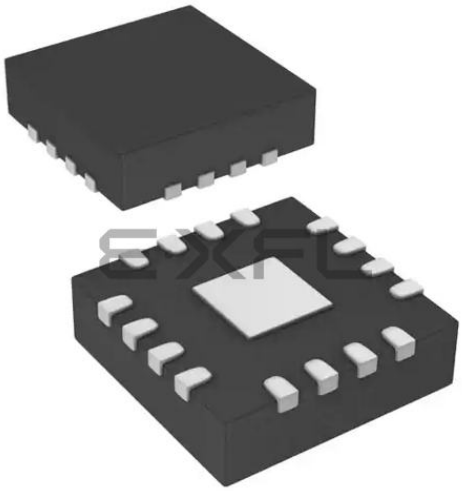

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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	20MHz
Connectivity	-
Peripherals	POR, WDT
Number of I/O	11
Program Memory Size	1.5KB (1K x 12)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	67 x 8
Voltage - Supply (Vcc/Vdd)	2V ~ 5.5V
Data Converters	A/D 4x8b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	16-VFQFN Exposed Pad
Supplier Device Package	16-QFN (3x3)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16f506t-i-mg

NOTES:

4.0 MEMORY ORGANIZATION

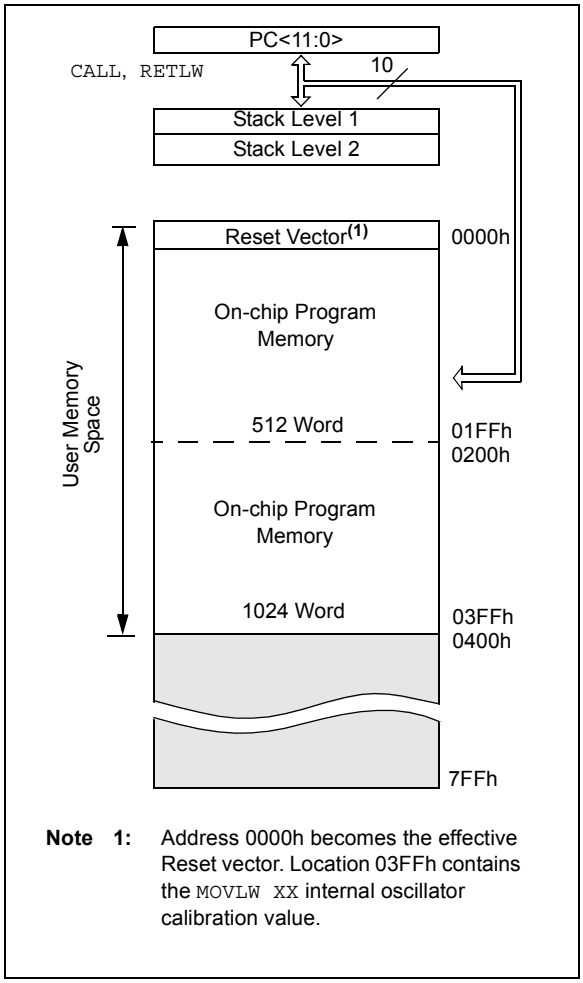
The PIC12F510/16F506 memories are organized into program memory and data memory. For devices with more than 512 bytes of program memory, a paging scheme is used. Program memory pages are accessed using STATUS register bit PA0. For the PIC12F510 and PIC16F506, with data memory register files of more than 32 registers, a banking scheme is used. Data memory banks are accessed using the File Select Register (FSR).

4.1 Program Memory Organization for the PIC12F510/16F506

The PIC12F510/16F506 devices have a 10-bit Program Counter (PC) capable of addressing a 2K x 12 program memory space.

Only the first 1K x 12 (0000h-03FFh) are physically implemented (see Figure 4-1). Accessing a location above these boundaries will cause a wraparound within the 1K x 12 space. The effective Reset vector is a 0000h (see Figure 4-1). Location 03FFh contains the internal clock oscillator calibration value. This value should never be overwritten.

FIGURE 4-1: PROGRAM MEMORY MAP AND STACK FOR THE PIC12F510/16F506



Note 1: Address 0000h becomes the effective Reset vector. Location 03FFh contains the `MOVLW XX` internal oscillator calibration value.

4.4 OPTION Register

The OPTION register is a 8-bit wide, write-only register, that contains various control bits to configure the Timer0/WDT prescaler and Timer0.

By executing the OPTION instruction, the contents of the W register will be transferred to the OPTION register. A Reset sets the OPTION<7:0> bits.

Note 1:	If TRIS bit is set to '0', the wake-up on change and pull-up functions are disabled for that pin (i.e., note that TRIS overrides Option control of $\overline{\text{GPPU}}$/RBPU and $\overline{\text{GPWU}}$/$\overline{\text{RBWU}}$).
2:	If the T0CS bit is set to '1', it will override the TRIS function on the T0CKI pin.

