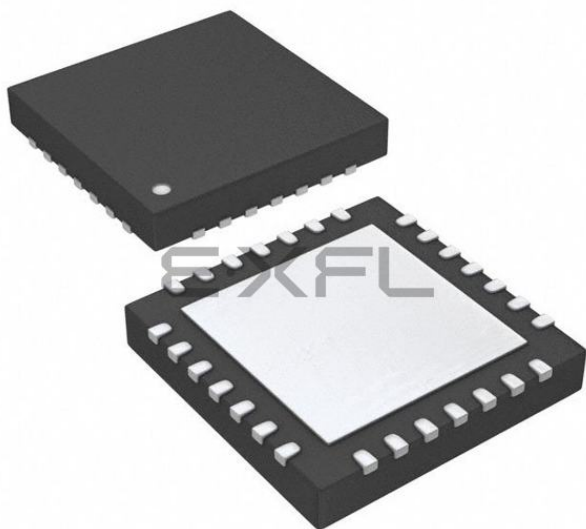




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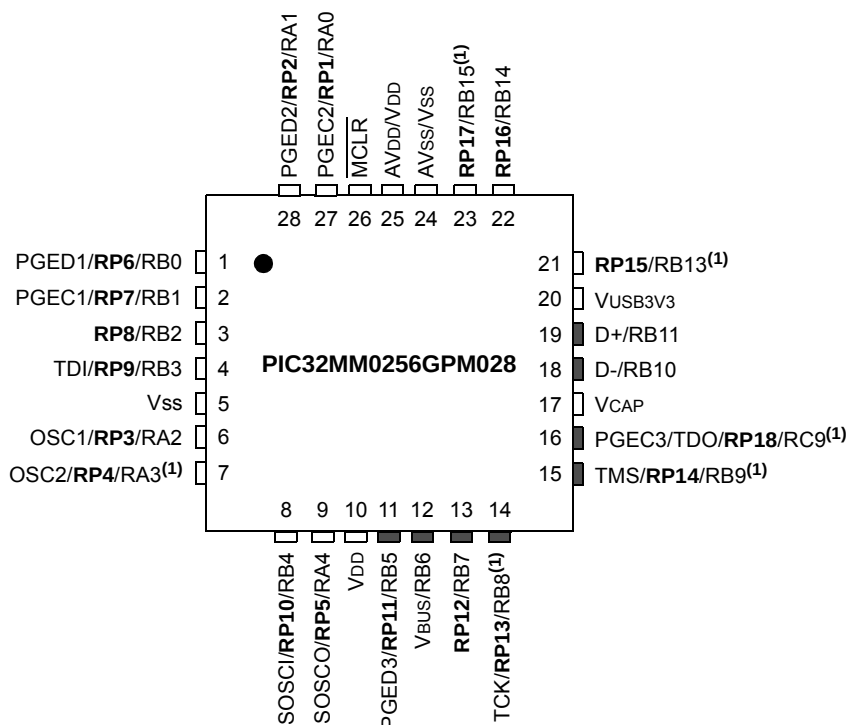
Details

Product Status	Active
Core Processor	MIPS32® microAptiv™
Core Size	32-Bit Single-Core
Speed	25MHz
Connectivity	IrDA, LINbus, SPI, UART/USART, USB, USB OTG
Peripherals	Brown-out Detect/Reset, DMA, HLVD, I ² S, POR, PWM, WDT
Number of I/O	21
Program Memory Size	128KB (128K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	16K x 8
Voltage - Supply (Vcc/Vdd)	2V ~ 3.6V
Data Converters	A/D 12x10/12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	28-VQFN Exposed Pad
Supplier Device Package	28-QFN (6x6)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic32mm0128gpm028t-i-ml

PIC32MM0256GPM064 FAMILY

Pin Diagrams (Continued)

28-Pin QFN/UQFN



Legend: Shaded pins are up to 5V tolerant.

Note 1: High drive strength pin.

TABLE 3: COMPLETE PIN FUNCTION DESCRIPTIONS FOR 28-PIN QFN/UQFN DEVICES

Pin	Function	Pin	Function
1	PGED1/AN2/C1IND/C2INB/C3INC/RP6/OCM2C/RB0	15	TMS/REFCLKI/RP14/SDA1/T1CK/T1G/T2CK/T2G/U1RTS/U1BCLK/SDO1/OCM1B/INT2/RB9 ⁽¹⁾
2	PGEC1/AN3/C1INC/C2INA/RP7/OCM2D/RB1	16	PGEC3/TDO/RP18/ASCL1 ⁽²⁾ /T3CK/T3G/USBOEN/SDO3/OCM2A/RC9 ⁽¹⁾
3	AN4/C1INB/RP8/SDA2/OCM2E/RB2	17	VCAP
4	TDI/AN11/C1INA/RP9/SCL2/OCM2F/RB3	18	D-/RB10
5	Vss	19	D+/RB11
6	OSC1/CLKI/AN5/RP3/OCM1C/RA2	20	VUSB3V3
7	OSC2/CLKO/AN6/C3IND/RP4/OCM1D/RA3 ⁽¹⁾	21	AN8/LVDIN/RP15/SCL3/SCK3/OCM3A/RB13 ⁽¹⁾
8	SOSC1/AN7/RP10/OCM3C/RB4	22	CVREF/AN9/C3INB/RP16/RTCC/U1TX/VBUSON/SDI1/OCM3B/INT1/RB14
9	SOSCO/SCLKI/RP5/PWRLCLK/OCM3D/RA4	23	AN10/C3INA/REFCLKO/RP17/U1RX/SS1/FSYNC1/OCM2B/INT0/RB15 ⁽¹⁾
10	VDD	24	AVss/Vss
11	PGED3/RP11/ASDA1 ⁽²⁾ /USBID/SS3/FSYNC3/OCM3E/RB5	25	AVDD/VDD
12	VBUS/RB6	26	MCLR
13	RP12/SDA3/SDI3/OCM3F/RB7	27	PGEC2/VREF+/CVREF+/AN0/RP1/OCM1E/INT3/RA0
14	TCK/RP13/SCL1/U1CTS/SCK1/OCM1A/RB8 ⁽¹⁾	28	PGED2/VREF-/AN1/RP2/OCM1F/RA1

Note 1: High drive strength pin.

Note 2: Alternate pin assignments for I2C1 as determined by the I2C1SEL Configuration bit.

