

**MICROCHIP****PIC18F2525/2620/4525/4620****PIC18F2525/2620/4525/4620 Rev. A4 Silicon Errata**

The PIC18F2525/2620/4525/4620 Rev. A4 parts you have received conform functionally to the Device Data Sheet (DS39626), except for the anomalies described below. Any Data Sheet Clarification issues related to the PIC18F2525/2620/4525/4620 will be reported in a separate Data Sheet errata. Please check the Microchip web site for any existing issues.

**The following silicon errata apply only to PIC18F2525/2620/4525/4620 devices with these Device/Revision IDs:**

| Part Number | Device ID   | Revision ID |
|-------------|-------------|-------------|
| PIC18F2525  | 00 1100 110 | 00100       |
| PIC18F2620  | 00 1100 100 | 00100       |
| PIC18F4525  | 00 1100 010 | 00100       |
| PIC18F4620  | 00 1100 000 | 00100       |

The Device IDs (DEVID1 and DEVID2) are located at addresses 3FFFFEh:3FFFFFh in the device's configuration space. They are shown in hexadecimal in the format "DEVID2 DEVID1".

**1. Module: MSSP**

In its current implementation, the I<sup>2</sup>C™ Master mode operates as follows:

- a) The Baud Rate Generator for I<sup>2</sup>C in Master mode is slower than the rates specified in Table 17-3 of the Device Data Sheet.

For this revision of silicon, use the values shown in Table 1 in place of those shown in Table 17-3 of the Device Data Sheet. The differences are shown in **bold** text.

- b) Use the following formula in place of the one shown in Register 17-4 (SSPCON1) of the Device Data Sheet for bit description SSPM3:SSPM0 = 1000.

$$SSPADD = \text{INT}((F_{CY}/F_{SCL}) - (F_{CY}/1.111 \text{ MHz})) - 1$$

**Date Codes that pertain to this issue:**

All engineering and production devices.

**TABLE 1: I<sup>2</sup>C™ CLOCK RATE w/BRG**

| Fosc          | Fcy    | Fcy * 2 | BRG Value  | Fscl<br>(2 Rollovers of BRG) |
|---------------|--------|---------|------------|------------------------------|
| <b>40 MHz</b> | 10 MHz | 20 MHz  | <b>0Eh</b> | 400 kHz <sup>(1)</sup>       |
| <b>40 MHz</b> | 10 MHz | 20 MHz  | <b>15h</b> | 312.5 kHz                    |
| <b>40 MHz</b> | 10 MHz | 20 MHz  | <b>59h</b> | 100 kHz                      |
| <b>16 MHz</b> | 4 MHz  | 8 MHz   | <b>05h</b> | 400 kHz <sup>(1)</sup>       |
| <b>16 MHz</b> | 4 MHz  | 8 MHz   | <b>08h</b> | 308 kHz                      |
| <b>16 MHz</b> | 4 MHz  | 8 MHz   | <b>23h</b> | 100 kHz                      |
| <b>4 MHz</b>  | 1 MHz  | 2 MHz   | <b>01h</b> | 333 kHz <sup>(1)</sup>       |
| <b>4 MHz</b>  | 1 MHz  | 2 MHz   | <b>08h</b> | 100 kHz                      |
| <b>4 MHz</b>  | 1 MHz  | 2 MHz   | 00h        | 1 MHz <sup>(1)</sup>         |

**Note 1:** The I<sup>2</sup>C™ interface does not conform to the 400 kHz I<sup>2</sup>C specification (which applies to rates greater than 100 kHz) in all details, but may be used with care where higher rates are required by the application.

## 2. Module: MSSP

After an I<sup>2</sup>C transfer is initiated, the SSPBUF register may be written for up to 10 T<sub>CY</sub> before additional writes are blocked. The data transfer may be corrupted if SSPBUF is written during this time.

The WCOL bit is set any time an SSPBUF write occurs during a transfer.

### **Work around**

Avoid writing SSPBUF until the data transfer is complete, indicated by the setting of the SSPIF bit (PIR1<3>).

