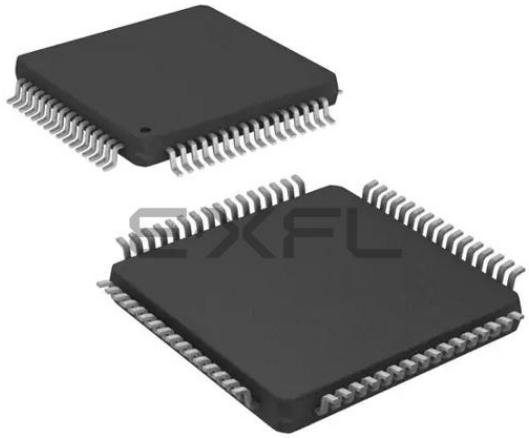
Microchip Technology - DSPIC33CH64MP206-I/PT Datasheet



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"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	dsPIC
Core Size	16-Bit Dual-Core
Speed	180MHz, 200MHz
Connectivity	I²C, IrDA, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, Motor Control PWM, POR, PWM, QEI, WDT
Number of I/O	53
Program Memory Size	88KB (88K x 8)
Program Memory Type	FLASH, PRAM
EEPROM Size	-
RAM Size	20K x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 3.6V
Data Converters	A/D 34x12b; D/A 4x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	64-TQFP
Supplier Device Package	64-TQFP (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/dspic33ch64mp206-i-pt

TABLE 7: 48-PIN QFN/TQFP/UQFN

Pin #	Master Core	Slave Core
1	**RP46**/PWM1H/RB14	**S1RP46**/S1PWM6L/S1RB14
2	**RP47**/PWM1L/RB15	**S1RP47**/S1PWM6H/S1RB15
3	**RP60**/RC12	**S1RP60**/S1PWM3H/S1RC12
4	**RP61**/RC13	**S1RP61**/S1PWM3L/S1RC13
5	$\overline{\text{MCLR}}$	—
6	RD13	S1ANN0/S1PGA1N2/S1RD13
7	AN12/IBIAS3/**RP48**/RC0	S1AN10/**S1RP48**/S1RC0
8	AN0/CMP1A/RA0	S1RA0
9	AN1/RA1	S1AN15/S1RA1
10	AN2/RA2	S1AN16/S1RA2
11	AN3/IBIAS0/RA3	S1AN0/S1CMP1A/S1PGA1P1/S1RA3
12	AN4/IBIAS1/RA4	$\overline{\text{S1MCLR3}}$/S1AN1/S1CMP2A/S1PGA2P1/S1PGA3P2/S1RA4
13	AVDD	AVDD
14	AVSS	AVSS
15	AN13/ISRC0/**RP49**/RC1	S1ANA1/**S1RP49**/S1RC1
16	AN14/ISRC1/**RP50**/RC2	S1ANA0/**S1RP50**/S1RC2
17	**RP54**/RC6	S1AN11/S1CMP1B/**S1RP54**/S1RC6
18	VDD	VDD
19	VSS	VSS
20	CMP1B/**RP51**/RC3	S1AN8/S1CMP3B/**S1RP51**/S1RC3
21	OSCI/CLKI/AN5/**RP32**/RB0	S1AN5/**S1RP32**/S1RB0
22	OSCO/CLKO/AN6/IBIAS2/**RP33**/RB1	S1AN4/**S1RP33**/S1RB1
23	ISRC3/RD10	S1AN13/S1CMP2B/S1RD10
24	AN15/ISRC2/**RP55**/RC7	S1AN12/**S1RP55**/S1RC7
25	DACOUT/AN7/CMP1D/**RP34**/INT0/RB2	$\overline{\text{S1MCLR2}}$/S1AN3/S1ANC0/S1ANC1/S1CMP1D/S1CMP2D/S1CMP3D/**S1RP34**/S1INT0/S1RB2
26	PGD2/AN8/**RP35**/RB3	S1PGD2/S1AN18/S1CMP3A/S1PGA3P1/**S1RP35**/S1RB3
27	PGC2/**RP36**/RB4	S1PGC2/S1AN9/**S1RP36**/S1PWM5L/S1RB4
28	**RP56**/ASDA1/SCK2/RC8	**S1RP56**/S1ASDA1/S1SCK1/S1RC8
29	**RP57**/ASCL1/SDI2/RC9	**S1RP57**/S1ASCL1/S1SDI1/S1RC9
30	SDO2/PCI19/RD8	S1SDO1/S1PCI19/S1RD8
31	VSS	VSS
32	VDD	VDD
33	PGD3/**RP37**/SDA2/RB5	S1PGD3/**S1RP37**/S1RB5
34	PGC3/**RP38**/SCL2/RB6	S1PGC3/**S1RP38**/S1RB6
35	TDO/AN9/**RP39**/RB7	$\overline{\text{S1MCLR1}}$/S1AN6/**S1RP39**/S1PWM5H/S1RB7
36	PGD1/AN10/**RP40**/SCL1/RB8	S1PGD1/S1AN7/**S1RP40**/S1SCL1/S1RB8
37	PGC1/AN11/**RP41**/SDA1/RB9	S1PGC1/**S1RP41**/S1SDA1/S1RB9
38	**RP52**/RC4	**S1RP52**/S1PWM2H/S1RC4
39	**RP53**/RC5	**S1RP53**/S1PWM2L/S1RC5
40	**RP58**/RC10	**S1RP58**/S1PWM1H/S1RC10
41	**RP59**/RC11	**S1RP59**/S1PWM1L/S1RC11
42	VSS	VSS
43	VDD	VDD
44	**RP65**/RD1	**S1RP65**/S1PWM4H/S1RD1
45	TMS/**RP42**/PWM3H/RB10	**S1RP42**/S1PWM8L/S1RB10
46	TCK/**RP43**/PWM3L/RB11	**S1RP43**/S1PWM8H/S1RB11
47	TDI/**RP44**/PWM2H/RB12	**S1RP44**/S1PWM7L/S1RB12
48	**RP45**/PWM2L/RB13	**S1RP45**/S1PWM7H/S1RB13