REGISTER 4-3: OPTION_REG: OPTION REGISTER (PIC12F510)

W-1	W-1	W-1	W-1	W-1	W-1	W-1	W-1
$\overline{\text{GPWU}}$	$\overline{\text{GPPU}}$	T0CS	T0SE	PSA	PS2	PS1	PS0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 7 **$\overline{\text{GPWU}}$:** Enable Wake-up On Pin Change bit (GP0, GP1, GP3)
1 = Disabled
0 = Enabled

bit 6 **$\overline{\text{GPPU}}$:** Enable Weak Pull-Ups bit (GP0, GP1, GP3)
1 = Disabled
0 = Enabled

bit 5 **T0CS:** Timer0 Clock Source Select bit
1 = Transition on T0CKI pin
0 = Internal instruction cycle clock (CLKOUT)

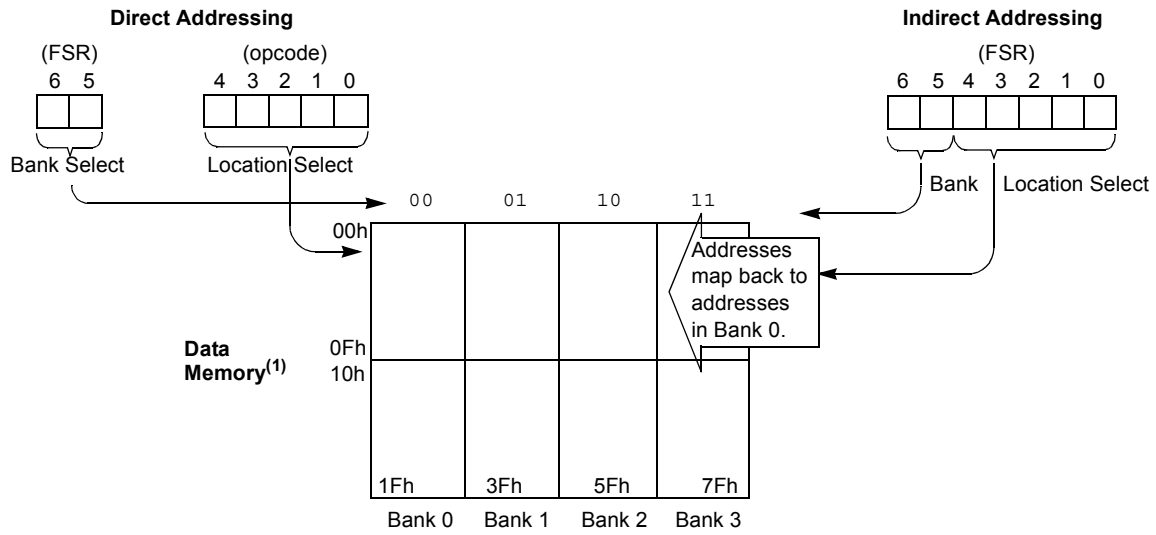
bit 4 **T0SE:** Timer0 Source Edge Select bit
1 = Increment on high-to-low transition on T0CKI pin
0 = Increment on low-to-high transition on T0CKI pin

bit 3 **PSA:** Prescaler Assignment bit
1 = Prescaler assigned to the WDT
0 = Prescaler assigned to Timer0

bit 2-0 **PS<2:0>:** Prescaler Rate Select bits

Bit Value	Timer0 Rate	WDT Rate
000	1 : 2	1 : 1
001	1 : 4	1 : 2
010	1 : 8	1 : 4
011	1 : 16	1 : 8
100	1 : 32	1 : 16
101	1 : 64	1 : 32
110	1 : 128	1 : 64
111	1 : 256	1 : 128

FIGURE 4-6: DIRECT/INDIRECT ADDRESSING (PIC16F506)



Note 1: For register map detail, see Figure 4-3.

5.0 I/O PORT

As with any other register, the I/O register(s) can be written and read under program control. However, read instructions (e.g., `MOVF PORTB, W`) always read the I/O pins independent of the pin's Input/Output modes. On Reset, all I/O ports are defined as input (inputs are at high-impedance) since the I/O control registers are all set.

Note:	On the PIC12F510, I/O PORTB is referenced as GPIO. On the PIC16F506, I/O PORTB is referenced as PORTB.

5.1 PORTB/GPIO

PORTB/GPIO is an 8-bit I/O register. Only the low-order 6 bits are used (RB/GP<5:0>). Bits 7 and 6 are unimplemented and read as '0's. Please note that RB3/GP3 is an input only pin. The Configuration Word can set several I/O's to alternate functions. When acting as alternate functions, the pins will read as '0' during a port read. Pins RB0/GP0, RB1/GP1, RB3/GP3 and RB4 (PIC16F506 only) can be configured with weak pull-up and also for wake-up on change. The wake-up on change and weak pull-up functions are not pin selectable. If RB3/GP3/$\overline{MCLR}$ is configured as $\overline{MCLR}$, weak pull-up is always on and wake-up on change for this pin is not enabled.

5.2 PORTC (PIC16F506 Only)

PORTC is an 8-bit I/O register. Only the low-order 6 bits are used (RC<5:0>). Bits 7 and 6 are unimplemented and read as '0's.

5.3 TRIS Registers

The Output Driver Control register is loaded with the contents of the W register by executing the `TRIS f` instruction. A '1' from a TRIS register bit puts the corresponding output driver in a High-Impedance mode. A '0' puts the contents of the output data latch on the selected pins, enabling the output buffer. The exception is RB3/GP3, which are input only, and the T0CKI pin, which may be controlled by the OPTION register. See Register 4-3.

