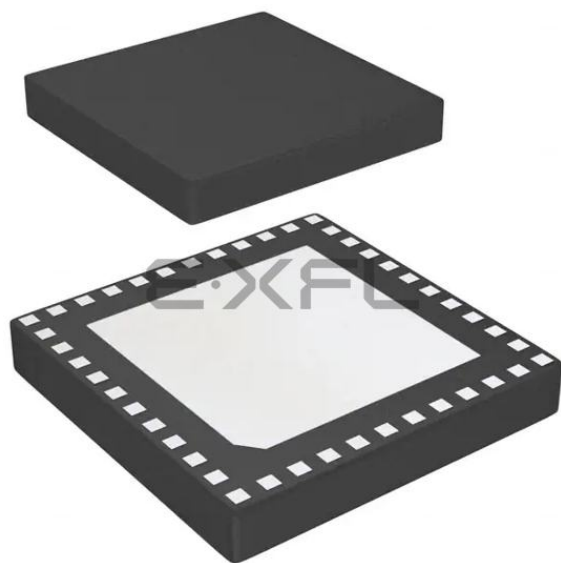




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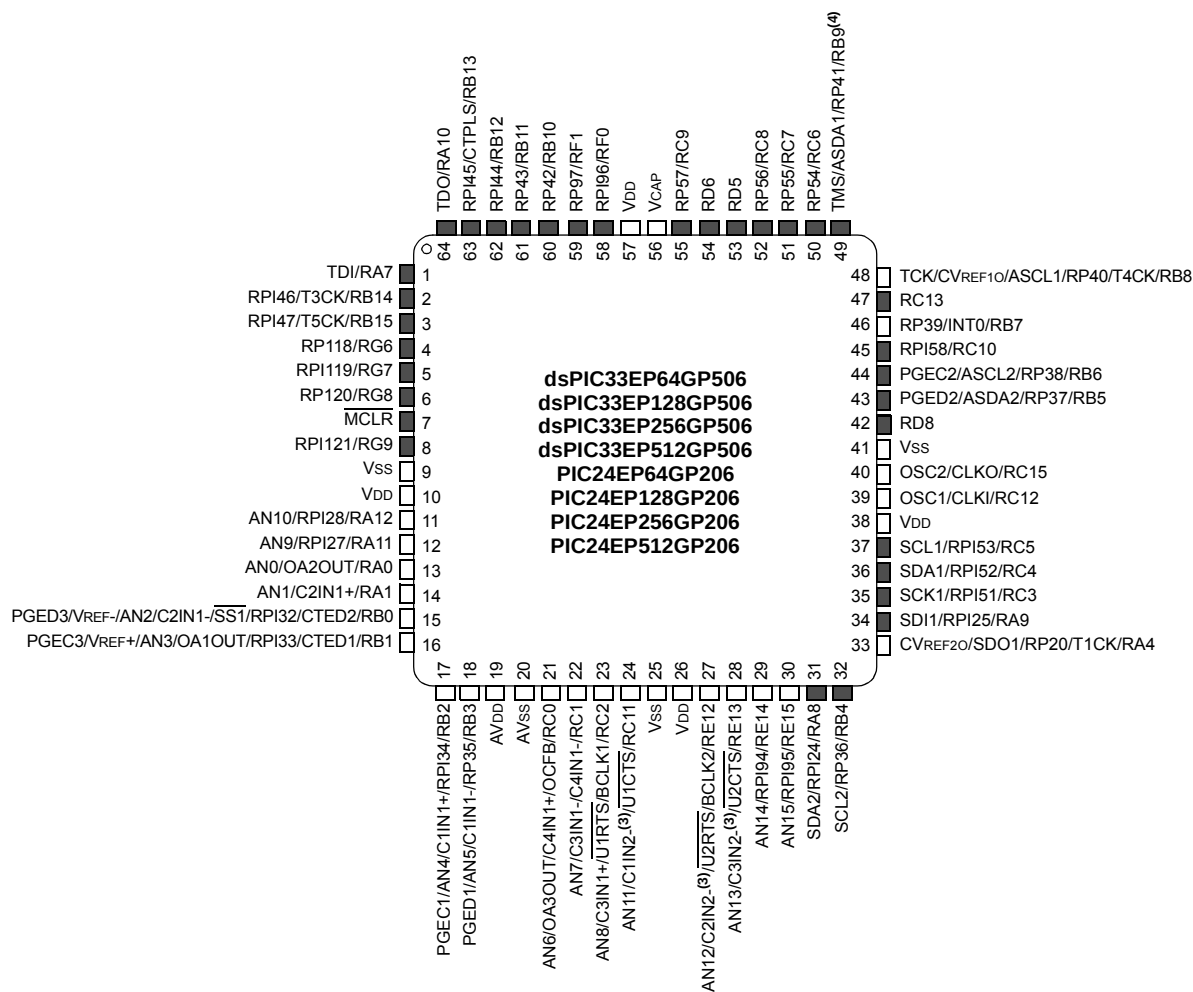
Details

Product Status	Obsolete
Core Processor	PIC
Core Size	16-Bit
Speed	60 MIPS
Connectivity	I ² C, IrDA, LINbus, QEI, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, Motor Control PWM, POR, PWM, WDT
Number of I/O	35
Program Memory Size	128KB (43K x 24)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	8K x 16
Voltage - Supply (Vcc/Vdd)	3V ~ 3.6V
Data Converters	A/D 9x10b/12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 150°C (TA)
Mounting Type	Surface Mount
Package / Case	44-VFTLA Exposed Pad
Supplier Device Package	44-VTLA (6x6)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic24ep128mc204-h-tl

Pin Diagrams (Continued)

64-Pin TQFP^(1,2,3)

■ = Pins are up to 5V tolerant



- Note**
- 1: The RPN/RPI pins can be used by any remappable peripheral with some limitation. See **Section 11.4 "Peripheral Pin Select (PPS)"** for available peripherals and for information on limitations.
 - 2: Every I/O port pin (RAX-RGx) can be used as a Change Notification pin (CNAX-CNGx). See **Section 11.0 "I/O Ports"** for more information.
 - 3: The metal pad at the bottom of the device is not connected to any pins and is recommended to be connected to Vss externally.
 - 4: There is an internal pull-up resistor connected to the TMS pin when the JTAG interface is active. See the JTAGEN bit field in Table 27-2.

