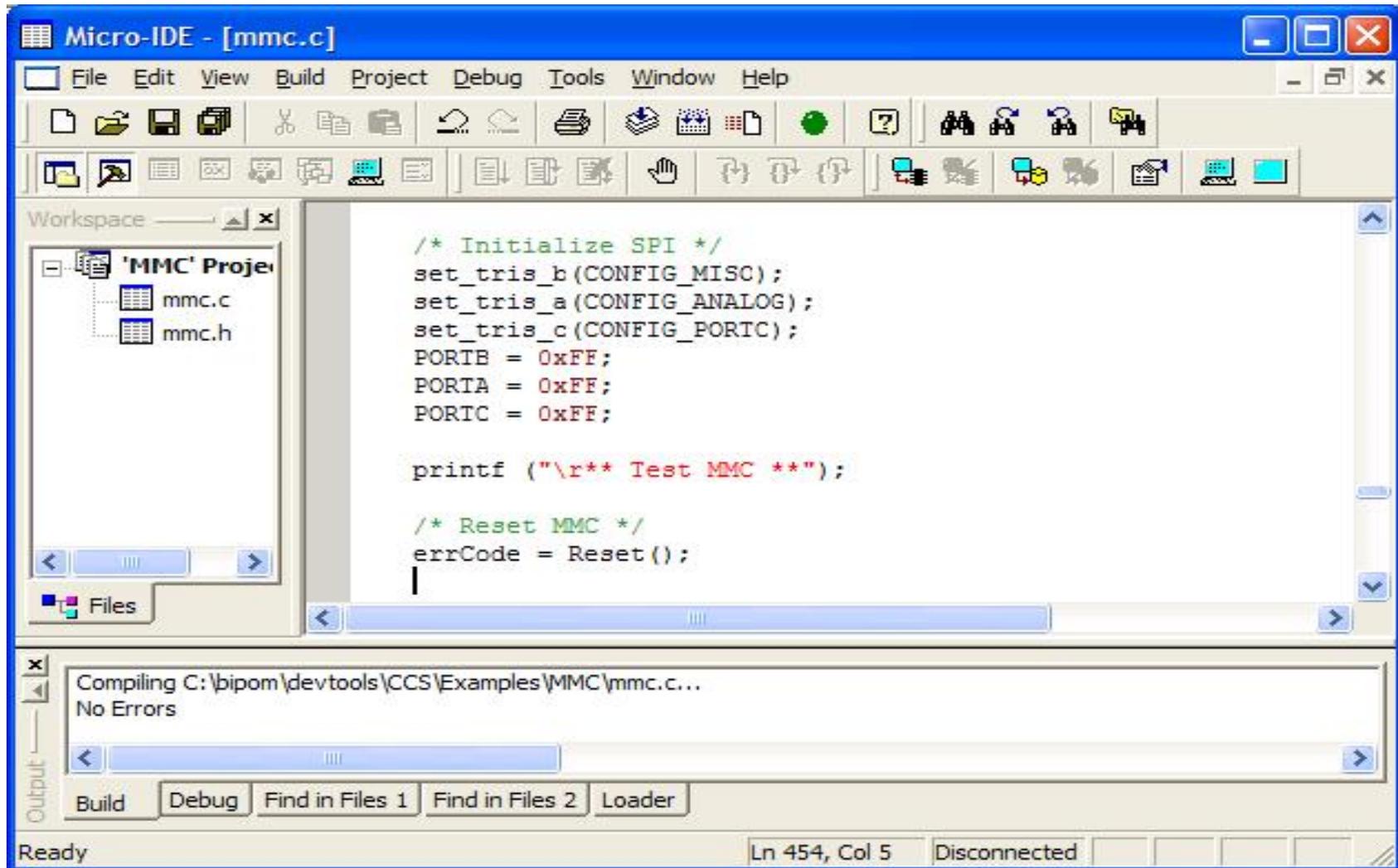
In-Circuit Debuggers

In-Circuit Emulators

Programmiers

Application Notes & Examples

Micro-IDE by BiPOM



Micro-IDE by BiPOM

- Free
- Windows-based Integrated Development Environment
- Editor, Project Manager, Downloader, Terminal
- Syntax Coloring
- Many PIC[®] Examples
- Allows user defined toolkits and downloaders
- Configured for MPASM, CCS C, Microchip C18 C Compilers
- ucLoader: command-line programmer

