dsPIC30F2011/2012/3012/3013

dsPIC30F2011/2012/3012/3013 Rev. A1 Silicon Errata

dsPIC30F2011/2012/3012/3013 (Rev. A1) Silicon Errata

The dsPIC30F2011/2012/3012/3013 (Rev. A1) samples you have received were found to conform to the specifications and functionality described in the following documents:

- DS70030 – dsPIC30F Programmer's Reference Manual
- DS70139 – dsPIC30F2011/2012/3012/3013 Data Sheet
- DS70046 – dsPIC30F Family Reference Manual

The exceptions to the specifications in the documents listed above are described in this section. The specific devices for which these exceptions are described are listed below:

- dsPIC30F2011
- dsPIC30F2012
- dsPIC30F3012
- dsPIC30F3013

These devices may be identified by the following message that appears in the MPLAB® ICD 2 Output Window under MPLAB IDE, when a "reset-and-connect" operation is performed within MPLAB IDE:

```
Setting Vdd source to target
Target Device dsPIC30F3013 found, revision = Rev 1001
...Reading ICD Product ID
Running ICD Self Test
...Passed
MPLAB ICD 2 Ready
```

The errata described in this section will be fixed in future revisions of dsPIC30F2011, dsPIC30F2012, dsPIC30F3012 and dsPIC30F3013 devices.

Silicon Errata Summary

The following list summarizes the errata described in further detail throughout the remainder of this document:

1. Malfunction of EMUC2 pin on dsPIC30F2011/2012/3012/3013

   On the dsPIC30F2011/2012/3012/3013, the EMUC2 pin is susceptible to negative voltage spikes and requires additional protection.

2. Data EEPROM

   The Most Significant bit of every 4th byte in data EEPROM may be corrupted.

3. Decimal Adjust Instruction

   The Decimal Adjust instruction, `DAW.b`, may improperly clear the Carry bit, C (SR<0>).

4. PSV Operations Using SR

   In certain instructions, fetching one of the operands from program memory using Program Space Visibility (PSV) will corrupt specific bits in the Status Register, SR.

5. Early Termination of Nested DO Loops

   When using two DO loops in a nested fashion, terminating the inner-level DO loop by setting the EDT (CORCON<11>) bit will produce unexpected results.

6. x4 PLL Operation

   The x4 PLL mode of operation may not function correctly for certain input frequencies.

7. Sequential Interrupts

   Sequential interrupts after modifying the CPU IPL, interrupt IPL, interrupt enable or interrupt flag may cause an Address Error trap.

8. Using OSC2/RC15 pin for Digital I/O

   For this revision of silicon, if the pin RC15 is required for digital input/output, the FPR<4:0> bits in the FOSC Configuration register may not be set up for FRC w/PLL 4x/8x/16x modes.

The following sections will describe the errata and work around to these errata, where they may apply.

1. Module: Malfunction of EMUC2 pin on dsPIC30F2011/2012/3012/3013

On the dsPIC30F2011/2012/3012/3013 devices, the EMUC2 pin is susceptible to negative voltage spikes and requires additional protection.

Work around

The work around depends on the usage of the EMUC2 pin.

