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Details

Product Status	Active
Core Processor	PIC
Core Size	16-Bit
Speed	32MHz
Connectivity	I ² C, IrDA, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, LVD, POR, PWM, WDT
Number of I/O	38
Program Memory Size	16KB (5.5K x 24)
Program Memory Type	FLASH
EEPROM Size	512 x 8
RAM Size	2K x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 3.6V
Data Converters	A/D 22x10b/12b; D/A 2x8b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	44-VQFN Exposed Pad
Supplier Device Package	44-QFN (8x8)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic24f16km204-i-ml

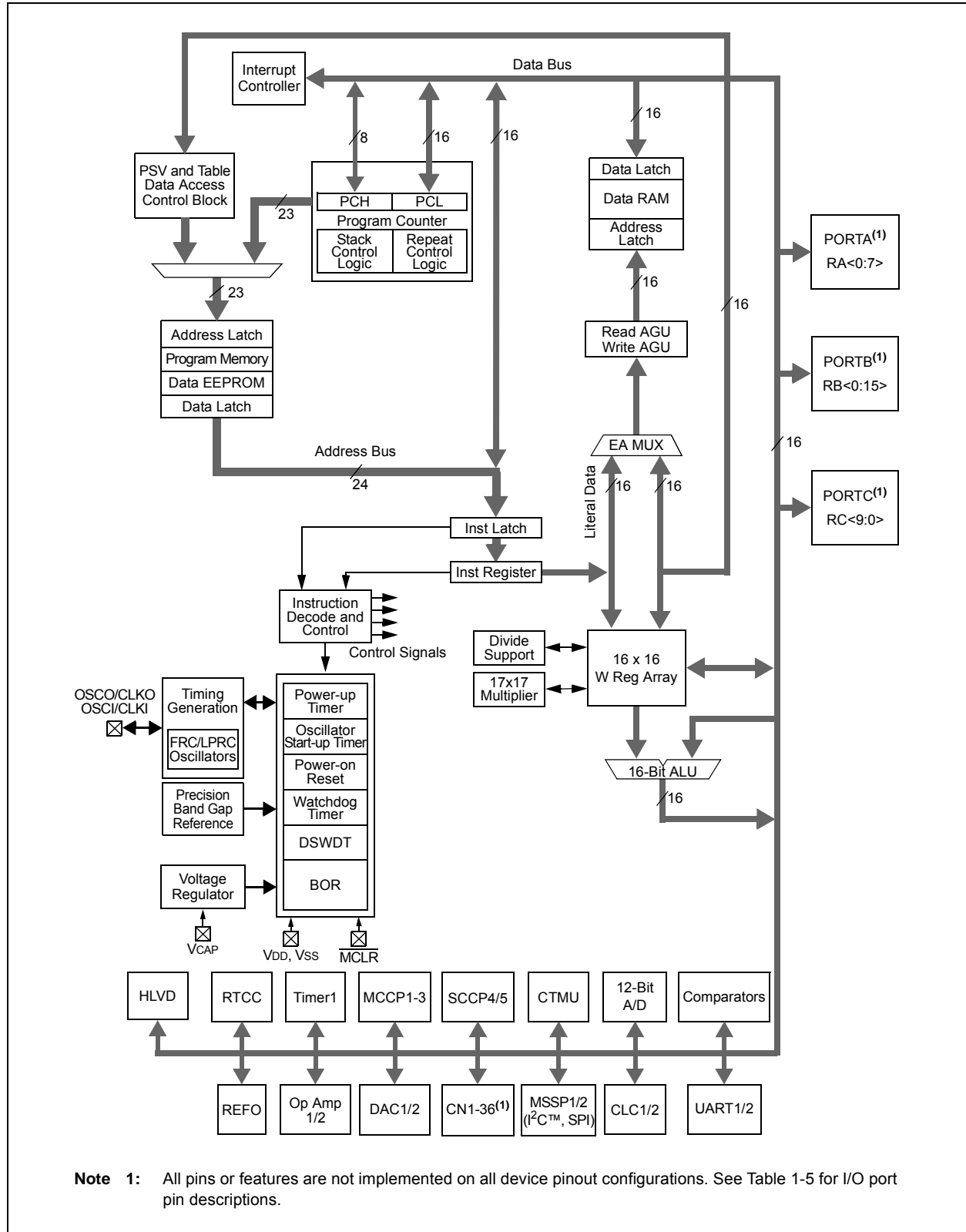
PIC24FV16KM204 FAMILY

TABLE 1-4: DEVICE FEATURES FOR THE PIC24FV16KM104 FAMILY

Features	PIC24FV16KM104	PIC24FV16KM102	PIC24FV08KM102	PIC24FV08KM101
Operating Frequency	DC-32 MHz			
Program Memory (bytes)	16K	16K	8K	8K
Program Memory (instructions)	5632	5632	2816	2816
Data Memory (bytes)	1024			
Data EEPROM Memory (bytes)	512			
Interrupt Sources (soft vectors/NMI traps)	25 (21/4)			
Voltage Range	2.0-5.5V			
I/O Ports	PORTA<11:7,5:0> PORTB<15:0> PORTC<9:0>	PORTA<7,5:0> PORTB<15:0>		PORTA<5:0> PORTB<15:12,9:7, 4,2:0>
Total I/O Pins	37	23		17
Timers	5 (One 16-bit timer, two MCCPs/SCCPs with up to two 16/32 timers each)			
Capture/Compare/PWM modules	1 1			
MCCP				
SCCP				
Serial Communications	1 1			
MSSP				
UART				
Input Change Notification Interrupt	36	22		16
12-Bit Analog-to-Digital Module (input channels)	22	19		16
Analog Comparators	1			
8-Bit Digital-to-Analog Converters	—			
Operational Amplifiers	—			
Charge Time Measurement Unit (CTMU)	Yes			
Real-Time Clock and Calendar (RTCC)	—			
Configurable Logic Cell (CLC)	1			
Resets (and delays)	POR, BOR, RESET Instruction, MCLR, WDT, Illegal Opcode, REPEAT Instruction, Hardware Traps, Configuration Word Mismatch (PWRT, OST, PLL Lock)			
Instruction Set	76 Base Instructions, Multiple Addressing Mode Variations			
Packages	44-Pin QFN/TQFP, 48-Pin UQFN	28-Pin SPDIP/SSOP/SOIC/QFN		20-Pin SOIC/SSOP/PDIP

PIC24FV16KM204 FAMILY

FIGURE 1-1: PIC24FXXXXX FAMILY GENERAL BLOCK DIAGRAMS



4.2.5 SOFTWARE STACK

In addition to its use as a working register, the W15 register in PIC24F devices is also used as a Software Stack Pointer. The pointer always points to the first available free word and grows from lower to higher addresses. It pre-decrements for stack pops and post-increments for stack pushes, as depicted in Figure 4-4.

For a PC push during any *CALL* instruction, the MSB of the PC is zero-extended before the push, ensuring that the MSB is always clear.

Note: A PC push during exception processing will concatenate the SRL register to the MSB of the PC prior to the push.

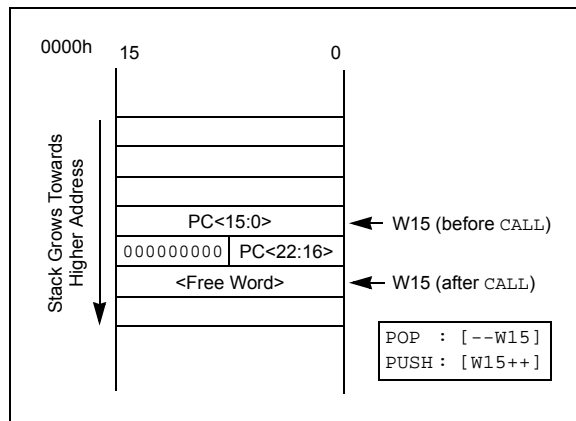
