

PIC16F627

PIC16F627 Rev. A Silicon Errata Sheet

The PIC16F627 (Rev. A) parts you have received conform functionally to the Device Data Sheet (DS40300**B**), except for the anomalies described below.

1. Module: I/O Ports

A read of the PORTB Data Direction Register (TRISB) returns the Data Direction state on the port pins themselves and not the contents of the TRISB register latch.

FIGURE 1: BLOCK DIAGRAM OF RB0/INT PIN

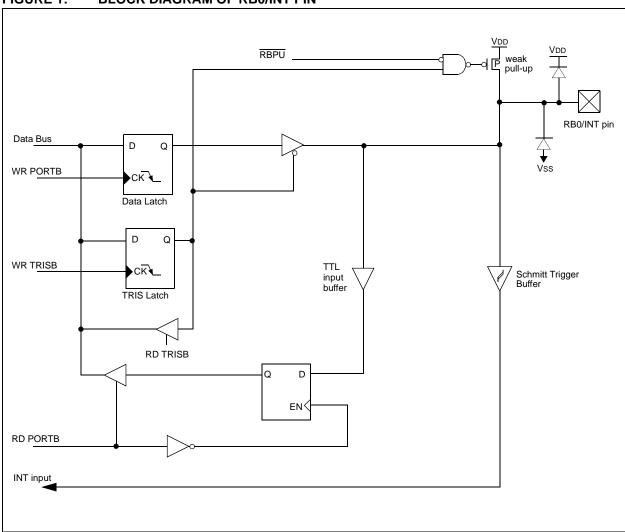


FIGURE 2: BLOCK DIAGRAM OF RB1/TX/DT PIN

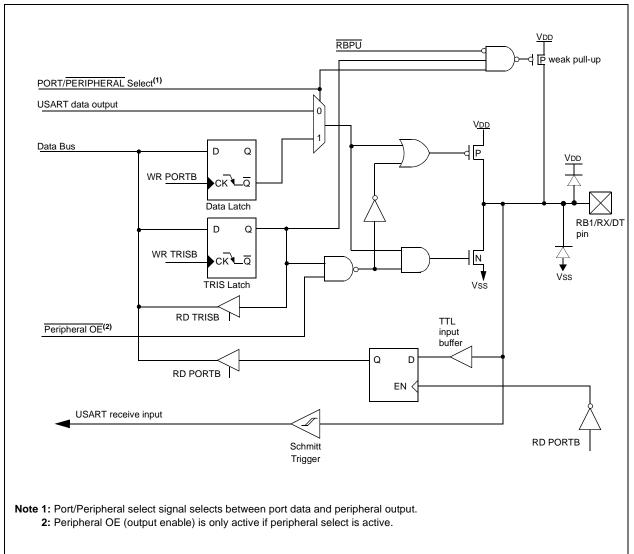


FIGURE 3: BLOCK DIAGRAM OF RB2/TX/CK PIN

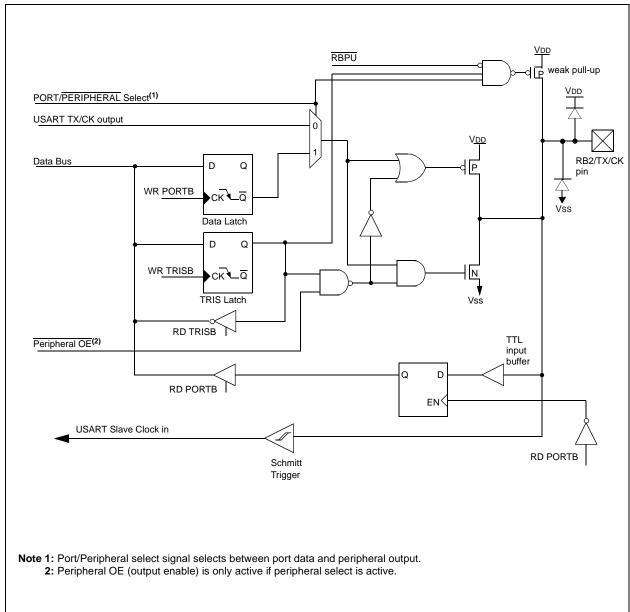


FIGURE 4: BLOCK DIAGRAM OF THE RB3/CCP1 PIN

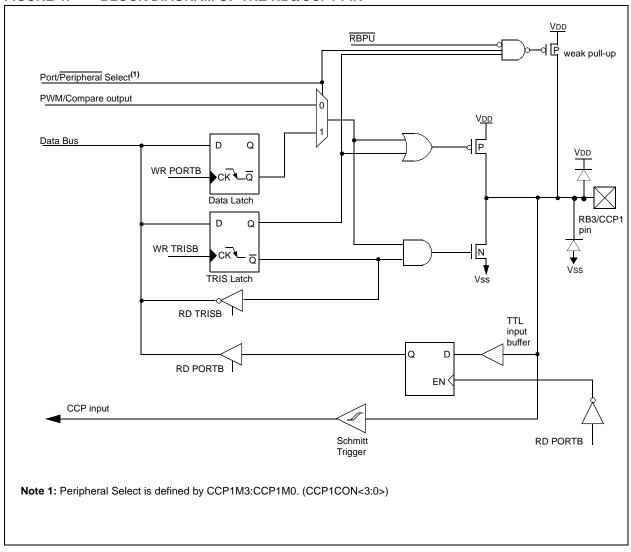


FIGURE 5: BLOCK DIAGRAM OF RB4/PGM PIN

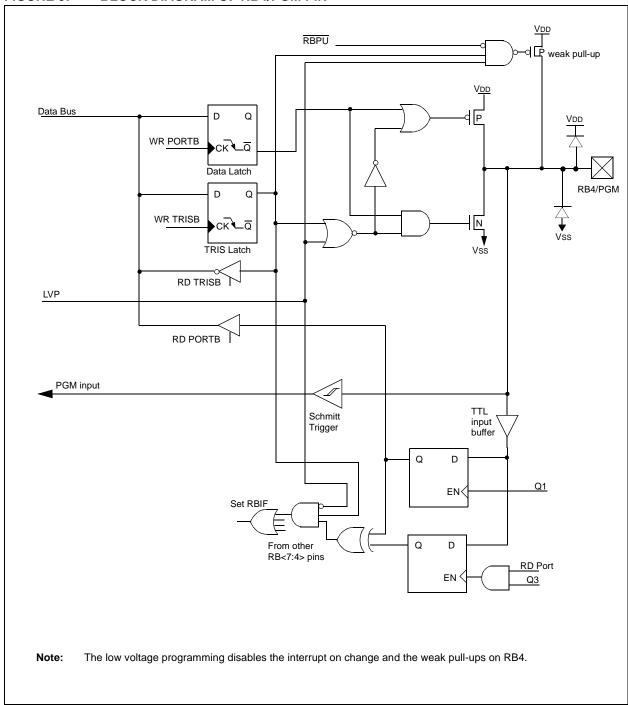
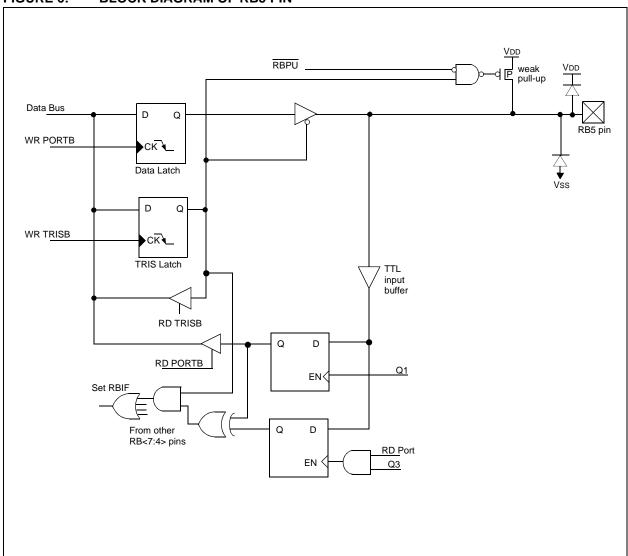