PIC32MM0256GPM064 FAMILY

TABLE 1-1: PIC32MM0256GPM064 FAMILY PINOUT DESCRIPTION

Pin Name	Pin Number						Pin Type	Buffer Type	Description
	28-Pin SSOP	28-Pin QFN/ UQFN	36-Pin QFN	40-Pin UQFN	48-Pin QFN/ TQFP	64-Pin QFN/ TQFP			
AN0	2	27	33	36	21	11	I	ANA	Analog-to-Digital Converter input channels
AN1	3	28	34	37	22	12	I	ANA	
AN2	4	1	35	38	23	13	I	ANA	
AN3	5	2	36	39	24	14	I	ANA	
AN4	6	3	1	1	25	15	I	ANA	
AN5	9	6	7	7	32	25	I	ANA	
AN6	10	7	8	8	33	26	I	ANA	
AN7	11	8	9	9	35	28	I	ANA	
AN8	24	21	27	30	12	63	I	ANA	
AN9	25	22	28	31	15	2	I	ANA	
AN10	26	23	29	32	16	3	I	ANA	
AN11	7	4	2	2	26	16	I	ANA	
AN12	—	—	3	3	27	19	I	ANA	
AN13	—	—	4	4	28	20	I	ANA	
AN14	—	—	20	21	4	52	I	ANA	
AN15	—	—	—	—	41	37	I	ANA	
AN16	—	—	—	—	—	6	I	ANA	
AN17	—	—	—	—	—	7	I	ANA	
AN18	—	—	—	—	—	8	I	ANA	
AN19	—	—	—	—	—	10	I	ANA	
AVDD	28	25	31	34	18	5	P	—	Analog modules power supply
AVss	27	24	30	33	17	4	P	—	Analog modules ground
C1INA	7	4	2	2	26	16	I	ANA	Comparator 1 Input A
C1INB	6	3	1	1	25	15	I	ANA	Comparator 1 Input B
C1INC	5	2	36	39	24	14	I	ANA	Comparator 1 Input C
C1IND	4	1	35	38	23	13	I	ANA	Comparator 1 Input D
C2INA	5	2	36	39	24	14	I	ANA	Comparator 2 Input A
C2INB	4	1	35	38	23	13	I	ANA	Comparator 2 Input B
C2INC	—	—	20	21	4	52	I	ANA	Comparator 2 Input C
C2IND	—	—	3	3	27	19	I	ANA	Comparator 2 Input D
C3INA	26	23	29	32	16	3	I	ANA	Comparator 3 Input A
C3INB	25	22	28	31	15	2	I	ANA	Comparator 3 Input B
C3INC	4	1	35	38	23	13	I	ANA	Comparator 3 Input C
C3IND	10	7	8	8	33	26	I	ANA	Comparator 3 Input D
CLKI	9	6	7	7	32	25	I	ST	External Clock source input (EC mode)
CLKO	10	7	8	8	33	26	O	DIG	System clock output
CVREF	25	22	28	31	15	2	O	ANA	Comparator voltage reference output
CVREF+	2	27	33	36	21	11	I	ANA	Positive comparator voltage reference input
D+	22	19	25	28	10	61	I/O	—	USB transceiver differential plus line
D-	21	18	24	27	9	60	I/O	—	USB transceiver differential minus line
FSYNC1	26	23	29	32	16	32	I/O	ST/DIG	SPI1 frame signal input or output
FSYNC3	14	11	15	15	45	22	I/O	ST/DIG	SPI3 frame signal input or output

Legend: ST = Schmitt Trigger input buffer
I2C = I²C/SMBus input buffer

DIG = Digital input/output
ANA = Analog level input/output

P = Power

PIC32MM0256GPM064 FAMILY

REGISTER 5-4: NVMDATAx: FLASH DATA x REGISTER (x = 0-1)

Bit Range	Bit 31/23/15/7	Bit 30/22/14/6	Bit 29/21/13/5	Bit 28/20/12/4	Bit 27/19/11/3	Bit 26/18/10/2	Bit 25/17/9/1	Bit 24/16/8/0
31:24	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMDATAx<31:24>							
23:16	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMDATAx<23:16>							
15:8	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMDATAx<15:8>							
7:0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMDATAx<7:0>							

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 31-0 **NVMDATAx<31:0>**: Flash Data x bits

Double-Word Program: Writes NVMDATA1:NVMDATA0 to the target Flash address defined in NVMADDR. NVMDATA0 contains the least significant instruction word.

Note: The bits in this register are only reset by a Power-on Reset (POR) and are not affected by other Reset sources.

REGISTER 5-5: NVMSRCADDR: SOURCE DATA ADDRESS REGISTER

Bit Range	Bit 31/23/15/7	Bit 30/22/14/6	Bit 29/21/13/5	Bit 28/20/12/4	Bit 27/19/11/3	Bit 26/18/10/2	Bit 25/17/9/1	Bit 24/16/8/0
31:24	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMSRCADDR<31:24>							
23:16	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMSRCADDR<23:16>							
15:8	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMSRCADDR<15:8>							
7:0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	NVMSRCADDR<7:0>							

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 31-0 **NVMSRCADDR<31:0>**: Source Data Address bits

The system physical address of the data to be programmed into the Flash when the NVMOP<3:0> bits (NVMCON<3:0>) are set to perform row programming.

Note: The bits in this register are only reset by a Power-on Reset (POR) and are not affected by other Reset sources.

9.3 FRC Active Clock Tuning

PIC32MM0256GPM064 family devices include an automatic mechanism to calibrate the FRC during run time. This system uses active clock tuning from a source of known accuracy to maintain the FRC within a very narrow margin of its nominal 8 MHz frequency. This allows for a frequency accuracy that is well within the requirements of the “*USB 2.0 Specification*” regarding full-speed USB devices.

Note: The self-tune feature maintains sufficient accuracy for operation in USB Device mode. For applications that function as a USB host, a high-accuracy clock source ($\pm 0.05\%$) is still required.

The self-tune system is controlled by the bits in the upper half of the OSCTUN register. Setting the ON bit (OSCTUN<15>) enables the self-tuning feature, allowing the hardware to calibrate to a source selected by the SRC bit (OSCTUN<12>). When SRC = 1, the system uses the Start-of-Frame (SOF) packets from an external USB host for its source. When SRC = 0, the system uses the crystal-controlled SOSC for its calibration source. Regardless of the source, the system uses the TUN<5:0> bits (OSCTUN<5:0>) to change the FRC Oscillator's frequency. Frequency monitoring and adjustment is dynamic, occurring continuously during run time. While the system is active, the TUNx bits cannot be written to by software.

Note: To use the USB as a reference clock tuning source (SRC = 1), the microcontroller must be configured for USB device operation and connected to a non-suspended USB host or hub port.

If the SOSC is to be used as the reference clock tuning source (SRC = 0), the SOSC must also be enabled for clock tuning to occur.

The self-tune system can generate a hardware interrupt, FSTIF. The interrupt can result from a drift of the FRC from the reference, by greater than 0.2% in either direction, or whenever the frequency deviation is beyond the ability of the TUNx bits to correct (i.e., greater than 1.5%). The LOCK and ORNG status bits (OSCTUN<11,9>) are used to indicate these conditions.