FIGURE 3-1: dsPIC33EPXXXGP50X, dsPIC33EPXXXMC20X/50X AND PIC24EPXXXGP/MC20X CPU BLOCK DIAGRAM

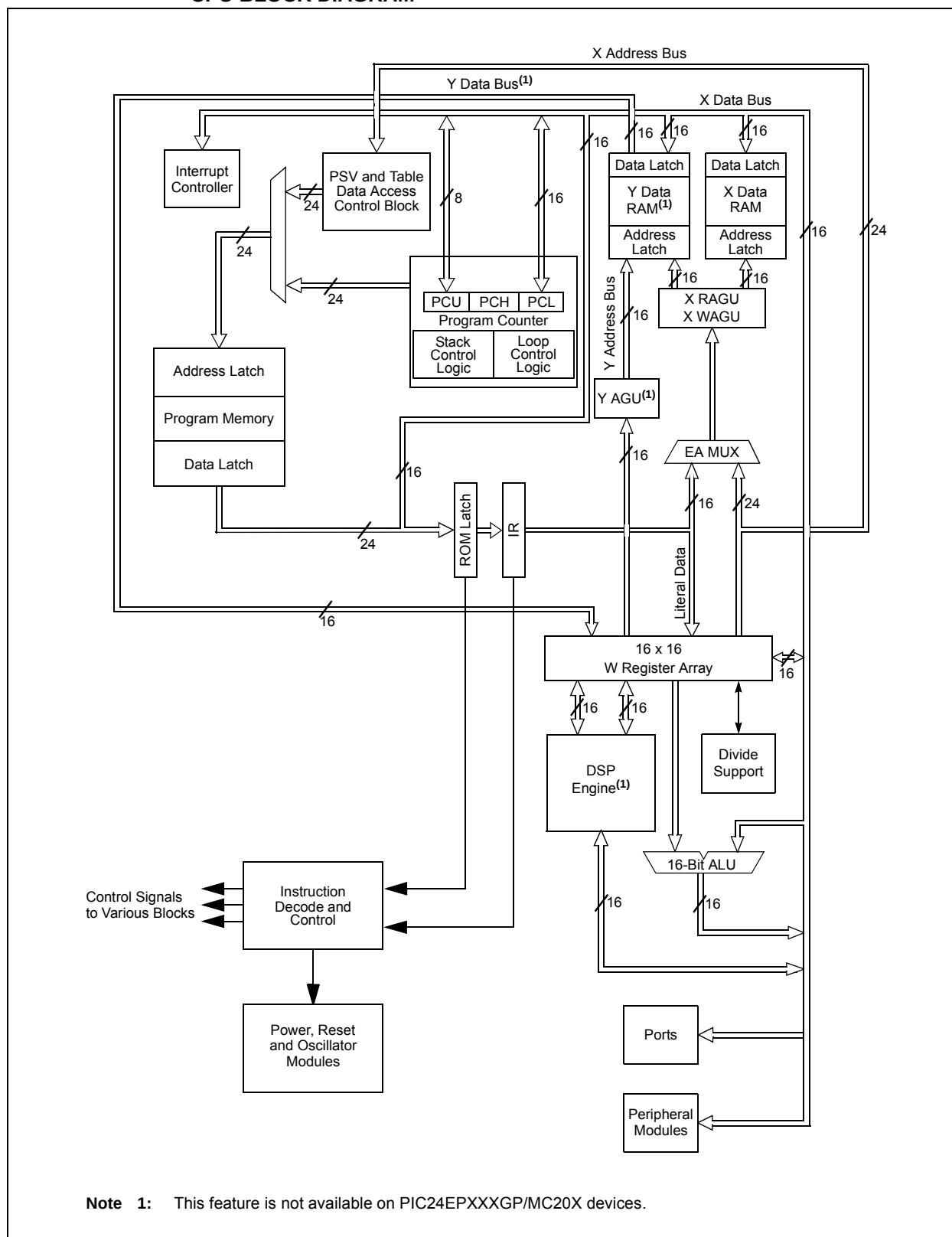


TABLE 4-3: INTERRUPT CONTROLLER REGISTER MAP FOR PIC24EPXXXGP20X DEVICES ONLY

File Name	Addr.	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	All Resets
IFS0	0800	—	DMA1IF	AD1IF	U1TXIF	U1RXIF	SPI1IF	SPI1EIF	T3IF	T2IF	OC2IF	IC2IF	DMA0IF	T1IF	OC1IF	IC1IF	INT0IF	0000
IFS1	0802	U2TXIF	U2RXIF	INT2IF	T5IF	T4IF	OC4IF	OC3IF	DMA2IF	—	—	—	INT1IF	CNIF	CMIF	MI2C1IF	SI2C1IF	0000
IFS2	0804	—	—	—	—	—	—	—	—	—	IC4IF	IC3IF	DMA3IF	—	—	SPI2IF	SPI2EIF	0000
IFS3	0806	—	—	—	—	—	—	—	—	—	—	—	—	—	MI2C2IF	SI2C2IF	—	0000
IFS4	0808	—	—	CTMUIF	—	—	—	—	—	—	—	—	—	CRCIF	U2EIF	U1EIF	—	0000
IFS8	0810	JTAGIF	ICDIF	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
IFS9	0812	—	—	—	—	—	—	—	—	—	PTG3IF	PTG2IF	PTG1IF	PTG0IF	PTGWDTIF	PTGSTIEIF	—	0000
IEC0	0820	—	DMA1IE	AD1IE	U1TXIE	U1RXIE	SPI1IE	SPI1EIE	T3IE	T2IE	OC2IE	IC2IE	DMA0IE	T1IE	OC1IE	IC1IE	INT0IE	0000
IEC1	0822	U2TXIE	U2RXIE	INT2IE	T5IE	T4IE	OC4IE	OC3IE	DMA2IE	—	—	—	INT1IE	CNIE	CMIE	MI2C1IE	SI2C1IE	0000
IEC2	0824	—	—	—	—	—	—	—	—	—	IC4IE	IC3IE	DMA3IE	—	—	SPI2IE	SPI2EIE	0000
IEC3	0826	—	—	—	—	—	—	—	—	—	—	—	—	—	MI2C2IE	SI2C2IE	—	0000
IEC4	0828	—	—	CTMUIE	—	—	—	—	—	—	—	—	—	CRCIE	U2EIE	U1EIE	—	0000
IEC8	0830	JTAGIE	ICDIE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
IEC9	0832	—	—	—	—	—	—	—	—	—	PTG3IE	PTG2IE	PTG1IE	PTG0IE	PTGWDTIE	PTGSTIEIE	—	0000
IPC0	0840	—	T1IP<2:0>			—	OC1IP<2:0>			—	IC1IP<2:0>			—	INT0IP<2:0>			4444
IPC1	0842	—	T2IP<2:0>			—	OC2IP<2:0>			—	IC2IP<2:0>			—	DMA0IP<2:0>			4444
IPC2	0844	—	U1RXIP<2:0>			—	SPI1IP<2:0>			—	SPI1EIP<2:0>			—	T3IP<2:0>			4444
IPC3	0846	—	—	—	—	—	DMA1IP<2:0>			—	AD1IP<2:0>			—	U1TXIP<2:0>			0444
IPC4	0848	—	CNIP<2:0>			—	CMIP<2:0>			—	MI2C1IP<2:0>			—	SI2C1IP<2:0>			4444
IPC5	084A	—	—	—	—	—	—	—	—	—	—	—	—	—	INT1IP<2:0>			0004
IPC6	084C	—	T4IP<2:0>			—	OC4IP<2:0>			—	OC3IP<2:0>			—	DMA2IP<2:0>			4444
IPC7	084E	—	U2TXIP<2:0>			—	U2RXIP<2:0>			—	INT2IP<2:0>			—	T5IP<2:0>			4444