FIGURE 6: BLOCK DIAGRAM OF RB5 PIN



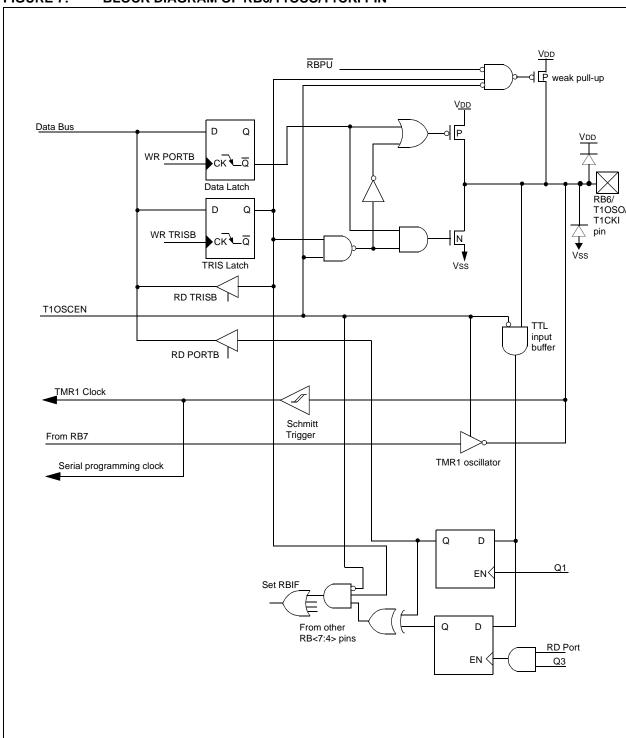


FIGURE 7: BLOCK DIAGRAM OF RB6/T10S0/T1CKI PIN

RBPU weak pull-up TMR1 oscillator To RB6 T1OSCEN Data Bus Q WR PORTB RB7/T1OSI ck \∟Q Data Latch Q WR TRISB ∙ck \∟ū TRIS Latch RD TRISB T10SCEN TTL RD PORTB input Serial programming input Schmitt Trigger Q D EN< Set RBIF Q D From other RB<7:4> pins RD Port EN ' Q3

FIGURE 8: BLOCK DIAGRAM OF THE RB7/T10SI PIN

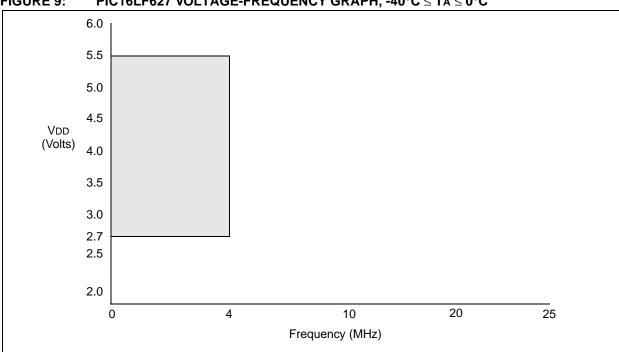


FIGURE 9: PIC16LF627 VOLTAGE-FREQUENCY GRAPH, $-40^{\circ}C \le TA \le 0^{\circ}C$

Note 1: The shaded region indicates the permissible combinations of voltage and frequency.

2: The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

Clarifications/Corrections to the Data Sheet:

In the Device Data Sheet (DS40300**B**), the following clarifications and corrections should be noted.

- The bit T1SYNC in the Register T1CON (address 10h) should be asserted logic low (ie., T1SYNC. Table 4-1, page 15, and Table 10-2, page 65, of DS40300B should be listed as follows:
- 2. The bit ADEN in Register RCSTA (address 18h), Table 4-1, is misspelled. The correct spelling should be ADDEN. This also appears in Figures and text on pages 72, 79, 80, 81, 82, 83, 84, 85, 86 and 89.

TABLE 4-1: SPECIAL REGISTERS SUMMARY BANKO

Address	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Value on POR Reset	Value on all other Resets ⁽¹⁾
Bank 0											
10h	T1CON	_	_	T1CKPS1	T1CKPS0	T1OSCEN	T1SYNC	TMR1CS	TMR10N	00 0000	uu uuuu
18h	RCSTA	SPEN	RX9	SREN	CREN	ADEN	FERR	OERR	RX9D	0000 -00x	0000 -00x

Legend: — = Unimplemented locations read as '0', u = unchanged, x = unknown, q = value depends on condition, shaded = unimplemented

Note 1: Other (non power-up) resets include MCLR Reset, Brown-out Detect and Watchdog Timer Reset during normal operation.