The Stack Pointer Limit Value (SPLIM) register, associated with the Stack Pointer, sets an upper address boundary for the stack. SPLIM is uninitialized at Reset. As is the case for the Stack Pointer, $SPLIM<0>$ is forced to '0' as all stack operations must be word-aligned. Whenever an EA is generated using W15 as a source or destination pointer, the resulting address is compared with the value in SPLIM. If the contents of the Stack Pointer (W15) and the SPLIM register are equal, and a push operation is performed, a stack error trap will not occur. The stack error trap will occur on a subsequent push operation.

Thus, for example, if it is desirable to cause a stack error trap when the stack grows beyond address, 0DF6 in RAM, initialize the SPLIM with the value, 0DF4.

Similarly, a Stack Pointer underflow (stack error) trap is generated when the Stack Pointer address is found to be less than 0800h. This prevents the stack from interfering with the Special Function Register (SFR) space.

Note: A write to the SPLIM register should not be immediately followed by an indirect read operation using W15.

FIGURE 4-4: CALL STACK FRAME



4.3 Interfacing Program and Data Memory Spaces

The PIC24F architecture uses a 24-bit-wide program space and 16-bit-wide Data Space (DS). The architecture is also a modified Harvard scheme, meaning that data can also be present in the program space. To use this data successfully, it must be accessed in a way that preserves the alignment of information in both spaces.

Apart from the normal execution, the PIC24F architecture provides two methods by which the program space can be accessed during operation:

- Using table instructions to access individual bytes or words anywhere in the program space
- Remapping a portion of the program space into the Data Space, PSV

Table instructions allow an application to read or write small areas of the program memory. This makes the method ideal for accessing data tables that need to be updated from time to time. It also allows access to all bytes of the program word. The remapping method allows an application to access a large block of data on a read-only basis, which is ideal for look ups from a large table of static data. It can only access the least significant word (lsb) of the program word.

4.3.1 ADDRESSING PROGRAM SPACE

Since the address ranges for the data and program spaces are 16 and 24 bits, respectively, a method is needed to create a 23-bit or 24-bit program address from 16-bit data registers. The solution depends on the interface method to be used.

For table operations, the 8-bit Table Memory Page Address register (TBLPAG) is used to define a 32K word region within the program space. This is concatenated with a 16-bit EA to arrive at a full 24-bit program space address. In this format, the Most Significant bit (MSb) of TBLPAG is used to determine if the operation occurs in the user memory (TBLPAG<7> = 0) or the configuration memory (TBLPAG<7> = 1).