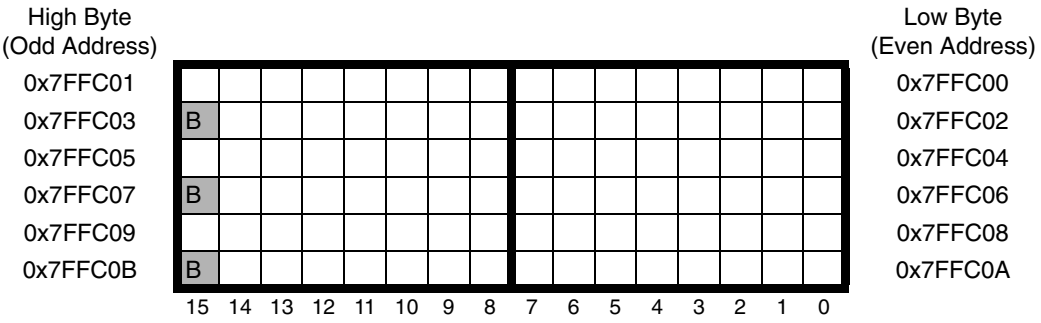
- If the EMUC2 pin is not used, terminate pin to ground through a 100 ohm resistor.
- If the EMUC2 pin is used for emulation, connect pin to the ICD 2 EMUC signal through a 100 ohm resistor.
- If the EMUC2 pin is used for I/O, add low-pass RC filter on the pin, with C = 1 nF and R = 100 ohm with the capacitor junction on the pin.

2. Module: Data EEPROM

The Most Significant bit of every fourth byte in data EEPROM may be corrupted on any write operation. This write corruption may occur while using either PRO MATE®, MPLAB ICD 2 or Run-Time Self-Programming (RTSP).

Figure 1 shows the first twelve bytes in data EEPROM and indicates the affected bits.

FIGURE 1: dsPIC30F3012/3013 DATA EEPROM



Note 1: The shaded bits labelled “B” represent the bits that may be corrupted on a write operation.

2: The memory map shown here depicts only the first twelve bytes of device EEPROM.

Work around

Work Around 1:

Use program Flash memory instead of data EEPROM to store constant data.

Work Around 2:

Use less than 16 bits in each word in the available data EEPROM, excluding the Most Significant bit.

Work Around 3:

Avoid using every fourth byte. Example 1 shows how the ASM30 assembler can be used to allocate data in the EEPROM under this constraint.

EXAMPLE 1:

```
.include   "p30f3013.inc"
.section   .eedata, "r"
.align 4
.hword 0xF345
.byte  0x23
.byte  0xFF            ;Unused byte
.hword 0x1234
.byte  0x23
.byte  0xFF            ;Unused byte"
```

3. Module: CPU – DAW.b Instruction

The Decimal Adjust instruction, DAW.b, may improperly clear the Carry bit, C (SR<0>), when executed.

Work around

Check the state of the Carry bit prior to executing the DAW.b instruction. If the Carry bit is set, set the Carry bit again after executing the DAW.b instruction. Example 2 shows how the application should process the Carry bit during a BCD addition operation.

EXAMPLE 2:

```
    .include "p30f3013.inc"
    .......
    MOV.b   #0x80, w0   ;First BCD number
    MOV.b   #0x80, w1   ;Second BCD number
    ADD.b   w0, w1, w2  ;Perform addition
    BRA     NC, L0      ;If C set go to L0
    DAW.b   w2          ;If not,do DAW and
    BSET.b  SR, #C      ;set the carry bit
    BRA     L1          ;and exit
L0:DAW.b    w2
L1: ....
```

4. Module: PSV Operations Using SR

When one of the operands of instructions shown in Table 1 is fetched from program memory using Program Space Visibility (PSV), the Status Register, SR and/or the results may be corrupted. These instructions are identified in Table 1. Example 3 demonstrates one scenario where this occurs.

TABLE 1:

Instruction(2)	Examples of Incorrect Operation	Data Corruption IN
ADDC	`ADDC W0, [W1++], W2 ;See Note 1`	SR<1:0> bits(3), Result in W2
SUBB	`SUBB.b W0, [++W1], W3 ;See Note 1`	SR<1:0> bits(3), Result in W3
CPB	`CPB W0, [W1++], W4 ;See Note 1`	SR<1:0> bits(3)
RLC	`RLC [W1], W4 ;See Note 1`	SR<1:0> bits(3), Result in W4
RRC	`RRC [W1], W2 ;See Note 1`	SR<1:0> bits(3), Result in W2
ADD (Accumulator-based)	`ADD [W1++], A ;See Note 1`	SR<1:0> bits(4)
LAC	`LAC [W1], A ;See Note 1`	SR<15:10> bits(4)

Note 1: The errata only affects these instructions when a PSV access is performed to fetch one of the source operands in the instruction. A PSV access is performed when the Effective Address of the source operand is greater than 0x8000 and the PSV (CORCON<2>) bit is set to '1'. In the examples shown, the data access from program memory is made via the W1 register.

