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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 "<u>Embedded -</u> <u>Microcontrollers</u>"

Details

Product Status	Active
Core Processor	PIC
Core Size	8-Bit
Speed	4MHz
Connectivity	-
Peripherals	POR, WDT
Number of I/O	20
Program Memory Size	3KB (2K x 12)
Program Memory Type	ОТР
EEPROM Size	-
RAM Size	72 x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 6.25V
Data Converters	-
Oscillator Type	External
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Through Hole
Package / Case	28-DIP (0.300", 7.62mm)
Supplier Device Package	28-SPDIP
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16c57-xt-sp

Email: info@E-XFL.COM

Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong

4.4 RC Oscillator

For timing insensitive applications, the RC device option offers additional cost savings. The RC oscillator frequency is a function of the supply voltage, the resistor (REXT) and capacitor (CEXT) values, and the operating temperature. In addition to this, the oscillator frequency will vary from unit to unit due to normal process parameter variation. Furthermore, the difference in lead frame capacitance between package types will also affect the oscillation frequency, especially for low CEXT values. The user also needs to take into account variation due to tolerance of external R and C components used.

Figure 4-5 shows how the R/C combination is connected to the PIC16C5X. For REXT values below 2.2 k Ω , the oscillator operation may become unstable, or stop completely. For very high REXT values (e.g., 1 M Ω) the oscillator becomes sensitive to noise, humidity and leakage. Thus, we recommend keeping REXT between 3 k Ω and 100 k Ω .

Although the oscillator will operate with no external capacitor (CEXT = 0 pF), we recommend using values above 20 pF for noise and stability reasons. With no or small external capacitance, the oscillation frequency can vary dramatically due to changes in external capacitances, such as PCB trace capacitance or package lead frame capacitance.

The Electrical Specifications sections show RC frequency variation from part to part due to normal process variation. The variation is larger for larger R (since leakage current variation will affect RC frequency more for large R) and for smaller C (since variation of input capacitance will affect RC frequency more).

Also, see the Electrical Specifications sections for variation of oscillator frequency due to VDD for given REXT/ CEXT values as well as frequency variation due to operating temperature for given R, C, and VDD values.

The oscillator frequency, divided by 4, is available on the OSC2/CLKOUT pin, and can be used for test purposes or to synchronize other logic.



Note: If you change from this device to another device, please verify oscillator characteristics in your application.

7.0 I/O PORTS

As with any other register, the I/O Registers 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 hi-impedance) since the I/O control registers (TRISA, TRISB, TRISC) are all set.

7.1 PORTA

PORTA is a 4-bit I/O Register. Only the low order 4 bits are used (RA<3:0>). Bits 7-4 are unimplemented and read as '0's.

7.2 PORTB

PORTB is an 8-bit I/O Register (PORTB<7:0>).

7.3 PORTC

PORTC is an 8-bit I/O Register for PIC16C55, PIC16C57 and PIC16CR57.

PORTC is a General Purpose Register for PIC16C54, PIC16CR54, PIC16CR56, PIC16CR56, PIC16CS8 and PIC16CR58.

7.4 TRIS Registers

The Output Driver Control Registers are 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 hi-impedance (input) mode. A '0' puts the contents of the output data latch on the selected pins, enabling the output buffer.

Note:	A read of the ports 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.

The TRIS Registers are "write-only" and are set (output drivers disabled) upon RESET.