For remapping operations, the 8-bit Program Space Visibility Page Address register (PSVPAG) is used to define a 16K word page in the program space. When the MSb of the EA is '1', PSVPAG is concatenated with the lower 15 bits of the EA to form a 23-bit program space address. Unlike the table operations, this limits remapping operations strictly to the user memory area.

See Table 4-35 and Figure 4-5 to know how the program EA is created for table operations and remapping accesses from the data EA. Here, P<23:0> refers to a program space word, whereas D<15:0> refers to a Data Space word.

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REGISTER 7-1: RCON: RESET CONTROL REGISTER⁽¹⁾

R/W-0, HS	R/W-0, HS	R/W-0	R/W-0	U-0	U-0	R/W-0	R/W-0
TRAPR	IOPUWR	SBOREN	RETEN ⁽³⁾	—	—	CM	PMSLP
bit 15						bit 8	

R/W-0, HS	R/W-0, HS	R/W-0, HS	R/W-0, HS	R/W-0, HS	R/W-0, HS	R/W-1, HS	R/W-1, HS
EXTR	SWR	SWDTEN ⁽²⁾	WDTO	SLEEP	IDLE	BOR	POR
bit 7						bit 0	

Legend:	HS = Hardware Settable bit		
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 15 **TRAPR:** Trap Reset Flag bit
 1 = A Trap Conflict Reset has occurred
 0 = A Trap Conflict Reset has not occurred
- bit 14 **IOPUWR:** Illegal Opcode or Uninitialized W Access Reset Flag bit
 1 = An illegal opcode detection, an illegal address mode or Uninitialized W register used as an Address Pointer caused a Reset
 0 = An illegal opcode or Uninitialized W Reset has not occurred
- bit 13 **SBOREN:** Software Enable/Disable of BOR bit
 1 = BOR is turned on in software
 0 = BOR is turned off in software
- bit 12 **RETEN:** Retention Sleep Mode⁽³⁾
 1 = Regulated voltage supply provided by the Retention Regulator (RETREG) during Sleep
 0 = Regulated voltage supply provided by the main Voltage Regulator (VREG) during Sleep
- bit 11-10 **Unimplemented:** Read as '0'
- bit 9 **CM:** Configuration Word Mismatch Reset Flag bit
 1 = A Configuration Word Mismatch Reset has occurred
 0 = A Configuration Word Mismatch Reset has not occurred
- bit 8 **PMSLP:** Program Memory Power During Sleep bit
 1 = Program memory bias voltage remains powered during Sleep
 0 = Program memory bias voltage is powered down during Sleep and the voltage regulator enters Standby mode
- bit 7 **EXTR:** External Reset ($\overline{\text{MCLR}}$) Pin bit
 1 = A Master Clear (pin) Reset has occurred
 0 = A Master Clear (pin) Reset has not occurred
- bit 6 **SWR:** Software RESET (Instruction) Flag bit
 1 = A RESET instruction has been executed
 0 = A RESET instruction has not been executed
- bit 5 **SWDTEN:** Software Enable/Disable of WDT bit⁽²⁾
 1 = WDT is enabled
 0 = WDT is disabled

- Note 1:** All of the Reset status bits may be set or cleared in software. Setting one of these bits in software does not cause a device Reset.
- 2:** If the FWDTEN<1:0> Configuration bits are '11' (unprogrammed), the WDT is always enabled regardless of the SWDTEN bit setting.
- 3:** This is implemented on PIC24FV16KMXXX parts only; not used on PIC24F16KMXXX devices.

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REGISTER 8-1: SR: ALU STATUS REGISTER

U-0	U-0	U-0	U-0	U-0	U-0	U-0	R-0, HSC
—	—	—	—	—	—	—	DC ⁽¹⁾
bit 15							bit 8

R/W-0, HSC	R/W-0, HSC	R/W-0, HSC	R-0, HSC	R/W-0, HSC	R/W-0, HSC	R/W-0, HSC	R/W-0, HSC
IPL2 ^(2,3)	IPL1 ^(2,3)	IPL0 ^(2,3)	RA ⁽¹⁾	N ⁽¹⁾	OV ⁽¹⁾	Z ⁽¹⁾	C ⁽¹⁾
bit 7							bit 0

Legend:	HSC = Hardware Settable/Clearable bit						
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 15-9 **Unimplemented:** Read as '0'

bit 7-5 **IPL<2:0>:** CPU Interrupt Priority Level Status bits^(2,3)

111 = CPU Interrupt Priority Level is 7 (15); user interrupts are disabled

110 = CPU Interrupt Priority Level is 6 (14)

101 = CPU Interrupt Priority Level is 5 (13)

100 = CPU Interrupt Priority Level is 4 (12)

011 = CPU Interrupt Priority Level is 3 (11)

010 = CPU Interrupt Priority Level is 2 (10)

001 = CPU Interrupt Priority Level is 1 (9)

000 = CPU Interrupt Priority Level is 0 (8)

Note 1: See Register 3-1 for the description of these bits, which are not dedicated to interrupt control functions.

2: The IPL<2:0> bits are concatenated with the IPL3 bit (CORCON<3>) to form the CPU Interrupt Priority Level. The value in parentheses indicates the Interrupt Priority Level if IPL3 = 1.

