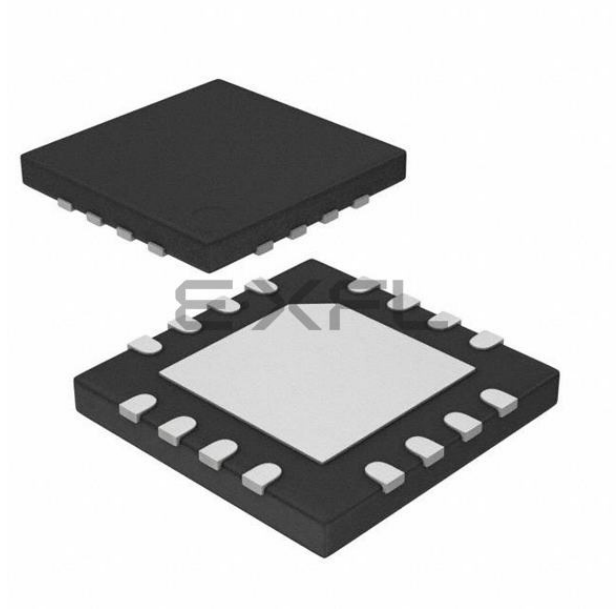


Welcome to E-XFL.COM

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	32MHz
Connectivity	I²C, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	12
Program Memory Size	3.5KB (2K x 14)
Program Memory Type	FLASH
EEPROM Size	256 x 8
RAM Size	128 x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 5.5V
Data Converters	A/D 8x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	16-UQFN Exposed Pad
Supplier Device Package	16-UQFN (4x4)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic16f1823-i-jq

TABLE 1-2: PIC12(L)F1822 PINOUT DESCRIPTION

Name	Function	Input Type	Output Type	Description
RA0/AN0/CPS0/C1IN+/ DACOUT/TX(1)/CK(1)/SDO(1)/ $\overline{SS}$(1)/P1B(1)/MDOUT/ICSPDAT/ ICDDAT	RA0	TTL	CMOS	General purpose I/O.
	AN0	AN	—	A/D Channel 0 input.
	CPS0	AN	—	Capacitive sensing input 0.
	C1IN+	AN	—	Comparator C1 positive input.
	DACOUT	—	AN	Digital-to-Analog Converter output.
	TX	—	CMOS	USART asynchronous transmit.
	CK	ST	CMOS	USART synchronous clock.
	SDO	—	CMOS	SPI data output.
	$\overline{SS}$	ST	—	Slave Select input.
	P1B	—	CMOS	PWM output.
	MDOUT	—	CMOS	Modulator output.
	ICSPDAT	ST	CMOS	ICSP™ Data I/O.
RA1/AN1/CPS1/VREF+/C1IN0-/ SRI/RX(1)/DT(1)/SCL/SCK/ MDMIN/ICSPCLK/ICDCLK	RA1	TTL	CMOS	General purpose I/O.
	AN1	AN	—	A/D Channel 1 input.
	CPS1	AN	—	Capacitive sensing input 1.
	VREF+	AN	—	A/D and DAC Positive Voltage Reference input.
	C1IN0-	AN	—	Comparator C1 or C2 negative input.
	SRI	ST	—	SR latch input.
	RX	ST	—	USART asynchronous input.
	DT	ST	CMOS	USART synchronous data.
	SCL	I^2C™	OD	I^2C™ clock.
	SCK	ST	CMOS	SPI clock.
	MDMIN	ST	—	Modulator source input.
	ICSPCLK	ST	—	Serial Programming Clock.
RA2/AN2/CPS2/C1OUT/SRQ/ T0CKI/CCP1(1)/P1A(1)/FLT0/ SDA/SDI/INT/MDCIN1	RA2	ST	CMOS	General purpose I/O.
	AN2	AN	—	A/D Channel 2 input.
	CPS2	AN	—	Capacitive sensing input 2.
	C1OUT	—	CMOS	Comparator C1 output.
	SRQ	—	CMOS	SR latch non-inverting output.
	T0CKI	ST	—	Timer0 clock input.
	CCP1	ST	CMOS	Capture/Compare/PWM 1.
	P1A	—	CMOS	PWM output.
	FLT0	ST	—	ECCP Auto-Shutdown Fault input.
	SDA	I^2C™	OD	I^2C™ data input/output.
	SDI	CMOS	—	SPI data input.
	INT	ST	—	External interrupt.
	MDCIN1	ST	—	Modulator Carrier Input 1.
RA3/$\overline{SS}$(1)/T1G(1)/VPP/$\overline{MCLR}$	RA3	TTL	—	General purpose input.
	$\overline{SS}$	ST	—	Slave Select input.
	T1G	ST	—	Timer1 Gate input.
	VPP	HV	—	Programming voltage.
	$\overline{MCLR}$	ST	—	Master Clear with internal pull-up.

Legend: AN = Analog input or output CMOS = CMOS compatible input or output OD = Open Drain
TTL = TTL compatible input ST = Schmitt Trigger input with CMOS levels I^2C™ = Schmitt Trigger input with I^2C levels
HV = High Voltage XTAL = Crystal

Note 1: Pin functions can be assigned to one of two pin locations via software. See APFCON register (Register 12-1).

4.0 DEVICE CONFIGURATION

Device Configuration consists of Configuration Word 1 and Configuration Word 2, Code Protection and Device ID.

4.1 Configuration Words

There are several Configuration Word bits that allow different oscillator and memory protection options. These are implemented as Configuration Word 1 at 8007h and Configuration Word 2 register at 8008h.

Note:	The $\overline{\text{DEBUG}}$ bit in Configuration Word 2 is managed automatically by device development tools including debuggers and programmers. For normal device operation, this bit should be maintained as a '1'.

5.4.2 TWO-SPEED START-UP SEQUENCE

1. Wake-up from Power-on Reset or Sleep.
2. Instructions begin execution by the internal oscillator at the frequency set in the IRCF<3:0> bits of the OSCCON register.
3. OST enabled to count 1024 clock cycles.
4. OST timed out, wait for falling edge of the internal oscillator.
5. OSTS is set.
6. System clock held low until the next falling edge of new clock (LP, XT or HS mode).
7. System clock is switched to external clock source.

5.4.3 CHECKING TWO-SPEED CLOCK STATUS

Checking the state of the OSTS bit of the OSCSTAT register will confirm if the microcontroller is running from the external clock source, as defined by the FOSC<2:0> bits in the Configuration Word 1, or the internal oscillator.