IPC8	0850	—	—	—	—	—	—	—	—	—	SPI2IP<2:0>			—	SPI2EIP<2:0>			0044
IPC9	0852	—	—	—	—	—	IC4IP<2:0>			—	IC3IP<2:0>			—	DMA3IP<2:0>			0444
IPC12	0858	—	—	—	—	—	MI2C2IP<2:0>			—	SI2C2IP<2:0>			—	—	—	—	0440
IPC16	0860	—	CRCIP<2:0>			—	U2EIP<2:0>			—	U1EIP<2:0>			—	—	—	—	4440
IPC19	0866	—	—	—	—	—	—	—	—	—	CTMUIP<2:0>			—	—	—	—	0040
IPC35	0886	—	JTAGIP<2:0>			—	ICDIP<2:0>			—	—	—	—	—	—	—	—	4400
IPC36	0888	—	PTG0IP<2:0>			—	PTGWDTIP<2:0>			—	PTGSTIEIP<2:0>			—	—	—	—	4440
IPC37	088A	—	—	—	—	—	PTG3IP<2:0>			—	PTG2IP<2:0>			—	PTG1IP<2:0>			0444
INTCON1	08C0	NSTDIS	OVAERR	OVERR	—	—	—	—	—	—	DIV0ERR	DMACERR	MATHERR	ADDRERR	STKERR	OSCFAIL	—	0000
INTCON2	08C2	GIE	DISI	SWTRAP	—	—	—	—	—	—	—	—	—	—	INT2EP	INT1EP	INT0EP	8000
INTCON3	08C4	—	—	—	—	—	—	—	—	—	—	DAE	DOOVR	—	—	—	—	0000
INTCON4	08C6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SGHT	0000
INTTREG	08C8	—	—	—	—	ILR<3:0>				VECNUM<7:0>								0000

Legend: — = unimplemented, read as '0'. Reset values are shown in hexadecimal.

TABLE 4-7: INTERRUPT CONTROLLER REGISTER MAP FOR dsPIC33EPXXXMC50X DEVICES ONLY (CONTINUED)

File Name	Addr.	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	All Resets
IPC23	086E	—	PWM2IP<2:0>			—	PWM1IP<2:0>			—	—	—	—	—	—	—	—	4400
IPC24	0870	—	—	—	—	—	—	—	—	—	—	—	—	—	PWM3IP<2:0>			0004
IPC35	0886	—	JTAGIP<2:0>			—	ICDIP<2:0>			—	—	—	—	—	—	—	—	4400
IPC36	0888	—	PTG0IP<2:0>			—	PTGWDTIP<2:0>			—	PTGSTEPIP<2:0>			—	—	—	—	4440
IPC37	088A	—	—	—	—	—	PTG3IP<2:0>			—	PTG2IP<2:0>			—	PTG1IP<2:0>			0444
INTCON1	08C0	NSTDIS	OVAERR	OVBERR	COVAERR	COVBERR	OVATE	OVATE	OVATE	SFTACERR	DIV0ERR	DMACERR	MATHERR	ADDRERR	STKERR	OSCFail	—	0000
INTCON2	08C2	GIE	DISI	SWTRAP	—	—	—	—	—	—	—	—	—	—	INT2EP	INT1EP	INT0EP	8000
INTCON3	08C4	—	—	—	—	—	—	—	—	—	—	DAE	DOOVR	—	—	—	—	0000
INTCON4	08C6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SGHT	0000
INTTREG	08C8	—	—	—	—	ILR<3:0>				VECNUM<7:0>								0000

Legend: — = unimplemented, read as '0'. Reset values are shown in hexadecimal.