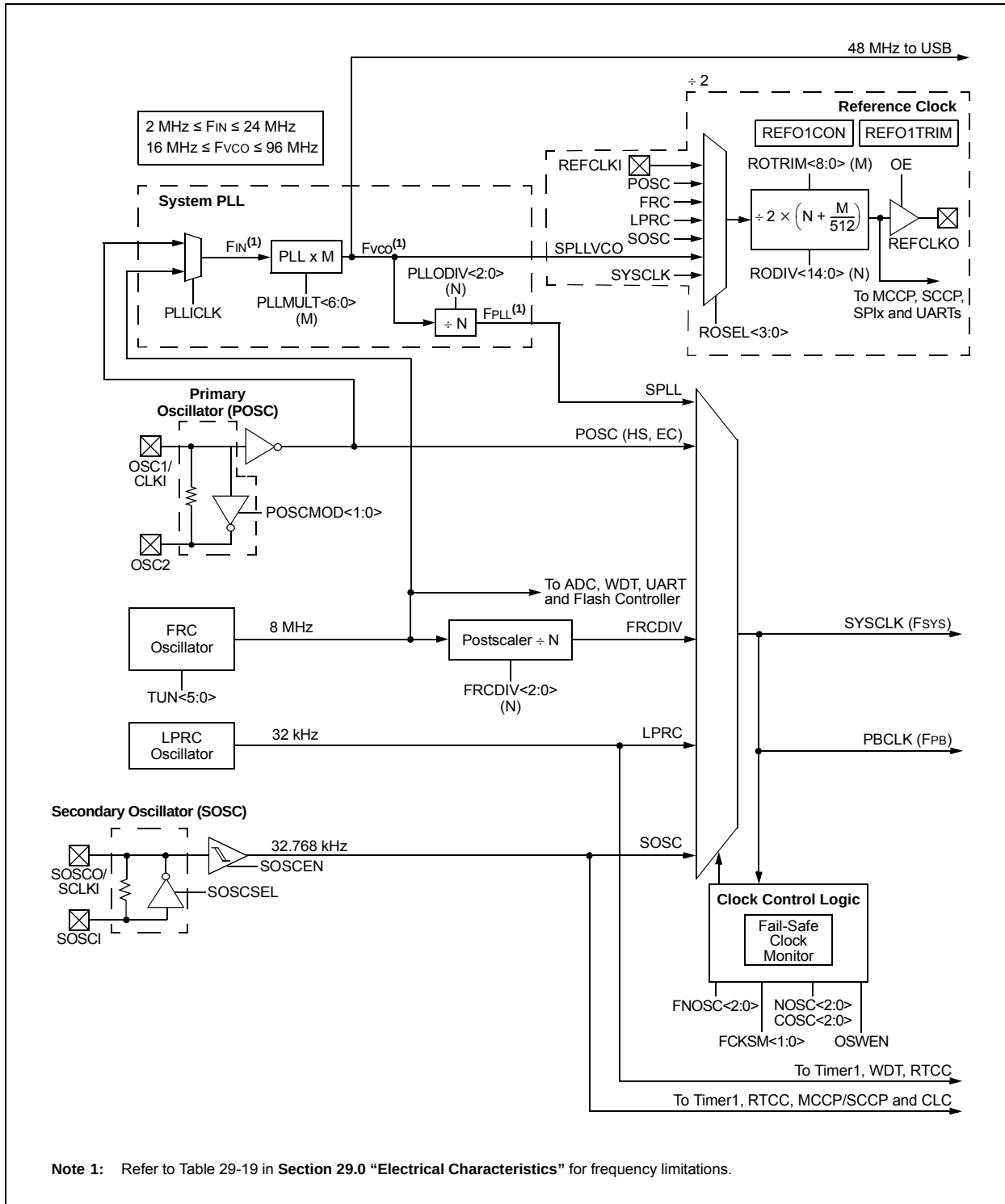
The POL and ORPOL bits (OSCTUN<10,8>) configure the FSTIF interrupt to occur in the presence or the absence of the conditions. It is the user's responsibility to monitor both the LOCK and ORNG bits to determine the exact cause of the interrupt.

Note: The POL and ORPOL bits should be ignored when the self-tune system is disabled (ON = 0).

Note: After exiting out of self-tune, 6 writes may be required to update the TUN<5:0> bits.

PIC32MM0256GPM064 FAMILY

FIGURE 9-1: PIC32MM0256GPM064 FAMILY OSCILLATOR DIAGRAM⁽¹⁾



10.10 I/O Ports Control Registers

TABLE 10-5: PORTA REGISTER MAP

Virtual Address (BF80_#)	Register Name ⁽¹⁾	Bit Range	Bits																All Resets
			31/15	30/14	29/13	28/12	27/11	26/10	25/9	24/8	23/7	22/6	21/5	20/4	19/3	18/2	17/1	16/0	
2BB0	ANSELA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	ANSA<13:11> ⁽²⁾				—	—	—	ANSA6 ⁽²⁾	—	—	ANSA<3:0>				000F
2BC0	TRISA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	TRISA<15:0> ⁽³⁾																021F
2BD0	PORTA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	RA<15:0> ⁽³⁾																xxxx
2BE0	LATA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	LATA<15:0> ⁽³⁾																0000
2BF0	ODCA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	ODCA<15:0> ⁽³⁾																0000
2C00	CNPUA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	CNPUA<15:0> ⁽³⁾																0000
2C10	CNPDA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	CNPDA<15:0> ⁽⁴⁾																0000
2C20	CNCONA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	ON	—	—	—	CNSTYLE	PORT32	—	—	—	—	—	—	—	—	—	—	0000
2C30	CNEN0A	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	CNIE0A<15:0> ⁽³⁾																0000
2C40	CNSTATA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	CNSTATA<15:0> ⁽³⁾																0000
2C50	CNEN1A	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	CNIE1A<15:0> ⁽³⁾																0000
2C60	CNFA	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	CNFA<15:0> ⁽³⁾																0000

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

Note 1: All registers in this table have corresponding CLR, SET and INV registers at their virtual address, plus an offset of 0x4, 0x8 and 0xC, respectively.

2: These bits are not available on 48, 36 or 28-pin devices.

3: Bits<14:11> are not available on 48-pin devices; bits<15:10> and bits<8:5> are not available on 36-pin devices.

4: Bits<15:5> are not available on 28-pin devices.

15.0 SERIAL PERIPHERAL INTERFACE (SPI) AND INTER-IC SOUND (I²S)

Note: This data sheet summarizes the features of the PIC32MM0256GPM064 family of devices. It is not intended to be a comprehensive reference source. To complement the information in this data sheet, refer to **Section 23. “Serial Peripheral Interface (SPI)”** (DS61106) in the “PIC32 Family Reference Manual”, which is available from the Microchip web site (www.microchip.com/PIC32). The information in this data sheet supersedes the information in the FRM.