3: The IPLx Status bits are read-only when NSTDIS (INTCON1<15>) = 1.

Note: Bit 8 and bits 4 through 0 are described in **Section 3.0 "CPU"**.

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REGISTER 8-2: CORCON: CPU CONTROL REGISTER

U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
—	—	—	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	U-0	R/C-0, HSC	R/W-0	U-0	U-0
—	—	—	—	IPL3 ⁽²⁾	PSV ⁽¹⁾	—	—
bit 7							bit 0

Legend:	C = Clearable bit	HSC = Hardware Settable/Clearable bit
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 15-4 **Unimplemented:** Read as '0'
- bit 3 **IPL3:** CPU Interrupt Priority Level Status bit⁽²⁾
 1 = CPU Interrupt Priority Level is greater than 7
 0 = CPU Interrupt Priority Level is 7 or less
- bit 1-0 **Unimplemented:** Read as '0'

- Note 1:** See Register 3-2 for the description of this bit, which is not dedicated to interrupt control functions.
- 2:** The IPL3 bit is concatenated with the IPL<2:0> bits (SR<7:5>) to form the CPU Interrupt Priority Level.

Note: Bit 2 is described in **Section 3.0 “CPU”**.

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REGISTER 8-3: INTCON1: INTERRUPT CONTROL REGISTER 1

R/W-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
NSTDIS	—	—	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	R/W-0, HS	R/W-0, HS	R/W-0, HS	R/W-0, HS	U-0
—	—	—	MATHERR	ADDRERR	STKERR	OSCFAIL	—
bit 7							bit 0

Legend:	HS = Hardware Settable bit		
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 15 **NSTDIS:** Interrupt Nesting Disable bit
 1 = Interrupt nesting is disabled
 0 = Interrupt nesting is enabled
- bit 14-5 **Unimplemented:** Read as '0'
- bit 4 **MATHERR:** Arithmetic Error Trap Status bit
 1 = Overflow trap has occurred
 0 = Overflow trap has not occurred
- bit 3 **ADDRERR:** Address Error Trap Status bit
 1 = Address error trap has occurred
 0 = Address error trap has not occurred
- bit 2 **STKERR:** Stack Error Trap Status bit
 1 = Stack error trap has occurred
 0 = Stack error trap has not occurred
- bit 1 **OSCFAIL:** Oscillator Failure Trap Status bit
 1 = Oscillator failure trap has occurred
 0 = Oscillator failure trap has not occurred
- bit 0 **Unimplemented:** Read as '0'

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REGISTER 8-13: IEC1: INTERRUPT ENABLE CONTROL REGISTER 1

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0	U-0	U-0
U2TXIE	U2RXIE	INT2IE	CCT4IE	CCT3IE	—	—	—
bit 15						bit 8	

U-0	R/W-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	CCP5IE	—	INT1IE	CNIE	CMIE	BCL1IE	SSP1IE
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 15 **U2TXIE:** UART2 Transmitter Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 14 **U2RXIE:** UART2 Receiver Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 13 **INT2IE:** External Interrupt 2 Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 12 **CCT4IE:** Capture/Compare 4 Timer Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 11 **CCT3IE:** Capture/Compare 3 Timer Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 10-7 **Unimplemented:** Read as '0'

bit 6 **CCP5IE:** Capture/Compare 5 Event Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

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

bit 4 **INT1IE:** External Interrupt 1 Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 3 **CNIE:** Input Change Notification Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 2 **CMIE:** Comparator Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 1 **BCL1IE:** MSSP1 I²C™ Bus Collision Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

bit 0 **SSP1IE:** MSSP1 SPI/I²C Event Interrupt Enable bit

1 = Interrupt request is enabled

0 = Interrupt request is not enabled

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REGISTER 8-22: IPC3: INTERRUPT PRIORITY CONTROL REGISTER 3

U-0	R/W-1	R/W-0	R/W-0	U-0	U-0	U-0	U-0
—	NVMIP2	NVMIP1	NVMIP0	—	—	—	—
bit 15							bit 8

U-0	R/W-1	R/W-0	R/W-0	U-0	R/W-1	R/W-0	R/W-0
—	AD1IP2	AD1IP1	AD1IP0	—	U1TXIP2	U1TXIP1	U1TXIP0
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 15 **Unimplemented:** Read as '0'

bit 14-12 **NVMIP<2:0>:** NVM Interrupt Priority bits
 111 = Interrupt is Priority 7 (highest priority interrupt)

•
•
•

001 = Interrupt is Priority 1
 000 = Interrupt source is disabled

bit 11-7 **Unimplemented:** Read as '0'

bit 6-4 **AD1IP<2:0>:** A/D Conversion Complete Interrupt Priority bits
 111 = Interrupt is Priority 7 (highest priority interrupt)

•
•
•

001 = Interrupt is Priority 1
 000 = Interrupt source is disabled

bit 3 **Unimplemented:** Read as '0'

bit 2-0 **U1TXIP<2:0>:** UART1 Transmitter Interrupt Priority bits
 111 = Interrupt is Priority 7 (highest priority interrupt)

•
•
•

001 = Interrupt is Priority 1
 000 = Interrupt source is disabled

PIC24FV16KM204 FAMILY

The following code sequence for a clock switch is recommended:

1. Disable interrupts during the OSCCON register unlock and write sequence.
2. Execute the unlock sequence for the OSCCON high byte by writing 78h and 9Ah to OSCCON<15:8>, in two back-to-back instructions.
3. Write the new oscillator source to the NOSCx bits in the instruction immediately following the unlock sequence.
4. Execute the unlock sequence for the OSCCON low byte by writing 46h and 57h to OSCCON<7:0>, in two back-to-back instructions.
5. Set the OSWEN bit in the instruction immediately following the unlock sequence.
6. Continue to execute code that is not clock-sensitive (optional).
7. Invoke an appropriate amount of software delay (cycle counting) to allow the selected oscillator and/or PLL to start and stabilize.
8. Check to see if OSWEN is '0'. If it is, the switch was successful. If OSWEN is still set, then check the LOCK bit to determine the cause of failure.

The core sequence for unlocking the OSCCON register and initiating a clock switch is shown in Example 9-1 and Example 9-2.

EXAMPLE 9-1: ASSEMBLY CODE SEQUENCE FOR CLOCK SWITCHING

```
;Place the new oscillator selection in W0
;OSCCONH (high byte) Unlock Sequence
MOV      #OSCCONH, w1
MOV      #0x78, w2
MOV      #0x9A, w3
MOV.b    w2, [w1]
MOV.b    w3, [w1]
;Set new oscillator selection
MOV.b    WREG, OSCCONH
;OSCCONL (low byte) unlock sequence
MOV      #OSCCONL, w1
MOV      #0x46, w2
MOV      #0x57, w3
MOV.b    w2, [w1]
MOV.b    w3, [w1]
;Start oscillator switch operation
BSET     OSCCON,#0
```

EXAMPLE 9-2: BASIC 'C' CODE SEQUENCE FOR CLOCK SWITCHING

```
//Use compiler built-in function to write
new clock setting
__builtin_write_OSCCONH(0x01); //0x01
switches to FRCPLL

//Use compiler built-in function to set the
OSWEN bit.
__builtin_write_OSCCONL(OSCCONL | 0x01);

//Optional: Wait for clock switch sequence
to complete
while(OSCCONbits.OSWEN == 1);
```

9.5 Reference Clock Output

In addition to the CLKO output ($F_{osc}/2$) available in certain oscillator modes, the device clock in the PIC24FXXXXXX family devices can also be configured to provide a reference clock output signal to a port pin. This feature is available in all oscillator configurations and allows the user to select a greater range of clock submultiples to drive external devices in the application.

This reference clock output is controlled by the REFOCON register (Register 9-4). Setting the ROEN bit (REFOCON<15>) makes the clock signal available on the REFO pin. The RODIV<3:0> bits (REFOCON<11:8>) enable the selection of 16 different clock divider options.

The ROSSLP and ROSEL bits (REFOCON<13:12>) control the availability of the reference output during Sleep mode. The ROSEL bit determines if the oscillator on OSC1 and OSC2, or the current system clock source, is used for the reference clock output. The ROSSLP bit determines if the reference source is available on REFO when the device is in Sleep mode.

To use the reference clock output in Sleep mode, both the ROSSLP and ROSEL bits must be set. The device clock must also be configured for one of the primary modes (EC, HS or XT); otherwise, if the ROSEL bit is not also set, the oscillator on OSC1 and OSC2 will be powered down when the device enters Sleep mode. Clearing the ROSEL bit allows the reference output frequency to change as the system clock changes during any clock switches.

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13.3 Output Compare Mode

Output Compare mode compares the Timer register value with the value of one or two Compare registers, depending on its mode of operation. The Output Compare x module on compare match events has the ability to generate a single output transition or a train of output