Legend: **RPn** and **S1RPn** represent remappable pins for Peripheral Pin Select functions.

TABLE 1-1: PINOUT I/O DESCRIPTIONS (CONTINUED)

Pin Name(1)	Pin Type	Buffer Type	PPS	Description
MCLR/S1MCLR1/S1MCLR2/ S1MCLR3	I/P	ST	No	Master Clear (Reset) input. This pin is an active-low Reset to the device. S1MCLRx is valid only for slave debug in Dual Debug mode.
AVDD	P	P	No	Positive supply for analog modules. This pin must be connected at all times.
AVSS	P	P	No	Ground reference for analog modules. This pin must be connected at all times.
VDD	P	—	No	Positive supply for peripheral logic and I/O pins
VSS	P	—	No	Ground reference for logic and I/O pins

Legend: CMOS = CMOS compatible input or output; Analog = Analog input; P = Power
ST = Schmitt Trigger input with CMOS levels; O = Output; I = Input
PPS = Peripheral Pin Select; TTL = TTL input buffer

Note 1: Not all pins are available in all package variants. See the **"Pin Diagrams"** section for pin availability.

2: These pins are remappable as well as dedicated. Some of the pins are associated with the Slave function and have S1 attached to the beginning of the name. For example, AN0 for the Slave is S1AN0.

3: S1 attached to the beginning of the name indicates the Slave feature for that function. For example, AN0 for the Slave is S1AN0.

REGISTER 3-18: INTCON1: INTERRUPT CONTROL 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
NSTDIS	OVAERR	OVBERR	COVAERR	COVBERR	OVATE	OVBTE	COVTE
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	U-0
SFTACERR	DIV0ERR	DMACERR	MATHERR	ADDRERR	STKERR	OSCFAIL	—
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 **NSTDIS:** Interrupt Nesting Disable bit
1 = Interrupt nesting is disabled
0 = Interrupt nesting is enabled

bit 14 **OVAERR:** Accumulator A Overflow Trap Flag bit
1 = Trap was caused by an overflow of Accumulator A
0 = Trap was not caused by an overflow of Accumulator A

bit 13 **OVBERR:** Accumulator B Overflow Trap Flag bit
1 = Trap was caused by an overflow of Accumulator B
0 = Trap was not caused by an overflow of Accumulator B

bit 12 **COVAERR:** Accumulator A Catastrophic Overflow Trap Flag bit
1 = Trap was caused by a catastrophic overflow of Accumulator A
0 = Trap was not caused by a catastrophic overflow of Accumulator A

bit 11 **COVBERR:** Accumulator B Catastrophic Overflow Trap Flag bit
1 = Trap was caused by a catastrophic overflow of Accumulator B
0 = Trap was not caused by a catastrophic overflow of Accumulator B

bit 10 **OVATE:** Accumulator A Overflow Trap Enable bit
1 = Trap overflow of Accumulator A
0 = Trap is disabled

bit 9 **OVBTE:** Accumulator B Overflow Trap Enable bit
1 = Trap overflow of Accumulator B
0 = Trap is disabled

bit 8 **COVTE:** Catastrophic Overflow Trap Enable bit
1 = Trap catastrophic overflow of Accumulator A or B is enabled
0 = Trap is disabled

bit 7 **SFTACERR:** Shift Accumulator Error Status bit
1 = Math error trap was caused by an invalid accumulator shift
0 = Math error trap was not caused by an invalid accumulator shift