The SPI/I²S module is a synchronous serial interface that is useful for communicating with external peripherals and other microcontroller devices, as well

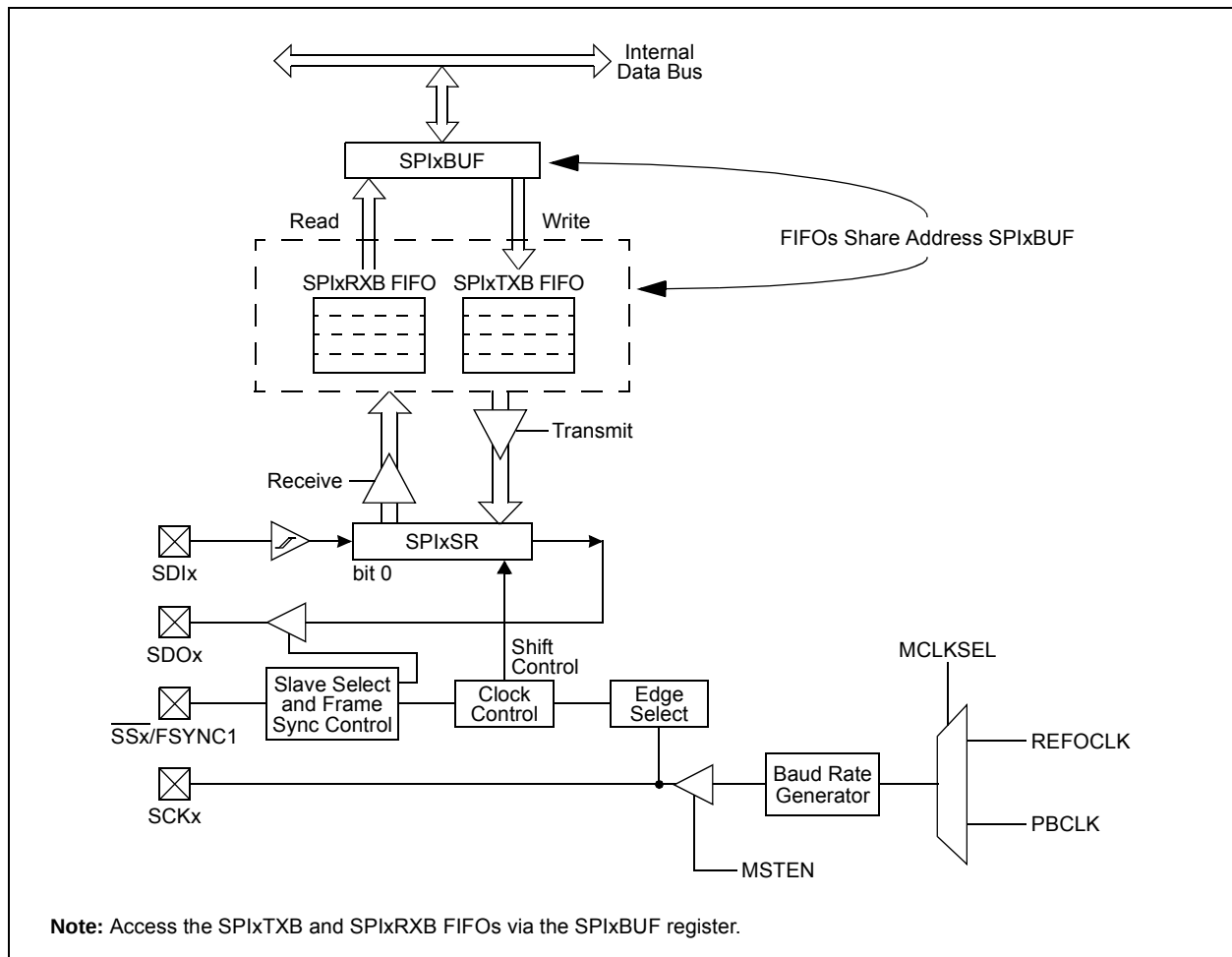
as digital audio devices. These peripheral devices may be serial EEPROMs, shift registers, display drivers, Analog-to-Digital Converters (ADC), etc.

The SPI/I²S module is compatible with Motorola® SPI and SIOP interfaces.

Some of the key features of the SPI module are:

- Master and Slave modes Support
- Four Different Clock Formats
- Enhanced Framed SPI Protocol Support
- User-Configurable 8-Bit, 16-Bit and 32-Bit Data Width
- Separate SPI FIFO Buffers for Receive and Transmit:
 - FIFO buffers act as 4/8/16-level deep FIFOs based on 32/16/8-bit data width
- Programmable Interrupt Event on every 8-Bit, 16-Bit and 32-Bit Data Transfer
- Operation during Sleep and Idle modes
- Audio Codec Support:
 - I²S protocol

FIGURE 15-1: SPI/I²S MODULE BLOCK DIAGRAM



15.1 SPI Control Registers

TABLE 15-1: SPI1, SPI2 AND SPI3 REGISTER MAP

Virtual Address (BF80_#)	Register Name ⁽¹⁾	Bit Range	Bits															All Resets	
			31/15	30/14	29/13	28/12	27/11	26/10	25/9	24/8	23/7	22/6	21/5	20/4	19/3	18/2	17/1		16/0
8100	SPI1CON	31:16	FRMEN	FRMSYNC	FRMPOL	MSEN	FRMSYPW	FRMCNT<2:0>			MCLKSEL	—	—	—	—	—	SPIFE	ENHBUF	0000
		15:0	ON	—	SIDL	DISSDO	MODE32	MODE16	SMP	CKE	SEN	CKP	MSTEN	DISSDI	STXISEL<1:0>		SRXISEL<1:0>		0000
8110	SPI1STAT	31:16	—	—	—	RXBUFELM<4:0>					—	—	—	TXBUFELM<4:0>					0000
		15:0	—	—	—	FRMERR	SPIBUSY	—	—	SPITUR	SRMT	SPIROV	SPIRBE	—	SPITBE	—	SPITBF	SPIRBF	0008
8120	SPI1BUF	31:16	DATA<31:0>																0000
		15:0																	0000
8130	SPI1BRG	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	BRG<12:0>													0000
8140	SPI1CON2	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	SPISGNEXT	—	—	FRMERREN	SPIROVEN	SPITUREN	IGNROV	IGNTUR	AUDEN	—	—	—	AUDMONO	—	AUDMOD<1:0>		0000
8200	SPI2CON	31:16	FRMEN	FRMSYNC	FRMPOL	MSEN	FRMSYPW	FRMCNT<2:0>			MCLKSEL	—	—	—	—	—	SPIFE	ENHBUF	0000
		15:0	ON	—	SIDL	DISSDO	MODE32	MODE16	SMP	CKE	SEN	CKP	MSTEN	DISSDI	STXISEL<1:0>		SRXISEL<1:0>		0000
8210	SPI2STAT	31:16	—	—	—	RXBUFELM<4:0>					—	—	—	TXBUFELM<4:0>					0000
		15:0	—	—	—	FRMERR	SPIBUSY	—	—	SPITUR	SRMT	SPIROV	SPIRBE	—	SPITBE	—	SPITBF	SPIRBF	0008
8220	SPI2BUF	31:16	DATA<31:0>																0000
		15:0																	0000
8230	SPI2BRG	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	BRG<12:0>													0000
8240	SPI2CON2	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	SPISGNEXT	—	—	FRMERREN	SPIROVEN	SPITUREN	IGNROV	IGNTUR	AUDEN	—	—	—	AUDMONO	—	AUDMOD<1:0>		0000
8300	SPI3CON	31:16	FRMEN	FRMSYNC	FRMPOL	MSEN	FRMSYPW	FRMCNT<2:0>			MCLKSEL	—	—	—	—	—	SPIFE	ENHBUF	0000
		15:0	ON	—	SIDL	DISSDO	MODE32	MODE16	SMP	CKE	SEN	CKP	MSTEN	DISSDI	STXISEL<1:0>		SRXISEL<1:0>		0000
8310	SPI3STAT	31:16	—	—	—	RXBUFELM<4:0>					—	—	—	TXBUFELM<4:0>					0000
		15:0	—	—	—	FRMERR	SPIBUSY	—	—	SPITUR	SRMT	SPIROV	SPIRBE	—	SPITBE	—	SPITBF	SPIRBF	0008
8330	SPI3BUF	31:16	DATA<31:0>																0000
		15:0																	0000
8320	SPI3BRG	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	BRG<12:0>													0000
8340	SPI3CON2	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	SPISGNEXT	—	—	FRMERREN	SPIROVEN	SPITUREN	IGNROV	IGNTUR	AUDEN	—	—	—	AUDMONO	—	AUDMOD<1:0>		0000