TABLE 7-1:	SUMMARY O	F PORT	REGISTERS
			LOIOI LIVO

Value on Value on Bit 4 Bit 3 Bit 1 Bit 0 MCLR and Address Name Bit 7 Bit 6 Bit 5 Bit 2 Power-On Reset WDT Reset TRIS N/A I/O Control Registers (TRISA, TRISB, TRISC) 1111 1111 1111 1111 05h PORTA RA3 RA2 RA1 RA0 _ _ _ _ xxxx _ _ _ _ uuuu PORTB 06h RB7 RB6 RB5 RB4 RB3 RB2 RB1 RB0 XXXX XXXX uuuu uuuu 07h PORTC RC7 RC6 RC5 RC4 RC3 RC2 RC1 RC0 XXXX XXXX uuuu uuuu

Legend: x = unknown, u = unchanged, - = unimplemented, read as '0', Shaded cells = unimplemented, read as '0'

7.5 I/O Interfacing

The equivalent circuit for an I/O port pin is shown in Figure 7-1. All ports may be used for both input and output operation. 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 TRISA, TRISB, TRISC) must be cleared (= 0). For use as an input, the corresponding TRIS bit must be set. Any I/O pin can be programmed individually as input or output.

FIGURE 7-1: EQUIVALENT CIRCUIT FOR A SINGLE I/O PIN



8.2 Prescaler

An 8-bit counter is available as a prescaler for the Timer0 module, or as a postscaler for the Watchdog Timer (WDT), respectively (Section 9.2.1). For simplicity, this counter is being referred to as "prescaler" throughout this data sheet. Note that the prescaler may be used by either the Timer0 module or the WDT, but not both. Thus, a prescaler assignment for the Timer0 module means that there is no prescaler for the WDT, and vice-versa.

The PSA and PS<2:0> bits (OPTION<3:0>) determine prescaler assignment and prescale ratio.

When assigned to the Timer0 module, all instructions writing to the TMR0 register (e.g., CLRF 1, MOVWF 1, BSF 1, x, etc.) will clear the prescaler. When assigned to WDT, a CLRWDT instruction will clear the prescaler along with the WDT. The prescaler is neither readable nor writable. On a RESET, the prescaler contains all '0's.

8.2.1 SWITCHING PRESCALER ASSIGNMENT

The prescaler assignment is fully under software control (i.e., it can be changed "on the fly" during program execution). To avoid an unintended device RESET, the following instruction sequence (Example 8-1) must be executed when changing the prescaler assignment from Timer0 to the WDT.

EXAMPLE 8-1: CHANGING PRESCALER (TIMER0→WDT)

CLRWDT	;Clear WDT
CLRF TMR0	;Clear TMR0 & Prescaler
MOVLW B'00xx1111'	;Last 3 instructions in
	this example
OPTION	;are required only if
	;desired
CLRWDT	;PS<2:0> are 000 or
	;001
MOVLW B'00xx1xxx'	;Set Prescaler to
OPTION	;desired WDT rate

To change prescaler from the WDT to the Timer0 module, use the sequence shown in Example 8-2. This sequence must be used even if the WDT is disabled. A CLRWDT instruction should be executed before switching the prescaler.

EXAMPLE 8-2: CHANGING PRESCALER (WDT \rightarrow TIMER0)

CLRWDT		;Clear WDT and
		;prescaler
MOVLW	B'xxxx0xxx'	;Select TMR0, new
		;prescale value and
		;clock source

OPTION

11.4 MPLINK Object Linker/ MPLIB Object Librarian

The MPLINK object linker combines relocatable objects created by the MPASM assembler and the MPLAB C17 and MPLAB C18 C compilers. It can also link relocatable objects from pre-compiled libraries, using directives from a linker script.

The MPLIB object librarian is a librarian for precompiled code to be used with the MPLINK object linker. When a routine from a library is called from another source file, only the modules that contain that routine will be linked in with the application. This allows large libraries to be used efficiently in many different applications. The MPLIB object librarian manages the creation and modification of library files.

The MPLINK object linker features include:

- Integration with MPASM assembler and MPLAB C17 and MPLAB C18 C compilers.
- Allows all memory areas to be defined as sections to provide link-time flexibility.

The MPLIB object librarian features include:

- Easier linking because single libraries can be included instead of many smaller files.
- Helps keep code maintainable by grouping related modules together.
- Allows libraries to be created and modules to be added, listed, replaced, deleted or extracted.