FIGURE 5-8: TWO-SPEED START-UP

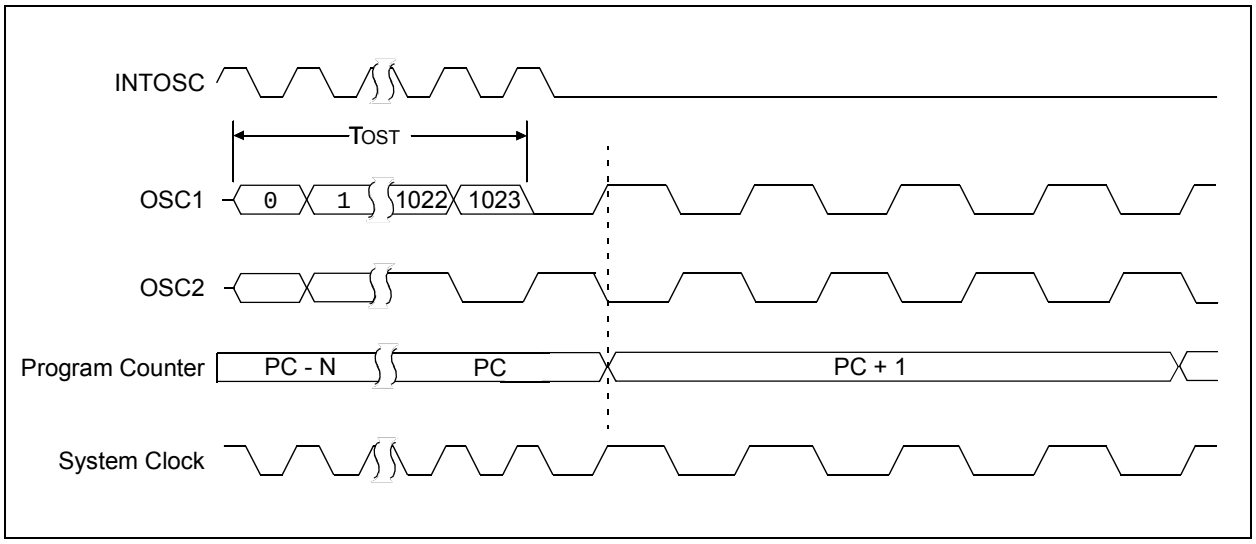


TABLE 8-1: SUMMARY OF REGISTERS ASSOCIATED WITH INTERRUPTS

Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Register on Page
INTCON	GIE	PEIE	TMR0IE	INTE	IOCIE	TMR0IF	INTF	IOCIF	86
OPTION_REG	$\overline{\text{WPUEN}}$	INTEDG	TMR0CS	TMR0SE	PSA	PS2	PS1	PS0	164
PIE1	TMR1GIE	ADIE	RCIE	TXIE	SSP1IE	CCP1IE	TMR2IE	TMR1IE	87
PIE2	OSFIE	C2IE(1)	C1IE	EEIE	BCL1IE	—	—	—	88
PIR1	TMR1GIF	ADIF	RCIF	TXIF	SSP1IF	CCP1IF	TMR2IF	TMR1IF	89
PIR2	OSFIF	C2IF(1)	C1IF	EEIF	BCL1IF	—	—	—	90

Legend: — = unimplemented locations read as '0'. Shaded cells are not used by Interrupts.

Note 1: PIC16(L)F1823 only.

10.0 WATCHDOG TIMER

The Watchdog Timer is a system timer that generates a Reset if the firmware does not issue a CLRWDT instruction within the time-out period. The Watchdog Timer is typically used to recover the system from unexpected events.

The WDT has the following features:

- Independent clock source
- Multiple operating modes
  - WDT is always on
  - WDT is off when in Sleep
  - WDT is controlled by software
  - WDT is always off
- Configurable time-out period is from 1 ms to 256 seconds (typical)
- Multiple Reset conditions
- Operation during Sleep

FIGURE 10-1: WATCHDOG TIMER BLOCK DIAGRAM

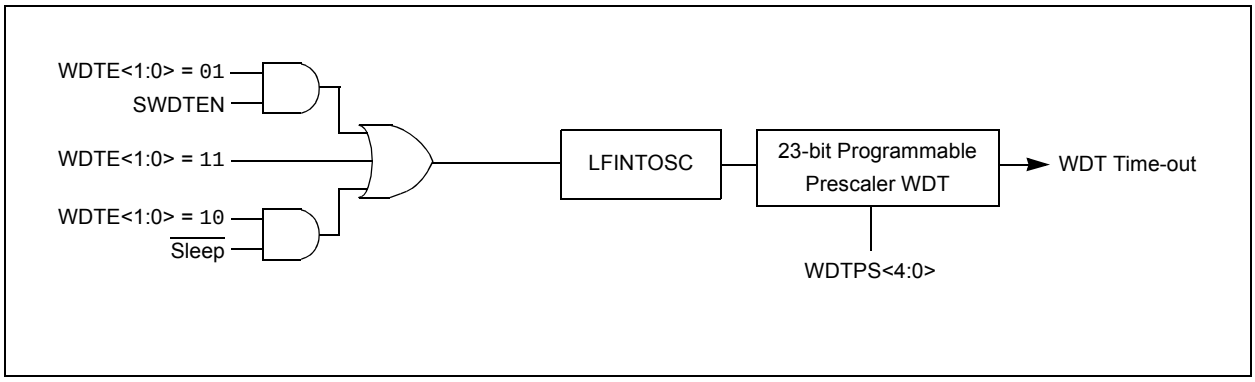
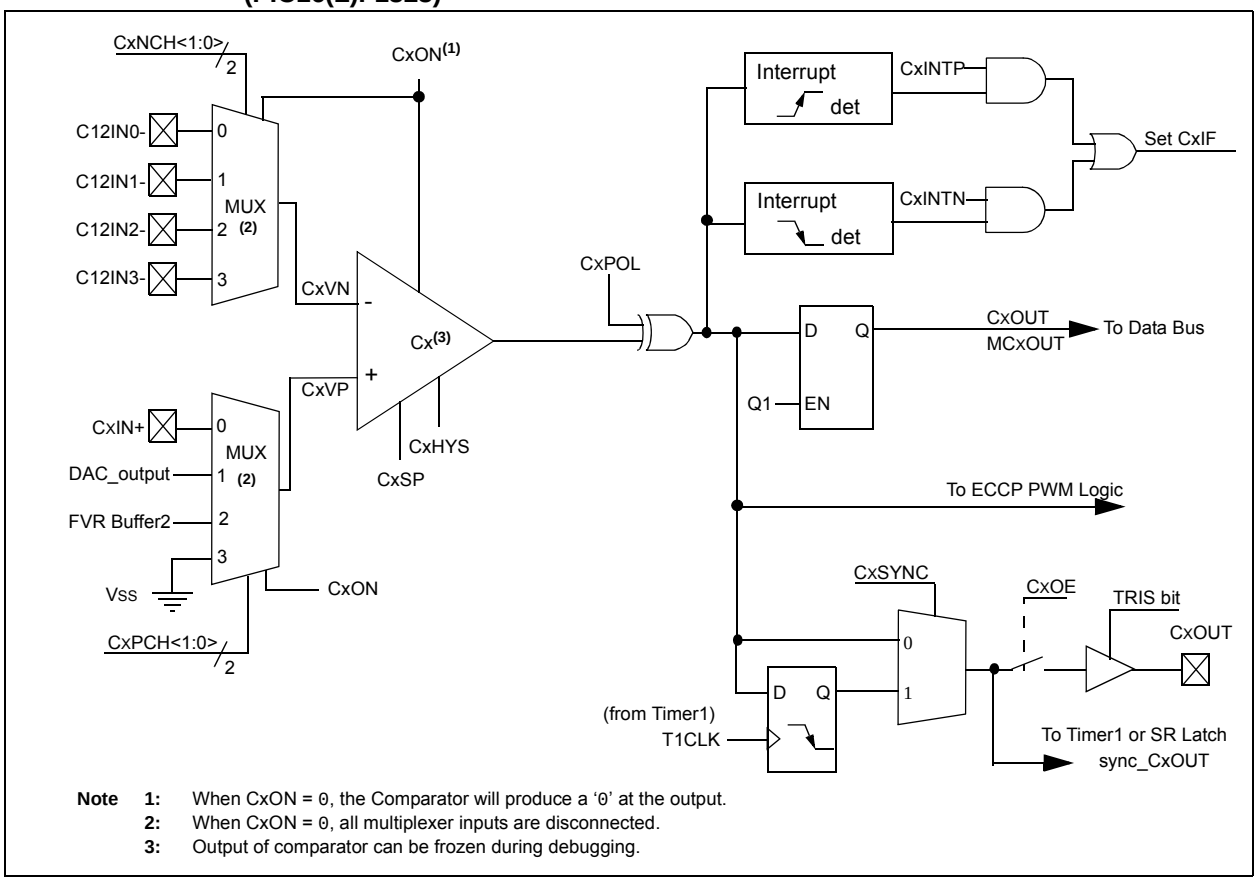
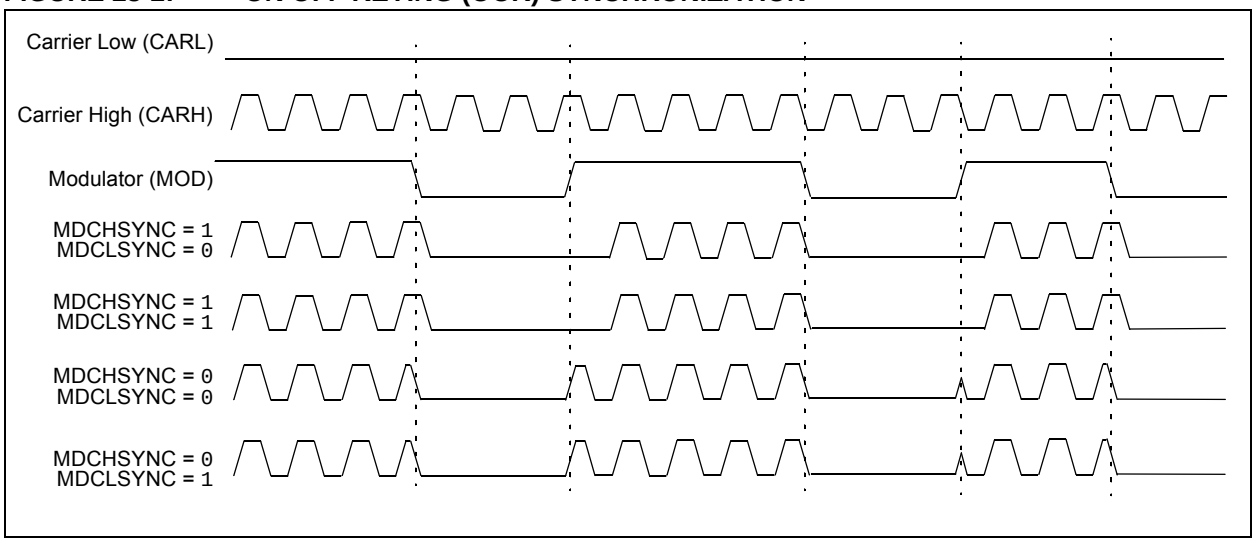