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

Note 1: All registers in this table, except SPIxBUF, have corresponding CLR, SET and INV registers at their virtual addresses, plus offsets of 0x4, 0x8 and 0xC, respectively.

16.1 I²C Control Registers

TABLE 16-1: I2C1, I2C2 AND I2C3 REGISTER MAP

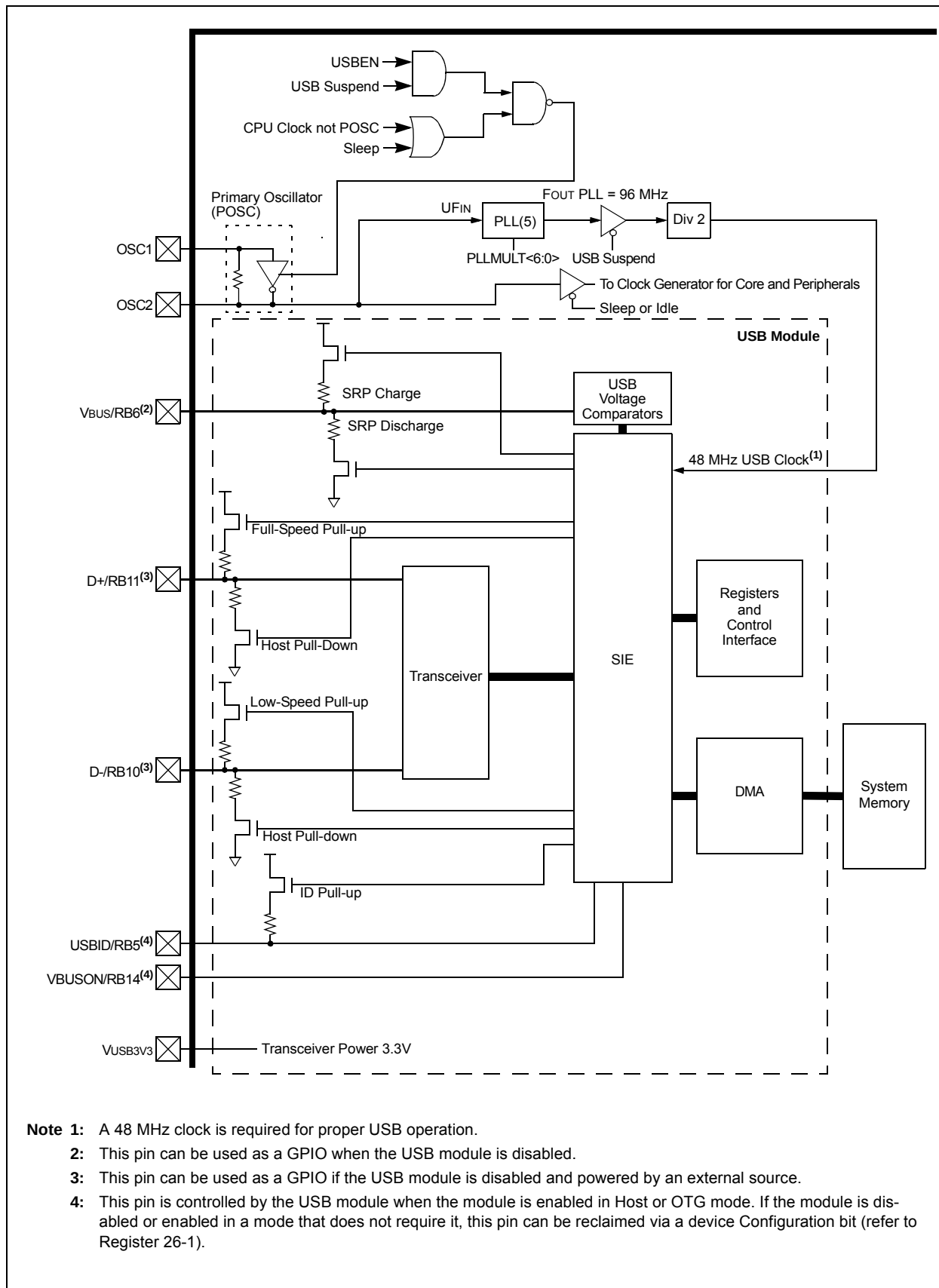
Virtual Address (BF80_#)	Register Name ⁽¹⁾	Bit Range	Bits																All Resets
			31/15	30/14	29/13	28/12	27/11	26/10	25/9	24/8	23/7	22/6	21/5	20/4	19/3	18/2	17/1	16/0	
1500	I2C1CON	31:16	—	—	—	—	—	—	—	—	—	PCIE	SCIE	BOEN	SDAHT	SBCDE	r	r	0000
		15:0	ON	—	SIDL	SCLREL	STRICT	A10M	DISSLW	SMEN	GCEN	STREN	ACKDT	ACKEN	RCEN	PEN	RSEN	SEN	1000
1510	I2C1STAT	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	ACKSTAT	TRSTAT	ACKTIM	—	—	BCL	GCSTAT	ADD10	IWCOL	I2COV	D/A	P	S	R/W	RBF	TBF	0000
1520	I2C1ADD	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	I2C1 Address Register										0000
1530	I2C1MSK	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	I2C1 Address Mask Register										0000
1540	I2C1BRG	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	Baud Rate Generator Register																0000
1550	I2C1TRN	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	—	—	I2C1 Transmit Register								0000
1560	I2C1RCV	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	—	—	I2C1 Receive Register								0000
1600	I2C2CON	31:16	—	—	—	—	—	—	—	—	—	PCIE	SCIE	BOEN	SDAHT	SBCDE	r	r	0000
		15:0	ON	—	SIDL	SCLREL	STRICT	A10M	DISSLW	SMEN	GCEN	STREN	ACKDT	ACKEN	RCEN	PEN	RSEN	SEN	1000
1610	I2C2STAT	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	ACKSTAT	TRSTAT	ACKTIM	—	—	BCL	GCSTAT	ADD10	IWCOL	I2COV	D/A	P	S	R/W	RBF	TBF	0000
1620	I2C2ADD	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	I2C2 Address Register										0000
1630	I2C2MSK	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	I2C2 Address Mask Register										0000
1640	I2C2BRG	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	Baud Rate Generator Register																0000
1650	I2C2TRN	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	—	—	I2C2 Transmit Register								0000
1660	I2C2RCV	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	—	—	I2C2 Receive Register								0000

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

Note 1: All registers in this table, except I2CxRCV, have corresponding CLR, SET and INV registers at their virtual addresses, plus offsets of 0x4, 0x8 and 0xC, respectively.