Verify the WCOL bit (SSPCON1<7>) is clear after writing SSPBUF to ensure any potential transfer in progress is not corrupted.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 3. Module: MSSP

In 10-Bit Addressing mode, when a Repeated Start is issued followed by the high address byte and a write command (R/W = 0), an ACK is not issued.

### **Work around**

There are two work arounds available:

#### 1. Single Master Environment:

In a single master environment, the user must issue a Stop, then a Start followed by a write to the address high, then the address low followed by the data.

#### 2. Multi-Master Environment:

In a multi-master environment, the user must issue a Repeated Start, send a dummy write command to a different address, issue another Repeated Start and then send a write to the original address. This procedure will help maintain control of the bus.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 4. Module: MSSP

I<sup>2</sup>C Receive mode should be enabled (i.e., RCEN bit should be set) only when the system is idle (i.e., when ACKEN, RCEN, PEN, RSEN and SEN all equal zero). It should not be possible to set the RCEN bit when the system is not idle, however, the RCEN bit can be set under this circumstance.

### **Work around**

Wait for the system to become idle before setting the RCEN bit. This requires a check for the following bits to be clear:

ACKEN, RCEN, PEN, RSEN and SEN.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 5. Module: ECCP

When the CCP1 auto-shutdown feature is configured for automatic restart by setting the PRSEN bit (PWM1CON<7>), the pulse terminates immediately in a shutdown event. In addition, the pulse may restart within the period if the shutdown condition expires. This may result in the generation of short pulses on the PWM output(s).

### **Work around**

Configure the auto-shutdown for software restart by clearing the PRSEN bit (PWM1CON<7>). The PWM can be re-enabled by clearing the ECCPASE bit (ECCP1AS<7>) after the shutdown condition expires.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 6. Module: ECCP

When monitoring a shutdown condition using a bit test on the ECCPASE bit (ECCP1AS<7>), or performing a bit operation on the ECCPASE bit, the device may produce unexpected results.

### Work around

Before performing a bit test or bit operation on the ECCPASE bit, copy the ECCP1AS register to the working register and perform the operation there.

By avoiding these operations on the ECCPASE bit in the ECCP1AS register, the module will operate normally.

In Example 1, ECCPASE bit operations are performed on the W register.

### Date Codes that pertain to this issue:

All engineering and production devices.

### EXAMPLE 1:

|       |                  |
|-------|------------------|
| MOVF  | ECCP1AS, W       |
| BTFSC | WREG, ECCPASE    |
| BRA   | SHUTDOWN_ROUTINE |

## 7. Module: ECCP

The auto-shutdown source, FLT0, has inverse polarity from the description in **Section 16.4.7 “Enhanced PWM Auto-Shutdown”** of the Device Data Sheet. A logic high-voltage level on FLT0 will generate a shutdown on CCP1.

### Work around

None.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 8. Module: ECCP and CCP

The CCP1 and CCP2 configured for PWM mode, with 1:1 Timer2 prescaler and duty cycle set to the period minus 1, may result in the PWM output(s) remaining at a logic low level.

Clearing the PR2 register to select the fastest period may also result in the output(s) remaining at a logic low output level.

### Work around

To ensure a reliable waveform, verify that the selected duty cycle does not equal the 10-bit period minus 1 prior to writing these locations, or use 1:4 or 1:16 Timer2 prescale. Also, verify the PR2 register is not written to 00h.

All other duty cycle and period settings will function as described in the Device Data Sheet.

The ECCP and CCP modules remain capable of 10-bit accuracy.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 9. Module: ECCP

CCP1 configured for auto-shutdown with Comparator 1 corrupts the PWM duty cycle pulse. In addition, it does not always synchronize the pulse to the beginning of the period and the end of the pulse can occur at any time within the period.

### Work around

Use FLT0 for the auto-shutdown source. Applications which can tolerate a shutdown response time of several Tcys may use the comparator interrupt flag to detect a shutdown event and disable the PWM by clearing the ECCPASE bit (ECCP1AS<7>).

### Date Codes that pertain to this issue:

All engineering and production devices.

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## 10. Module: ECCP

When the shutdown state of the PWM pin(s) is configured to tri-state the outputs, the device may consume higher than expected current during the shutdown event.