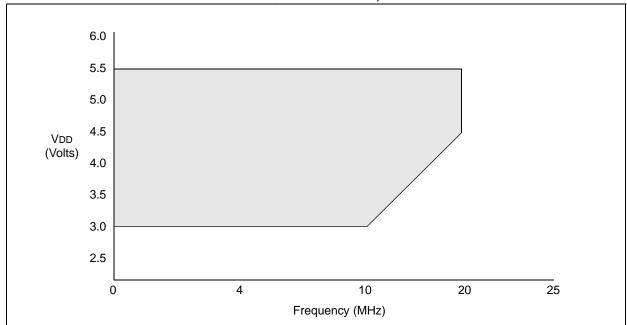
TABLE 10-2 REGISTERS ASSOCIATED WITH CAPTURE, COMPARE, AND TIMER1

Address	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Value on POR	Value on all other resets
10h	T1CON	_	_	T1CKPS1	T1CKPS0	T10SCEN	T1SYNC	TMR1CS	TMR10N	00 0000	uu uuuu

Legend: x = unknown, u = unchanged, - = unimplemented read as '0'. Shaded cells are not used by Capture and Timer1.

3. Valid regions of operation:

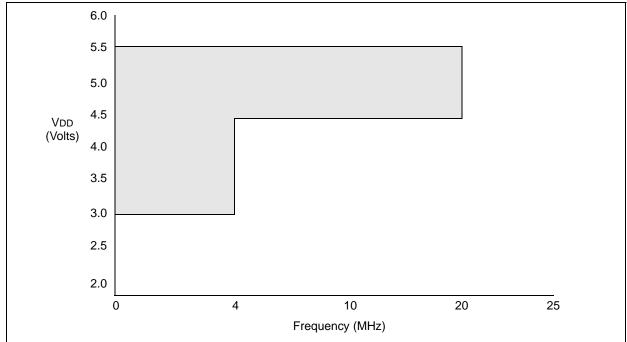
FIGURE 17-1: PIC16F62X VOLTAGE-FREQUENCY GRAPH, 0°C ≤ TA ≤ +70°C



Note 1: The shaded region indicates the permissible combinations of voltage and frequency.

2: The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

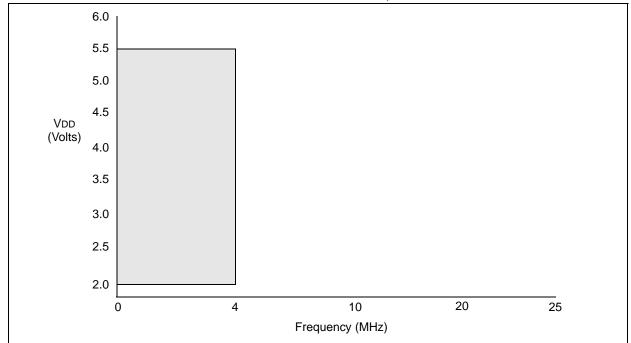
FIGURE 17-2: PIC16F62X VOLTAGE-FREQUENCY GRAPH, -40°C \leq TA < 0°C, +70°C < TA \leq +125°C



Note 1: The shaded region indicates the permissible combinations of voltage and frequency.

2: The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

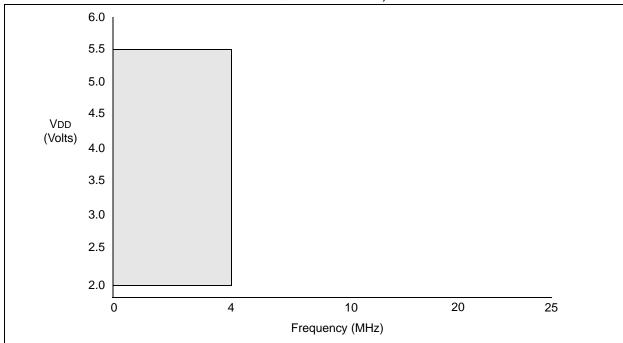
FIGURE 17-3: PIC16LF62X VOLTAGE-FREQUENCY GRAPH, 0°C ≤ TA ≤ +70°C



Note 1: The shaded region indicates the permissible combinations of voltage and frequency.

2: The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

FIGURE 17-4: PIC16LF62X VOLTAGE-FREQUENCY GRAPH, +70°C ≤ TA ≤ +125°C



Note 1: The shaded region indicates the permissible combinations of voltage and frequency.

2: The maximum rated speed of the part limits the permissible combinations of voltage and frequency. Please reference the Product Identification System section for the maximum rated speed of the parts.