11.5 MPLAB SIM Software Simulator

The MPLAB SIM software simulator allows code development in a PC-hosted environment by simulating the PIC series microcontrollers on an instruction level. On any given instruction, the data areas can be examined or modified and stimuli can be applied from a file, or user-defined key press, to any of the pins. The execution can be performed in single step, execute until break, or trace mode.

The MPLAB SIM simulator fully supports symbolic debugging using the MPLAB C17 and the MPLAB C18 C compilers and the MPASM assembler. The software simulator offers the flexibility to develop and debug code outside of the laboratory environment, making it an excellent multiproject software development tool.

11.6 MPLAB ICE High Performance Universal In-Circuit Emulator with MPLAB IDE

The MPLAB ICE universal in-circuit emulator is intended to provide the product development engineer with a complete microcontroller design tool set for PIC microcontrollers (MCUs). Software control of the MPLAB ICE in-circuit emulator is provided by the MPLAB Integrated Development Environment (IDE), which allows editing, building, downloading and source debugging from a single environment.

The MPLAB ICE 2000 is a full-featured emulator system with enhanced trace, trigger and data monitoring features. Interchangeable processor modules allow the system to be easily reconfigured for emulation of different processors. The universal architecture of the MPLAB ICE in-circuit emulator allows expansion to support new PIC microcontrollers.

The MPLAB ICE in-circuit emulator system has been designed as a real-time emulation system, with advanced features that are generally found on more expensive development tools. The PC platform and Microsoft[®] Windows environment were chosen to best make these features available to you, the end user.

11.7 ICEPIC In-Circuit Emulator

The ICEPIC low cost, in-circuit emulator is a solution for the Microchip Technology PIC16C5X, PIC16C6X, PIC16C7X and PIC16CXXX families of 8-bit One-Time-Programmable (OTP) microcontrollers. The modular system can support different subsets of PIC16C5X or PIC16CXXX products through the use of interchangeable personality modules, or daughter boards. The emulator is capable of emulating without target application circuitry being present.

12.5 DC Characteristics: PIC16C54/55/56/57-RCE, XTE, 10E, HSE, LPE (Extended)

DC CHARACTERISTICS		Standard Operating Conditions (unless otherwise specified)Operating Temperature $-40^{\circ}C \le TA \le +125^{\circ}C$ for extended					
Param No.	Symbol	Characteristic	Min	Тур†	Мах	Units	Conditions
D030	Vil	Input Low Voltage I/O ports MCLR (Schmitt Trigger) T0CKI (Schmitt Trigger) OSC1 (Schmitt Trigger) OSC1 (Schmitt Trigger)	Vss Vss Vss Vss Vss Vss		0.15 VDD 0.15 VDD 0.15 VDD 0.15 VDD 0.15 VDD 0.3 VDD		Pin at hi-impedance PIC16C5X-RC only ⁽³⁾ PIC16C5X-XT, 10, HS, LP
D040	Vih	Input High Voltage I/O ports I/O ports I/O ports MCLR (Schmitt Trigger) T0CKI (Schmitt Trigger) OSC1 (Schmitt Trigger) OSC1 (Schmitt Trigger)	0.45 VDD 2.0 0.36 VDD 0.85 VDD 0.85 VDD 0.85 VDD 0.7 VDD		VDD VDD VDD VDD VDD VDD VDD VDD	V V V V V V V	For all $V_{DD}^{(4)}$ 4.0V < $V_{DD} \le 5.5V^{(4)}$ $V_{DD} > 5.5 V$ PIC16C5X-RC only ⁽³⁾ PIC16C5X-XT, 10, HS, LP
D050	VHYS	Hysteresis of Schmitt Trigger inputs	0.15 Vdd*	—	—	V	
D060	Ιι∟	Input Leakage Current ^(1,2) I/O ports MCLR MCLR T0CKI OSC1	-1 -5 - -3 -3	0.5 — 0.5 0.5 0.5	+1 +5 +3 +3	μΑ μΑ μΑ μΑ μΑ	$\label{eq:statestar} \begin{array}{l} \mbox{For Vdd} \leq \mbox{5.5 V:} \\ \mbox{Vss} \leq \mbox{VplN} \leq \mbox{Vdd}, \\ \mbox{pin at hi-impedance} \\ \mbox{VplN} = \mbox{Vss} + \mbox{0.25V} \\ \mbox{VplN} = \mbox{Vdd} \\ \mbox{VplN} = \mbox{Vdd} \\ \mbox{Vss} \leq \mbox{VplN} \leq \mbox{Vdd} \\ \mbox{Vss} \leq \mbox{VplN} \leq \mbox{Vdd} \\ \mbox{Vss} \leq \mbox{VplN} \leq \mbox{Vdd} \\ \mbox{PlC16C5X-XT, 10, HS, LP} \end{array}$
D080	Vol	Output Low Voltage I/O ports OSC2/CLKOUT	—	_	0.6 0.6	V V	IOL = 8.7 mA, VDD = 4.5V IOL = 1.6 mA, VDD = 4.5V, PIC16C5X-RC
D090	Voн	Output High Voltage ⁽²⁾ I/O ports OSC2/CLKOUT	VDD - 0.7 VDD - 0.7			V V	IOH = -5.4 mA, VDD = 4.5V IOH = -1.0 mA, VDD = 4.5V, PIC16C5X-RC