### Work around

Configure the PWM output for either a high or low logic state during the shutdown via the PSSAC1:PSSAC0 (ECCP1AS<3:2>) and PSSBD1: PSSBD0 (ECCP1AS<1:0>) bits. Clearing the auto-shutdown event will return the device to normal current consumption levels.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 11. Module: ECCP

The PWM pin(s) may change state if a breakpoint is encountered during emulation and an auto-shutdown event occurs via FLT0. This affects the MPLAB® ICD 2 debugger and the ICE 2000 and ICE 4000 emulators.

### Work around

During emulation, use the comparator for auto-shutdown or use the external interrupt (INT0) flag to detect a shutdown event and disable the PWM by clearing the EECPPASE bit (ECCP1AS<7>).

### Date Codes that pertain to this issue:

All engineering and production devices.

## 12. Module: ECCP

When operating either Timer1 or Timer3 as a counter, with a prescale value other than 1:1 and operating the ECCP in Compare mode with the Special Event Trigger (CCP1CON bits, CCP1M3:CCP1M0 = 1011), the Special Event Trigger Reset of the timer occurs as soon as there is a match between TMRxH:TMRxL and CCPR1H:CCPR1L.

This differs from the PIC18F452, where the Special Event Trigger Reset of the timer occurs on the next prescaler output pulse after the match between TMRxH:TMRxL and CCPR1H:CCPR1L.

### Work around

To achieve the same timer Reset period on the PIC18F4620 family as the PIC18F452 family for a given clock source, add 1 to the value in CCPR1H:CCPR1L. In other words, if  $CCPR1H:CCPR1L = x$  for the PIC18F452, to achieve the same Reset period on the PIC18F4620 family, use  $CCPR1H:CCPR1L = x + 1$ , where the prescale is 1, 2, 4 or 8 depending on the T1CKPS1:T1CKPS0 bit values.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 13. Module: ECCP

When a shutdown condition occurs, the output port(s) is made inactive for the duration of the event. After the event that caused the shutdown ends, the ECCP module enables the PWM output right away instead of waiting until the beginning of the next PWM cycle.

### Work around

Disable the auto-restart feature in software, polling the Timer2 Interrupt Flag, TMR2IF, and wait until it is set before clearing the EECPPASE bit.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 14. Module: ECCP

When switching direction in Full-Bridge PWM mode, the modulated outputs will switch immediately instead of waiting for the next PWM cycle. This may generate unexpected short pulses on the modulated outputs.

### **Work around**

Disable the PWM or set duty cycle to zero prior to switching directions.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 15. Module: EUSART

When performing back-to-back transmission in 9-bit mode (TX9D bit in the TXSTA register is set), an ongoing transmission's timing can be corrupted if the TX9D bit (for the next transmission) is not written immediately following the setting of TXIF. This is because any write to the TXSTA register results in a reset of the baud rate timer which will effect any ongoing transmission.

### **Work around**

Load TX9D just after TXIF is set, either by polling TXIF or by writing TX9D at the beginning of the Interrupt Service Routine, or only write to TX9D when a transmission is not in progress (TRMT = 1).

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 16. Module: EUSART

When performing back-to-back transmission in 9-bit mode (TX9D bit in the TXSTA register is set), the second byte may be corrupted if it is written into TXREG immediately after the TMRT bit is set.

### **Work around**

Execute a software delay, at least one half the transmission's bit time, after TMRT is set and prior to writing subsequent bytes into TXREG.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 17. Module: Timer1/Timer3

When Timer1 or Timer3 is configured for the external clock source and the CCPxCON register is configured with 0x0B (Compare mode, trigger special event), the timer is not reset on a Special Event Trigger.

### **Work around**

Modify firmware to reset the Timer registers upon detection of the compare match condition – TMRxL and TMRxH.

Date Codes that pertain to this issue:

All engineering and production devices.

## 18. Module: Timer1/Timer3

When Timer1 or Timer3 is in External Clock Synchronized mode and the external clock period is between 1 and 2 Tcy, interrupts will occasionally be skipped.