FIGURE 19-3: COMPARATOR 1 AND 2 MODULES SIMPLIFIED BLOCK DIAGRAM (PIC16(L)F1823)



Note 1: When CxON = 0, the Comparator will produce a '0' at the output.
2: When CxON = 0, all multiplexer inputs are disconnected.
3: Output of comparator can be frozen during debugging.

FIGURE 23-2: ON OFF KEYING (OOK) SYNCHRONIZATION



EXAMPLE 23-1: NO SYNCHRONIZATION (MDSHSYNC = 0, MDCLSYNC = 0)

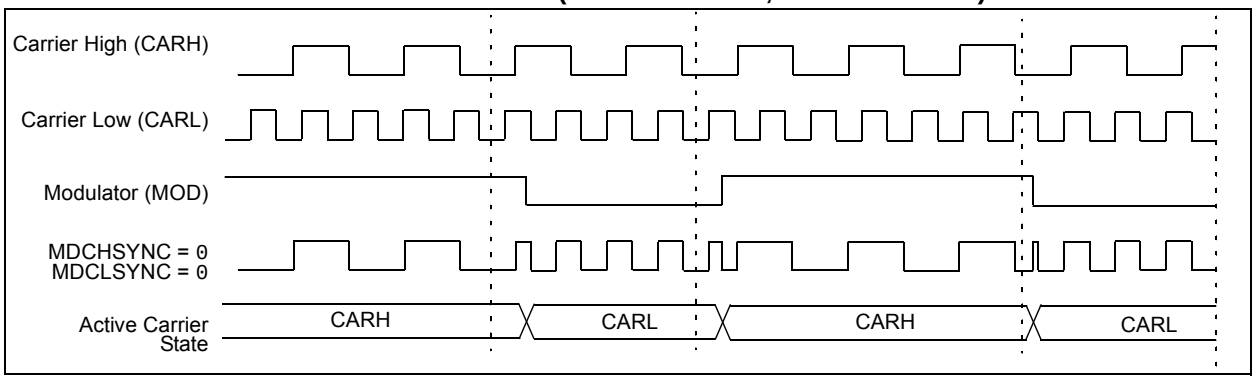
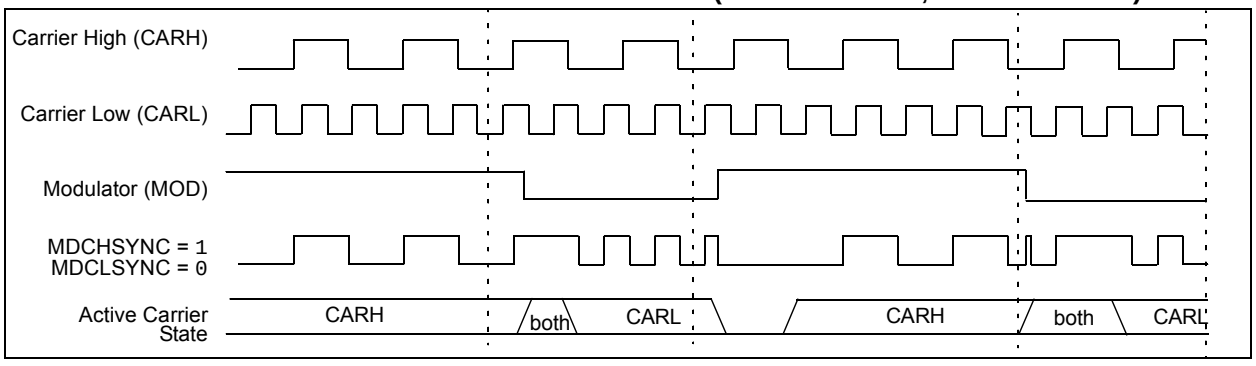


FIGURE 23-3: CARRIER HIGH SYNCHRONIZATION (MDSHSYNC = 1, MDCLSYNC = 0)



24.3.6 OPERATION IN SLEEP MODE

In Sleep mode, the TMR2 register will not increment and the state of the module will not change. If the CCP1 pin is driving a value, it will continue to drive that value. When the device wakes up, TMR2 will continue from its previous state.

24.3.7 CHANGES IN SYSTEM CLOCK FREQUENCY

The PWM frequency is derived from the system clock frequency. Any changes in the system clock frequency will result in changes to the PWM frequency. See **Section 5.0 "Oscillator Module (With Fail-Safe Clock Monitor)"** for additional details.

24.3.8 EFFECTS OF RESET

Any Reset will force all ports to Input mode and the CCP registers to their Reset states.

24.3.9 ALTERNATE PIN LOCATIONS

This module incorporates I/O pins that can be moved to other locations with the use of the alternate pin function register, APFCON. To determine which pins can be moved and what their default locations are upon a Reset, see **Section 12.1 "Alternate Pin Function"** for more information.

TABLE 24-8: SUMMARY OF REGISTERS ASSOCIATED WITH STANDARD PWM

Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Register on Page
APFCON	RXDTSEL	SDOSEL	SSSEL	—	T1GSEL	TXCKSEL	P1BSEL(2)	CCP1SEL(2)	114
CCP1CON	P1M<1:0>		DC1B<1:0>		CCP1M<3:0>				213
CCPR1L	Capture/Compare/PWM Register x Low Byte (LSB)								191
INTCON	GIE	PEIE	TMR0IE	INTE	IOCIE	TMR0IF	INTF	IOCIF	86
PIE1	TMR1GIE	ADIE	RCIE	TXIE	SSP1IE	CCP1IE	TMR2IE	TMR1IE	87
PIR1	TMR1GIF	ADIF	RCIF	TXIF	SSP1IF	CCP1IF	TMR2IF	TMR1IF	89
PR2	Timer2 Period Register								176*
T2CON	—	T2OUTPS<3:0>				TMR2ON	T2CKPS<:0>1		178
TMR2	Timer2 Module Register								176*
TRISA	—	—	TRISA5	TRISA4	TRISA3	TRISA2	TRISA1	TRISA0	117
TRISC(1)	—	—	TRISC5	TRISC4	TRISC3	TRISC2	TRISC1	TRISC0	121

Legend: — = Unimplemented location, read as '0'. Shaded cells are not used by the PWM.

* Page provides register information.

Note 1: PIC16(L)F1823 only.

2: PIC12(L)F1822 only.

REGISTER 24-4: PSTR1CON: PWM STEERING CONTROL REGISTER(1)

U-0	U-0	U-0	R/W-0/0	R/W-0/0	R/W-0/0	R/W-0/0	R/W-1/1
—	—	—	STR1SYNC	STR1D	STR1C	STR1B	STR1A
bit 7							bit 0

Legend:		
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'
u = Bit is unchanged	x = Bit is unknown	-n/n = Value at POR and BOR/Value at all other Resets
'1' = Bit is set	'0' = Bit is cleared	

bit 7-5 **Unimplemented:** Read as '0'

bit 4 **STR1SYNC:** Steering Sync bit
1 = Output steering update occurs on next PWM period
0 = Output steering update occurs at the beginning of the instruction cycle boundary

bit 3 **STR1D:** Steering Enable bit D(2)
1 = P1D pin has the PWM waveform with polarity control from CCP1M<1:0>
0 = P1D pin is assigned to port pin

bit 2 **STR1C:** Steering Enable bit C(2)
1 = P1C pin has the PWM waveform with polarity control from CCP1M<1:0>
0 = P1C pin is assigned to port pin

bit 1 **STR1B:** Steering Enable bit B
1 = P1B pin has the PWM waveform with polarity control from CCP1M<1:0>
0 = P1B pin is assigned to port pin

bit 0 **STR1A:** Steering Enable bit A
1 = P1A pin has the PWM waveform with polarity control from CCP1M<1:0>
0 = P1A pin is assigned to port pin

Note 1: The PWM Steering mode is available only when the CCP1CON register bits CCP1M<3:2> = 11 and P1M<1:0> = 00.
2: PIC16(L)F1823 only.