REGISTER 3-22: INTTREG: INTERRUPT CONTROL AND STATUS REGISTER

U-0	U-0	R-0	U-0	R-0	R-0	R-0	R-0
—	—	VHOLD	—	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 15-14 **Unimplemented:** Read as '0'

bit 13 **VHOLD:** Vector Number Capture Enable bit
1 = VECNUM<7:0> bits read current value of vector number encoding tree (i.e., highest priority pending interrupt)
0 = Vector number latched into VECNUM<7:0> at Interrupt Acknowledge and retained until next IACK

bit 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, Reserved; do not use
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 3-28: CNPUx: CHANGE NOTIFICATION PULL-UP ENABLE FOR PORTx REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
CNPUx<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
CNPUx<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 **CNPUx<15:0>:** Change Notification Pull-up Enable for PORTx bits
1 = The pull-up for PORTx[n] is enabled – takes precedence over the pull-down selection
0 = The pull-up for PORTx[n] is disabled

REGISTER 3-29: CNPDx: CHANGE NOTIFICATION PULL-DOWN ENABLE FOR PORTx REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
CNPDx<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
CNPDx<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 **CNPDx<15:0>:** Change Notification Pull-Down Enable for PORTx bits
1 = The pull-down for PORTx[n] is enabled (if the pull-up for PORTx[n] is not enabled)
0 = The pull-down for PORTx[n] is disabled

REGISTER 3-53: RPINR19: PERIPHERAL PIN SELECT INPUT REGISTER 19

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
U2DSRR7	U2DSRR6	U2DSRR5	U2DSRR4	U2DSRR3	U2DSRR2	U2DSRR1	U2DSRR0
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
U2RXR7	U2RXR6	U2RXR5	U2RXR4	U2RXR3	U2RXR2	U2RXR1	U2RXR0
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 **U2DSRR<7:0>:** Assign UART2 Data-Set-Ready ($\overline{\text{U2DSR}}$) to the Corresponding RPn Pin bits
See Table 3-30.

bit 7-0 **U2RXR<7:0>:** Assign UART2 Receive (U2RX) to the Corresponding RPn Pin bits
See Table 3-30.

REGISTER 3-54: RPINR20: PERIPHERAL PIN SELECT INPUT REGISTER 20

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
SCK1R7	SCK1R6	SCK1R5	SCK1R4	SCK1R3	SCK1R2	SCK1R1	SCK1R0
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
SDI1R7	SDI1R6	SDI1R5	SDI1R4	SDI1R3	SDI1R2	SDI1R1	SDI1R0
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 **SCK1R<7:0>:** Assign SPI1 Clock Input (SCK1IN) to the Corresponding RPn Pin bits
See Table 3-30.

bit 7-0 **SDI1R<7:0>:** Assign SPI1 Data Input (SDI1) to the Corresponding RPn Pin bits
See Table 3-30.

REGISTER 3-84: RPOR16: PERIPHERAL PIN SELECT OUTPUT REGISTER 16

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP65R5	RP65R4	RP65R3	RP65R2	RP65R1	RP65R0
bit 15							bit 8

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP64R5	RP64R4	RP64R3	RP64R2	RP64R1	RP64R0
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 **Unimplemented:** Read as '0'

bit 13-8 **RP65R<5:0>:** Peripheral Output Function is Assigned to RP65 Output Pin bits (see Table 3-33 for peripheral function numbers)

bit 7-6 **Unimplemented:** Read as '0'

bit 5-0 **RP64R<5:0>:** Peripheral Output Function is Assigned to RP64 Output Pin bits (see Table 3-33 for peripheral function numbers)

REGISTER 3-85: RPOR17: PERIPHERAL PIN SELECT OUTPUT REGISTER 17

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP67R5	RP67R4	RP67R3	RP67R2	RP67R1	RP67R0
bit 15							bit 8

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	RP66R5	RP66R4	RP66R3	RP66R2	RP66R1	RP66R0
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 **Unimplemented:** Read as '0'

bit 13-8 **RP67R<5:0>:** Peripheral Output Function is Assigned to RP67 Output Pin bits (see Table 3-33 for peripheral function numbers)

bit 7-6 **Unimplemented:** Read as '0'

bit 5-0 **RP66R<5:0>:** Peripheral Output Function is Assigned to RP66 Output Pin bits (see Table 3-33 for peripheral function numbers)

REGISTER 3-143: C1TXQUAH: CAN TRANSMIT QUEUE USER ADDRESS REGISTER HIGH(1)

R-x	R-x	R-x	R-x	R-x	R-x	R-x	R-x
TXQUA<31:24>							
bit 15							bit 8

R-x	R-x	R-x	R-x	R-x	R-x	R-x	R-x
TXQUA<23:16>							
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 **TXQUA<31:16>:** TXQ User Address bits
A read of this register will return the address where the next message is to be written (TXQ head).