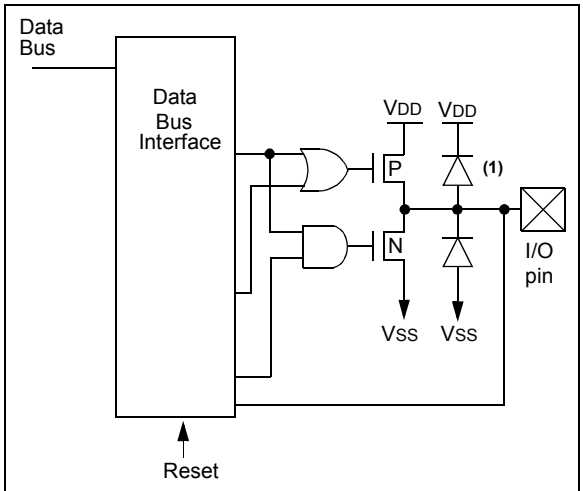
Note:	A read of the port reads the pins, not the output data latches. That is, if an output driver on a pin is enabled and driven high but the external system is holding it low, a read of the port will indicate that the pin is low.

Note:	The TRIS registers are write-only and are set (output drivers disabled) upon Reset.

5.4 I/O Interfacing

The equivalent circuit for an I/O port pin is shown in Figure 5-1. All port pins, except RB3/GP3 which is input only, may be used for both input and output operations. For input operations, these ports are non-latching. Any input must be present until read by an input instruction (e.g., `MOVF PORTB, W`). The outputs are latched and remain unchanged until the output latch is rewritten. To use a port pin as output, the corresponding direction control bit in TRIS must be cleared (= `0`). For use as an input, the corresponding TRIS bit must be set. Any I/O pin (except RB3/GP3) can be programmed individually as input or output.

FIGURE 5-1: PIC12F510/16F506 EQUIVALENT CIRCUIT FOR PIN DRIVE(2)



Note 1: GP3/RB3 has protection diode to VSS only.

2: For pin specific information, see Figure 5-2 through Figure 5-13.

NOTES:

7.0 COMPARATOR(S)

The PIC12F510 contains one analog comparator module. The PIC16F506 contains two comparators and a comparator voltage reference.

REGISTER 7-1: CM1CON0: COMPARATOR C1 CONTROL REGISTER (PIC12F510)

R-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
C1OUT	$\overline{\text{C1OUTEN}}$	C1POL	$\overline{\text{C1T0CS}}$	C1ON	C1NREF	C1PREF	$\overline{\text{C1WU}}$
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 7 **C1OUT:** Comparator Output bit
1 = $V_{IN+} > V_{IN-}$
0 = $V_{IN+} < V_{IN-}$

bit 6 **$\overline{\text{C1OUTEN}}$:** Comparator Output Enable bit(1), (2)
1 = Output of comparator is NOT placed on the C1OUT pin
0 = Output of comparator is placed in the C1OUT pin

bit 5 **C1POL:** Comparator Output Polarity bit(2)
1 = Output of comparator is not inverted
0 = Output of comparator is inverted

bit 4 **$\overline{\text{C1T0CS}}$:** Comparator TMR0 Clock Source bit(2)
1 = TMR0 clock source selected by T0CS control bit
0 = Comparator output used as TMR0 clock source

bit 3 **C1ON:** Comparator Enable bit
1 = Comparator is on
0 = Comparator is off

bit 2 **C1NREF:** Comparator Negative Reference Select bit(2)
1 = C1IN- pin
0 = 0.6V internal reference

bit 1 **C1PREF:** Comparator Positive Reference Select bit(2)
1 = C1IN+ pin
0 = C1IN- pin

bit 0 **$\overline{\text{C1WU}}$:** Comparator Wake-up On Change Enable bit(2)
1 = Wake-up On Comparator Change is disabled
0 = Wake-up On Comparator Change is enabled

Note 1: Overrides T0CS bit for TRIS control of RB2.
2: When comparator is turned on, these control bits assert themselves.

REGISTER 7-3: CM2CON0: COMPARATOR C2 CONTROL REGISTER (PIC16F506)

R-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
C2OUT	$\overline{\text{C2OUTEN}}$	C2POL	C2PREF2	C2ON	C2NREF	C2PREF1	$\overline{\text{C2WU}}$
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 7 **C2OUT:** Comparator Output bit
1 = $V_{IN+} > V_{IN-}$
0 = $V_{IN+} < V_{IN-}$

bit 6 **$\overline{\text{C2OUTEN}}$:** Comparator Output Enable bit(1), (2)
1 = Output of comparator is NOT placed on the C2OUT pin
0 = Output of comparator is placed in the C2OUT pin

bit 5 **C2POL:** Comparator Output Polarity bit(2)
1 = Output of comparator not inverted
0 = Output of comparator inverted

bit 4 **C2PREF2:** Comparator Positive Reference Select bit(2)
1 = C1IN+ pin
0 = C2IN- pin

bit 3 **C2ON:** Comparator Enable bit
1 = Comparator is on
0 = Comparator is off

bit 2 **C2NREF:** Comparator Negative Reference Select bit(2)
1 = C2IN- pin
0 = CV_{REF}

bit 1 **C2PREF1:** Comparator Positive Reference Select bit(2)
1 = C2IN+ pin
0 = C2PREF2 controls analog input selection

bit 0 **$\overline{\text{C2WU}}$:** Comparator Wake-up on Change Enable bit(2)
1 = Wake-up on Comparator change is disabled
0 = Wake-up on Comparator change is enabled.