25.3 I²C MODE OVERVIEW

The Inter-Integrated Circuit Bus (I^2C) is a multi-master serial data communication bus. Devices communicate in a master/slave environment where the master devices initiate the communication. A Slave device is controlled through addressing.

The I^2C bus specifies two signal connections:

- Serial Clock (SCL)
- Serial Data (SDA)

Figure 25-11 shows the block diagram of the MSSP1 module when operating in I^2C mode.

Both the SCL and SDA connections are bidirectional open-drain lines, each requiring pull-up resistors for the supply voltage. Pulling the line to ground is considered a logical zero and letting the line float is considered a logical one.

Figure 25-11 shows a typical connection between two processors configured as master and slave devices.

The I^2C bus can operate with one or more master devices and one or more slave devices.

There are four potential modes of operation for a given device:

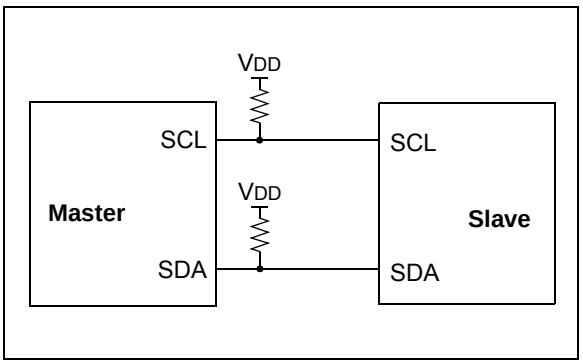
- Master Transmit mode
  (master is transmitting data to a slave)
- Master Receive mode
  (master is receiving data from a slave)
- Slave Transmit mode
  (slave is transmitting data to a master)
- Slave Receive mode
  (slave is receiving data from the master)

To begin communication, a master device starts out in Master Transmit mode. The master device sends out a Start bit followed by the address byte of the slave it intends to communicate with. This is followed by a single Read/Write bit, which determines whether the master intends to transmit to or receive data from the slave device.

If the requested slave exists on the bus, it will respond with an Acknowledge bit, otherwise known as an $\overline{ACK}$. The master then continues in either Transmit mode or Receive mode and the slave continues in the complement, either in Receive mode or Transmit mode, respectively.

A Start bit is indicated by a high-to-low transition of the SDA line while the SCL line is held high. Address and data bytes are sent out, Most Significant bit (MSb) first. The Read/Write bit is sent out as a logical one when the master intends to read data from the slave, and is sent out as a logical zero when it intends to write data to the slave.

FIGURE 25-11: I²C MASTER/ SLAVE CONNECTION



The Acknowledge bit ($\overline{ACK}$) is an active-low signal, which holds the SDA line low to indicate to the transmitter that the slave device has received the transmitted data and is ready to receive more.

The transition of a data bit is always performed while the SCL line is held low. Transitions that occur while the SCL line is held high are used to indicate Start and Stop bits.

If the master intends to write to the slave, then it repeatedly sends out a byte of data, with the slave responding after each byte with an $\overline{ACK}$ bit. In this example, the master device is in Master Transmit mode and the slave is in Slave Receive mode.

If the master intends to read from the slave, then it repeatedly receives a byte of data from the slave, and responds after each byte with an $\overline{ACK}$ bit. In this example, the master device is in Master Receive mode and the slave is Slave Transmit mode.

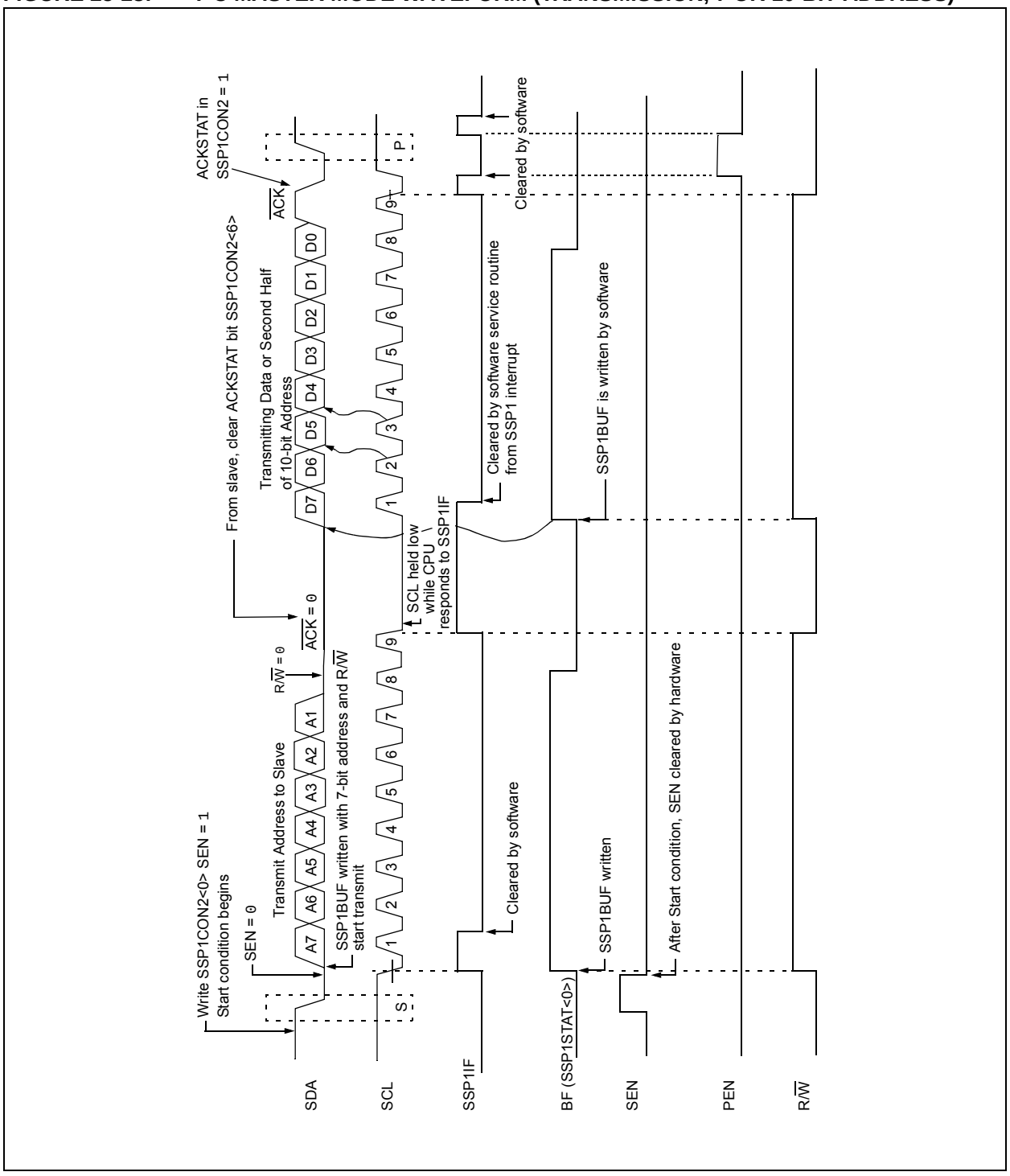
On the last byte of data communicated, the master device may end the transmission by sending a Stop bit. If the master device is in Receive mode, it sends the Stop bit in place of the last $\overline{ACK}$ bit. A Stop bit is indicated by a low-to-high transition of the SDA line while the SCL line is held high.

In some cases, the master may want to maintain control of the bus and re-initiate another transmission. If so, the master device may send another Start bit in place of the Stop bit or last $\overline{ACK}$ bit when it is in receive mode.