Note 1: This register is not ensured to read correctly in Configuration mode and should only be accessed when the module is not in Configuration mode.

REGISTER 3-144: C1TXQUAL: CAN TRANSMIT QUEUE USER ADDRESS REGISTER LOW(1)

R-x	R-x	R-x	R-x	R-x	R-x	R-x	R-x
TXQUA<15:8>							
bit 15							bit 8

R-x	R-x	R-x	R-x	R-x	R-x	R-x	R-x
TXQUA<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 **TXQUA<15:0>:** TXQ User Address bits
A read of this register will return the address where the next message is to be written (TXQ head).

Note 1: This register is not ensured to read correctly in Configuration mode and should only be accessed when the module is not in Configuration mode.

REGISTER 3-174: ADIEL: ADC INTERRUPT ENABLE REGISTER LOW

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
IE<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
IE<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 **IE<15:0>:** Common Interrupt Enable bits
1 = Common and individual interrupts are enabled for the corresponding channel
0 = Common and individual interrupts are disabled for the corresponding channel

REGISTER 3-175: ADIEH: ADC INTERRUPT ENABLE REGISTER HIGH

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

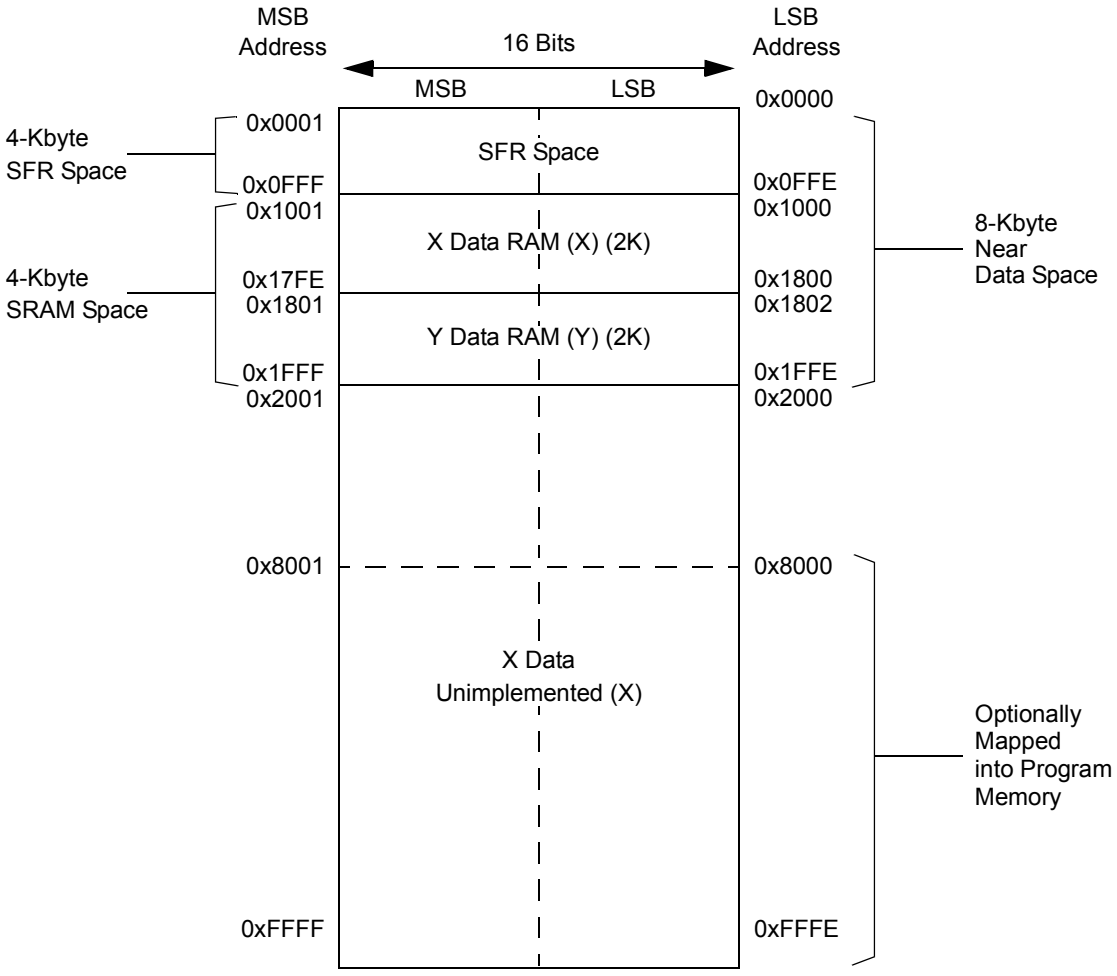
U-0	U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	—	IE<20:16>				
bit 7							bit 0

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 **Unimplemented:** Read as '0'

bit 4-0 **IE<20:16>:** Common Interrupt Enable bits
1 = Common and individual interrupts are enabled for the corresponding channel
0 = Common and individual interrupts are disabled for the corresponding channel

FIGURE 4-5: DATA MEMORY MAP FOR SLAVE dsPIC33CH128MP508S1 DEVICES



Note: Memory areas are not shown to scale.