TABLE 17-1: DC CHARACTERISTICS: PIC16F62X-04 (COMMERCIAL, INDUSTRIAL, EXTENDED)
PIC16F62X-20 (COMMERCIAL, INDUSTRIAL, EXTENDED)

		Standard Operating Conditions (unless otherwise stated)							
		Operating temperature −40°C ≤ 1							
		0°C ≤ TA ≤ +70°C for commercial and							
		-40°C ≤ 1	TA ≤ +1 2	25°C fo	r exter	nded			
Param	Sym	Characteristic	Min	Typ†	Max	Units	Conditions		
No.									
D001	VDD	Supply Voltage	3.0	-	5.5	V			
D002	VDR	RAM Data Retention Voltage (Note 1)	1	1.5*	_	V	Device in SLEEP mode		
D003	VPOR	VDD start voltage to ensure Power-on Reset	1	Vss	_	V	See section on power-on reset for details		
D004	SVDD	VDD rise rate to ensure Power-on Reset	0.05*	-	_	V/ms	See section on power-on reset for details		
D005	VBOD	Brown-out Detect Voltage	3.7	4.0	4.35	V	BODEN configuration bit is cleared		
D010	IDD	Supply Current (Note 2, 5)	_	_	0.7	mA	Fosc = 4.0MHz, VDD = 3.0		
							FOSC = $4.0MHz$, $VDD = 5.5*$		
D013			_	4.0	7.0	mA	FOSC = $20.0MHz$, VDD = $5.5*$		
			_	_	6.0	mA	FOSC = 20.0MHz, VDD = 4.5		
			-	_	2.0	mA	Fosc = 10.0MHz, VDD = 3.0 (Note 6) Fosc = 32kHz, VDD = 3.0		
D020	IPD	Power Down Current (Note 3)	_	_	2.2	μΑ	VDD = 3.0		
			_	_	5.0	μΑ	VDD = 4.5		
			-	_	9.0	μΑ	VDD = 5.5*		
			_	_	15.0	μΑ	VDD = 5.5 Extended*		
D022	ΔI WDT	WDT Current (Note 4)	_	6.0	20	μΑ	VDD = 4.0V		
					25	μΑ	(125°C)		
D022A	ΔIBOD	Brown-out Detect Current (Note 4)	_	75	125	μΑ	BOD enabled, VDD = 5.0V		
D023	ΔІСОМР	Comparator Current for each Comparator (Note 4)	-	30	50	μΑ	VDD = 4.0V		
D023A	Δ IVREF	VREF Current (Note 4)	_		135	μΑ	VDD = 4.0V		
1A	Fosc	LP Oscillator Operating Frequency	0	_	200	kHz	All temperatures		
		INTRC Oscillator Operating Frequency	_	_	4	MHz	All temperatures		
		XT Oscillator Operating Frequency	0	_	4	MHz	All temperatures		
		HS Oscillator Operating Frequency	0		20	MHz	All temperatures		

- * These parameters are characterized but not tested.
- † Data in "Typ" column is at 5.0V, 25°C, unless otherwise stated. These parameters are for design guidance only and are not tested.
- Note 1: This is the limit to which VDD can be lowered in SLEEP mode without losing RAM data.
 - 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.

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,

MCLR = VDD: WDT enabled/disabled as specified.

- 3: The power down current in SLEEP mode does not depend on the oscillator type. Power down current is measured with the part in SLEEP mode, with all I/O pins in hi-impedance state and tied to VDD or Vss.
- 4: The Δ current is the additional current consumed when this peripheral is enabled. This current should be added to the base IDD or IPD measurement.
- 5: For RC osc configuration, current through Rext is not included. The current through the resistor can be estimated by the formula, Ir = VDD/2Rext (mA) with Rext in kΩ.
- 6: Commercial temperature range only.

TABLE 17-2: DC CHARACTERISTICS: PIC16LF62X-04 (COMMERCIAL, INDUSTRIAL, EXTENDED)

Standard Operating Conditions (unless otherwise stated)

Operating temperature $-40^{\circ}\text{C} \le \text{TA} \le +85^{\circ}\text{C}$ for industrial and $0^{\circ}\text{C} \le \text{TA} \le +70^{\circ}\text{C}$ for commercial and $-40^{\circ}\text{C} \le \text{TA} \le +125^{\circ}\text{C}$ for extended