The I^2C bus specifies three message protocols;

- Single message where a master writes data to a slave.
- Single message where a master reads data from a slave.
- Combined message where a master initiates a minimum of two writes, or two reads, or a combination of writes and reads, to one or more slaves.

FIGURE 25-28: I²C MASTER MODE WAVEFORM (TRANSMISSION, 7 OR 10-BIT ADDRESS)



REGISTER 25-1: SSP1STAT: SSP1 STATUS REGISTER

R/W-0/0	R/W-0/0	R-0/0	R-0/0	R-0/0	R-0/0	R-0/0	R-0/0
SMP	CKE	D/$\overline{A}$	P	S	R/$\overline{W}$	UA	BF
bit 7							bit 0

Legend:		
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'
u = Bit is unchanged	x = Bit is unknown	-n/n = Value at POR and BOR/Value at all other Resets
'1' = Bit is set	'0' = Bit is cleared	

bit 7 **SMP:** SPI Data Input Sample bit

SPI Master mode:
1 = Input data sampled at end of data output time
0 = Input data sampled at middle of data output time

SPI Slave mode:
SMP must be cleared when SPI is used in Slave mode

In I^2C Master or Slave mode:
1 = Slew rate control disabled for standard speed mode (100 kHz and 1 MHz)
0 = Slew rate control enabled for high speed mode (400 kHz)

bit 6 **CKE:** SPI Clock Edge Select bit (SPI mode only)

In SPI Master or Slave mode:
1 = Transmit occurs on transition from active to Idle clock state
0 = Transmit occurs on transition from Idle to active clock state

In I^2C™ mode only:
1 = Enable input logic so that thresholds are compliant with SMBus specification
0 = Disable SMBus specific inputs

bit 5 **D/$\overline{A}$:** Data/$\overline{Address}$ bit (I^2C mode only)
1 = Indicates that the last byte received or transmitted was data
0 = Indicates that the last byte received or transmitted was address

bit 4 **P:** Stop bit
(I^2C mode only. This bit is cleared when the MSSP1 module is disabled, SSP1EN is cleared.)
1 = Indicates that a Stop bit has been detected last (this bit is '0' on Reset)
0 = Stop bit was not detected last

bit 3 **S:** Start bit
(I^2C mode only. This bit is cleared when the MSSP1 module is disabled, SSP1EN is cleared.)
1 = Indicates that a Start bit has been detected last (this bit is '0' on Reset)
0 = Start bit was not detected last

bit 2 **R/$\overline{W}$:** Read/$\overline{Write}$ bit information (I^2C mode only)
This bit holds the R/$\overline{W}$ bit information following the last address match. This bit is only valid from the address match to the next Start bit, Stop bit, or not ACK bit.

In I^2C Slave mode:
1 = Read
0 = Write

In I^2C Master mode:
1 = Transmit is in progress
0 = Transmit is not in progress
OR-ing this bit with SEN, RSEN, PEN, RCEN or ACKEN will indicate if the MSSP1 is in Idle mode.

bit 1 **UA:** Update Address bit (10-bit I^2C mode only)
1 = Indicates that the user needs to update the address in the SSP1ADD register
0 = Address does not need to be updated

bit 0 **BF:** Buffer Full Status bit

Receive (SPI and I^2C modes):
1 = Receive complete, SSP1BUF is full
0 = Receive not complete, SSP1BUF is empty

Transmit (I^2C mode only):
1 = Data transmit in progress (does not include the $\overline{ACK}$ and Stop bits), SSP1BUF is full
0 = Data transmit complete (does not include the $\overline{ACK}$ and Stop bits), SSP1BUF is empty

30.2 DC Characteristics: PIC12(L)F1822/16(L)F1823-I/E (Industrial, Extended)

PIC12LF1822/16LF1823			**Standard Operating Conditions (unless otherwise stated)** Operating temperature -40°C ≤ TA ≤ +85°C for industrial -40°C ≤ TA ≤ +125°C for extended				
PIC12F1822/16F1823			**Standard Operating Conditions (unless otherwise stated)** Operating temperature -40°C ≤ TA ≤ +85°C for industrial -40°C ≤ TA ≤ +125°C for extended				
Param No.	**Device Characteristics**	**Min.**	**Typ†**	**Max.**	**Units**	**Conditions**	
						VDD	**Note**
	Supply Current (IDD)(1, 2)						
D010		—	5.0	15	µA	1.8	FOSC = 32 kHz, -40°C to +85°C LP Oscillator mode
		—	8.0	19	µA	3.0	
D010		—	24	36	µA	1.8	FOSC = 32 kHz, -40°C to +85°C LP Oscillator mode
		—	30	48	µA	3.0	
		—	32	66	µA	5.0	
D010A		—	5.0	21	µA	1.8	FOSC = 32 kHz, -40°C to +125°C LP Oscillator mode
		—	7.5	25	µA	3.0	
D010A		—	24	60	µA	1.8	FOSC = 32 kHz, -40°C to +125°C LP Oscillator mode
		—	30	70	µA	3.0	
		—	32	80	µA	5.0	
D011		—	60	115	µA	1.8	FOSC = 1 MHz XT Oscillator mode
		—	111	200	µA	3.0	
D011		—	82	135	µA	1.8	FOSC = 1 MHz XT Oscillator mode
		—	141	225	µA	3.0	
		—	200	320	µA	5.0	
D012		—	145	280	µA	1.8	FOSC = 4 MHz XT Oscillator mode
		—	260	460	µA	3.0	
D012		—	165	300	µA	1.8	FOSC = 4 MHz XT Oscillator mode
		—	290	500	µA	3.0	
		—	368	700	µA	5.0	
D013		—	34	170	µA	1.8	FOSC = 1 MHz EC Oscillator mode, Medium-power mode
		—	59	250	µA	3.0	
D013		—	60	200	µA	1.8	FOSC = 1 MHz EC Oscillator mode Medium-power mode
		—	92	260	µA	3.0	
		—	126	350	µA	5.0	
D014		—	118	250	µA	1.8	FOSC = 4 MHz EC Oscillator mode, Medium-power mode
		—	210	420	µA	3.0	

* These parameters are characterized but not tested.

† Data in "Typ" column is at 3.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

Note 1: 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 VDD; $\overline{MCLR}$ = VDD; WDT disabled.

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

3: 8 MHz internal RC oscillator with 4x PLL enabled.

4: 8 MHz crystal oscillator with 4x PLL enabled.

5: For RC oscillator configurations, current through REXT is not included. The current through the resistor can be extended by the formula IR = VDD/2REXT (mA) with REXT in kΩ.

30.9 High Temperature Operation

This section outlines the specifications for the following devices operating in the high temperature range between -40°C and 150°C.**(2)**

- PIC12F1822**(4)**
- PIC16F1823**(4)**

When the value of any parameter is identical for both the 125°C Extended and the 150°C High Temp. temperature ranges, then that value will be found in the standard specification tables shown earlier in this chapter, under the fields listed for the 125°C Extended temperature range. If the value of any parameter is unique to the 150°C High Temp. temperature range, then it will be listed here, in this section of the data sheet.

If a Silicon Errata exists for the product and it lists a modification to the 125°C Extended temperature range value, one that is also shared at the 150°C High Temp. temperature range, then that modified value will apply to both temperature ranges.

Note 1: Writes are **not allowed** for Flash program memory above 125°C.

2: AEC-Q100 reliability testing for devices intended to operate at 150°C is 1,000 hours. Any design in which the total operating time from 125°C to 150°C will be greater than 1,000 hours is not warranted without prior written approval from Microchip Technology Inc.

3: The temperature range indicator in the catalog part number and device marking is “H” for -40°C to 150°C.

Example: PIC12F1822T-H/SN indicates the device is shipped in a Tape and Reel configuration, in the SOIC package, and is rated for operation from -40°C to 150°C.

4: The low voltage versions of these devices, PIC12LF1822 and PIC16LF1823, is not released for operation above +125°C.

5: Errata Sheet DS80502 lists various mask revisions. 150°C operation applies only to revisions A9 and later.

6: The Capacitive Sensing module (CPS) should not be used in High Temperature devices. Function and its parametrics are not warranted.

7: Only SOIC (SN or SL), TSSOP (ST), and DFN/QFN (MF or ML) packages will be offered, not PDIP or UQFN.