Note 1: Overrides TOCS bit for TRIS control of RC4.

2: When comparator is turned on, these control bits assert themselves. Otherwise, the other registers have precedence.

DECF	Decrement f
Syntax:	[*label*] DECF f,d
Operands:	$0 \le f \le 31$ $d \in [0,1]$
Operation:	(f) – 1 → (dest)
Status Affected:	Z
Description:	Decrement register ‘f’. If ‘d’ is ‘0’, the result is stored in the W register. If ‘d’ is ‘1’, the result is stored back in register ‘f’.

DECFSZ	Decrement f, Skip if 0
Syntax:	[*label*] DECFSZ f,d
Operands:	$0 \le f \le 31$ $d \in [0,1]$
Operation:	(f) – 1 → d; skip if result = 0
Status Affected:	None
Description:	The contents of register ‘f’ are decremented. If ‘d’ is ‘0’, the result is placed in the W register. If ‘d’ is ‘1’, the result is placed back in register ‘f’. If the result is ‘0’, the next instruction, which is already fetched, is discarded and a NOP is executed instead making it a two-cycle instruction.

GOTO	Unconditional Branch
Syntax:	[*label*] GOTO k
Operands:	$0 \le k \le 511$
Operation:	k → PC<8:0>; STATUS <6:5> → PC<10:9>
Status Affected:	None
Description:	GOTO is an unconditional branch. The 9-bit immediate value is loaded into PC bits <8:0>. The upper bits of PC are loaded from STATUS <6:5>. GOTO is a two-cycle instruction.

INCF	Increment f
Syntax:	[*label*] INCF f,d
Operands:	$0 \le f \le 31$ $d \in [0,1]$
Operation:	(f) + 1 → (dest)
Status Affected:	Z
Description:	The contents of register ‘f’ are incremented. If ‘d’ is ‘0’, the result is placed in the W register. If ‘d’ is ‘1’, the result is placed back in register ‘f’.

INCFSZ	Increment f, Skip if 0
Syntax:	[*label*] INCFSZ f,d
Operands:	$0 \le f \le 31$ $d \in [0,1]$
Operation:	(f) + 1 → (dest), skip if result = 0
Status Affected:	None
Description:	The contents of register ‘f’ are incremented. If ‘d’ is ‘0’, the result is placed in the W register. If ‘d’ is ‘1’, the result is placed back in register ‘f’. If the result is ‘0’, then the next instruction, which is already fetched, is discarded and a NOP is executed instead making it a two-cycle instruction.

IORLW	Inclusive OR literal with W
Syntax:	[*label*] IORLW k
Operands:	$0 \le k \le 255$
Operation:	(W) .OR. (k) → (W)
Status Affected:	Z
Description:	The contents of the W register are OR’ed with the eight-bit literal ‘k’. The result is placed in the W register.

12.0 DEVELOPMENT SUPPORT

The PIC® microcontrollers are supported with a full range of hardware and software development tools:

- Integrated Development Environment
  - MPLAB® IDE Software
- Assemblers/Compilers/Linkers
  - MPASM™ Assembler
  - MPLAB C18 and MPLAB C30 C Compilers
  - MPLINK™ Object Linker/ MPLIB™ Object Librarian
  - MPLAB ASM30 Assembler/Linker/Library
- Simulators
  - MPLAB SIM Software Simulator
- Emulators
  - MPLAB ICE 2000 In-Circuit Emulator
  - MPLAB REAL ICE™ In-Circuit Emulator
- In-Circuit Debugger
  - MPLAB ICD 2
- Device Programmers
  - PICSTART® Plus Development Programmer
  - MPLAB PM3 Device Programmer
  - PICkit™ 2 Development Programmer
- Low-Cost Demonstration and Development Boards and Evaluation Kits

12.1 MPLAB Integrated Development Environment Software

The MPLAB IDE software brings an ease of software development previously unseen in the 8/16-bit microcontroller market. The MPLAB IDE is a Windows® operating system-based application that contains:

- A single graphical interface to all debugging tools
  - Simulator
  - Programmer (sold separately)
  - Emulator (sold separately)
  - In-Circuit Debugger (sold separately)
- A full-featured editor with color-coded context
- A multiple project manager
- Customizable data windows with direct edit of contents
- High-level source code debugging
- Visual device initializer for easy register initialization
- Mouse over variable inspection
- Drag and drop variables from source to watch windows
- Extensive on-line help
- Integration of select third party tools, such as HI-TECH Software C Compilers and IAR C Compilers

The MPLAB IDE allows you to:

- Edit your source files (either assembly or C)
- One touch assemble (or compile) and download to PIC MCU emulator and simulator tools (automatically updates all project information)
- Debug using:
  - Source files (assembly or C)
  - Mixed assembly and C
  - Machine code

MPLAB IDE supports multiple debugging tools in a single development paradigm, from the cost-effective simulators, through low-cost in-circuit debuggers, to full-featured emulators. This eliminates the learning curve when upgrading to tools with increased flexibility and power.

12.11 PICSTART Plus Development Programmer

The PICSTART Plus Development Programmer is an easy-to-use, low-cost, prototype programmer. It connects to the PC via a COM (RS-232) port. MPLAB Integrated Development Environment software makes using the programmer simple and efficient. The PICSTART Plus Development Programmer supports most PIC devices in DIP packages up to 40 pins. Larger pin count devices, such as the PIC16C92X and PIC17C76X, may be supported with an adapter socket. The PICSTART Plus Development Programmer is CE compliant.