These parameters are characterized but not tested.

† 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.

Note 1: The leakage current on the MCLR/VPP pin is strongly dependent on the applied voltage level. The specified levels represent normal operating conditions. Higher leakage current may be measured at different input voltage.

2: Negative current is defined as coming out of the pin.

3: For PIC16C5X-RC devices, the OSC1/CLKIN pin is a Schmitt Trigger input. It is not recommended that the PIC16C5X be driven with external clock in RC mode.

4: The user may use the better of the two specifications.

12.6 Timing Parameter Symbology and Load Conditions

The timing parameter symbols have been created with one of the following formats:

1. TppS2ppS

2. Tp	ppS	
Т		
F	Frequency	T Time
Lowe	ercase letters (pp) and their meanings:	
рр		
2	to	mc MCLR
ck	CLKOUT	osc oscillator
су	cycle time	os OSC1
drt	device reset timer	t0 T0CKI
io	I/O port	wdt watchdog timer
Uppe	ercase letters and their meanings:	
S		
F	Fall	P Period
Н	High	R Rise
Ι	Invalid (Hi-impedance)	V Valid
L	Low	Z Hi-impedance

FIGURE 12-1: LOAD CONDITIONS FOR DEVICE TIMING SPECIFICATIONS - PIC16C54/55/56/57



13.5 Timing Parameter Symbology and Load Conditions

The timing parameter symbols have been created with one of the following formats:

1. TppS2ppS

2. Tp	pS	
Т		
F	Frequency	T Time
Lowe	ercase letters (pp) and their meanings:	
рр		
2	to	mc MCLR
ck	CLKOUT	osc oscillator
су	cycle time	os OSC1
drt	device reset timer	t0 T0CKI
io	I/O port	wdt watchdog timer
Uppe	ercase letters and their meanings:	
S		
F	Fall	P Period
Н	High	R Rise
Ι	Invalid (Hi-impedance)	V Valid
L	Low	Z Hi-impedance

FIGURE 13-1: LOAD CONDITIONS FOR DEVICE TIMING SPECIFICATIONS - PIC16CR54A



14.0 DEVICE CHARACTERIZATION - PIC16C54A

The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

"Typical" represents the mean of the distribution at 25°C. "Maximum" or "minimum" represents (mean + 3σ) or (mean - 3σ) respectively, where σ is a standard deviation, over the whole temperature range.