TABLE 30-18: ABSOLUTE MAXIMUM RATINGS

Parameter	Condition	Value
Max. Current: V_{DD}	Source	15 mA
Max. Current: V_{SS}	Sink	15 mA
Max. Current: Pin	Source	5 mA
Max. Current: Pin	Sink	5 mA
Max. Storage Temperature	—	-65°C to 155°C
Max. Junction Temperature	—	+155°C
Ambient Temperature under Bias	—	-40°C to +150°C

Note: 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 above maximum rating conditions for extended periods may affect device reliability.

FIGURE 31-15: IDD TYPICAL, EC OSCILLATOR, HIGH-POWER MODE, PIC12LF1822 AND PIC16LF1823 ONLY

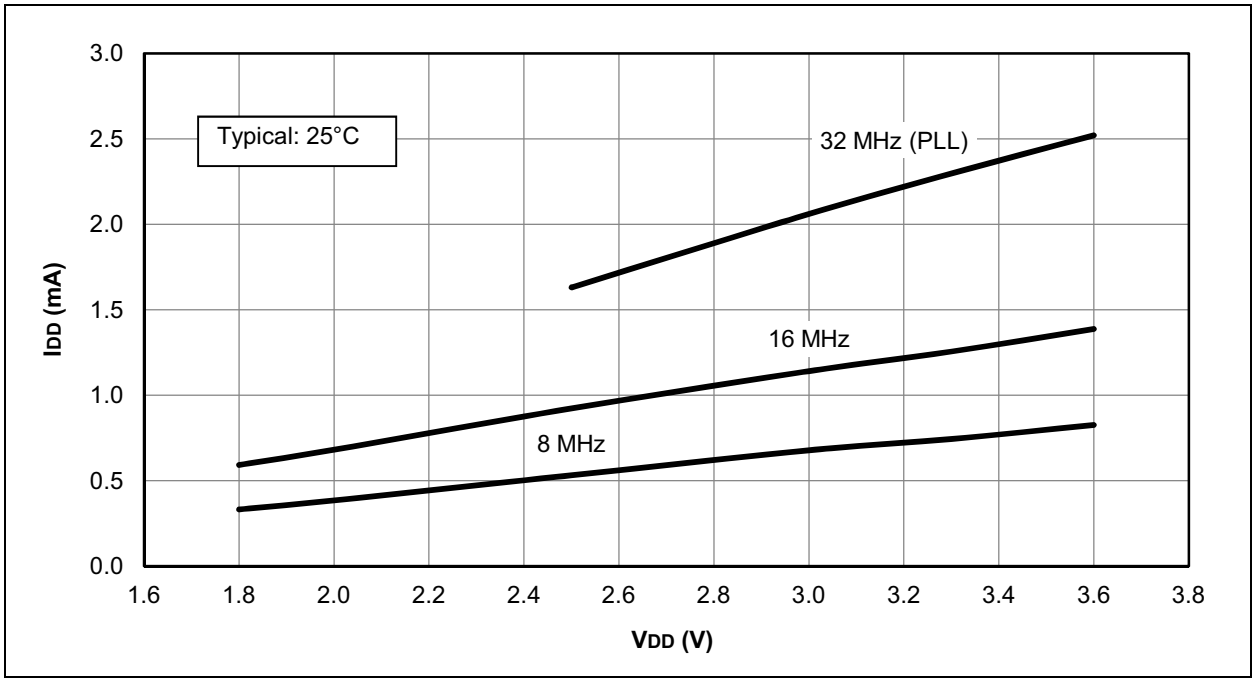