12.12 PICkit 2 Development Programmer

The PICkit™ 2 Development Programmer is a low-cost programmer and selected Flash device debugger with an easy-to-use interface for programming many of Microchip's baseline, mid-range and PIC18F families of Flash memory microcontrollers. The PICkit 2 Starter Kit includes a prototyping development board, twelve sequential lessons, software and HI-TECH's PICC™ Lite C compiler, and is designed to help get up to speed quickly using PIC® microcontrollers. The kit provides everything needed to program, evaluate and develop applications using Microchip's powerful, mid-range Flash memory family of microcontrollers.

12.13 Demonstration, Development and Evaluation Boards

A wide variety of demonstration, development and evaluation boards for various PIC MCUs and dsPIC DSCs allows quick application development on fully functional systems. Most boards include prototyping areas for adding custom circuitry and provide application firmware and source code for examination and modification.

The boards support a variety of features, including LEDs, temperature sensors, switches, speakers, RS-232 interfaces, LCD displays, potentiometers and additional EEPROM memory.

The demonstration and development boards can be used in teaching environments, for prototyping custom circuits and for learning about various microcontroller applications.

In addition to the PICDEM™ and dsPICDEM™ demonstration/development board series of circuits, Microchip has a line of evaluation kits and demonstration software for analog filter design, KEELOQ® security ICs, CAN, IrDA®, PowerSmart® battery management, SEEVAL® evaluation system, Sigma-Delta ADC, flow rate sensing, plus many more.

Check the Microchip web page (www.microchip.com) and the latest *"Product Selector Guide"* (DS00148) for the complete list of demonstration, development and evaluation kits.

13.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Ambient temperature under bias ..... -40°C to +125°C
Storage temperature ..... -65°C to +150°C
Voltage on V_{DD} with respect to V_{SS} ..... 0 to +7.0V
Voltage on $\overline{MCLR}$ with respect to V_{SS} ..... 0 to +14V
Voltage on all other pins with respect to V_{SS} ..... -0.3V to (V_{DD} + 0.3V)
Total power dissipation(1) ..... 700 mW
Max. current out of V_{SS} pin ..... 200 mA
Max. current into V_{DD} pin ..... 150 mA
Input clamp current, I_{IK} (V_I < 0 or V_I > V_{DD}) ..... ±20 mA
Output clamp current, I_{OK} (V_O < 0 or V_O > V_{DD}) ..... ±20 mA
Max. output current sunk by any I/O pin ..... 25 mA
Max. output current sourced by any I/O pin ..... 25 mA
Max. output current sourced by I/O port ..... 100 mA
Max. output current sunk by I/O port ..... 100 mA

Note 1: Power dissipation is calculated as follows: $P_{DIS} = V_{DD} \times \{I_{DD} - \sum I_{OH}\} + \sum \{(V_{DD}-V_{OH}) \times I_{OH}\} + \sum(V_{OL} \times I_{OL})$

†NOTICE: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

13.1 DC Characteristics: PIC12F510/16F506 (Industrial)

DC Characteristics			Standard Operating Conditions (unless otherwise specified) Operating Temperature 40°C ≤ TA ≤ +85°C (industrial)				
Param No.	**Sym**	**Characteristic**	**Min**	**Typ(1)**	**Max**	**Units**	**Conditions**
D001	VDD	**Supply Voltage**	2.0		5.5	V	See **Figure 14-1**
D002	VDR	**RAM Data Retention Voltage(2)**	—	1.5*	—	V	Device in Sleep mode
D003	VPOR	**VDD Start Voltage** to ensure Power-on Reset	—	Vss	—	V	See **Section 10.4 "Power-on Reset (POR)"** for details
D004	SVDD	**VDD Rise Rate** to ensure Power-on Reset	0.05*	—	—	V/ms	See **Section 10.4 "Power-on Reset (POR)"** for details
D010	IDD	**Supply Current(3,4)**	— —	175 0.625	275 1.1	µA mA	FOSC = 4 MHz, VDD = 2.0V FOSC = 4 MHz, VDD = 5.0V
			— —	250 1.0	450 1.5	µA mA	FOSC = 8 MHz, VDD = 2.0V FOSC = 8 MHz, VDD = 5.0V
			—	1.4	2.0	mA	FOSC = 20 MHz, VDD = 5.0V
			— —	11 38	15 52	µA µA	FOSC = 32 kHz, VDD = 2.0V FOSC = 32 kHz, VDD = 5.0V
D020	IPD	**Power-down Current(5)**	— —	0.1 0.35	1.2 2.4	µA µA	VDD = 2.0V VDD = 5.0V
D022	IWDT	**WDT Current(5)**	— —	1.0 7.0	3.0 16.0	µA µA	VDD = 2.0V VDD = 5.0V
D023	ICMP	**Comparator Current(5)**	— —	15 55	22 67	µA µA	VDD = 2.0V (per comparator) VDD = 5.0V (per comparator)
D022	ICVREF	**CVREF Current(5)**	— —	30 75	60 125	µA µA	VDD = 2.0V (high range) VDD = 5.0V (high range)
D023	IFVR	**Internal 0.6V Fixed Voltage Reference Current(5)**	— —	85 175	120 205	µA µA	VDD = 2.0V (0.6V reference and 1 comparator enabled) VDD = 5.0V (0.6V reference and 1 comparator enabled)
D024	ΔIAD	**A/D Conversion Current(5)**	—	120	150	µA	2.0V
			—	200	250	µA	5.0V

* These parameters are characterized but not tested.