PIC32MM0256GPM064 FAMILY

FIGURE 18-1: PIC32MM0256GPM064 FAMILY USB INTERFACE DIAGRAM



PIC32MM0256GPM064 FAMILY

REGISTER 18-5: U1PWRC: USB POWER CONTROL REGISTER

Bit Range	Bit 31/23/15/7	Bit 30/22/14/6	Bit 29/21/13/5	Bit 28/20/12/4	Bit 27/19/11/3	Bit 26/18/10/2	Bit 25/17/9/1	Bit 24/16/8/0
31:24	U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
	—	—	—	—	—	—	—	—
23:16	U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
	—	—	—	—	—	—	—	—
15:8	U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
	—	—	—	—	—	—	—	—
7:0	R-0	U-0	U-0	R/W-0	R/W-0	U-0	R/W-0	R/W-0
	UACTPND	—	—	USLPGRD	USBBUSY ⁽¹⁾	—	USUSPEND	USBPWR ⁽¹⁾

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 31-8 **Unimplemented:** Read as '0'

bit 7 **UACTPND:** USB Activity Pending bit

1 = USB bus activity has been detected, but an interrupt is pending; it has not been generated yet

0 = An interrupt is not pending

bit 6-5 **Unimplemented:** Read as '0'

bit 4 **USLPGRD:** USB Sleep Entry Guard bit

1 = Sleep entry is blocked if USB bus activity is detected or if a notification is pending

0 = USB module does not block Sleep entry

bit 3 **USBBUSY:** USB Module Busy bit⁽¹⁾

1 = USB module is active or disabled, but not ready to be enabled

0 = USB module is not active and is ready to be enabled

bit 2 **Unimplemented:** Read as '0'

bit 1 **USUSPEND:** USB Suspend Mode bit

1 = USB module is placed in Suspend mode

(The 48 MHz USB clock will be gated off. The transceiver is placed in a low-power state.)

0 = USB module operates normally

bit 0 **USBPWR:** USB Operation Enable bit⁽¹⁾

1 = USB module is turned on

0 = USB module is disabled

(Outputs held inactive, device pins not used by USB, analog features are shut down to reduce power consumption.)

Note 1: When USBPWR = 0 and USBBUSY = 1, status from all other registers is invalid and writes to all USB module registers produce undefined results.

PIC32MM0256GPM064 FAMILY

REGISTER 18-9: U1EIE: USB ERROR INTERRUPT ENABLE REGISTER

Bit Range	Bit 31/23/15/7	Bit 30/22/14/6	Bit 29/21/13/5	Bit 28/20/12/4	Bit 27/19/11/3	Bit 26/18/10/2	Bit 25/17/9/1	Bit 24/16/8/0
31:24	U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
	—	—	—	—	—	—	—	—
23:16	U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
	—	—	—	—	—	—	—	—
15:8	U-0	U-0	U-0	U-0	U-0	U-0	U-0	U-0
	—	—	—	—	—	—	—	—
7:0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
	BTSEE	BMXEE	DMAEE	BTOEE	DFN8EE	CRC16EE	CRC5EE ⁽¹⁾ EOFEE ⁽²⁾	PIDEE

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 31-8 **Unimplemented:** Read as '0'

bit 7 **BTSEE:** Bit Stuff Error Interrupt Enable bit

1 = BTSEF interrupt is enabled

0 = BTSEF interrupt is disabled

bit 6 **BMXEE:** Bus Matrix Error Interrupt Enable bit

1 = BMXEF interrupt is enabled

0 = BMXEF interrupt is disabled

bit 5 **DMAEE:** DMA Error Interrupt Enable bit

1 = DMAEF interrupt is enabled

0 = DMAEF interrupt is disabled

bit 4 **BTOEE:** Bus Turnaround Time-out Error Interrupt Enable bit

1 = BTOEF interrupt is enabled

0 = BTOEF interrupt is disabled

bit 3 **DFN8EE:** Data Field Size Error Interrupt Enable bit

1 = DFN8EF interrupt is enabled

0 = DFN8EF interrupt is disabled

bit 2 **CRC16EE:** CRC16 Failure Interrupt Enable bit

1 = CRC16EF interrupt is enabled

0 = CRC16EF interrupt is disabled

bit 1 **CRC5EE:** CRC5 Host Error Interrupt Enable bit⁽¹⁾

1 = CRC5EF interrupt is enabled

0 = CRC5EF interrupt is disabled

EOFEE: EOF Error Interrupt Enable bit⁽²⁾

1 = EOF interrupt is enabled

0 = EOF interrupt is disabled

bit 0 **PIDEE:** PID Check Failure Interrupt Enable bit

1 = PIDEF interrupt is enabled

0 = PIDEF interrupt is disabled

Note 1: Device mode.

2: Host mode.

REGISTER 21-2: CLCxSEL: CLCx INPUT MUX SELECT REGISTER (CONTINUED)

- bit 11 **Unimplemented:** Read as '0'
- bit 10-8 **DS3<2:0>:** Data Selection MUX 3 Signal Selection bits
- For CLC1:
- 111 = Unused
 - 110 = MCCP1 OCMP compare match event
 - 101 = DMA Channel 0 interrupt
 - 100 = ADC end of conversion
 - 011 = UART1 TX out
 - 010 = CMP1 out
 - 001 = CLC2 out
 - 000 = CLCINB I/O pin
- For CLC2:
- 111 = Unused
 - 110 = MCCP1 OCMP compare match event
 - 101 = DMA Channel 1 interrupt
 - 100 = ADC end of conversion
 - 011 = UART2 TX out
 - 010 = CMP1 out
 - 001 = CLC1 out
 - 000 = CLCINB I/O pin
- For CLC3:
- 111 = Reserved
 - 110 = MCCP2 OCMP compare match event
 - 101 = DMA Channel 0 interrupt
 - 100 = ADC end of conversion
 - 011 = UART3 TX out
 - 010 = CMP1 out
 - 001 = CLC4 out
 - 000 = CLCINB I/O pin
- For CLC4:
- 111 = Reserved
 - 110 = MCCP3 OCMP compare match event
 - 101 = DMA Channel 1 interrupt
 - 100 = ADC end of conversion
 - 011 = Reserved
 - 010 = CMP1 out
 - 001 = CLC3 out
 - 000 = CLCINB I/O pin
- bit 7 **Unimplemented:** Read as '0'