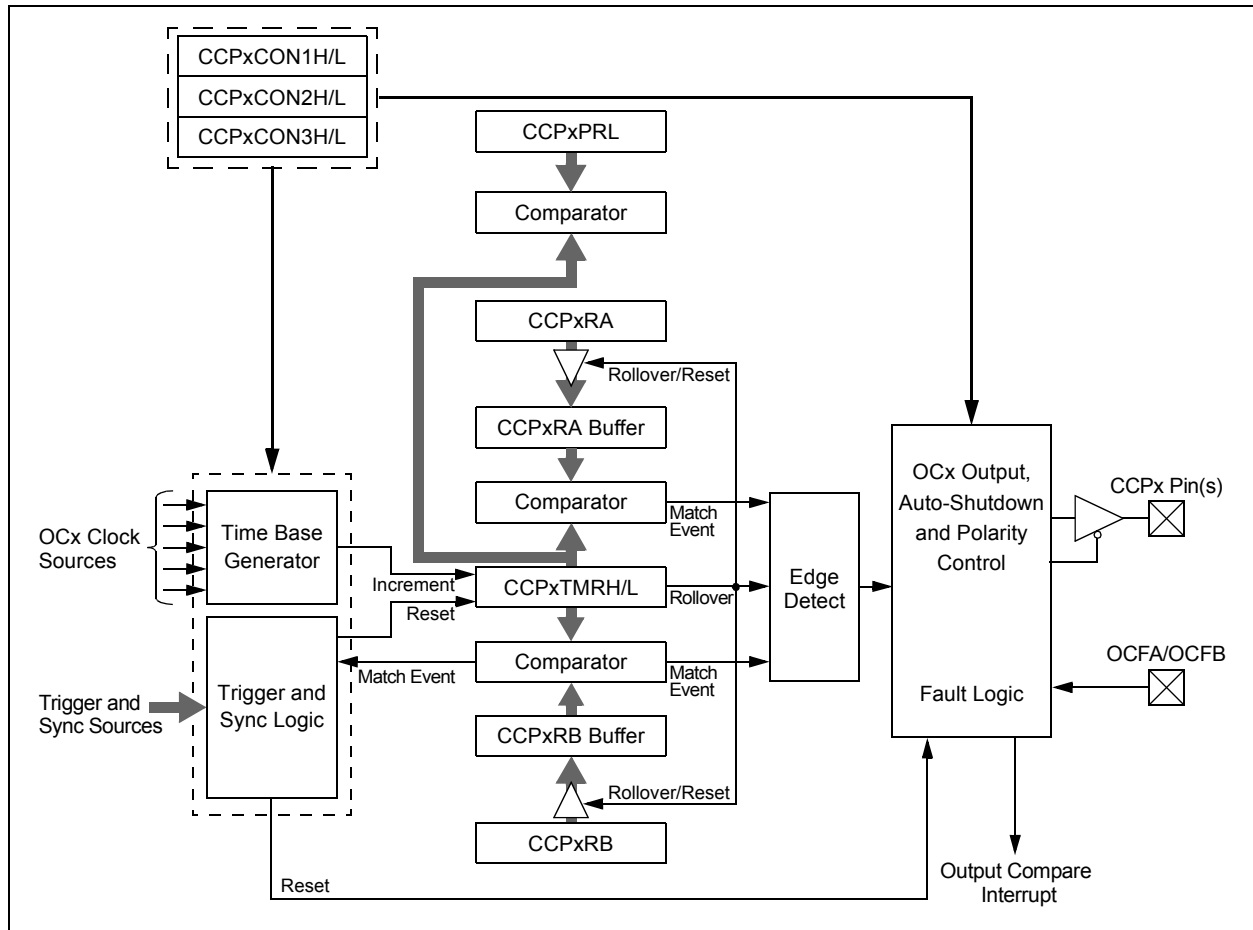
pulses. Like most PIC® MCU peripherals, the Output Compare x module can also generate interrupts on a compare match event.

Table 13-3 shows the various modes available in Output Compare modes.

TABLE 13-3: OUTPUT COMPARE/PWM MODES

MOD<3:0> (CCPxCON1L<3:0>)	T32 (CCPxCON1L<5>)	Operating Mode	
0001	0	Output High on Compare (16-bit)	Single Edge Mode
0001	1	Output High on Compare (32-bit)	
0010	0	Output Low on Compare (16-bit)	
0010	1	Output Low on Compare (32-bit)	
0011	0	Output Toggle on Compare (16-bit)	
0011	1	Output Toggle on Compare (32-bit)	
0100	0	Dual Edge Compare (16-bit)	Dual Edge Mode
0101	0	Dual Edge Compare (16-bit buffered)	PWM Mode
0110	0	Center-Aligned Pulse (16-bit buffered)	Center PWM
0111	0	Variable Frequency Pulse (16-bit)	
0111	1	Variable Frequency Pulse (32-bit)	

FIGURE 13-5: OUTPUT COMPARE x BLOCK DIAGRAM



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REGISTER 14-1: SSPxSTAT: MSSPx STATUS REGISTER (SPI MODE)

U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
—	—	—	—	—	—	—	—
bit 15				bit 8			

R/W-0	R/W-0	R-0	R-0	R-0	R-0	R-0	R-0
SMP	CKE ⁽¹⁾	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'

-n = Value at POR

'1' = Bit is set

'0' = Bit is cleared

x = Bit is unknown

bit 15-8 **Unimplemented:** Read as '0'

bit 7 **SMP:** Sample bit

SPI Master mode:

1 = Input data is sampled at the end of data output time

0 = Input data is sampled at the middle of data output time

SPI Slave mode:

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

bit 6 **CKE:** SPI Clock Select bit⁽¹⁾

1 = Transmit occurs on transition from active to Idle clock state

0 = Transmit occurs on transition from Idle to active clock state

bit 5 **D/ \overline{A} :** Data/Address bit

Used in I²C™ mode only.

bit 4 **P:** Stop bit

Used in I²C mode only. This bit is cleared when the MSSPx module is disabled; SSPEN bit is cleared.

bit 3 **S:** Start bit

Used in I²C mode only.

bit 2 **R/ \overline{W} :** Read/Write Information bit

Used in I²C mode only.

bit 1 **UA:** Update Address bit

Used in I²C mode only.

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

1 = Receive is complete, SSPxBUF is full

0 = Receive is not complete, SSPxBUF is empty

Note 1: Polarity of clock state is set by the CKP bit (SSPxCON1<4>).