Note 1: Data in the Typical ("Typ") column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

2: This is the limit to which VDD can be lowered in Sleep mode without losing RAM data.

3: The supply current is mainly a function of the operating voltage and frequency. Other factors such as bus loading, oscillator type, bus rate, internal code execution pattern and temperature also have an impact on the current consumption.

4: The test conditions for all IDD measurements in active operation mode are: OSC1 = external square wave, from rail-to-rail; all I/O pins tri-stated, pulled to VSS, T0CKI = VDD, $\overline{\text{MCLR}}$ = VDD; WDT enabled/disabled as specified.

5: For standby current measurements, the conditions are the same as IDD, except that the device is in Sleep mode. If a module current is listed, the current is for that specific module enabled and the device in Sleep.

6: Does not include current through REXT. The current through the resistor can be estimated by the formula: I = VDD/2REXT (mA) with REXT in kΩ.

TABLE 13-7: RESET, WATCHDOG TIMER AND DEVICE RESET TIMER

AC CHARACTERISTICS			Standard Operating Conditions (unless otherwise specified) Operating Temperature -40°C ≤ TA ≤ +85°C (industrial) -40°C ≤ TA ≤ +125°C (extended)				
Param No.	**Sym**	**Characteristic**	**Min**	**Typ(1)**	**Max**	**Units**	**Conditions**
30	TMCL	$\overline{MCLR}$ Pulse Width (low)	2000*	—	—	ns	VDD = 5.0V
31	TWDT	Watchdog Timer Time-out Period (No Prescaler)	9* 9*	18* 18*	30* 40*	ms ms	VDD = 5.0V (Industrial) VDD = 5.0V (Extended)
32	TDRT	Device Reset Timer Period					
		Standard	9* 9*	18* 18*	30* 40*	ms ms	VDD = 5.0V (Industrial) VDD = 5.0V (Extended)
		Short	0.5* 0.5*	1.125* 1.125*	2* 2.5*	ms ms	VDD = 5.0V (Industrial) VDD = 5.0V (Extended)
34	TIOZ	I/O high-impedance from $\overline{MCLR}$ low	—	—	2000*	ns	

* These parameters are characterized but not tested.

Note 1: Data in the Typical ("Typ") column is at 5V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

FIGURE 13-9: TIMER0 CLOCK TIMINGS

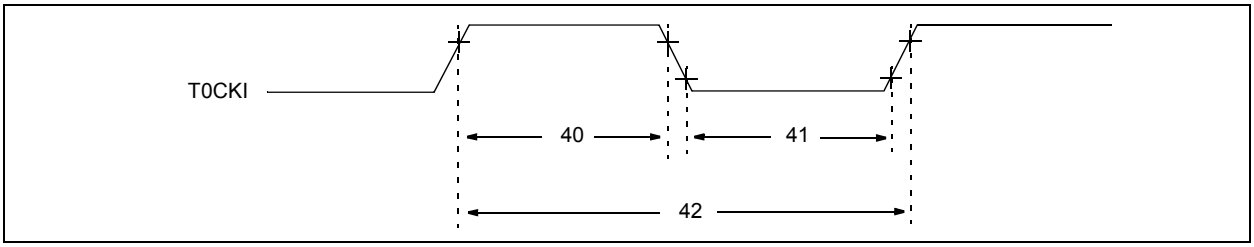


TABLE 13-8: TIMER0 CLOCK REQUIREMENTS

AC CHARACTERISTICS				Standard Operating Conditions (unless otherwise specified) Operating Temperature -40°C ≤ TA ≤ +85°C (industrial) -40°C ≤ TA ≤ +125°C (extended)				
Parm No.	**Sym**	**Characteristic**		**Min**	**Typ(1)**	**Max**	**Units**	**Conditions**
40	Tt0H	T0CKI High Pulse Width	No Prescaler	0.5 TCY + 20*	—	—	ns	
			With Prescaler	10*	—	—	ns	
41	Tt0L	T0CKI Low Pulse Width	No Prescaler	0.5 TCY + 20*	—	—	ns	
			With Prescaler	10*	—	—	ns	
42	Tt0P	T0CKI Period		20 or TCY + 40* N	—	—	ns	Whichever is greater. N = Prescale Value (1, 2, 4,..., 256)

* These parameters are characterized but not tested.