2: Refer to the Programmer's Reference Manual for details on the dsPIC30F instruction set.

3: SR<1:0> bits represent Sticky Zero and Carry status bits respectively.

4: SR<15:10> bits represent Accumulator Overflow and Saturation status bits

EXAMPLE 3:

```
.include "p30fxxxx.inc"
.......
MOV.B #0x00, W0      ;Load PSVPAG register
MOV.B WREG, PSVPAG
BSET  CORCON, #PSV   ;Enable PSV
....
MOV   #0x8200, W1    ;Set up W1 for
                     ;indirect PSV access
                     ;from 0x000200
ADD   W3, [W1++], W5 ;This instruction
                     ;works ok
ADDC  W4, [W1++], W6 ;Carry flag and
                     ;W6 gets
                     ;corrupted here!
```

Work around

Work Around 1: For Assembly Language Source Code

To work around the erratum in the MPLAB® ASM30 assembler, the application may perform a PSV access to move the source operand from program memory to RAM or a W register prior to performing the operations listed in Table 1. The work around for Example 3 is demonstrated in Example 4.

EXAMPLE 4:

```
.include "p30fxxxx.inc"
.......
MOV.B #0x00, w0      ;Load PSVPAG register
MOV.B WREG, PSVPAG
BSET  CORCON, #PSV   ;Enable PSV
....
MOV   #0x8200, W1    ;Set up W1 for
                     ;indirect PSV access
                     ;from 0x000200
ADD   W3, [W1++], W5 ;This instruction
                     ;works ok
MOV   [W1++], W2     ;Load W2 with data
                     ;from program memory
ADDC  W4, W2, W6     ;Carry flag and W4
                     ;results are ok!
```

Work Around 2: For C Language Source Code

For applications using C language, MPLAB C30 versions 1.20.04 or higher provide the following command-line switch that implements a work around for the erratum.

```
-merrata=psv
```

Refer to the "`readme.txt`" file in the MPLAB C30 v1.20.04 toolsuite for further details.

5. Module: Early Termination of Nested DO Loops

When using two DO loops in a nested fashion, terminating the inner-level DO loop by setting the EDT (CORCON<11>) bit will produce unexpected results. Specifically, the device may continue executing code within the outer DO loop forever. This erratum does not affect the operation of the MPLAB C30 compiler.

Work around

The application should save the DCOUNT SFR prior to entering the inner DO loop and restore it upon exiting the inner DO loop. This work around is shown in Example 5.

EXAMPLE 5:

```
       .include "p30fxxxx.inc"
       .......
       DO #CNT1, LOOP0     ;Outer loop start
       ....
       PUSH DCOUNT         ;Save DCOUNT
       DO   #CNT2, LOOP1   ;Inner loop
       ....                ;starts
       BTSS Flag, #0
       BSET CORCON, #EDT   ;Terminate inner
       ....                ;DO-loop early
       ....
LOOP1: MOV  W1, W5         ;Inner loop ends
       POP  DCOUNT         ;Restore DCOUNT
       ...
LOOP0: MOV  W5, W8         ;Outer loop ends

Note:  For details on the functionality of
       EDT bit, see section 2.9.2.4
       in the dsPIC30F Family Reference
       Manual.
```

6. Module: PLL

When the x4 PLL mode of operation is selected, the specified input frequency range of 4-10 MHz is not fully supported.