FIGURE 31-16: IDD MAXIMUM, EC OSCILLATOR, HIGH-POWER MODE, PIC12LF1822 AND PIC16LF1823 ONLY

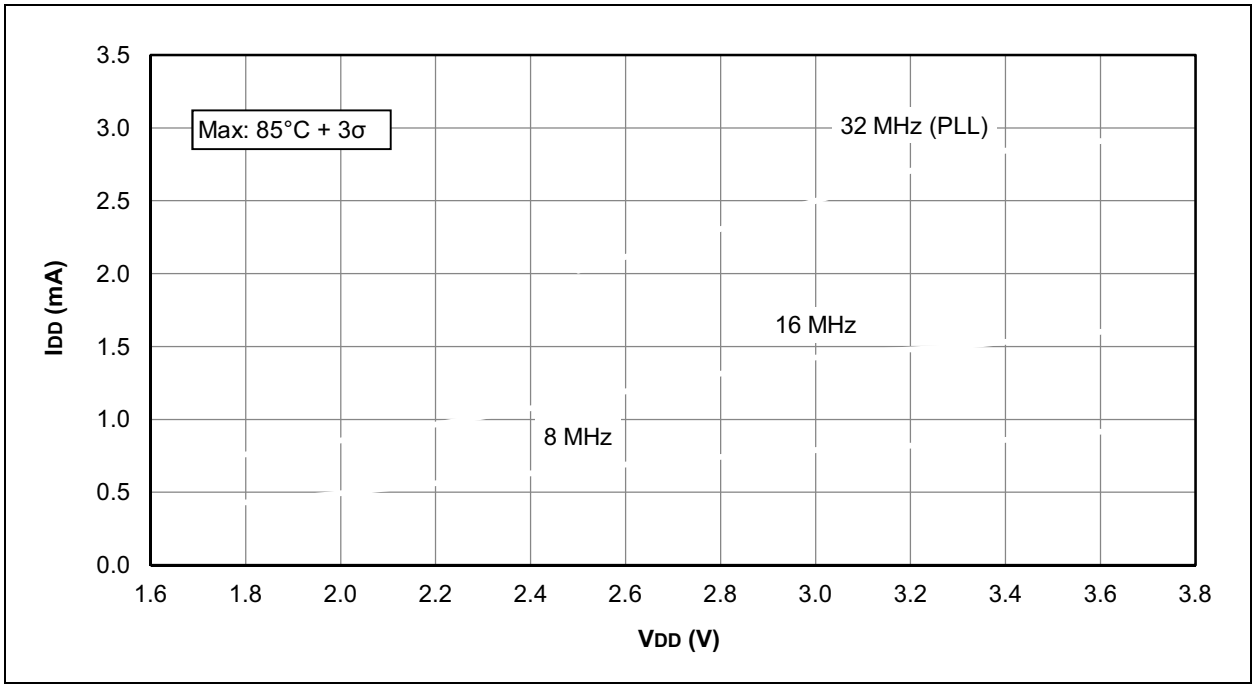


FIGURE 31-27: IDD TYPICAL, HS OSCILLATOR, PIC12LF1822 AND PIC16LF1823 ONLY

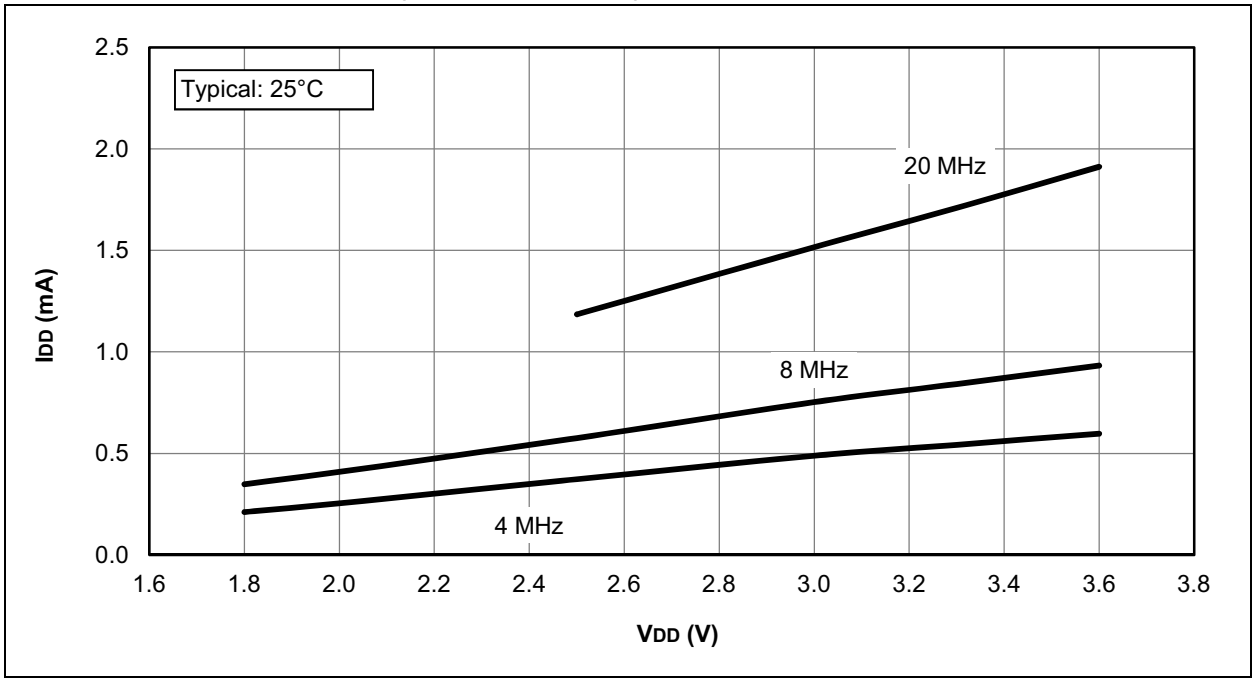


FIGURE 31-28: IDD MAXIMUM, HS OSCILLATOR, PIC12LF1822 AND PIC16LF1823 ONLY

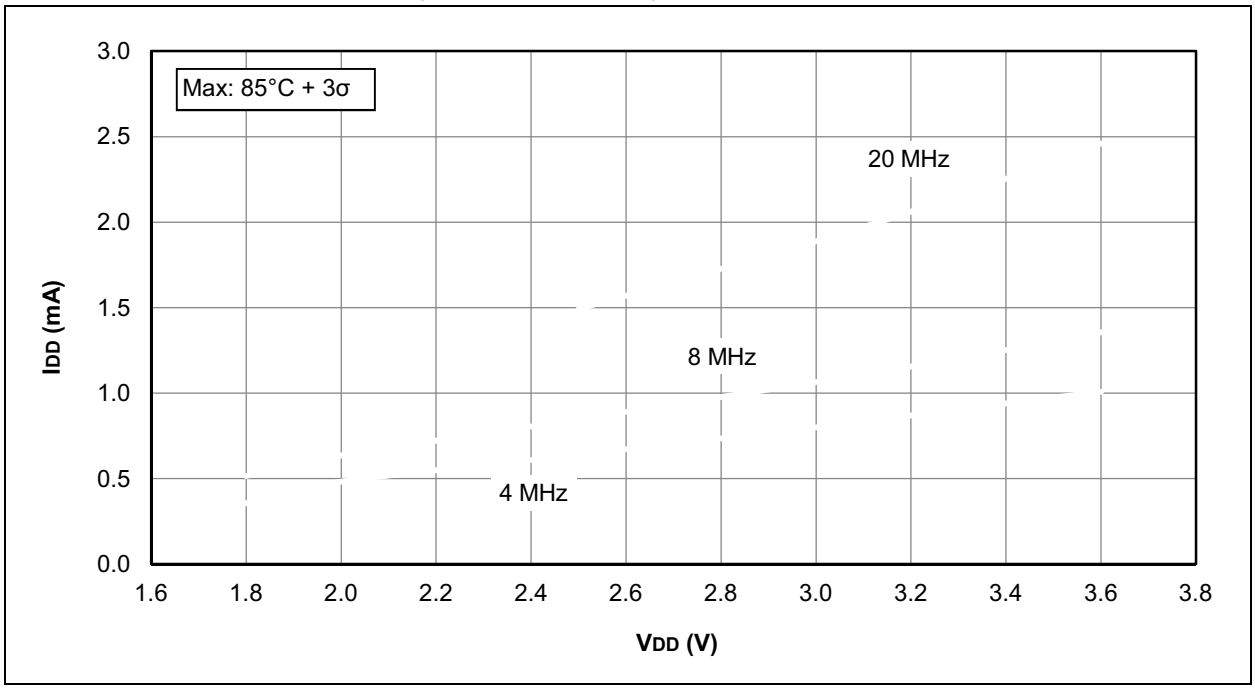


FIGURE 31-31: IPD BASE, LOW-POWER SLEEP MODE, PIC12LF1822 AND PIC16LF1823 ONLY

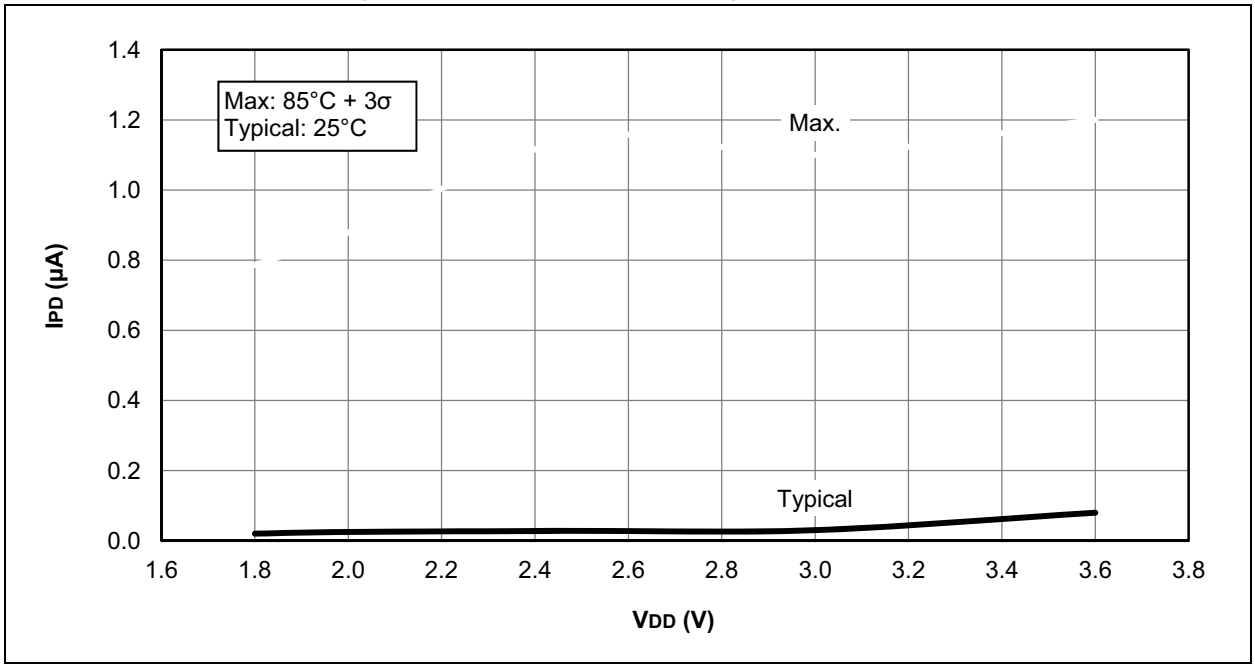
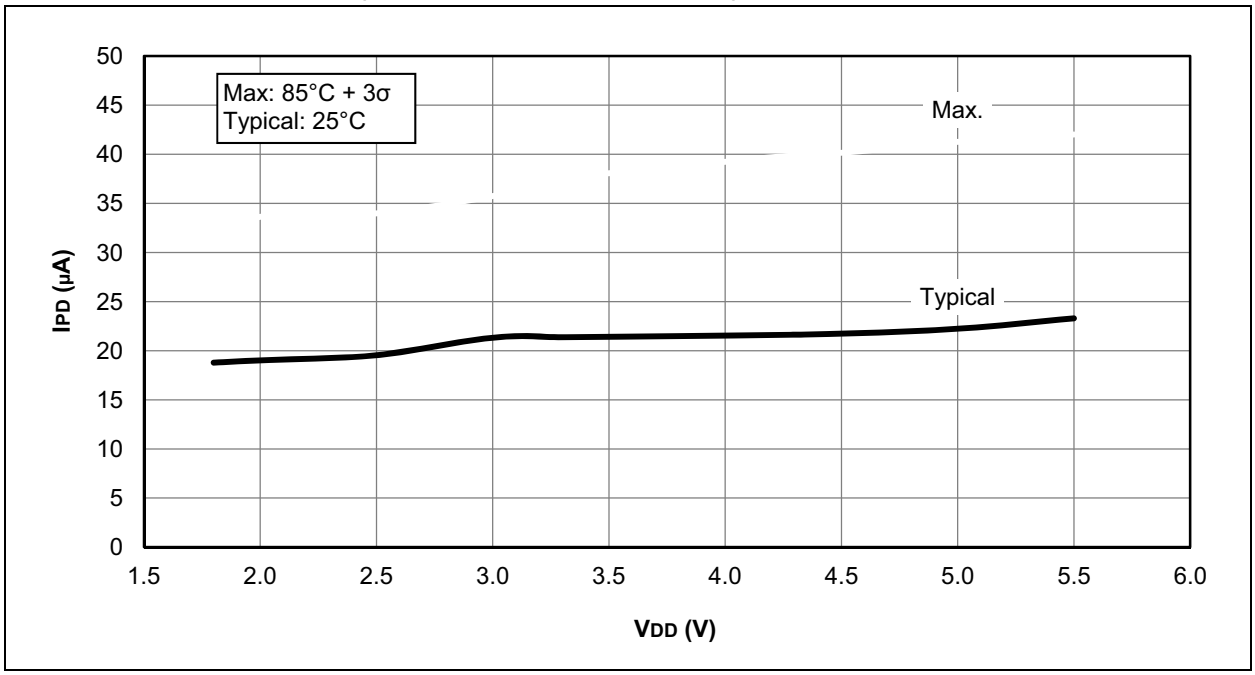
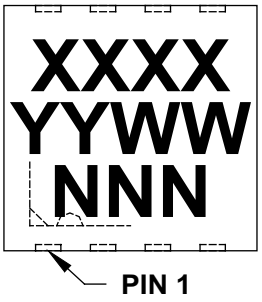