Note 1: Data in the Typical ("Typ") column is at 5V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

TABLE 13-9: PULL-UP RESISTOR RANGES

VDD (Volts)	Temperature (°C)	Min	Typ	Max	Units
RB0 (GP0)/RB1 (GP1)					
2.0	-40	73K	105K	186K	Ω
	25	73K	113K	187K	Ω
	85	82K	123K	190K	Ω
	125	86K	132k	190K	Ω
5.5	-40	15K	21K	33K	Ω
	25	15K	22K	34K	Ω
	85	19K	26k	35K	Ω
	125	23K	29K	35K	Ω
RB3 (GP3)					
2.0	-40	63K	81K	96K	Ω
	25	77K	93K	116K	Ω
	85	82K	96k	116K	Ω
	125	86K	100K	119K	Ω
5.5	-40	16K	20k	22K	Ω
	25	16K	21K	23K	Ω
	85	24K	25k	28K	Ω
	125	26K	27K	29K	Ω

FIGURE 14-2: TYPICAL IPD vs. VDD (SLEEP MODE, ALL PERIPHERALS DISABLED)

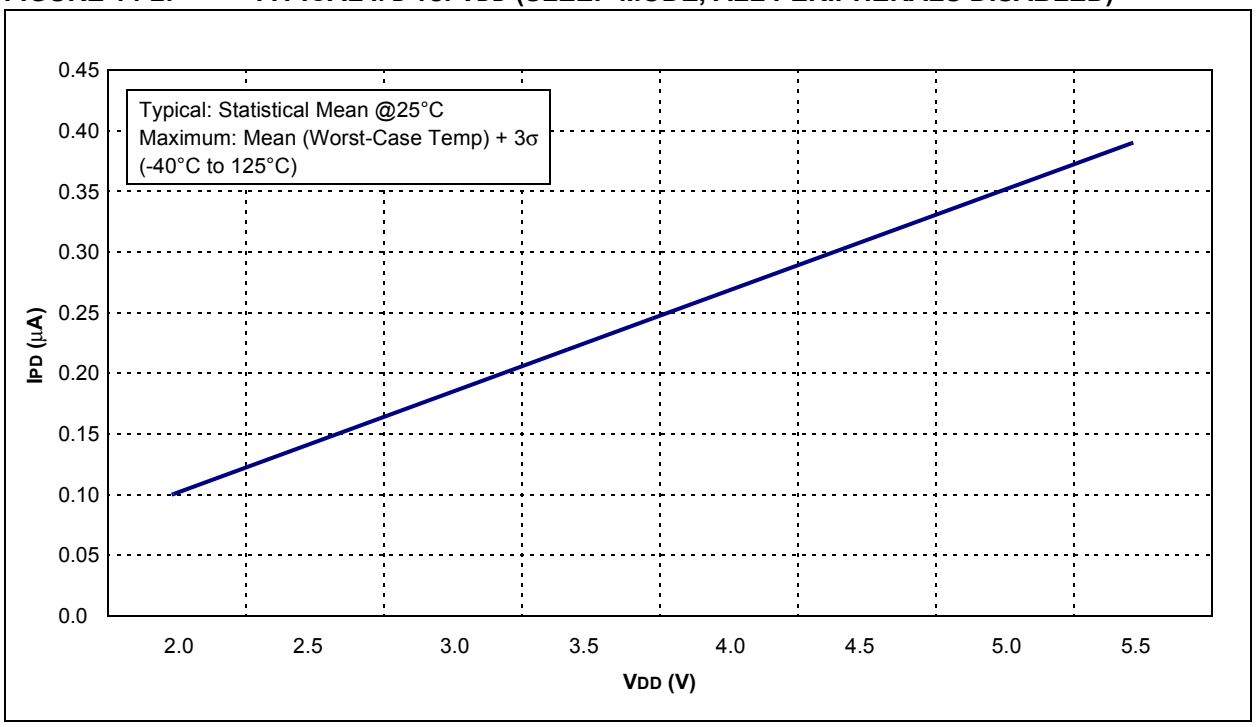
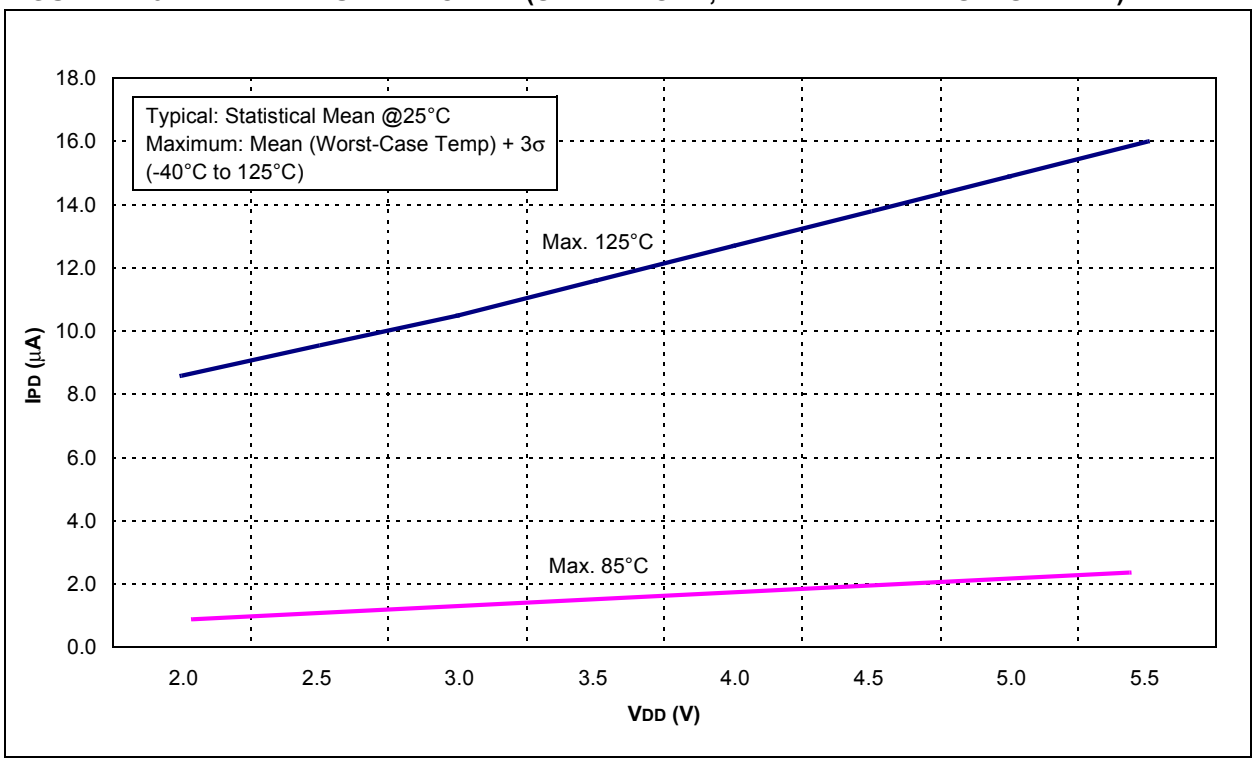