TABLE 14-1: RC OSCILLATOR FREQUENCIES

Сехт	Rext	Ave Fosc @	rage 5 V, 25°C
20 pF	3.3K	5 MHz	± 27%
	5K	3.8 MHz	± 21%
	10K	2.2 MHz	± 21%
	100K	262 kHz	± 31%
100 pF	3.3K	1.6 MHz	± 13%
	5K	1.2 MHz	± 13%
	10K	684 kHz	± 18%
	100K	71 kHz	± 25%
300 pF	3.3K	660 kHz	± 10%
	5.0K	484 kHz	± 14%
	10K	267 kHz	± 15%
	100K	29 kHz	± 19%

The frequencies are measured on DIP packages.

The percentage variation indicated here is part-to-part variation due to normal process distribution. The variation indicated is ± 3 standard deviations from the average value for VDD = 5V.



TABLE 15-2: CLKOUT AND I/O TIMING REQUIREMENTS - PIC16C54A

AC CharacteristicsStandard Operating Conditions (unless otherwise specified) Operating Temperature $0^{\circ}C \le TA \le +70^{\circ}C$ for commercial $-40^{\circ}C \le TA \le +85^{\circ}C$ for industrial $-20^{\circ}C \le TA \le +85^{\circ}C$ for industrial - PIC16LV54A-02I $-40^{\circ}C \le TA \le +125^{\circ}C$ for extended						
Param No.	Symbol	Characteristic	Min	Тур†	Max	Units
10	TosH2ckL	OSC1↑ to CLKOUT↓ ⁽¹⁾		15	30**	ns
11	TosH2ckH	OSC1↑ to CLKOUT↑ ⁽¹⁾		15	30**	ns
12	TckR	CLKOUT rise time ⁽¹⁾	—	5.0	15**	ns
13	TckF	CLKOUT fall time ⁽¹⁾		5.0	15**	ns
14	TckL2ioV	CLKOUT↓ to Port out valid ⁽¹⁾		—	40**	ns
15	TioV2ckH	Port in valid before CLKOUT↑ ⁽¹⁾	0.25 TCY+30*	_	_	ns
16	TckH2iol	Port in hold after CLKOUT ⁽¹⁾	0*	—	_	ns
17	TosH2ioV	OSC1 [↑] (Q1 cycle) to Port out valid ⁽²⁾	—	_	100*	ns
18	TosH2iol	OSC1 [↑] (Q2 cycle) to Port input invalid (I/O in hold time)	TBD		_	ns
19	TioV2osH	Port input valid to OSC1↑ (I/O in setup time)	TBD	—	_	ns
20	TioR	Port output rise time ⁽²⁾	—	10	25**	ns
21	TioF	Port output fall time ⁽²⁾		10	25**	ns

* These parameters are characterized but not tested.

** These parameters are design targets and are not tested. No characterization data available at this time.

† 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.

Note 1: Measurements are taken in RC Mode where CLKOUT output is 4 x Tosc.

2: Please refer to Figure 15-1 for load conditions.

Typical: statistical mean @ 25°C. Maximum: mean - 3 s (-40°C to 125°C) Minimum: mean

FIGURE 16-14: TYPICAL IDD vs. FREQUENCY (WDT DISABLED, RC MODE @ 300 PF, 25°C)

FIGURE 16-15: MAXIMUM IDD vs. FREQUENCY (WDT DISABLED, RC MODE @ 300 PF, -40°C to +85°C)





FIGURE 16-17: TRANSCONDUCTANCE (gm) OF HS OSCILLATOR vs. VDD





TABLE 16-2:INPUT CAPACITANCE FOR
PIC16C54A/C58A

Pin	Typical Capa	acitance (pF)
FIII	18L PDIP	18L SOIC
RA port	5.0	4.3
RB port	5.0	4.3
MCLR	17.0	17.0
OSC1	4.0	3.5
OSC2/CLKOUT	4.3	3.5
TOCKI	3.2	2.8

All capacitance values are typical at 25°C. A part-to-part variation of $\pm 25\%$ (three standard deviations) should be taken into account.