REGISTER 4-19: INTCON2: SLAVE INTERRUPT CONTROL REGISTER 2

R/W-1	R/W-0	R/W-0	U-0	U-0	U-0	U-0	U-0
GIE	DISI	SWTRAP	—	—	—	—	—
bit 15							bit 8

U-0	U-0	U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	—	—	INT3EP	INT2EP	INT1EP	INT0EP
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 **GIE:** Global Interrupt Enable bit
1 = Interrupts and associated IE bits are enabled
0 = Interrupts are disabled, but traps are still enabled

bit 14 **DISI:** DISI Instruction Status bit
1 = DISI instruction is active
0 = DISI instruction is not active

bit 13 **SWTRAP:** Software Trap Status bit
1 = Software trap is enabled
0 = Software trap is disabled

bit 12-4 **Unimplemented:** Read as '0'

bit 3 **INT3EP:** External Interrupt 3 Edge Detect Polarity Select bit
1 = Interrupt on negative edge
0 = Interrupt on positive edge

bit 2 **INT2EP:** External Interrupt 2 Edge Detect Polarity Select bit
1 = Interrupt on negative edge
0 = Interrupt on positive edge

bit 1 **INT1EP:** External Interrupt 1 Edge Detect Polarity Select bit
1 = Interrupt on negative edge
0 = Interrupt on positive edge

bit 0 **INT0EP:** External Interrupt 0 Edge Detect Polarity Select bit
1 = Interrupt on negative edge
0 = Interrupt on positive edge

REGISTER 4-28: CNPUx: CHANGE NOTIFICATION PULL-UP ENABLE FOR PORTx REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
CNPUx<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
CNPUx<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 **CNPUx<15:0>:** Change Notification Pull-up Enable for PORTx bits
1 = The pull-up for PORTx[n] is enabled – takes precedence over pull-down selection
0 = The pull-up for PORTx[n] is disabled

REGISTER 4-29: CNPDx: CHANGE NOTIFICATION PULL-DOWN ENABLE FOR PORTx REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
CNPDx<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
CNPDx<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 **CNPDx<15:0>:** Change Notification Pull-Down Enable for PORTx bits
1 = The pull-down for PORTx[n] is enabled (if the pull-up for PORTx[n] is not enabled)
0 = The pull-down for PORTx[n] is disabled

4.6.4 INPUT CHANGE NOTIFICATION (ICN)

The Input Change Notification function of the I/O ports allows the dsPIC33CH128MP508S1 family devices to generate interrupt requests to the processor in response to a Change-of-State (COS) on selected input pins. This feature can detect input Change-of-States, even in Sleep mode, when the clocks are disabled. Every I/O port pin can be selected (enabled) for generating an interrupt request on a Change-of-State. Five control registers are associated with the Change Notification (CN) functionality of each I/O port. To enable the Change Notification feature for the port, the ON bit (CNCONx<15>) must be set.

The CNEN0x and CNEN1x registers contain the CN interrupt enable control bits for each of the input pins. The setting of these bits enables a CN interrupt for the corresponding pins. Also, these bits, in combination with the CNSTYLE bit (CNCONx<11>), define a type of transition when the interrupt is generated. Possible CN event options are listed in Table 4-26.

The CNSTATx register indicates whether a change occurred on the corresponding pin since the last read of the PORTx bit. In addition to the CNSTATx register, the CNFx register is implemented for each port. This register contains flags for Change Notification events. These flags are set if the valid transition edge, selected in the CNEN0x and CNEN1x registers, is detected. CNFx stores the occurrence of the event. CNFx bits must be cleared in software to get the next Change Notification interrupt. The CN interrupt is generated only for the I/Os configured as inputs (corresponding TRISx bits must be set).

TABLE 4-26: CHANGE NOTIFICATION EVENT OPTIONS

CNSTYLE Bit (CNCONx<11>)	CNEN1x Bit	CNEN0x Bit	Change Notification Event Description
0	Does not matter	0	Disabled
0	Does not matter	1	Detects a mismatch between the last read state and the current state of the pin
1	0	0	Disabled
1	0	1	Detects a positive transition only (from '0' to '1')
1	1	0	Detects a negative transition only (from '1' to '0')
1	1	1	Detects both positive and negative transitions

Note: Pull-ups and pull-downs on Input Change Notification pins should always be disabled when the port pin is configured as a digital output.