26.9 Configuration Word Registers

TABLE 26-3: CONFIGURATION WORDS SUMMARY

Virtual Address (BFC0_#)	Register Name	Bit Range	Bits															
			31:15	30:14	29:13	28:12	27:11	26:10	25:9	24:8	23:7	22:6	21:5	20:4	19:3	18:2	17:1	16:0
17C0	RESERVED	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
17C4	FDEVOPT	31:16	USERID<15:0>															
		15:0	FVBUSIO	FUSBIDIO	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	ALT2C	SOSCHP	r-1	r-1	r-1
17C8	FICD	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	ICS<1:0>		JTAGEN	r-1	r-1
17CC	FPOR	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	LPBOREN	RETVR	BOREN<1:0>	
17D0	FWDT	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	FWDTEN	RCLKSEL<1:0>		RWDTPS<4:0>					WINDIS	FWDTWINSZ<1:0>			SWDTPS<4:0>			
17D4	FOSCSSEL	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	FCKSM<1:0>			SOSCSSEL	r-1	OSCIOFNC	POSCMOD<1:0>		IESO	SOSCEN	r-1	PLLSRC	r-1	FNOSC<2:0>		
17D8	FSEC	31:16	CP	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
17DC	RESERVED	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
17E0	RESERVED	31:16	r-0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
17E4	RESERVED	31:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
		15:0	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1

Legend: r-0 = Reserved bit, must be programmed as '0'; r-1 = Reserved bit, must be programmed as '1'.

PIC32MM0256GPM064 FAMILY

REGISTER 26-5: FOSCSEL/AFOSCSEL: OSCILLATOR SELECTION CONFIGURATION REGISTER

Bit Range	Bit 31/23/15/7	Bit 30/22/14/6	Bit 29/21/13/5	Bit 28/20/12/4	Bit 27/19/11/3	Bit 26/18/10/2	Bit 25/17/9/1	Bit 24/16/8/0
31:24	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
	—	—	—	—	—	—	—	—
23:16	r-1	r-1	r-1	r-1	r-1	r-1	r-1	r-1
	—	—	—	—	—	—	—	—
15:8	R/P	R/P	r-1	R/P	r-1	R/P	R/P	R/P
	FCKSM<1:0>		—	SOSCSEL	—	OSCIOFNC	POSCMOD<1:0>	
7:0	R/P	R/P	r-1	R/P	r-1	R/P	R/P	R/P
	IESO	SOSCEN	—	PLLSRC	—	FNOSC<2:0>		

Legend:	r = Reserved bit	P = Programmable 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 31-16 **Reserved:** Program as '1'

bit 15-14 **FCKSM<1:0>:** Clock Switching and Fail-Safe Clock Monitor Enable bits

11 = Clock switching is enabled; Fail-Safe Clock Monitor is enabled

10 = Clock switching is disabled; Fail-Safe Clock Monitor is enabled

01 = Clock switching is enabled; Fail-Safe Clock Monitor is disabled

00 = Clock switching is disabled; Fail-Safe Clock Monitor is disabled

bit 13 **Reserved:** Program as '1'

bit 12 **SOSCSEL:** Secondary Oscillator (SOSC) External Clock Enable bit

1 = Crystal is used (RA4 and RB4 pins are controlled by the SOSC)

0 = External clock connected to the SOSCO pin is used (RA4 and RB4 pins are controlled by I/O PORTx registers)

bit 11 **Reserved:** Program as '1'

bit 10 **OSCIOFNC:** System Clock on CLKO Pin Enable bit

1 = CLKO/OSC2 pin operates as normal I/O

0 = System clock is connected to the CLKO/OSC2 pin

bit 9-8 **POSCMOD<1:0>:** Primary Oscillator (POSC) Mode Selection bits

11 = Primary Oscillator is disabled

10 = HS Oscillator mode is selected

01 = XT Oscillator mode is selected

00 = External Clock (EC) mode is selected

bit 7 **IESO:** Two-Speed Start-up Enable bit

1 = Two-Speed Start-up is enabled

0 = Two-Speed Start-up is disabled

bit 6 **SOSCEN:** Secondary Oscillator (SOSC) Enable bit

1 = Secondary Oscillator enable

0 = Secondary Oscillator disable

bit 5 **Reserved:** Program as '1'

bit 4 **PLLSRC:** System PLL Input Clock Selection bit

1 = FRC oscillator is selected as the PLL reference input on a device Reset

0 = Primary Oscillator (POSC) is selected as the PLL reference input on a device Reset

bit 3 **Reserved:** Program as '1'

TABLE 26-6: BAND GAP REGISTER MAP

Virtual Address (BF80_#)	Register Name	Bit Range	Bits																All Resets
			31/15	30/14	29/13	28/12	27/11	26/10	25/9	24/8	23/7	22/6	21/5	20/4	19/3	18/2	17/1	16/0	
2300	ANCFG ⁽¹⁾	31:16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0000
		15:0	—	—	—	—	—	—	—	—	—	—	—	—	—	VBGADC	VBGCMP	—	0000

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

Note 1: This register has corresponding CLR, SET and INV registers at its virtual address, plus an offset of 0x4, 0x8 and 0xC, respectively.

28.0 DEVELOPMENT SUPPORT

The PIC® microcontrollers (MCU) and dsPIC® digital signal controllers (DSC) are supported with a full range of software and hardware development tools:

- Integrated Development Environment
 - MPLAB® X IDE Software
- Compilers/Assemblers/Linkers
 - MPLAB XC Compiler
 - MPASM™ Assembler
 - MPLINK™ Object Linker/
MPLIB™ Object Librarian
 - MPLAB Assembler/Linker/Librarian for
Various Device Families
- Simulators
 - MPLAB X SIM Software Simulator
- Emulators
 - MPLAB REAL ICE™ In-Circuit Emulator
- In-Circuit Debuggers/Programmers
 - MPLAB ICD 3
 - PICKit™ 3
- Device Programmers
 - MPLAB PM3 Device Programmer
- Low-Cost Demonstration/Development Boards,
Evaluation Kits and Starter Kits
- Third-party development tools

28.1 MPLAB X Integrated Development Environment Software

The MPLAB X IDE is a single, unified graphical user interface for Microchip and third-party software, and hardware development tool that runs on Windows®, Linux and Mac OS® X. Based on the NetBeans IDE, MPLAB X IDE is an entirely new IDE with a host of free software components and plug-ins for high-performance application development and debugging. Moving between tools and upgrading from software simulators to hardware debugging and programming tools is simple with the seamless user interface.

With complete project management, visual call graphs, a configurable watch window and a feature-rich editor that includes code completion and context menus, MPLAB X IDE is flexible and friendly enough for new users. With the ability to support multiple tools on multiple projects with simultaneous debugging, MPLAB X IDE is also suitable for the needs of experienced users.