### **Work around**

Avoid using an external clock with a period (1/frequency) between 1 and 2 Tcy.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 19. Module: Timer1/Timer3

When Timer1/Timer3 is operating in 16-bit mode and the prescale setting is not 1:1, a write to the TMR1H/TMR3H Buffer registers may lengthen the duration of the period between the increments of the timer for the period in which TMR1H/TMR3H were written.

### **Work around**

Two work arounds are available: 1) Stop Timer1/Timer3 before writing the TMR1H/TMR3H registers; 2) Write TMR1L/TMR3L immediately after writing TMR1H/TMR3H.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

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## 20. Module: Interrupts

If an interrupt occurs during a two-cycle instruction that modifies the STATUS, BSR or WREG register, the unmodified value of the register will be saved to the corresponding Fast Return (Shadow) register and upon a fast return from the interrupt, the unmodified value will be restored to the STATUS, BSR or WREG register.

For example, if a high priority interrupt occurs during the instruction, `MOVFF TEMP, WREG`, the `MOVFF` instruction will be completed and WREG will be loaded with the value of TEMP before branching to ISR. However, the previous value of WREG will be saved to the Fast Return register during ISR branching. Upon return from the interrupt with a fast return, the previous value of WREG in the Fast Return register will be written to WREG. This results in WREG containing the value it had before execution of `MOVFF TEMP, WREG`.

Affected instructions are:

`MOVFF Fs, Fd`  
where Fd is WREG, BSR or STATUS;

`MOVSF Zs, Fd`  
where Fd is WREG, BSR or STATUS; and

`MOVSS [Zs], [Zd]`  
where the destination is WREG, BSR or STATUS.

### Work around

1. Assembly Language Programming:
  - a) If any two-cycle instruction is used to modify the WREG, BSR or STATUS register, do not use the `RETFIE FAST` instruction to return from the interrupt. Instead, save/restore WREG, BSR and STATUS via software per Example 8-1 in the Device Data Sheet. Alternatively, in the case of `MOVFF`, use the `MOVF` instruction to write to WREG instead. For example, use:  
  

```
MOVF    TEMP, W
MOVWF   BSR
```

  
instead of `MOVFF TEMP, BSR`.
  - b) As another alternative, the following work around shown in Example 2 can be used. This example overwrites the Fast Return register by making a dummy call to `Foo` with the fast option in the high priority service routine.

### Date Codes that pertain to this issue:

All engineering and production devices.

### EXAMPLE 2:

```
ISR @ 0x0008
CALL    Foo, FAST      ; store current value of WREG, BSR, STATUS for a second time
Foo:
POP      ; clears return address of Foo call
:        ; insert high priority ISR code here
:
RETFIE   FAST
```

2. C Language Programming: The exact work around depends on the compiler in use. Please refer to your C compiler documentation for details.

If using the Microchip MPLAB® C18 C Compiler, define both high and low priority interrupt handler functions as “low priority” by using the `pragma interruptlow` directive. This

directive instructs the compiler to not use the `RETFIE FAST` instruction. If the proper high priority interrupt bit is set in the `IPRx` register, then the interrupt is treated as high priority in spite of the `pragma interruptlow` directive.

The code segment shown in Example 3 demonstrates the work around using the C18 compiler:

## EXAMPLE 3:

```
#pragma interruptlow MyLowISR
void MyLowISR(void)
{
    // Handle low priority interrupts.
}

// Although MyHighISR is a high priority interrupt, use interruptlow pragma so that
// the compiler will not use retfie FAST.

#pragma interruptlow MyHighISR
void MyHighISR(void)
{
    // Handle high priority interrupts.
}

#pragma code highVector=0x08
void HighVector (void)
{
    _asm goto MyHighISR _endasm
}
#pragma code /* return to default code section */

#pragma code lowVector=0x18
void LowVector (void)
{
    _asm goto MyLowISR _endasm
}
#pragma code /* return to default code section */
```

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An optimized C18 version is also provided in Example 4. This example illustrates how it reduces the instruction cycle count from 10 cycles to 3:

## EXAMPLE 4:

```
#pragma code high_vector_section=0x8
void high_vector (void)
{
    _asm
        CALL high_vector_branch, 1
    _endasm
}

void high_vector_branch (void)
{
    _asm
        POP
        GOTO high_isr
    _endasm
}

#pragma interrupt high_isr
void high_isr (void)
{
    ...
}
```



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## 21. Module: A/D

The A/D offset is greater than the specified limit in Table 26-24 of the Device Data Sheet. The updated conditions and limits are shown in **bold** text in Table 2.