EXAMPLE 4-3: PORT WRITE/READ EXAMPLE

```
MOV   0xFF00, W0   ; Configure PORTB<15:8>
                   ; as inputs
MOV   W0, TRISB    ; and PORTB<7:0>
                   ; as outputs
NOP                ; Delay 1 cycle
BTSS  PORTB, #13   ; Next Instruction
```

4.6.5 PERIPHERAL PIN SELECT (PPS)

A major challenge in general purpose devices is providing the largest possible set of peripheral features, while minimizing the conflict of features on I/O pins. The challenge is even greater on low pin count devices. In an application where more than one peripheral needs to be assigned to a single pin, inconvenient work arounds in application code, or a complete redesign, may be the only option.

Peripheral Pin Select configuration provides an alternative to these choices by enabling peripheral set selection and placement on a wide range of I/O pins. By increasing the pinout options available on a particular device, users can better tailor the device to their entire application, rather than trimming the application to fit the device.

The Peripheral Pin Select configuration feature operates over a fixed subset of digital I/O pins. Users may independently map the input and/or output of most digital peripherals to any one of these I/O pins. Hardware safeguards are included that prevent accidental or spurious changes to the peripheral mapping once it has been established.

4.6.5.1 Available Pins

The number of available pins is dependent on the particular device and its pin count. Pins that support the Peripheral Pin Select feature include the label, “S1RPn”, in their full pin designation, where “n” is the remappable pin number. “S1RP” is used to designate pins that support both remappable input and output functions.

4.6.5.2 Available Peripherals

The peripherals managed by the Peripheral Pin Select are all digital only peripherals. These include general serial communications (UART and SPI), general purpose timer clock inputs, timer-related peripherals (input capture and output compare) and interrupt-on-change inputs.

In comparison, some digital only peripheral modules are never included in the Peripheral Pin Select feature. This is because the peripheral’s function requires special I/O circuitry on a specific port and cannot be easily connected to multiple pins. One example includes I^2C modules. A similar requirement excludes all modules with analog inputs, such as the ADC Converter.

A key difference between remappable and non-remappable peripherals is that remappable peripherals are not associated with a default I/O pin. The peripheral must always be assigned to a specific I/O pin before it can be used. In contrast, non-remappable peripherals are always available on a default pin, assuming that the peripheral is active and not conflicting with another peripheral.

When a remappable peripheral is active on a given I/O pin, it takes priority over all other digital I/Os and digital communication peripherals associated with the pin. Priority is given regardless of the type of peripheral that is mapped. Remappable peripherals never take priority over any analog functions associated with the pin.

4.6.5.3 Controlling Peripheral Pin Select

Peripheral Pin Select features are controlled through two sets of SFRs: one to map peripheral inputs and one to map outputs. Because they are separately controlled, a particular peripheral’s input and output (if the peripheral has both) can be placed on any selectable function pin without constraint.

The association of a peripheral to a peripheral-selectable pin is handled in two different ways, depending on whether an input or output is being mapped.