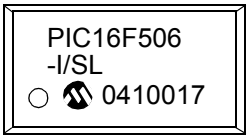
FIGURE 14-3: MAXIMUM IPD vs. VDD (SLEEP MODE, ALL PERIPHERALS DISABLED)



15.2 Package Marking Information (Cont'd)

14-Lead SOIC (3.90 mm)

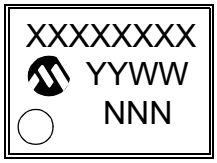
Example



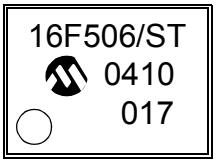
8-Lead MSOP

Example

14-Lead TSSOP (4.4 mm)

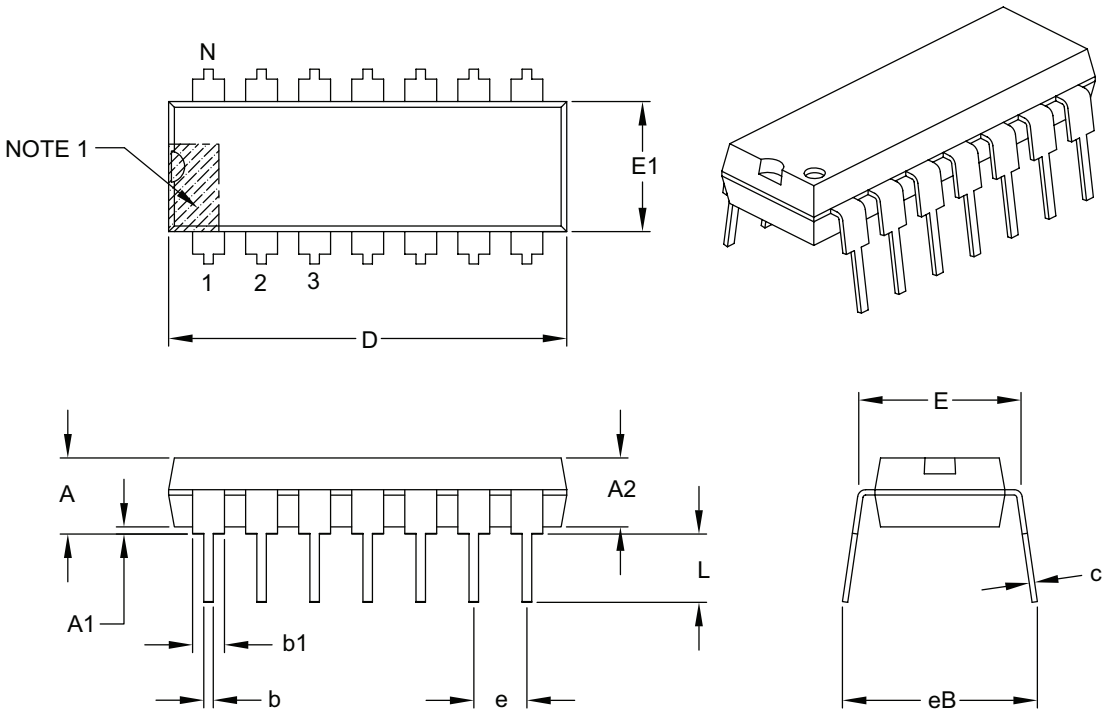


Example



14-Lead Plastic Dual In-Line (P) – 300 mil Body [PDIP]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		INCHES		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		14	
Pitch	e		.100 BSC	
Top to Seating Plane	A	–	–	.210
Molded Package Thickness	A2	.115	.130	.195
Base to Seating Plane	A1	.015	–	–
Shoulder to Shoulder Width	E	.290	.310	.325
Molded Package Width	E1	.240	.250	.280
Overall Length	D	.735	.750	.775
Tip to Seating Plane	L	.115	.130	.150
Lead Thickness	c	.008	.010	.015
Upper Lead Width	b1	.045	.060	.070
Lower Lead Width	b	.014	.018	.022
Overall Row Spacing §	eB	–	–	.430

Notes:

1. Pin 1 visual index feature may vary, but must be located with the hatched area.
2. § Significant Characteristic.
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
4. Dimensioning and tolerancing per ASME Y14.5M.

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-005B

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