FIGURE 16-23: PORTA, B AND C IOL vs. VOL, VDD = 5V











TARI F 17-2-	CLKOUT AND I/O TIMING REQUIREMENTS - PIC16C5X PIC16CR5X

AC Characteristics		$\begin{array}{ll} \mbox{Standard Operating Conditions (unless otherwise specified)} \\ \mbox{Operating Temperature} & 0^{\circ}C \leq TA \leq +70^{\circ}C \mbox{ for commercial} \\ -40^{\circ}C \leq TA \leq +85^{\circ}C \mbox{ for industrial} \\ -40^{\circ}C \leq TA \leq +125^{\circ}C \mbox{ for extended} \end{array}$					
Param No.	Symbol	Characteristic	Min	Тур†	Мах	Units	
10	TosH2ckL	OSC1↑ to CLKOUT↓ ⁽¹⁾		15	30**	ns	
11	TosH2ckH	OSC1↑ to CLKOUT↑ ⁽¹⁾	—	15	30**	ns	
12	TckR	CLKOUT rise time ⁽¹⁾	—	5.0	15**	ns	
13	TckF	CLKOUT fall time ⁽¹⁾	—	5.0	15**	ns	
14	TckL2ioV	CLKOUT↓ to Port out valid ⁽¹⁾	—	_	40**	ns	
15	TioV2ckH	Port in valid before CLKOUT ⁽¹⁾	0.25 TCY+30*	_	—	ns	
16	TckH2iol	Port in hold after CLKOUT ⁽¹⁾	0*	_	—	ns	
17	TosH2ioV	OSC1↑ (Q1 cycle) to Port out valid ⁽²⁾	—	_	100*	ns	
18	TosH2iol	OSC1 [↑] (Q2 cycle) to Port input invalid (I/O in hold time)	TBD		—	ns	
19	TioV2osH	Port input valid to OSC1↑ (I/O in setup time)	TBD	—	—	ns	
20	TioR	Port output rise time ⁽²⁾	—	10	25**	ns	
21	TioF	Port output fall time ⁽²⁾	—	10	25**	ns	

* These parameters are characterized but not tested.

** These parameters are design targets and are not tested. No characterization data available at this time.

† 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.

Note 1: Measurements are taken in RC Mode where CLKOUT output is 4 x Tosc.

2: Refer to Figure 17-5 for load conditions.



TABLE 18-2:INPUT CAPACITANCE

Bin	Typical Capacitance (pF)				
FIII	18L PDIP	18L SOIC			
RA port	5.0	4.3			
RB port	5.0	4.3			
MCLR	17.0	17.0			
OSC1	4.0	3.5			
OSC2/CLKOUT	4.3	3.5			
TOCKI	3.2	2.8			

All capacitance values are typical at 25° C. A part-to-part variation of ±25% (three standard deviations) should be taken into account.

19.3 Timing Parameter Symbology and Load Conditions

The timing parameter symbols have been created with one of the following formats:

1. TppS2ppS

2. TppS						
Т						
F Frequency		T Time				
Lowe	Lowercase letters (pp) and their meanings:					
рр						
2	to	mc MCLR				
ck	CLKOUT	osc oscillator				
су	cycle time	os OSC1				
drt	device reset timer	t0 T0CKI				
io I/O port		wdt watchdog timer				
Uppercase letters and their meanings:						
S						
F	Fall	P Period				
Н	High	R Rise				
Ι	Invalid (Hi-impedance)	V Valid				
L	Low	Z Hi-impedance				