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NOTES:

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16.2.6 ALRMVAL REGISTER MAPPINGS

REGISTER 16-8: ALMTHDY: ALARM MONTH AND DAY VALUE REGISTER⁽¹⁾

U-0	U-0	U-0	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
—	—	—	MTHTEN0	MTHONE3	MTHONE2	MTHONE1	MTHONE0
bit 15							bit 8

U-0	U-0	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
—	—	DAYTEN1	DAYTEN0	DAYONE3	DAYONE2	DAYONE1	DAYONE0
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 15-13 **Unimplemented:** Read as '0'
- bit 12 **MTHTEN0:** Binary Coded Decimal Value of Month's Tens Digit bit
Contains a value of '0' or '1'.
- bit 11-8 **MTHONE<3:0>:** Binary Coded Decimal Value of Month's Ones Digit bits
Contains a value from 0 to 9.
- bit 7-6 **Unimplemented:** Read as '0'
- bit 5-4 **DAYTEN<1:0>:** Binary Coded Decimal Value of Day's Tens Digit bits
Contains a value from 0 to 3.
- bit 3-0 **DAYONE<3:0>:** Binary Coded Decimal Value of Day's Ones Digit bits
Contains a value from 0 to 9.

Note 1: A write to this register is only allowed when RTCWREN = 1.

REGISTER 16-9: ALWDHR: ALARM WEEKDAY AND HOURS VALUE REGISTER⁽¹⁾

U-0	U-0	U-0	U-0	U-0	R/W-x	R/W-x	R/W-x
—	—	—	—	—	WDAY2	WDAY1	WDAY0
bit 15							bit 8

U-0	U-0	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
—	—	HRTEN1	HRTEN0	HRONE3	HRONE2	HRONE1	HRONE0
bit 7							bit 0

Legend:

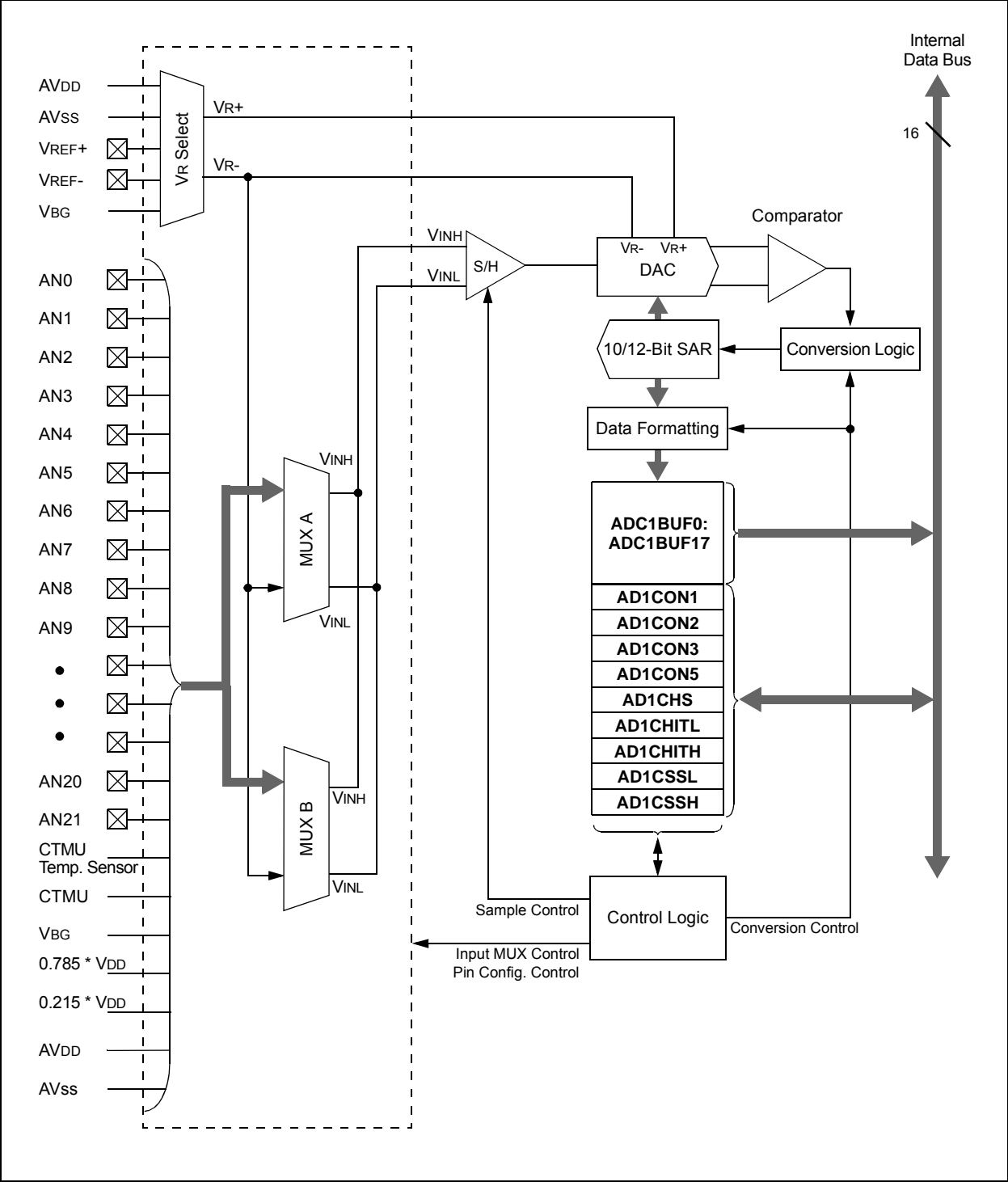
R = Readable bit W = Writable bit U = Unimplemented bit, read as '0'
 -n = Value at POR '1' = Bit is set '0' = Bit is cleared x = Bit is unknown