Feature-Rich Editor:

- Color syntax highlighting
- Smart code completion makes suggestions and provides hints as you type
- Automatic code formatting based on user-defined rules
- Live parsing

User-Friendly, Customizable Interface:

- Fully customizable interface: toolbars, toolbar buttons, windows, window placement, etc.
- Call graph window

Project-Based Workspaces:

- Multiple projects
- Multiple tools
- Multiple configurations
- Simultaneous debugging sessions

File History and Bug Tracking:

- Local file history feature
- Built-in support for Bugzilla issue tracker

PIC32MM0256GPM064 FAMILY

FIGURE 29-8: MCCP AND SCCP PWM MODE TIMING CHARACTERISTICS

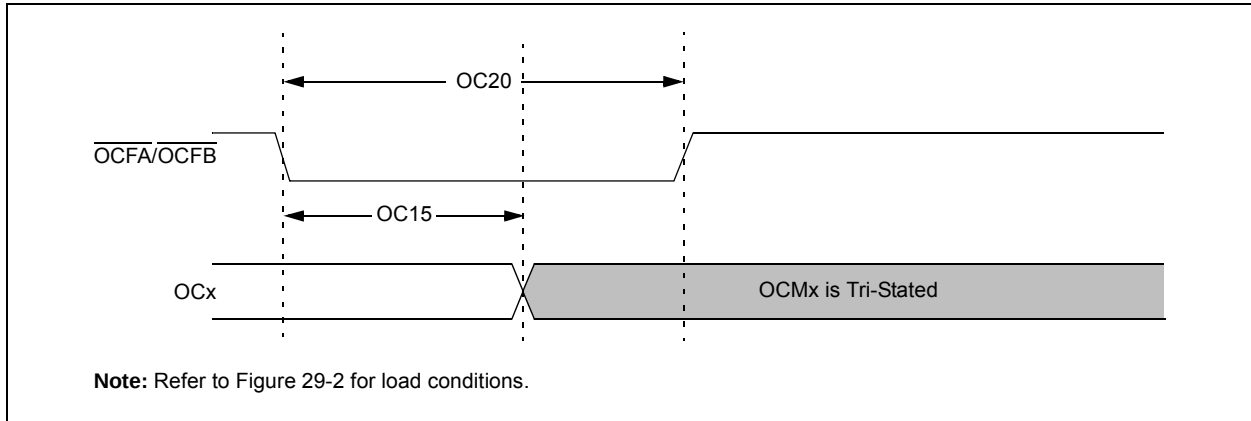


TABLE 29-27: MCCP AND SCCP PWM MODE TIMING REQUIREMENTS

AC CHARACTERISTICS			Standard Operating Conditions: 2.0V to 3.6V (unless otherwise stated) Operating temperature $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$				
Param No.	Symbol	Characteristics ⁽¹⁾	Min	Typical	Max	Units	Conditions
OC15	T _{FD}	Fault Input to PWM I/O Change	—	—	50	ns	
OC20	T _{FLT}	Fault Input Pulse Width	10	—	—	ns	

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

**48-Lead Ultra Thin Plastic Quad Flat, No Lead Package (M4) - 6x6 mm Body [UQFN]
With Corner Anchors and 4.6x4.6 mm Exposed Pad**

NOTE 1

(DATUM B)

(DATUM A)

2X

2X

TOP VIEW

8X (b1)

8X (b2)

D2

E2

L

e

48X b

BOTTOM VIEW

A1

52X

A3

SEATING PLANE

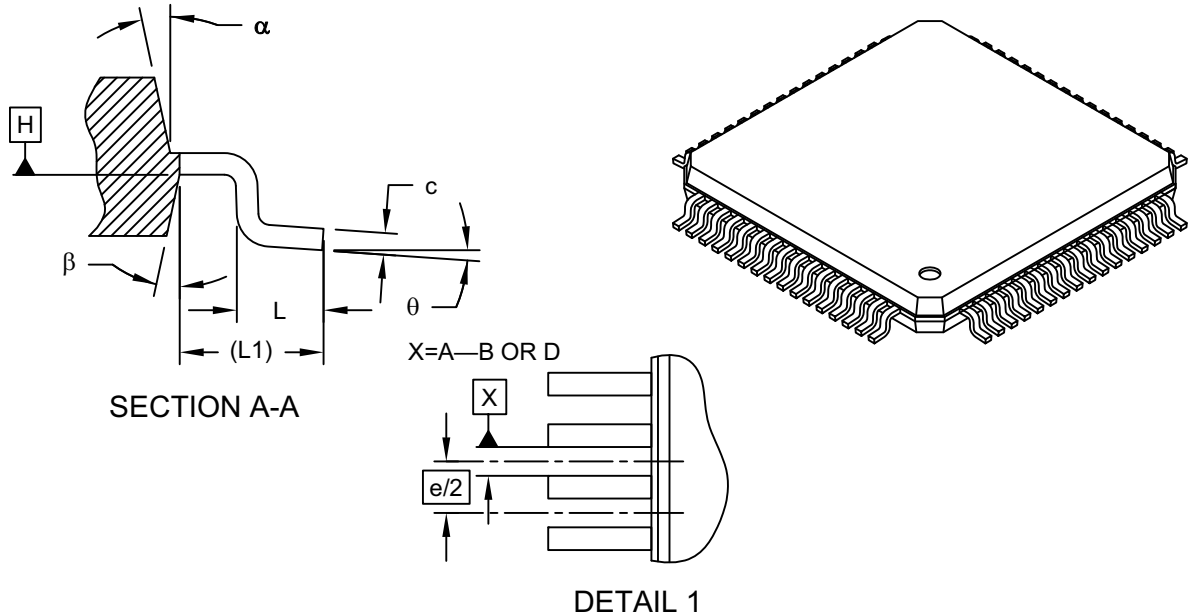
SIDE VIEW

Microchip Technology Drawing C04-442A-M4 Sheet 1 of 2

PIC32MM0256GPM064 FAMILY

64-Lead Plastic Thin Quad Flatpack (PT)-10x10x1 mm Body, 2.00 mm Footprint [TQFP]

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



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Leads	N	64		
Lead Pitch	e	0.50 BSC		
Overall Height	A	-	-	1.20
Molded Package Thickness	A2	0.95	1.00	1.05
Standoff	A1	0.05	-	0.15
Foot Length	L	0.45	0.60	0.75
Footprint	L1	1.00 REF		
Foot Angle	ϕ	0°	3.5°	7°
Overall Width	E	12.00 BSC		
Overall Length	D	12.00 BSC		
Molded Package Width	E1	10.00 BSC		
Molded Package Length	D1	10.00 BSC		
Lead Thickness	c	0.09	-	0.20
Lead Width	b	0.17	0.22	0.27
Mold Draft Angle Top	α	11°	12°	13°
Mold Draft Angle Bottom	β	11°	12°	13°

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Chamfers at corners are optional; size may vary.
3. Dimensions D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M

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

REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-085C Sheet 2 of 2