### Work around

Three work arounds exist.

1. Configure the A/D to use the VREF+ and VREF- pins for the voltage references. This is done by setting the VCFG<1:0> bits (ADCON1<5:4>).
2. Perform a conversion on a known voltage reference voltage and adjust the A/D result in software.
3. Increase system clock speed to 40 MHz and adjust A/D settings accordingly. Higher system clock frequencies decrease offset error.

### Date Codes that pertain to this issue:

All engineering and production devices.

**TABLE 2: A/D CONVERTER CHARACTERISTICS: PIC18F2525/2620/4525/4620 (INDUSTRIAL)  
PIC18LF2525/2620/4525/4620 (INDUSTRIAL)**

| Param No. | Symbol | Characteristic | Min | Typ | Max   | Units | Conditions             |
|-----------|--------|----------------|-----|-----|-------|-------|------------------------|
| A06A      | EOFF   | Offset Error   | —   | —   | <±2.0 | LSb   | VREF = VREF+ and VREF- |
| A06       | EOFF   | Offset Error   | —   | —   | <±3.5 | LSb   | VREF = Vss and VDD     |

## 22. Module: BOR

The BOR module may reset below the minimum operating voltage of the device when configured for BORV1:BORV0 = 11. The updated Reset voltage specifications are shown in **bold** in Table 3.

**TABLE 3: BROWN-OUT RESET VOLTAGE**

| Param No. | Sym  | Characteristic                 | Min | Typ  | Max | Unit |
|-----------|------|--------------------------------|-----|------|-----|------|
| D005      | VBOR | <b>Brown-out Reset Voltage</b> |     |      |     |      |
|           |      | PIC18LF2525/2620/4525/4620     |     |      |     |      |
|           |      | BORV1:BORV0 = 11               | N/A | 2.05 | N/A | V    |

### Work around

Use the next higher BOR voltage setting to ensure a low VDD is detected above 2.0V.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 23. Module: EUSART

The EUSART auto-baud feature may periodically measure the incoming baud rate incorrectly. The rate of incorrect baud rate measurements will depend on the frequency of the incoming synchronization byte and the system clock frequency.

### Work around

None.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 24. Module: EUSART

In Synchronous mode (SYNC = 1) with clock polarity high (SCKP = 1), the EUSART transmits a shorter than expected clock on the CK pin for bit 0.

### Work around

None.

### Date Codes that pertain to this issue:

All engineering and production devices.

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## 25. Module: EUSART

In Synchronous mode, EUSART baud rates using SPBRG values of '0' and '1' may not function correctly.

### Work around

Use another baud rate configuration to generate the desired baud rate.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 26. Module: EUSART

During an auto-baud operation, the TX pin is tri-stated. Transceivers which do not provide a pull-up on the TX signal may cause the bus to become inadvertently active and prevent additional bus activity.

### Work around

None.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 27. Module: MSSP

In an I<sup>2</sup>C system with multiple slave nodes, an unaddressed slave may respond to bus activity when data on the bus matches its address. The first occurrence will set the BF bit. The second occurrence will set the BF and the SSPOV bits. In both situations, the SSPIF bit is not set and an interrupt will not occur. The device will vector to the Interrupt Service Routine only if the interrupt is enabled and an address match occurs.

### Work around

The I<sup>2</sup>C slave must clear the SSPOV bit after each I<sup>2</sup>C event to maintain normal operation.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 28. Module: MSSP

In I<sup>2</sup>C Master mode, the BRG value of '0' may not work correctly.

### Work around

Use a BRG value greater than '0' by setting SSPADD  $\geq 1$ .

Date Codes that pertain to this issue:

All engineering and production devices.

## 29. Module: MSSP

In I<sup>2</sup>C Master mode, the RCEN bit is set by software to begin data reception and cleared by the peripheral after a byte is received. After a byte is received, the device may take up to 80 Tcy to clear RCEN and 800 Tcy during emulation.