TABLE 4-56: PORTA REGISTER MAP FOR PIC24EPXXXGP/MC203 AND dsPIC33EPXXXGP/MC203/503 DEVICES ONLY

File Name	Addr.	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	All Resets
TRISA	0E00	—	—	—	—	—	—	—	TRISA8	—	—	—	TRISA4	TRISA3	TRISA2	TRISA1	TRISA0	011F
PORTA	0E02	—	—	—	—	—	—	—	RA8	—	—	—	RA4	RA3	RA2	RA1	RA0	0000
LATA	0E04	—	—	—	—	—	—	—	LATA8	—	—	—	LATA4	LATA3	LATA2	LA1TA1	LA0TA0	0000
ODCA	0E06	—	—	—	—	—	—	—	ODCA8	—	—	—	ODCA4	ODCA3	ODCA2	ODCA1	ODCA0	0000
CNENA	0E08	—	—	—	—	—	—	—	CNIEA8	—	—	—	CNIEA4	CNIEA3	CNIEA2	CNIEA1	CNIEA0	0000
CNPUA	0E0A	—	—	—	—	—	—	—	CNPUA8	—	—	—	CNPUA4	CNPUA3	CNPUA2	CNPUA1	CNPUA0	0000
CNPDA	0E0C	—	—	—	—	—	—	—	CNPDA8	—	—	—	CNPDA4	CNPDA3	CNPDA2	CNPDA1	CNPDA0	0000
ANSELA	0E0E	—	—	—	—	—	—	—	—	—	—	—	ANSA4	—	—	ANSA1	ANSA0	0013

Legend: — = unimplemented, read as '0'. Reset values are shown in hexadecimal.

TABLE 4-57: PORTB REGISTER MAP FOR PIC24EPXXXGP/MC203 AND dsPIC33EPXXXGP/MC203/503 DEVICES ONLY

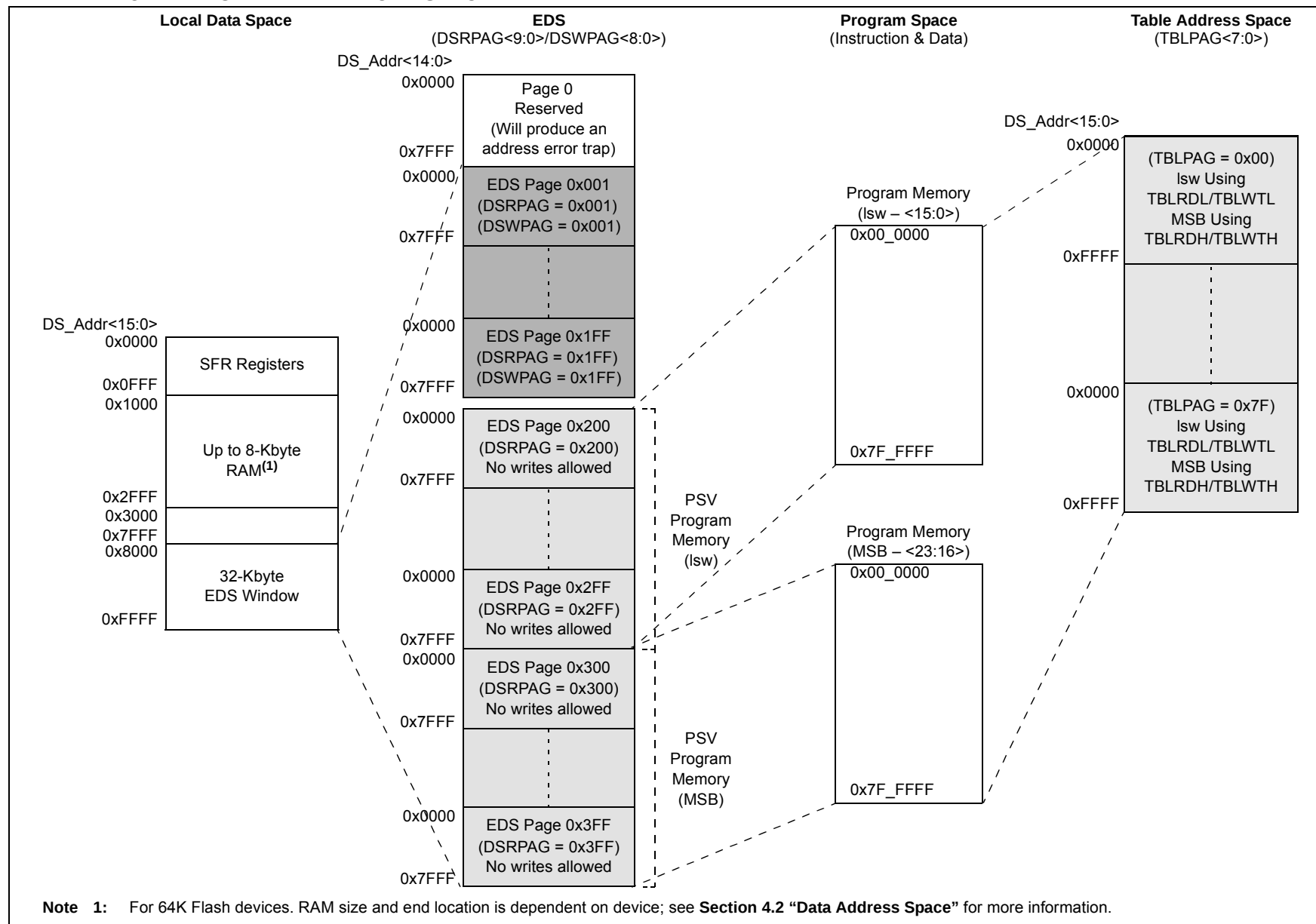
File Name	Addr.	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	All Resets
TRISB	0E10	TRISB15	TRISB14	TRISB13	TRISB12	TRISB11	TRISB10	TRISB9	TRISB8	TRISB7	TRISB6	TRISB5	TRISB4	TRISB3	TRISB2	TRISB1	TRISB0	FFFF
PORTB	0E12	RB15	RB14	RB13	RB12	RB11	RB10	RB9	RB8	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0	xxxx
LATB	0E14	LATB15	LATB14	LATB13	LATB12	LATB11	LATB10	LATB9	LATB8	LATB7	LATB6	LATB5	LATB4	LATB3	LATB2	LATB1	LATB0	xxxx
ODCB	0E16	ODCB15	ODCB14	ODCB13	ODCB12	ODCB11	ODCB10	ODCB9	ODCB8	ODCB7	ODCB6	ODCB5	ODCB4	ODCB3	ODCB2	ODCB1	ODCB0	0000
CNENB	0E18	CNIEB15	CNIEB14	CNIEB13	CNIEB12	CNIEB11	CNIEB10	CNIEB9	CNIEB8	CNIEB7	CNIEB6	CNIEB5	CNIEB4	CNIEB3	CNIEB2	CNIEB1	CNIEB0	0000
CNPUB	0E1A	CNPUB15	CNPUB14	CNPUB13	CNPUB12	CNPUB11	CNPUB10	CNPUB9	CNPUB8	CNPUB7	CNPUB6	CNPUB5	CNPUB4	CNPUB3	CNPUB2	CNPUB1	CNPUB0	0000
CNPDB	0E1C	CNPDB15	CNPDB14	CNPDB13	CNPDB12	CNPDB11	CNPDB10	CNPDB9	CNPDB8	CNPDB7	CNPDB6	CNPDB5	CNPDB4	CNPDB3	CNPDB2	CNPDB1	CNPDB0	0000
ANSELB	0E1E	—	—	—	—	—	—	—	ANSB8	—	—	—	—	ANSB3	ANSB2	ANSB1	ANSB0	010F