Operating voltage VDD range as described in DC spec Table 17-1 and Table 12-2

D	0	vm Characteristic Min Typt Max Units Conditions					
Param	Sym	Characteristic	Min	Typ†	wax	Units	Conditions
No.							
D001	VDD	Supply Voltage	2.0	-	5.5	V	
D002	Vdr	RAM Data Retention	-	1.5*	-	V	Device in SLEEP mode
		Voltage (Note 1)					
D003	VPOR	VDD start voltage to	_	Vss	_	V	See section on Power-on Reset for details
		ensure Power-on Reset					
D004	SVDD	VDD rise rate to ensure	0.05*	-	-	V/ms	See section on Power-on Reset for details
		Power-on Reset					
D005	VBOD	Brown-out Detect Voltage	3.7	4.0	4.35	V	BODEN configuration bit is cleared
D010	IDD	Supply Current (Note 2, 5)	_	_	0.6	mA	Fosc = 4.0MHz, VDD = 2.0, WDT disabled (Note 5)
D013							FOSC = 4.0MHz, VDD = 5.5, WDT disabled (Note 5)*
							Fosc = 32kHz, VDD = 2.0, WDT disabled
Dooo	1	David David Outstand (Alada O. O.)					1/ 0.0
D020	IPD	Power Down Current (Note 2, 3)			0.0	^	VDD = 2.0
			_	_	2.0 2.2	μA μA	VDD = 2.5* VDD = 3.0*
					9.0	μA μA	VDD = 5.5
					15.0	μA	VDD = 5.5 Extended
	Alwdt	WDT Current (Note 4)		6.0	15	μΑ	VDD = 3.0V
D023	Albod	Brown-out Detect Current (Note 4)	_	75	125	μA	BOD enabled, VDD = 5.0V
2020	ΔICOMP	Comparator Current for each		. •	0	μ	302 0.102.100.1
		Comparator (Note 4)	-	30	50	μΑ	VDD = 3.0V
	ΔI VREF	VREF Current (Note 4)	-		135	μA	VDD = 3.0V
1A	Fosc	LP Oscillator Operating Frequency	0	-	200	kHz	All temperatures
		INTRC Oscillator Operating Frequency	-	-	4	MHz	All temperatures
		XT Oscillator Operating Frequency	0	-	4	MHz	All temperatures
		HS Oscillator Operating Frequency	0	-	20	MHz	All temperatures

^{*} These parameters are characterized but not tested.

- † Data in "Typ" column is at 5.0V, 25°C, unless otherwise stated. These parameters are for design guidance only and are not tested.
- Note 1: This is the limit to which VDD can be lowered in SLEEP mode without losing RAM data.
 - 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.

The test conditions for all IDD measurements in active operation mode are:

OSC1=external square wave, from rail to rail; all I/O pins tristated, pulled to VDD,

MCLR = VDD; WDT enabled/disabled as specified.

- 3: The power down current in SLEEP mode does not depend on the oscillator type. Power down current is measured with the part in SLEEP mode, with all I/O pins in hi-impedance state and tied to VDD to VSs.
- 4: The Δ current is the additional current consumed when this peripheral is enabled. This current should be added to the base IDD or IPD measurement.
- 5: For RC osc configuration, current through Rext is not included. The current through the resistor can be estimated by the formula Ir = VDD/2Rext (mA) with Rext in kΩ.

TABLE 17-3: DC CHARACTERISTICS: PIC16F62X (COMMERCIAL, INDUSTRIAL, EXTENDED)
PIC16LF62X (COMMERCIAL, INDUSTRIAL, EXTENDED)

Standard Operating Conditions (unless otherwise stated)

Operating temperature $-40^{\circ}\text{C} \le \text{TA} \le +85^{\circ}\text{C}$ for industrial and $0^{\circ}\text{C} \le \text{TA} \le +70^{\circ}\text{C}$ for commercial and $-40^{\circ}\text{C} \le \text{TA} \le +125^{\circ}\text{C}$ for extended