### Work around

Single byte receptions are typically not affected, since the delay between byte receptions typically is long enough for the RCEN bit to clear. For multiple byte receptions, the software must wait until the bit is cleared by the peripheral before the next byte can be received.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 30. Module: MSSP

Setting the SEN bit initiates a Start sequence on the bus, after which, the SEN bit is cleared automatically by hardware. If the SEN bit is set again (without an address byte being transmitted), a Start sequence will not commence and the SEN bit will not be cleared. This condition causes the bus to remain in an active state. The system is Idle when ACKEN, RCEN, PEN, RSEN, and SEN are clear.

### Work around

Set the PEN or RSEN bit to transmit a Stop or Repeated Start sequence, although the SEN bit may still be set, indicating the bus is active. After the sequence has completed, the PEN, RSEN and SEN bit will be clear, indicating the bus is Idle. Clearing and setting the SSPEN bit will also reset the I<sup>2</sup>C peripheral and clear the PEN, RSEN and SEN status bits.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 31. Module: MSSP

In SPI mode, the Buffer Full flag (BF bit in the SSPSTAT register), the Write Collision Detect bit (WCOL bit in SSPCON1) and the Receive Overflow Indicator bit (SSPOV in SSPCON1) are not reset upon disabling the SPI module (by clearing the SSPEN bit in the SSPCON1 register).

For example, if SSPBUF is full (BF bit is set) and the MSSP module is disabled and re-enabled, the BF bit will remain set. In SPI Slave mode, a subsequent write to SSPBUF will result in a write collision. Also, if a new byte is received, a receive overflow will occur.

### Work around

Ensure that if the buffer is full, SSPBUF is read (thus clearing the BF flag) and WCOL is clear before disabling the MSSP module. If the module is configured in SPI Slave mode, ensure that the SSPOV bit is clear before disabling the module.

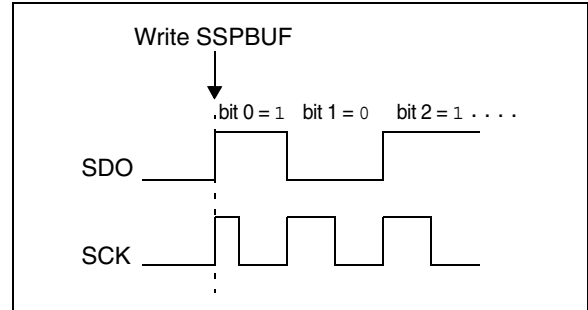
### Date Codes that pertain to this issue:

All engineering and production devices.

## 32. Module: MSSP (SPI Mode)

When the SPI is using Timer2/2 as the clock source, a shorter than expected SCK pulse may occur on the first bit of the transmitted/received data (Figure 1).

**FIGURE 1: SCK PULSE VARIATION USING TIMER2/2**



### Work around

To avoid producing the short pulse, turn off Timer2 and clear the TMR2 register, load the SSPBUF with the data to transmit and then turn Timer2 back on. Refer to Example 5 for sample code.

## **EXAMPLE 5: AVOIDING THE INITIAL SHORT SCK PULSE**

```

LOOP BTFSS SSPSTAT, BF      ;Data received?
                                ;(Xmit complete?)
    BRA  LOOP                ;No
    MOVF  SSPBUF, W           ;W = SSPBUF
    MOVWF RXDATA              ;Save in user RAM
    MOVF  TXDATA, W           ;W = TXDATA
    BCF   T2CON, TMR2ON       ;Timer2 off
    CLRF  TMR2                ;Clear Timer2
    MOVWF SSPBUF              ;Xmit New data
    BSF   T2CON, TMR2ON       ;Timer2 on
    
```

### Date Codes that pertain to this issue:

All engineering and production devices.

## 33. Module: EUSART

In rare situations, one or more extra zero bytes have been observed in a packet transmitted by the module operating in asynchronous mode. The actual data is not lost or corrupted; only unwanted (extra) zero bytes are observed in the packet.