Legend: x = unknown value on Reset, — = unimplemented, read as '0'. Reset values are shown in hexadecimal.

TABLE 4-58: PORTC REGISTER MAP FOR PIC24EPXXXGP/MC203 AND dsPIC33EPXXXGP/MC203/503 DEVICES ONLY

File Name	Addr.	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	All Resets
TRISC	0E20	—	—	—	—	—	—	—	TRISC8	—	—	—	—	—	—	TRISC1	TRISC0	0103
PORTC	0E22	—	—	—	—	—	—	—	RC8	—	—	—	—	—	—	RC1	RC0	xxxx
LATC	0E24	—	—	—	—	—	—	—	LATC8	—	—	—	—	—	—	LATC1	LATC0	xxxx
ODCC	0E26	—	—	—	—	—	—	—	ODCC8	—	—	—	—	—	—	ODCC1	ODCC0	0000
CNENC	0E28	—	—	—	—	—	—	—	CNIEC8	—	—	—	—	—	—	CNIEC1	CNIEC0	0000
CNPUC	0E2A	—	—	—	—	—	—	—	CNPUC8	—	—	—	—	—	—	CNPUC1	CNPUC0	0000
CNPDC	0E2C	—	—	—	—	—	—	—	CNPDC8	—	—	—	—	—	—	CNPDC1	CNPDC0	0000
ANSELC	0E2E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	ANSC1	ANSC0	0003

Legend: x = unknown value on Reset, — = unimplemented, read as '0'. Reset values are shown in hexadecimal.

EXAMPLE 4-3: PAGED DATA MEMORY SPACE

REGISTER 7-7: INTTREG: INTERRUPT CONTROL AND STATUS REGISTER

U-0	U-0	U-0	U-0	R-0	R-0	R-0	R-0
—	—	—	—	ILR3	ILR2	ILR1	ILR0
bit 15				bit 8			

R-0	R-0	R-0	R-0	R-0	R-0	R-0	R-0
VECNUM7	VECNUM6	VECNUM5	VECNUM4	VECNUM3	VECNUM2	VECNUM1	VECNUM0
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 15-12 **Unimplemented:** Read as '0'

bit 11-8 **ILR<3:0>:** New CPU Interrupt Priority Level bits
1111 = CPU Interrupt Priority Level is 15
•
•
•
0001 = CPU Interrupt Priority Level is 1
0000 = CPU Interrupt Priority Level is 0

bit 7-0 **VECNUM<7:0>:** Vector Number of Pending Interrupt bits
11111111 = 255, Reserved; do not use
•
•
•
00001001 = 9, IC1 – Input Capture 1
00001000 = 8, INT0 – External Interrupt 0
00000111 = 7, Reserved; do not use
00000110 = 6, Generic soft error trap
00000101 = 5, DMAC error trap
00000100 = 4, Math error trap
00000011 = 3, Stack error trap
00000010 = 2, Generic hard trap
00000001 = 1, Address error trap
00000000 = 0, Oscillator fail trap

REGISTER 11-9: RPINR15: PERIPHERAL PIN SELECT INPUT REGISTER 15
(dsPIC33EPXXXMC20X/50X and PIC24EPXXXMC20X DEVICES ONLY)

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	HOME1R<6:0>						
bit 15							bit 8

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	INDX1R<6:0>						
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 14-8 **HOME1R<6:0>:** Assign QE11 HOME1 (HOME1) to the Corresponding RPn Pin bits
(see Table 11-2 for input pin selection numbers)
1111001 = Input tied to RPI121
.
.
.
0000001 = Input tied to CMP1
0000000 = Input tied to Vss

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

bit 6-0 **INDX1R<6:0>:** Assign QE11 INDEX1 (INDX1) to the Corresponding RPn Pin bits
(see Table 11-2 for input pin selection numbers)
1111001 = Input tied to RPI121
.
.
.
0000001 = Input tied to CMP1
0000000 = Input tied to Vss

NOTES:

17.2 QEI Control Registers

REGISTER 17-1: QE1CON: QE1 CONTROL REGISTER

R/W-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
QE1EN	—	QE1SIDL	PIMOD2 ⁽¹⁾	PIMOD1 ⁽¹⁾	PIMOD0 ⁽¹⁾	IMV1 ⁽²⁾	IMV0 ⁽²⁾
bit 15							bit 8

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	INTDIV2 ⁽³⁾	INTDIV1 ⁽³⁾	INTDIV0 ⁽³⁾	CNTPOL	GATEN	CCM1	CCM0
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 **QE1EN:** Quadrature Encoder Interface Module Counter Enable bit
1 = Module counters are enabled
0 = Module counters are disabled, but SFRs can be read or written to
- bit 14 **Unimplemented:** Read as '0'
- bit 13 **QE1SIDL:** QE1 Stop in Idle Mode bit
1 = Discontinues module operation when device enters Idle mode
0 = Continues module operation in Idle mode
- bit 12-10 **PIMOD<2:0>:** Position Counter Initialization Mode Select bits⁽¹⁾
111 = Reserved
110 = Modulo Count mode for position counter
101 = Resets the position counter when the position counter equals QE1GEC register
100 = Second index event after home event initializes position counter with contents of QE1IC register
011 = First index event after home event initializes position counter with contents of QE1IC register
010 = Next index input event initializes the position counter with contents of QE1IC register
001 = Every index input event resets the position counter
000 = Index input event does not affect position counter
- bit 9 **IMV1:** Index Match Value for Phase B bit⁽²⁾
1 = Phase B match occurs when QEB = 1
0 = Phase B match occurs when QEB = 0
- bit 8 **IMV0:** Index Match Value for Phase A bit⁽²⁾
1 = Phase A match occurs when QEA = 1
0 = Phase A match occurs when QEA = 0
- bit 7 **Unimplemented:** Read as '0'

- Note 1:** When CCM<1:0> = 10 or 11, all of the QE1 counters operate as timers and the PIMOD<2:0> bits are ignored.
- 2:** When CCM<1:0> = 00, and QEA and QEB values match the Index Match Value (IMV), the POSCNTNTH and POSCNTL registers are reset. QEA/QEB signals used for the index match have swap and polarity values applied, as determined by the SWPAB and QEAPOL/QEBPOL bits.
- 3:** The selected clock rate should be at least twice the expected maximum quadrature count rate.

REGISTER 21-4: CxFCTRL: ECANx FIFO CONTROL REGISTER

R/W-0	R/W-0	R/W-0	U-0	U-0	U-0	U-0	U-0
DMABS2	DMABS1	DMABS0	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	—	FSA4	FSA3	FSA2	FSA1	FSA0
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 **DMABS<2:0>**: DMA Buffer Size bits

111 = Reserved

110 = 32 buffers in RAM

101 = 24 buffers in RAM

100 = 16 buffers in RAM

011 = 12 buffers in RAM

010 = 8 buffers in RAM

001 = 6 buffers in RAM

000 = 4 buffers in RAM

bit 12-5 **Unimplemented**: Read as '0'

bit 4-0 **FSA<4:0>**: FIFO Area Starts with Buffer bits

11111 = Read Buffer RB31

11110 = Read Buffer RB30

•

•

•

00001 = TX/RX Buffer TRB1

00000 = TX/RX Buffer TRB0

REGISTER 21-11: CxFEN1: ECANx ACCEPTANCE FILTER ENABLE REGISTER 1

R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
FLTEN15	FLTEN14	FLTEN13	FLTEN12	FLTEN11	FLTEN10	FLTEN9	FLTEN8
bit 15							bit 8

R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
FLTEN7	FLTEN6	FLTEN5	FLTEN4	FLTEN3	FLTEN2	FLTEN1	FLTEN0
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 15-0 **FLTEN<15:0>**: Enable Filter n to Accept Messages bits
1 = Enables Filter n
0 = Disables Filter n

REGISTER 21-12: CxBUFNT1: ECANx FILTER 0-3 BUFFER POINTER REGISTER 1

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
F3BP<3:0>				F2BP<3:0>			
bit 15							bit 8

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
F1BP<3:0>				F0BP<3:0>			
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 15-12 **F3BP<3:0>**: RX Buffer Mask for Filter 3 bits
1111 = Filter hits received in RX FIFO buffer
1110 = Filter hits received in RX Buffer 14
.
.
.
0001 = Filter hits received in RX Buffer 1
0000 = Filter hits received in RX Buffer 0

bit 11-8 **F2BP<3:0>**: RX Buffer Mask for Filter 2 bits (same values as bits<15:12>)

bit 7-4 **F1BP<3:0>**: RX Buffer Mask for Filter 1 bits (same values as bits<15:12>)

bit 3-0 **F0BP<3:0>**: RX Buffer Mask for Filter 0 bits (same values as bits<15:12>)

REGISTER 21-16: CxRXFnSID: ECANx ACCEPTANCE FILTER n STANDARD IDENTIFIER REGISTER (n = 0-15)

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
SID10	SID9	SID8	SID7	SID6	SID5	SID4	SID3
bit 15						bit 8	

R/W-x	R/W-x	R/W-x	U-0	R/W-x	U-0	R/W-x	R/W-x
SID2	SID1	SID0	—	EXIDE	—	EID17	EID16
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 15-5 **SID<10:0>**: Standard Identifier bits
 1 = Message address bit, SIDx, must be '1' to match filter
 0 = Message address bit, SIDx, must be '0' to match filter
- bit 4 **Unimplemented**: Read as '0'
- bit 3 **EXIDE**: Extended Identifier Enable bit
 If MIDE = 1:
 1 = Matches only messages with Extended Identifier addresses
 0 = Matches only messages with Standard Identifier addresses
 If MIDE = 0:
 Ignores EXIDE bit.
- bit 2 **Unimplemented**: Read as '0'
- bit 1-0 **EID<17:16>**: Extended Identifier bits
 1 = Message address bit, EIDx, must be '1' to match filter
 0 = Message address bit, EIDx, must be '0' to match filter