TABLE 4-30: SLAVE REMAPPABLE OUTPUT PIN REGISTERS

Register	S1RP Pin	I/O Port
RPOR0<5:0>	S1RP32	Port Pin S1RB0
RPOR0<13:8>	S1RP33	Port Pin S1RB1
RPOR1<5:0>	S1RP34	Port Pin S1RB2
RPOR1<13:8>	S1RP35	Port Pin S1RB3
RPOR2<5:0>	S1RP36	Port Pin S1RB4
RPOR2<13:8>	S1RP37	Port Pin S1RB5
RPOR3<5:0>	S1RP38	Port Pin S1RB6
RPOR3<13:8>	S1RP39	Port Pin S1RB7
RPOR4<5:0>	S1RP40	Port Pin S1RB8
RPOR4<13:8>	S1RP41	Port Pin S1RB9
RPOR5<5:0>	S1RP42	Port Pin S1RB10
RPOR5<13:8>	S1RP43	Port Pin S1RB11
RPOR6<5:0>	S1RP44	Port Pin S1RB12
RPOR6<13:8>	S1RP45	Port Pin S1RB13
RPOR7<5:0>	S1RP46	Port Pin S1RB14
RPOR7<13:8>	S1RP47	Port Pin S1RB15
RPOR8<5:0>	S1RP48	Port Pin S1RC0
RPOR8<13:8>	S1RP49	Port Pin S1RC1
RPOR9<5:0>	S1RP50	Port Pin S1RC2
RPOR9<13:8>	S1RP51	Port Pin S1RC3
RPOR10<5:0>	S1RP52	Port Pin S1RC4
RPOR10<13:8>	S1RP53	Port Pin S1RC5
RPOR11<5:0>	S1RP54	Port Pin S1RC6
RPOR11<13:8>	S1RP55	Port Pin S1RC7
RPOR12<5:0>	S1RP56	Port Pin S1RC8
RPOR12<13:8>	S1RP57	Port Pin S1RC9
RPOR13<5:0>	S1RP58	Port Pin S1RC10
RPOR13<13:8>	S1RP59	Port Pin S1RC11
RPOR14<5:0>	S1RP60	Port Pin S1RC12
RPOR14<13:8>	S1RP61	Port Pin S1RC13
RPOR15<5:0>	S1RP62	Port Pin S1RC14
RPOR15<13:8>	S1RP63	Port Pin S1RC15
RPOR16<5:0>	S1RP64	Port Pin S1RD0
RPOR16<13:8>	S1RP65	Port Pin S1RD1
RPOR17<5:0>	S1RP66	Port Pin S1RD2
RPOR17<13:8>	S1RP67	Port Pin S1RD3
RPOR18<5:0>	S1RP68	Port Pin S1RD4
RPOR18<13:8>	S1RP69	Port Pin S1RD5
RPOR19<5:0>	S1RP70	Port Pin S1RD6
RPOR19<13:8>	S1RP71	Port Pin S1RD7
	S1RP181-S1RP176	Reserved
RPOR20<5:0>	S1RP170	Virtual Pin S1RPV0
RPOR20<13:8>	S1RP171	Virtual Pin S1RPV1
RPOR21<5:0>	S1RP172	Virtual Pin S1RPV2
RPOR21<13:8>	S1RP173	Virtual Pin S1RPV3
RPOR22<5:0>	S1RP174	Virtual Pin S1RPV4
RPOR22<13:8>	S1RP175	Virtual Pin S1RPV5

REGISTER 6-8: APLLDIV1: APLL OUTPUT DIVIDER REGISTER (MASTER)

U-0	U-0	U-0	U-0	U-0	U-0	R/W-0	R/W-0
—	—	—	—	—	—	AVCODIV<1:0>	
bit 15							bit 8

U-0	R/W-1	R/W-0	R/W-0	U-0	R/W-0	R/W-0	R/W-1
—	APOST1DIV<2:0>(1,2)			—	APOST2DIV<2:0>(1,2)		
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 15-10 **Unimplemented:** Read as '0'

bit 9-8 **AVCODIV<1:0>:** APLL VCO Output Divider Select bits
11 = AFVCO
10 = AFVCO/2
01 = AFVCO/3
00 = AFVCO/4

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

bit 6-4 **APOST1DIV<2:0>:** APLL Output Divider #1 Ratio bits(1,2)
APOST1DIV<2:0> can have a valid value, from 1 to 7 (the APOST1DIVx value should be greater than or equal to the APOST2DIVx value). The APOST1DIVx divider is designed to operate at higher clock rates than the APOST2DIVx divider.

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

bit 2-0 **APOST2DIV<2:0>:** APLL Output Divider #2 Ratio bits(1,2)
APOST2DIV<2:0> can have a valid value, from 1 to 7 (the APOST2DIVx value should be less than or equal to the APOST1DIVx value). The APOST1DIVx divider is designed to operate at higher clock rates than the APOST2DIVx divider.

Note 1: The APOST1DIVx and APOST2DIVx values must not be changed while the PLL is operating.
2: The default values for APOST1DIVx and APOST2DIVx are 4 and 1, respectively, yielding a 150 MHz system source clock.

8.5 DMA Control Registers

REGISTER 8-1: DMACON: DMA ENGINE CONTROL REGISTER

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

U-0	U-0	U-0	U-0	U-0	U-0	U-0	R/W-0
—	—	—	—	—	—	—	PRSSEL
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 **DMAEN:** DMA Module Enable bit
1 = Enables module
0 = Disables module and terminates all active DMA operation(s)

bit 14-1 **Unimplemented:** Read as '0'

bit 0 **PRSSEL:** Channel Priority Scheme Selection bit
1 = Round robin scheme
0 = Fixed priority scheme

REGISTER 10-1: CCPxCON1L: CCPx CONTROL 1 LOW REGISTERS (CONTINUED)

bit 3-0 **MOD<3:0>:** CCPx Mode Select bits

For CCSEL = 1 (Input Capture modes):

1xxx = Reserved
011x = Reserved
0101 = Capture every 16th rising edge
0100 = Capture every 4th rising edge
0011 = Capture every rising and falling edge
0010 = Capture every falling edge
0001 = Capture every rising edge
0000 = Capture every rising and falling edge (Edge Detect mode)