i	-40°C ≤ TA ≤ +125°C for extended Operating voltage VDD range as described in DC spec Table 17-1 and Table 12-2								
Param. No.	Sym	Characteristic	Min	Тур†	Max	Unit	Conditions		
	VIL	Input Low Voltage							
		I/O ports							
D030		with TTL buffer	Vss	_	0.8V	V	VDD = 4.5V to 5.5V		
					0.15VDD		otherwise		
D031		with Schmitt Trigger input	Vss		0.2Vdd	V			
D032		MCLR, RA4/T0CKI,OSC1 (in ER	Vss	_	0.2VDD	V	Note1		
		mode)							
D033		OSC1 (in XT and HS)	Vss	_	0.3VDD	V			
		OSC1 (in LP)	Vss	_	0.6VDD-1.0	V			
	VIH	Input High Voltage							
		I/O ports		_					
D040		with TTL buffer	2.0V	_	VDD	V	VDD = 4.5V to 5.5V		
			.25VDD + 0.8V		VDD		otherwise		
D041		with Schmitt Trigger input	0.8VDD	_	VDD				
D042		MCLR RA4/T0CKI	0.8VDD	_	VDD	V			
D043		OSC1 (XT, HS and LP)	0.7Vdd	_	VDD	V			
D043A		OSC1 (in ER mode)	0.9Vdd				Note1		
D070	IPURB	PORTB weak pull-up current	50	200	400	μΑ	VDD = 5.0V, VPIN = VSS		
		Input Leakage Current							
	lı∟	(Notes 2, 3)					N (N (N (N (N (N (N (N		
Dooo		I/O ports (Except PORTA)			±1.0	μA	VSS ≤ VPIN ≤ VDD, pin at hi-impedance		
D060		PORTA	_	_	±0.5	μΑ	Vss ≤ VPIN ≤ VDD, pin at hi-impedance		
D061		RA4/T0CKI	_	_	±1.0	μΑ	Vss ≤ Vpin ≤ Vdd		
D063		OSC1, MCLR	_	_	±5.0	μΑ	Vss ≤ VPIN ≤ VDD, XT, HS and LP osc configuration		
	Vol	Output Low Voltage							
D080		I/O ports	_	_	0.6	V	IOL=8.5 mA, VDD=4.5V, -40° to +85°C		
			_	_	0.6	V	IOL=7.0 mA, VDD=4.5V, +125°C		
D083		OSC2/CLKOUT (ER only)	_	_	0.6	V	IOL=1.6 mA, VDD=4.5V, -40° to +85°C		
			_	_	0.6	V	IOL=1.2 mA, VDD=4.5V, +125°C		
	Voн	Output High Voltage (Note 3)							
D090		I/O ports (Except RA4)	VDD-0.7	_	_	V	IOH=-3.0 mA, VDD=4.5V, -40° to +85°C		
		,	VDD-0.7	_	_	V	IOH=-2.5 mA, VDD=4.5V, +125°C		
D092		OSC2/CLKOUT (ER only)	VDD-0.7	_	_	V	IOH=-1.3 mA, VDD=4.5V, -40° to +85°C		
		` ''	VDD-0.7	_	_	V	IOH=-1.0 mA, VDD=4.5V, +125°C		
D150	Vod	Open-Drain High Voltage	-	_	8.5	V	RA4 pin PIC16F62X, PIC16LF62X		
		Capacitive Loading Specs on							
		Output Pins							
D100	COSC2	OSC2 pin		_	15	pF	In XT, HS and LP modes when external clock used to drive OSC1.		
D101	Сю	All I/O pins/OSC2 (in ER mode)		_	50	pF	Sissic asset to arrive SGO1.		

^{*} These parameters are characterized but not tested.

[†] Data in "Typ" column is at 5.0V, 25°C unless otherwise stated. These parameters are for design guidance only and are not tested.

Note 1: In ER oscillator configuration, the OSC1 pin is a Schmitt Trigger input. It is not recommended that the PIC16F62X be driven with

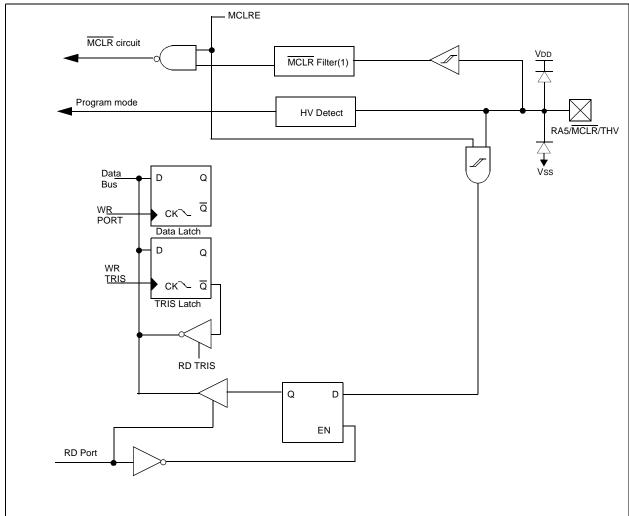
external clock in ER mode.