**REGISTER 21-17: CxRXFnEID: ECANx ACCEPTANCE FILTER n EXTENDED IDENTIFIER
REGISTER (n = 0-15)**

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
EID15	EID14	EID13	EID12	EID11	EID10	EID9	EID8
bit 15							bit 8

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
EID7	EID6	EID5	EID4	EID3	EID2	EID1	EID0
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 15-0 **EID<15:0>**: Extended Identifier bits
1 = Message address bit, EIDx, must be '1' to match filter
0 = Message address bit, EIDx, must be '0' to match filter

REGISTER 21-18: CxFMSKSEL1: ECANx FILTER 7-0 MASK SELECTION REGISTER 1

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
F7MSK<1:0>		F6MSK<1:0>		F5MSK<1:0>		F4MSK<1:0>	
bit 15							bit 8

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
F3MSK<1:0>		F2MSK<1:0>		F1MSK<1:0>		F0MSK<1:0>	
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 15-14 **F7MSK<1:0>**: Mask Source for Filter 7 bits
11 = Reserved
10 = Acceptance Mask 2 registers contain mask
01 = Acceptance Mask 1 registers contain mask
00 = Acceptance Mask 0 registers contain mask

bit 13-12 **F6MSK<1:0>**: Mask Source for Filter 6 bits (same values as bits<15:14>)

bit 11-10 **F5MSK<1:0>**: Mask Source for Filter 5 bits (same values as bits<15:14>)

bit 9-8 **F4MSK<1:0>**: Mask Source for Filter 4 bits (same values as bits<15:14>)

bit 7-6 **F3MSK<1:0>**: Mask Source for Filter 3 bits (same values as bits<15:14>)

bit 5-4 **F2MSK<1:0>**: Mask Source for Filter 2 bits (same values as bits<15:14>)

bit 3-2 **F1MSK<1:0>**: Mask Source for Filter 1 bits (same values as bits<15:14>)

bit 1-0 **F0MSK<1:0>**: Mask Source for Filter 0 bits (same values as bits<15:14>)

BUFFER 21-7: ECAN™ MESSAGE BUFFER WORD 6

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
Byte 7							
bit 15				bit 8			

R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
Byte 6							
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 **Byte 7<15:8>:** ECAN Message Byte 7 bits

bit 7-0 **Byte 6<7:0>:** ECAN Message Byte 6 bits

BUFFER 21-8: ECAN™ MESSAGE BUFFER WORD 7

U-0	U-0	U-0	R/W-x	R/W-x	R/W-x	R/W-x	R/W-x
—	—	—	FILHIT4 ⁽¹⁾	FILHIT3 ⁽¹⁾	FILHIT2 ⁽¹⁾	FILHIT1 ⁽¹⁾	FILHIT0 ⁽¹⁾
bit 15				bit 8			

U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
—	—	—	—	—	—	—	—
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 12-8 **FILHIT<4:0>:** Filter Hit Code bits⁽¹⁾
 Encodes number of filter that resulted in writing this buffer.

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

Note 1: Only written by module for receive buffers, unused for transmit buffers.

REGISTER 24-4: PTGT0LIM: PTG TIMER0 LIMIT REGISTER⁽¹⁾

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
PTGT0LIM<15:8>							
bit 15				bit 8			

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
PTGT0LIM<7:0>							
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 15-0 **PTGT0LIM<15:0>**: PTG Timer0 Limit Register bits
General Purpose Timer0 Limit register (effective only with a PTGT0 Step command).

Note 1: This register is read-only when the PTG module is executing Step commands (PTGEN = 1 and PTGSTRT = 1).

REGISTER 24-5: PTGT1LIM: PTG TIMER1 LIMIT REGISTER⁽¹⁾

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
PTGT1LIM<15:8>							
bit 15				bit 8			

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
PTGT1LIM<7:0>							
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 15-0 **PTGT1LIM<15:0>**: PTG Timer1 Limit Register bits
General Purpose Timer1 Limit register (effective only with a PTGT1 Step command).

Note 1: This register is read-only when the PTG module is executing Step commands (PTGEN = 1 and PTGSTRT = 1).

NOTES:

TABLE 27-2: CONFIGURATION BITS DESCRIPTION

Bit Field	Description
GCP	General Segment Code-Protect bit 1 = User program memory is not code-protected 0 = Code protection is enabled for the entire program memory space
GWRP	General Segment Write-Protect bit 1 = User program memory is not write-protected 0 = User program memory is write-protected
IESO	Two-Speed Oscillator Start-up Enable bit 1 = Start up device with FRC, then automatically switch to the user-selected oscillator source when ready 0 = Start up device with user-selected oscillator source
PWMLOCK ⁽¹⁾	PWM Lock Enable bit 1 = Certain PWM registers may only be written after a key sequence 0 = PWM registers may be written without a key sequence
FNOSC<2:0>	Oscillator Selection bits 111 = Fast RC Oscillator with Divide-by-N (FRCDIVN) 110 = Fast RC Oscillator with Divide-by-16 (FRCDIV16) 101 = Low-Power RC Oscillator (LPRC) 100 = Reserved; do not use 011 = Primary Oscillator with PLL module (XT + PLL, HS + PLL, EC + PLL) 010 = Primary Oscillator (XT, HS, EC) 001 = Fast RC Oscillator with Divide-by-N with PLL module (FRCPLL) 000 = Fast RC Oscillator (FRC)
FCKSM<1:0>	Clock Switching Mode bits 1x = Clock switching is disabled, Fail-Safe Clock Monitor is disabled 01 = Clock switching is enabled, Fail-Safe Clock Monitor is disabled 00 = Clock switching is enabled, Fail-Safe Clock Monitor is enabled
IOL1WAY	Peripheral Pin Select Configuration bit 1 = Allow only one reconfiguration 0 = Allow multiple reconfigurations
OSCIOFNC	OSC2 Pin Function bit (except in XT and HS modes) 1 = OSC2 is the clock output 0 = OSC2 is a general purpose digital I/O pin
POSCMD<1:0>	Primary Oscillator Mode Select bits 11 = Primary Oscillator is disabled 10 = HS Crystal Oscillator mode 01 = XT Crystal Oscillator mode 00 = EC (External Clock) mode
FWDTEN	Watchdog Timer Enable bit 1 = Watchdog Timer is always enabled (LPRC oscillator cannot be disabled. Clearing the SWDTEN bit in the RCON register will have no effect.) 0 = Watchdog Timer is enabled/disabled by user software (LPRC can be disabled by clearing the SWDTEN bit in the RCON register)
WINDIS	Watchdog Timer Window Enable bit 1 = Watchdog Timer in Non-Window mode 0 = Watchdog Timer in Window mode
PLLKEN	PLL Lock Enable bit 1 = PLL lock is enabled 0 = PLL lock is disabled