For CCSEL = 0 (Output Compare/Timer modes):

1111 = External Input mode: Pulse generator is disabled, source is selected by ICS<2:0>
1110 = Reserved
110x = Reserved
10xx = Reserved
0111 = Reserved
0110 = Reserved
0101 = Dual Edge Compare mode, buffered
0100 = Dual Edge Compare mode
0011 = 16-Bit/32-Bit Single Edge mode, toggles output on compare match
0010 = 16-Bit/32-Bit Single Edge mode, drives output low on compare match
0001 = 16-Bit/32-Bit Single Edge mode, drives output high on compare match
0000 = 16-Bit/32-Bit Timer mode, output functions are disabled

Note 1: Clock selection is the same for the Master and the Slave.

REGISTER 14-6: SPIxIMSKL: SPIx INTERRUPT MASK REGISTER LOW

U-0	U-0	U-0	R/W-0	R/W-0	U-0	U-0	R/W-0
—	—	—	FRMERREN	BUSYEN	—	—	SPITUREN
bit 15							bit 8

R/W-0	R/W-0	R/W-0	U-0	R/W-0	U-0	R/W-0	R/W-0
SRMTEN	SPIROVEN	SPIRBEN	—	SPITBEN	—	SPITBFEN	SPIRBFEN
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 **FRMERREN:** Enable Interrupt Events via FRMERR bit
1 = Frame error generates an interrupt event
0 = Frame error does not generate an interrupt event

bit 11 **BUSYEN:** Enable Interrupt Events via SPIBUSY bit
1 = SPIBUSY generates an interrupt event
0 = SPIBUSY does not generate an interrupt event

bit 10-9 **Unimplemented:** Read as '0'

bit 8 **SPITUREN:** Enable Interrupt Events via SPITUR bit
1 = Transmit Underrun (TUR) generates an interrupt event
0 = Transmit Underrun does not generate an interrupt event

bit 7 **SRMTEN:** Enable Interrupt Events via SRMT bit
1 = Shift Register Empty (SRMT) generates interrupt events
0 = Shift Register Empty does not generate interrupt events

bit 6 **SPIROVEN:** Enable Interrupt Events via SPIROV bit
1 = SPIx Receive Overflow (ROV) generates an interrupt event
0 = SPIx Receive Overflow does not generate an interrupt event

bit 5 **SPIRBEN:** Enable Interrupt Events via SPIRBE bit
1 = SPIx RX buffer empty generates an interrupt event
0 = SPIx RX buffer empty does not generate an interrupt event

bit 4 **Unimplemented:** Read as '0'

bit 3 **SPITBEN:** Enable Interrupt Events via SPITBE bit
1 = SPIx transmit buffer empty generates an interrupt event
0 = SPIx transmit buffer empty does not generate an interrupt event

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

bit 1 **SPITBFEN:** Enable Interrupt Events via SPITBF bit
1 = SPIx transmit buffer full generates an interrupt event
0 = SPIx transmit buffer full does not generate an interrupt event

bit 0 **SPIRBFEN:** Enable Interrupt Events via SPIRBF bit
1 = SPIx receive buffer full generates an interrupt event
0 = SPIx receive buffer full does not generate an interrupt event

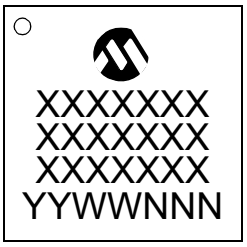
25.1 Package Marking Information (Continued)

48-Lead TQFP (7x7 mm)

Example

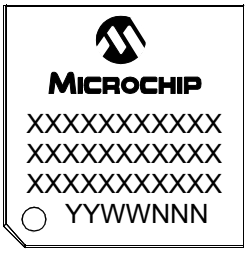
CH64MP
2041810
017

48-Lead UQFN (6x6 mm)

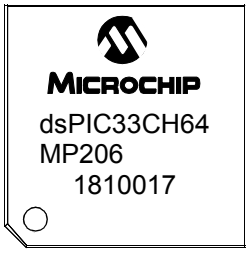


Example

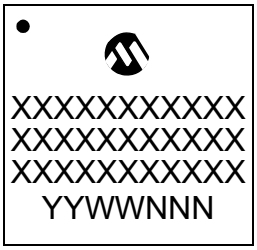
64-Lead TQFP (10x10x1 mm)



Example

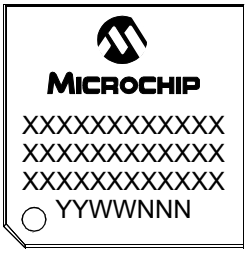


64-Lead QFN (9x9x0.9 mm)



Example

80-Lead TQFP (12x12x1 mm)



Example