This situation has only been observed when the contents of the transmit buffer, TXREG, are transferred to the TSR during the transmission of a Stop bit. For this to occur, three things must happen in the same instruction cycle:

- TXREG is written to;
- the baud rate counter overflows (at the end of the bit period); and
- a Stop bit is being transmitted (shifted out of TSR).

### **Work around**

If possible, do not use the module's double buffer capability. Instead, load the TXREG register when the TRMT bit (TXSTA<1>) is set, indicating the TSR is empty.

If double-buffering is used and back-to-back transmission is performed, then load TXREG immediately after TXIF is set or wait 1-bit time after TXIF is set. Both solutions prevent writing TXREG while a Stop bit is transmitted. Note that TXIF is set at the beginning of the Stop bit transmission.

If transmission is intermittent, then do the following:

- Wait for the TRMT bit to be set before loading TXREG
- Alternatively, use a free timer resource to time the baud period. Set up the timer to overflow at the end of Stop bit, then start the timer when you load the TXREG. Do not load the TXREG when timer is about to overflow.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 34. Module: EUSART

In 9-Bit Asynchronous Full-Duplex Receive mode, the received data may be corrupted if the TX9D bit (TXSTA<0>) is not modified immediately after the RCIDL bit (BAUDCON<6>) is set.

### **Work around**

Write to TX9D only when a reception is not in progress (RCIDL = 1). Since there is no interrupt associated with RCIDL, it must be polled in software to determine when TX9D can be updated.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 35. Module: EUSART

After the last received byte has been read from the EUSART receive buffer, RCREG, the value is no longer valid for subsequent read operations.

### **Work around**

The RCREG register should only be read once for each byte received. After each byte is received from the EUSART, store the byte into a user variable. To determine when a byte is available to read from RCREG, poll the RCIDL bit (BAUDCON<6>) for a low to high transition, or use the EUSART receive interrupt, RCIF (PIR1<5>).

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 36. Module: EUSART

With the auto-wake-up option enabled by setting the WUE (BAUDCON<1>) bit, the RCIF (PIR1<5>) bit will become set on a high-to-low transition on the RX pin. However, the WUE bit may not clear within 1 Tcy of a low-to-high transition on RX. While the WUE bit is set, reading the receive buffer, RCREG, will not clear the RCIF interrupt flag. Therefore, the first opportunity to automatically clear RCIF by reading RCREG may take longer than expected.

**Note:** RCIF can only be cleared by reading RCREG

### **Work around**

There are two work arounds available:

1. Clear the WUE bit in software after the wake-up event has occurred prior to reading the receive buffer, RCREG.
2. Poll the WUE bit and read RCREG after the WUE bit is automatically cleared.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 37. Module: Timer1

In 16-Bit Asynchronous Counter mode (with or without use of the Timer1 oscillator), the TMR1H and TMR3H buffers do not update when TMRxL is read.

This issue only affects reading the TMRxH registers. The timers increments and set the interrupt flags as expected. The timer registers can also be written as expected.

### **Work around**

1. Use 8-bit mode by clearing the RD16 bit (T1CON<7>).
2. Use the internal clock synchronization option by clearing the T1SYNC bit (T1CON<2>).

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 38. Module: MSSP

The MSSP configured in SPI slave mode will generate a write collision if SSPBUF is updated and the previous SSPBUF contents have not been transferred to the shift register.

Reinitializing the MSSP by clearing and setting the SSPEN (SSPCON1<5>) bit prior to rewriting SSPBUF will not prevent the error condition.

### **Work around**

Prior to updating the SSPBUF register with a new value, verify whether the previous contents were transferred by reading the BF (SSPSTAT<0>) bit. If the previous byte has not been transferred, update SSPBUF and clear the WCOL (SSPCON1<7>) bit if necessary.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 39. Module: MSSP

In SPI mode, the SDO output may change after the inactive clock edge of the bit '0' output. This may affect some SPI components that read data over 300 ns after the inactive edge of SCK.

### **Work around**

None

### **Date Codes that pertain to this issue:**

All engineering and production devices.

## 40. Module: MSSP

It has been observed that, following a Power-on Reset, I<sup>2</sup>C mode may not initialize properly by just configuring the SCL and SDA pins as either inputs or outputs. This has only been seen in a few unique system environments.