MPLAB by Microchip

The screenshot displays the MPLAB IDE v8.56 interface. The top menu bar includes File, Edit, View, Project, Debugger, Programmer, Tools, Configure, Window, and Help. The toolbar contains various icons for file operations and debugging. The status bar at the top right shows the checksum as 0x5bd1. The main workspace is divided into several panes:

- Configuration Bits:** A table showing configuration bits set in code.
- Watch:** A table for monitoring variables.
- Special Function Registers:** A table for monitoring SFRs.
- io.mcp:** A file explorer showing the project structure.
- Output:** A window displaying assembly code and status messages.

Configuration Bits Table:

Address	Value	Field	Category	Setting
300001	22	OSC	Oscillator	HS
300002	03	OSCS	Osc. Switch Enable	Disabled
		PUT	Power Up Timer	Disabled
		BODEN	Brown Out Detect	Enabled
300003	0E	BODENV	Brown Out Voltage	4.5V
		WDT	Watchdog Timer	Disabled-Controlled by SWDTEN bit
		WDTPS	Watchdog Postscaler	1:128

Watch Table:

Update	Address	Symbol Name	Value
	F83	PORTD	0x00
	FE8	WREG	0x00

Special Function Registers Table:

Address	SFR Name	Hex
F82	PORTC	0x00
F83	PORTD	0x00
F84	PORTE	0x00
FED	POSTDECO	--
FE5	POSTDEC1	--
FDD	POSTDEC2	--
FEE	POSTINCO	--
FE6	POSTINC1	--
FDE	POSTINC2	--
FCB	PR2	0x00
FEC	PREINCO	--
FE4	PREINC1	--

Assembly Code (io.asm):

```
; Tools: MICRO-IDE
; MPASMWIN 5.37 or higher
;
;
;*****
list p=18f458 ; list directive to define processor
#include <p18f458.inc> ; processor specific variables

CONFIG LVP = OFF , OSC = HS , BOR = ON , BORV = 45 , WDT

COUNT1 RES 2
COUNT2 RES 2

; Program starts here

; Turn comparator function off on PORT D
movlw 07h
movwf CMCON

; Set all PORT B pins as outputs
; Writing a 0 to a TRISB bit makes the corresponding
movlw b'00000000'
movwf TRISB
bsf PORTE, 6 ; prevent reset

; Set all PORT D pins as outputs
; Writing a 0 to a TRISD bit makes the corresponding
movlw b'00000000'
movwf TRISD

; Loop forever
loop cllrf PORTD ;Make all PORT D outputs logic 0
call Delay
movlw b'11111111' ;Put FFh into accumulator
```

The status bar at the bottom shows: PICkit 3, PIC18F458, pc:0, W:0, n ov z dc c, bank 0.

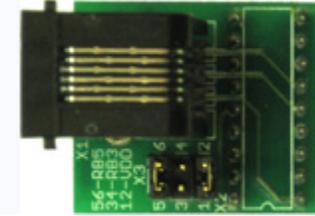
MPLAB by Microchip

- Free
- Windows-based Integrated Development Environment
- Editor, Project Manager, Programmer
- Simulator and Debugger
- Syntax Coloring
- Configured for many language toolkits
- Version Control Support
- Supports ICD2, ICD3, PICKit™ 3

Language Toolkits

- MPASM: Assembler by Microchip
- PASM-MC: BiPOM/Phyton
- MPLAB C Compiler: Microchip
- Flowcode: BiPOM/Matrix Multimedia
- CCS C Compiler: CCS
- Hi-Tech C Compiler: Hi-Tech
- IAR C Compiler: IAR

Debugging Support



- Simulation:
 - MPLAB Simulator: Microchip
 - PDS-MC Simulator: BiPOM/Phyton
- In-Circuit Debugging:
 - ICD2 & ICD3: Microchip
 - PICKit™ 2 & 3: Microchip
- In-Circuit Emulation:
 - PICE-MC: BiPOM/Phyton
 - REAL ICE: Microchip



Programming/Downloading Support

- MINI-MAX/P18 supports direct download
- QuickWriter: BiPOM/Techtools
- PCARD: BiPOM
- ICD2 & ICD3: Microchip
- PICKit™ 2 & 3: Microchip
- PICSTART Plus: Microchip