Note 1: This bit is only available on dsPIC33EPXXXMC20X/50X and PIC24EPXXXMC20X devices.

2: When JTAGEN = 1, an internal pull-up resistor is enabled on the TMS pin. Erased devices default to JTAGEN = 1. Applications requiring I/O pins in a high-impedance state (tri-state) in Reset should use pins other than TMS for this purpose.

TABLE 28-1: SYMBOLS USED IN OPCODE DESCRIPTIONS (CONTINUED)

Field	Description
Wm,Wn	Dividend, Divisor working register pair (direct addressing)
Wm*Wm	Multiplicand and Multiplier working register pair for Square instructions $\in \{W4 * W4, W5 * W5, W6 * W6, W7 * W7\}$
Wm*Wn	Multiplicand and Multiplier working register pair for DSP instructions $\in \{W4 * W5, W4 * W6, W4 * W7, W5 * W6, W5 * W7, W6 * W7\}$
Wn	One of 16 working registers $\in \{W0...W15\}$
Wnd	One of 16 destination working registers $\in \{W0...W15\}$
Wns	One of 16 source working registers $\in \{W0...W15\}$
WREG	W0 (working register used in file register instructions)
Ws	Source W register $\in \{Ws, [Ws], [Ws++] , [Ws--], [++Ws], [--Ws] \}$
Wso	Source W register $\in \{Wns, [Wns], [Wns++] , [Wns--], [++Wns], [--Wns], [Wns+Wb] \}$
Wx	X Data Space Prefetch Address register for DSP instructions $\in \{[W8] + = 6, [W8] + = 4, [W8] + = 2, [W8], [W8] - = 6, [W8] - = 4, [W8] - = 2, [W9] + = 6, [W9] + = 4, [W9] + = 2, [W9], [W9] - = 6, [W9] - = 4, [W9] - = 2, [W9 + W12], \text{none}\}$
Wxd	X Data Space Prefetch Destination register for DSP instructions $\in \{W4...W7\}$
Wy	Y Data Space Prefetch Address register for DSP instructions $\in \{[W10] + = 6, [W10] + = 4, [W10] + = 2, [W10], [W10] - = 6, [W10] - = 4, [W10] - = 2, [W11] + = 6, [W11] + = 4, [W11] + = 2, [W11], [W11] - = 6, [W11] - = 4, [W11] - = 2, [W11 + W12], \text{none}\}$
Wyd	Y Data Space Prefetch Destination register for DSP instructions $\in \{W4...W7\}$

**TABLE 30-38: SPI2 SLAVE MODE (FULL-DUPLEX, CKE = 1, CKP = 1, SMP = 0)
TIMING REQUIREMENTS**

AC CHARACTERISTICS			Standard Operating Conditions: 3.0V to 3.6V (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +85°C for Industrial -40°C ≤ TA ≤ +125°C for Extended				
Param.	Symbol	Characteristic ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units	Conditions
SP70	FscP	Maximum SCK2 Input Frequency	—	—	Lesser of F _P or 11	MHz	(Note 3)
SP72	TscF	SCK2 Input Fall Time	—	—	—	ns	See Parameter DO32 (Note 4)
SP73	TscR	SCK2 Input Rise Time	—	—	—	ns	See Parameter DO31 (Note 4)
SP30	TdoF	SDO2 Data Output Fall Time	—	—	—	ns	See Parameter DO32 (Note 4)
SP31	TdoR	SDO2 Data Output Rise Time	—	—	—	ns	See Parameter DO31 (Note 4)
SP35	Tsch2doV, TscL2doV	SDO2 Data Output Valid after SCK2 Edge	—	6	20	ns	
SP36	TdoV2scH, TdoV2scL	SDO2 Data Output Setup to First SCK2 Edge	30	—	—	ns	
SP40	TdiV2scH, TdiV2scL	Setup Time of SDI2 Data Input to SCK2 Edge	30	—	—	ns	
SP41	Tsch2diL, TscL2diL	Hold Time of SDI2 Data Input to SCK2 Edge	30	—	—	ns	
SP50	TssL2scH, TssL2scL	$\overline{SS2} \downarrow$ to SCK2 $\uparrow$ or SCK2 $\downarrow$ Input	120	—	—	ns	
SP51	TssH2doZ	$\overline{SS2} \uparrow$ to SDO2 Output High-Impedance	10	—	50	ns	(Note 4)
SP52	Tsch2ssH TscL2ssH	$\overline{SS2} \uparrow$ after SCK2 Edge	1.5 T _{CY} + 40	—	—	ns	(Note 4)
SP60	TssL2doV	SDO2 Data Output Valid after $\overline{SS2}$ Edge	—	—	50	ns	

Note 1: These parameters are characterized, but are not tested in manufacturing.

2: Data in “Typical” column is at 3.3V, +25°C unless otherwise stated.

3: The minimum clock period for SCK2 is 91 ns. Therefore, the SCK2 clock generated by the master must not violate this specification.

4: Assumes 50 pF load on all SPI2 pins.