When device V_{DD} is 2.5-3.0V, the x4 PLL input frequency must be in the range of 4-5 MHz. When device V_{DD} is 3.0-3.6V, the x4 PLL input frequency must be in the range of 4-6 MHz for both industrial and extended temperature ranges.

Work around

1. Use x8 PLL or x16 PLL mode of operation and set final device clock speed using the POST<1:0> oscillator postscaler control bits (OSCCON<7:6>).
2. Use the EC without PLL Clock mode with a suitable clock frequency to obtain the equivalent x4 PLL clock rate.

7. Module: Interrupt Controller – Sequential Interrupts

When interrupt nesting is enabled (or NSTDIS (INTCON1<15>) bit is '0'), the following sequence of events will lead to an Address Error trap. The generic terms "Interrupt 1" and "Interrupt 2" are used to represent any two enabled dsPIC30F interrupts.

1. Interrupt 1 processing begins.
2. Interrupt 1 is negated by user software by one of the following methods:
   - CPU IPL is raised to Interrupt 1 IPL level or higher or
   - Interrupt 1 IPL is lowered to CPU IPL level or lower or
   - Interrupt 1 is disabled (Interrupt 1 IE bit set to '0') or
   - Interrupt 1 flag is cleared
3. Interrupt 2 with priority higher than Interrupt 1 occurs.

Work around

The user may disable interrupt nesting or execute a DISI instruction before modifying the CPU IPL or Interrupt 1 setting. A minimum DISI value of 2 is required if the DISI is executed immediately before the CPU IPL or Interrupt 1 is modified, as shown in Example 6. If the MPLAB C30 compiler is being used, one must inspect the Disassembly Listing in the MPLAB IDE file to determine the exact number of cycles to disable level 1-6 interrupts. One may use a large DISI value and then set the DISICNT register to zero, as shown in Example 7. A macro may also be used to perform this task, as shown in Example 8.

EXAMPLE 6:

```
.include       "p30fxxxx.inc"
...
DISI    #2                ; protect the disable of INT1
BCLR    IEC1, #INT1IE     ; disable interrupt 1
...                       ; next instruction protected by DISI
```

EXAMPLE 7:

```
.include       "p30fxxxx.h"
...
__asm__ volatile ("DISI #0x1FFF");   // protect CPU IPL modification
SRbits.IPL = 0x5;                    // set CPU IPL to 5
DISICNT = 0x0;                       // remove DISI protection
```

EXAMPLE 8:

```
#define DISI_PROTECT(X) {              \
      __asm__ volatile ("DISI #0x1FFF");\
      X;                               \
      DISICNT = 0; }

DISI_PROTECT(SRbits.IPL = 0x5);   // safely modify the CPU IPL
```

8. Module: Using OSC2/RC15 pin for Digital I/O

The port pin, RC15, is multiplexed with the primary oscillator pin, OSC2. When pin RC15 is required for digital input/output, specific bits in the Oscillator Configuration register, FOSC, may be set up as follows:

- FOS<2:0> (FOSC<10:8>) bits configured for LP, LPRC, FRC, ECIO, ERCIO or ECIO w/PLL 4x/8x/16x
- FPR<4:0> (FOSC<4:0>) bits may be configured for ECIO w/PLL 4x/8x/16x

For this revision of silicon, if the RC15 digital I/O port function is desired, the FPR<4:0> bits in the FOSC Configuration register may not be set up for FRC w/PLL 4x/8x/16x modes.

Work around

None. In future revisions of silicon, port pin RC15 may also be configured for digital I/O when the FPR<4:0> bits in the FOSC Configuration register are set up for FRC w/PLL 4x/8x/16x modes.

APPENDIX A: REVISION HISTORY

Revision A (11/2004)

Original version of the document.

Revision B (3/2005)

Added silicon issues 6 (PLL) and 7 (Interrupt Controller – Sequential Interrupts).

Revision C (4/2005)

Added silicon issue 8 (Using OSC2/RC15 pin for Digital I/O).

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