FIGURE 31-32: IPD BASE, LOW-POWER SLEEP MODE, PIC12F1822 AND PIC16F1823 ONLY



33.1 Package Marking Information (Continuation)

8-Lead DFN (3x3x0.9 mm)
8-Lead UDFN (3x3x0.5 mm)



Example

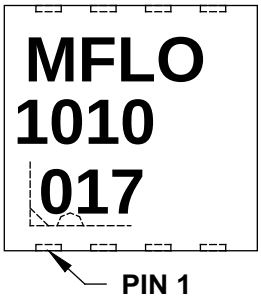


TABLE 33-1: 8-LEAD 3x3x0.9 DFN (MF) TOP MARKING

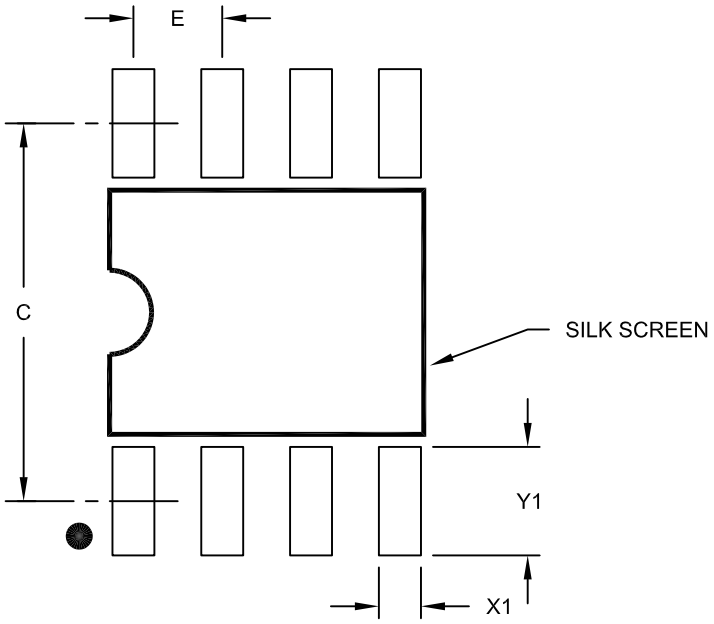
Part Number	Marking
PIC12F1822T-E/MF	MFLO
PIC12F1822T-I/MF	MFMO
PIC12LF1822T-E/MF	MFPO
PIC12LF1822T-I/MF	MFNO

TABLE 33-2: 8-LEAD 3x3x0.5 UDFN (RF) TOP MARKING

Part Number	Marking
PIC12F1822T-E/RF	DABO
PIC12F1822T-I/RF	DAAO
PIC12LF1822T-E/RF	DAHO
PIC12LF1822T-I/RF	DAGO

8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm Body [SOIC]

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		1.27 BSC	
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

Notes:

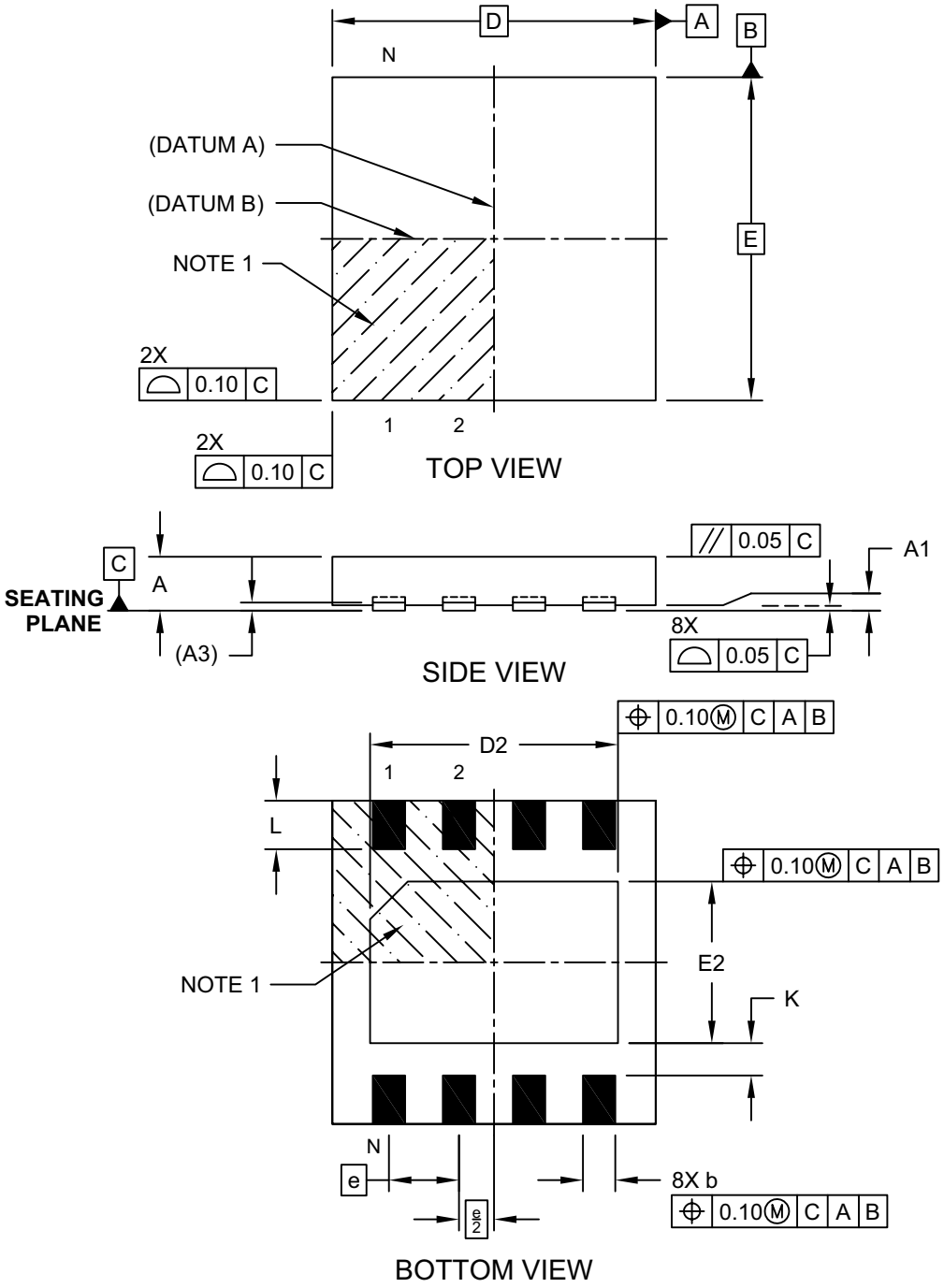
1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2057A

8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (RF) - 3x3x0.50 mm Body [UDFN]

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



Microchip Technology Drawing C04-254A Sheet 1 of 2