FIGURE 19-2: LOAD CONDITIONS FOR DEVICE TIMING SPECIFICATIONS -PIC16C54C/C55A/C56A/C57C/C58B-40





FIGURE 19-5: RESET, WATCHDOG TIMER, AND DEVICE RESET TIMER TIMING - PIC16C5X-40

TABLE 19-3: RESET, WATCHDOG TIMER, AND DEVICE RESET TIMER - PIC16C5X-40

AC Characteristics		Standard Operating Conditions (unless otherwise specified)Operating Temperature $0^{\circ}C \le TA \le +70^{\circ}C$ (commercial)Operating Voltage VDD range is described in Section 19.1.					
Param No.	Symbol	Characteristic	Min	Тур†	Max	Units	Conditions
30	TmcL	MCLR Pulse Width (low)	1000*		_	ns	VDD = 5.0V
31	Twdt	Watchdog Timer Time-out Period (No Prescaler)	9.0*	18*	30*	ms	VDD = 5.0V (Comm)
32	Tdrt	Device Reset Timer Period	9.0*	18*	30*	ms	VDD = 5.0V (Comm)
34	Tioz	I/O Hi-impedance from MCLR Low	100*	300*	1000*	ns	

* These parameters are characterized but not tested.

† 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.









PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

PART NO.	· <u>xx x</u>	<u>/xx</u>	<u>xxx</u>	Examples:
Device	Frequency Temperatu Range/OSC Range Type	e Package	Pattern	 a) PIC16C55A - 04/P 301 = Commercial Temp., PDIP package, 4 MHz, standard VDD limits, QTP pattern #301 b) PIC16I C5C _ 04/ISO ladustrial Temp. SOIC
Device Frequency Range/ Oscillator Type	PIC16C54 PIC16C55 PIC16C54A PIC16C5 PIC16CR54A PIC16C5 PIC16C55 PIC16C5 PIC16C55 PIC16C5 PIC16C56 PIC16C5 PIC16C56A PIC16C5 PIC16C55 PIC16C5 PIC16C56 PIC16C56 PIC16C57 PIC16C57 PIC16C57C PIC16C57 PIC16C57C PIC16C57 PIC16C57C PIC16C57 PIC16C57B PIC16C57 PIC16C57C PIC16C57 PIC16C58B PIC16C57 PIC16C58B	$\begin{array}{c} 4T^{(2)} \\ 4AT^{(2)} \\ 54AT^{(2)} \\ 54CT^{(2)} \\ 54CT^{(2)} \\ 55T^{(2)} \\ 55T^{(2)} \\ 56AT^{(2)} \\ 56AT^{(2)} \\ 56AT^{(2)} \\ 77C1^{(2)} \\ 57CT^{(2)} \\ 57CT^{(2)} \\ 58BT^{(2)} \end{array}$		 b) Fischer of the Set for the Set and the Set of the Set and the Set of the Set and the Set of the Set and the Set and the Set of the Set and the Set and
	 XT Standard Crystal/Resonatc High Speed Crystal 200 KHz (LP) or 2 MHz (X' 200 KHz (LP) or 4 MHz (X' 200 KHz (LP) or 4 MHz (X' 10 MHz (HS only) 20 20 MHz (HS only) 40 MHz (HS only) 40 MHz (HS only) 40 MHz (HS only) 50 xo scillator type for JW pi *RC/LP/XT/HS are for 16C54/55 -02 is available for 16LV54A onl -40 is available for 16C54C/55A 	and RC) and RC) ckages ⁽³⁾ /56/57 devices onl / or all other device: 56A/57C/58B devi	ly s ices only	 programmed to any device configura- tion. JW Devices meet the electrical requirements of each oscillator type, including LC devices. 4: b = Blank
Temperature Range	$b^{(4)} = 0^{\circ}C \text{ to } +70^{\circ}C \\ I = -40^{\circ}C \text{ to } +85^{\circ}C \\ E = -40^{\circ}C \text{ to } +125^{\circ}C \\ \end{array}$			
Package	S = Die in Waffle Pack JW = 28-pin 600 mil/18-pin DIP ⁽³⁾ P = 28-pin 600 mil/18-pin SO = 300 mil SOIC SS SS = 209 mil SSOP SP SP = 28-pin 300 mil Skinny *See Section 21 for additional p	300 mil windowed 300 mil PDIP PDIP ackage information	I CER-	
Pattern	QTP, SQTP, ROM code (factory Requirements. Blank for OTP and	specified) or Spec d Windowed devic	ial ces.	

Sales and Support

Data Sheets

Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

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