^{2:} The leakage current on the MCLR pin is strongly dependent on applied voltage level. The specified levels represent normal operating conditions. Higher leakage current may be measured at different input voltages.

^{3:} Negative current is defined as coming out of the pin.

4. The following block diagram shown in Section 5, Figure 5-5 is incorrect. The following figure should be used instead.

FIGURE 5-5: BLOCK DIAGRAM OF THE RA5/MCLR/THV PIN



The example given in Section 9, Example 9-1, concerning Initializing the Comparator Module is incorrect. The following code example should be used instead.

EXAMPLE 9-1: INITIALIZING COMPARATOR MODULE

```
BCF
                    INTCON, GIE
                                      ; Turn OFF Global Interrupts
                                      ; Turn OFF Peripheral Interrupts
        BCF
                    INTCON, PEIE
        CLRF
                    PORTA
                                     ; Init Port A
       MOVLW
                    0X03
                                     ; Init comparator mode
       MOVWF
                    CMCON
                                     ; CM < 2:0 > = 011
        BSF
                    STATUS, RPO
                                     ; Select BANK 1
       MOVLW
                    0 \times 07
                                      ; Initialize Port A Direction
       MOVWF
                    TRISA
                                      ; Set RA<2:0> as Inputs
                                      ; RA<4:3> as outputs
                                      ; TRIS<5> always reads '0'
        BCF
                    STATUS, RPO
                                      ; Select BANK 0
        CALL
                    DELAY10
                                      ; Wait 10us for comparator output to become valid
                                     ; See Table 17-1 Parameter 301
       MOVF
                    CMCON, F
                                     ; Read CMCON to end change condition
                    PIR1,CMIF
                                     ; Clear pending interrupts
        BSF
                    STATUS, RPO
                                     ; Select BANK 1
        BSF
                    PIE1,CMIE
                                     ; Enable Comparator Interrupts
        BCF
                    STATUS, RPO
                                     ; Select BANK 0
        BSF
                    INTCON, PEIE
                                     ; Enable Peripheral Interrupts
        BSF
                    INTCON, GIE
                                      ; Global Interrupt Enable
        ; Insert Your code....
        ; Helper function is the Delay for 10us routine show below.
DELAY10
                    ; burns 8 cycles + the call for 10 cycles or 10us at 4\mbox{Mhz}
       goto $+1
                    ; goto the next instruction and burn 2 cycles
       call retlbl ; goto the next instruction and burn 2 more cycles
                    ; go back and burn 2 cycles (actualy done 2x for 4 cycles consumed)
```

PIC16F627

6. The examples given in Section 13, concerning the Data EEPROM are incorrect. The EEPROM registers are all located in Bank 1. The examples show the registers in Bank 0 and Bank 1. The following code examples should be used instead to use this feature.

EXAMPLE 13-1: DATA EEPROM READ

```
BSF STATUS, RPO ; Bank 1

MOVLW CONFIG_ADDR ;

MOVWF EEADR ; Address to read

BSF EECON1, RD ; EE Read

MOVF EEDATA, W ; W = EEDATA

BCF STATUS, RPO ; Bank 0
```

EXAMPLE 13-2: DATA EEPROM WRITE

```
; set up the data and
                    the address
BSF
       STATUS, RPO ; Bank 1
MOVLW CONFIG_ADDR ;
MOVWF EEADR
               ; Address to write
MOVLW CONFIG_DATA;
MOVWF EEDATA
                 ; Data to write
                  ; perform the write
                    operation
       EECON, WREN ; Enable Write
BSF
       INTCON, GIE ; Disable INTs
BCF
MOVLW 055h
MOVWF
      EECON2
                  ; Write 55
MOVLW 0AAh
MOVWF EECON2
                  ; Write AA
       EECON1, WR ; Set WR bit
BSF
BCF
       STATUS, RPO ; Bank 0
```

EXAMPLE 13-3: DATA EEPROM VERIFY

```
; after the write in complete (i.e. in the
 write interrupt)
   BSF STATUS, RPO; Bank 1
   MOVF EEDATA, W ; load the last
                      written value into W
   BSF EECON, RD ; start a read
; Is the value written (in W Reg) and
; read (in EEDATA) the same?
   SUBWF EEDATA, W
                   ; the EEDATA has fresh
                      data
   BTFSS STATUS, Z
                   ; Is the Zero flag set?
                   ; NO, Write Error
   GOTO WRITE_ERR
                    ; YES, Good Write
                     ; continue program
```

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