- bit 15-11 **Unimplemented:** Read as '0'
- bit 10-8 **WDAY<2:0>:** Binary Coded Decimal Value of Weekday Digit bits
Contains a value from 0 to 6.
- bit 7-6 **Unimplemented:** Read as '0'
- bit 5-4 **HRTEN<1:0>:** Binary Coded Decimal Value of Hour's Tens Digit bits
Contains a value from 0 to 2.
- bit 3-0 **HRONE<3:0>:** Binary Coded Decimal Value of Hour's Ones Digit bits
Contains a value from 0 to 9.

Note 1: A write to this register is only allowed when RTCWREN = 1.

PIC24FV16KM204 FAMILY

FIGURE 19-1: 12-BIT A/D CONVERTER BLOCK DIAGRAM



PIC24FV16KM204 FAMILY

REGISTER 25-8: DEVID: DEVICE ID REGISTER

U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
—	—	—	—	—	—	—	—
bit 23							bit 16

R	R	R	R	R	R	R	R
FAMID7	FAMID6	FAMID5	FAMID4	FAMID3	FAMID2	FAMID1	FAMID0
bit 15							bit 8

R	R	R	R	R	R	R	R
DEV7	DEV6	DEV5	DEV4	DEV3	DEV2	DEV1	DEV0
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 23-16 **Unimplemented:** Read as '0'

bit 15-8 **FAMID<7:0>:** Device Family Identifier bits

01000101 = PIC24FV16KM204 family

bit 7-0 **DEV<7:0>:** Individual Device Identifier bits

00011111 = PIC24FV16KM204

00011011 = PIC24FV16KM202

00010111 = PIC24FV08KM204

00010011 = PIC24FV08KM202

00001111 = PIC24FV16KM104

00001011 = PIC24FV16KM102

00000011 = PIC24FV08KM102

00000001 = PIC24FV08KM101

00011110 = PIC24F16KM204

00011010 = PIC24F16KM202

00010110 = PIC24F08KM204

00010010 = PIC24F08KM202

00001110 = PIC24F16KM104

00001010 = PIC24F16KM102

00000010 = PIC24F08KM102

00000000 = PIC24F08KM101

PIC24FV16KM204 FAMILY

TABLE 27-9: DC CHARACTERISTICS: I/O PIN INPUT SPECIFICATIONS

DC CHARACTERISTICS			Standard Operating Conditions: 1.8V to 3.6V (PIC24F16KM204) 2.0V to 5.5V (PIC24FV16KM204) Operating temperature -40°C ≤ TA ≤ +85°C for Industrial -40°C ≤ TA ≤ +125°C for Extended				
Param No.	Sym	Characteristic	Min	Typ ⁽¹⁾	Max	Units	Conditions
DI10	VIL	Input Low Voltage⁽⁴⁾ I/O Pins	VSS	—	0.2 VDD	V	
DI15		MCLR	VSS	—	0.2 VDD	V	
DI16		OSCI (XT mode)	VSS	—	0.2 VDD	V	
DI17		OSCI (HS mode)	VSS	—	0.2 VDD	V	
DI18		I/O Pins with I ² C™ Buffer	VSS	—	0.3 VDD	V	SMBus disabled
DI19		I/O Pins with SMBus Buffer	VSS	—	0.8	V	SMBus enabled
DI20	VIH	Input High Voltage^(4,5) I/O Pins: with Analog Functions	0.8 VDD	—	VDD	V	
		Digital Only	0.8 VDD	—	VDD	V	
DI25		MCLR	0.8 VDD	—	VDD	V	
DI26		OSCI (XT mode)	0.7 VDD	—	VDD	V	
DI27		OSCI (HS mode)	0.7 VDD	—	VDD	V	
DI28		I/O Pins with I ² C Buffer: with Analog Functions	0.7 VDD	—	VDD	V	
		Digital Only	0.7 VDD	—	VDD	V	
DI29		I/O Pins with SMBus	2.1	—	VDD	V	2.5V ≤ VPIN ≤ VDD
DI30	ICNPU	CNx Pull-up Current	50	250	500	μA	VDD = 3.3V, VPIN = VSS
DI31	IPU	Maximum Load Current for Digital High Detection w/Internal Pull-up	—	—	30	μA	VDD = 2.0V
			—	—	1000	μA	VDD = 3.3V
DI50	IIL	Input Leakage Current^(2,3) I/O Ports	—	0.050	±0.100	μA	VSS ≤ VPIN ≤ VDD, Pin at high-impedance
DI51		Pins with OAxOUT Functions (RB15 and RB3)	—	0.100	±0.200	μA	VSS ≤ VPIN ≤ VDD, Pin at high-impedance

Note 1: Data in “Typ” column is at 3.3V, +25°C unless otherwise stated.

2: The leakage current on the MCLR 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 voltages.

3: Negative current is defined as current sourced by the pin.

4: Refer to Table 1-4 and Table 1-5 for I/O pin buffer types.

5: VIH requirements are met when the internal pull-ups are enabled.

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