A test of a statistically significant sample of pre-production systems, across the voltage and current range of the application's power supply, should indicate if a system is susceptible to this issue.

### **Work around**

Before configuring the module for I<sup>2</sup>C operation:

1. Configure the SCL and SDA pins as outputs by clearing their corresponding TRIS bits.
2. Force SCL and SDA low by clearing the corresponding LAT bits.
3. While keeping the LAT bits clear, configure SCL and SDA as inputs by setting their TRIS bits.

Once this is done, use the SSPCON1 and SSPCON2 registers to configure the proper I<sup>2</sup>C mode as before.

### **Date Codes that pertain to this issue:**

All engineering and production devices.

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## 41. Module: MSSP

When the MSSP is configured for SPI mode, the Buffer Full Status bit, BF (SSPSTAT<0>), should not be polled in software to determine when the transfer is complete.

### Work around

Copy the SSPSTAT register into a variable and perform the bit test on the variable. In Example 6, SSPSTAT is copied into the working register where the bit test is performed.

### EXAMPLE 6:

```
loop_MSB:
    MOVF    SSPSTAT, W
    BTFSS   WREG, BF
    BRA     loop_MSB
```

A second option is to poll the Master Synchronous Serial Port Interrupt Flag bit, SSPIF (PIR1<3>). This bit can be polled and will set when the transfer is complete.

### Date Codes that pertain to this issue:

All engineering and production devices.

## 42. Module: Reset

This version of silicon does not support the functionality described in Note 1 of parameter D002 in **Section 26.1 “DC Characteristics: Supply Voltage”** of the data sheet. The RAM content may be altered during a Reset event if following conditions are met.

- Device is accessing RAM.
- Asynchronous Reset (i.e., WDT, BOR or  $\overline{\text{MCLR}}$  occurs when a write operation is being executed (start of a Q4 cycle).

### Work around

None

### Date Codes that pertain to this issue:

All engineering and production devices.

## 43. Module: MSSP (I<sup>2</sup>C Slave)

The MSSP module operating in I<sup>2</sup>C, 7-Bit Slave mode (SSPM3:SSPM0 = 0110) may not send a NACK bit (/ACK) in response to receiving the slave address loaded in SSPADD<7:1>. Addresses are in one of these ranges:

- 0x00 to 0x07
- 0x78 to 0x7F

These addresses were reserved by Philips® Semiconductors in “*The I<sup>2</sup>C Specification*”, Version 2.1, released January 2000. Section 10.1 “Definition of bits in the first byte” defines the purposes of these addresses.

This specification can be found at:

<http://www.semiconductors.philips.com/i2c>

### Work around

This version of the silicon does not respond to slave addresses in the ranges previously listed. Use either of these work arounds:

- Change the 7-bit slave address in SSPADD to an address in the range of 0x08 to 0x77.
- Use Revision B silicon. This version of silicon removes this issue’s addressing restrictions.

### Date Codes that pertain to this issue:

All engineering and production devices.

## REVISION HISTORY

### Rev A Document (01/2005)

First revision of this document.

Issues 1-4 (MSSP), 5-7 (ECCP), 8 (ECCP and CCP), 9-14 (ECCP), 15-16 (EUSART), 17-19 (Timer1/Timer3), 20 (Interrupts), 21 (A/D) and 22 (BOR).

### Rev B Document (9/2005)

Updated issue 3 (MSSP), issue 8 (ECCP and CCP) and issue 20 (Interrupts), and added issues 23-26 (EUSART), 27-31 (MSSP), 32 (SSP – SPI Mode) and 33 (Timer1 – Asynchronous Counter).

### Rev C Document (4/2006)

Removed issue 33 (Timer1). Added Example 4 in issue 20 (Interrupts). Added issues 33-36 (EUSART), 37 (Timer1), 38-41 (MSSP) and 42 (Reset). Added Date Code information to new issues from revision B (issues 23-32).

### Rev D Document (2/2007)

Added issue 43 (MSSP (I<sup>2</sup>C Slave)).

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NOTES:



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