TB3010

Maximize Software Portability for Future PIC32 MCUs

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INTRODUCTION

This document describes the programming techniques that will maximize the software portability when the user is migrating from one revision to another or between two different families of PIC32 microcontrollers. It also offers recommendations to increase the probability of running old software on future PIC32 MCUs. The changes required to port a software application depends on the functional and architectural similarity of the two microcontroller families.

The following cases are provided to describe these techniques:

- Case 1: Writing to SFR
- Case 2: Reading from SFR
- Case 3: Creating a Delay Logic
- Case 4: Using Compiler Supplied Supporting Files

CASE 1: WRITING TO SFR

While modifying the register values, write the recommended values into reserved bit positions in Special Function Registers (SFRs), as specified in the datasheet.

The reserved bits are frequently used to define new capabilities or improvements to existing capabilities.

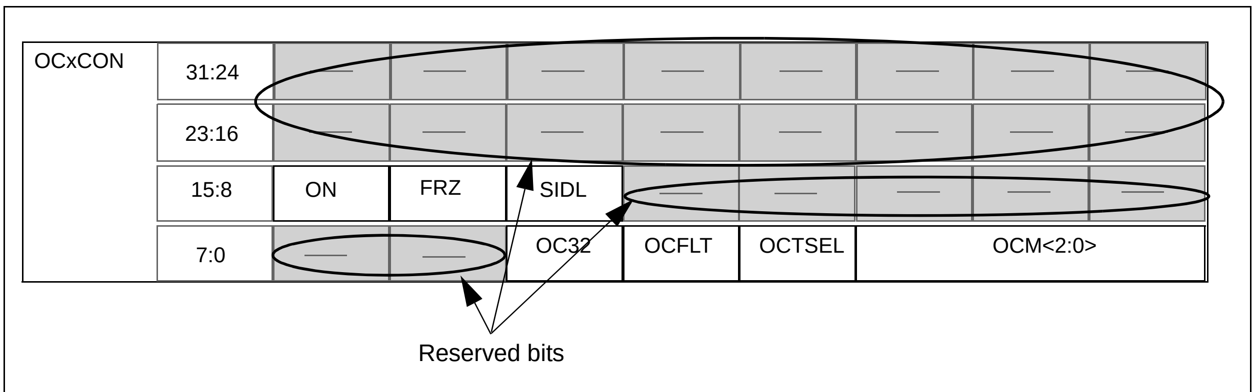
In most cases, new capabilities are enabled by writing '1' in the appropriate bits. Writing a value of '0' in reserved bit positions ensures that new capabilities will not be enabled accidentally and will not interfere with previously configured capabilities.

For example, to configure the Output Compare module for the PWM mode, load the desired values in the Output Compare Configuration bits.

```
OCxCON = 0x8026;
```

This will write the desired configuration values in the implemented bits and zeros in the reserved bits.

FIGURE 1: WRITING TO SFR



CASE 2: READING FROM SFR

While reading from an SFR, ignore the values of reserved bits.

For example, to check whether there is any new data in the RX buffer of UART, read register bit UxSTA<0> (RXDA) and mask all other bits except the desired bit 0.

```
unsigned int dataReady = (UxSTA & 0x01);
```

This method ensures that all the bits except bit 0 are ignored and the result represents the value of bit 0 only.

Alternative way of achieving this is by using the register bit structures. For example, call UxSTAbits.RXDA to read the bit. The compiler will execute the necessary bitwise AND operation.

CASE 3: CREATING A DELAY LOGIC

The exact timing of reads and writes to SFRs or memory locations may change when the future revisions or products contain bus matrix changes in one or more of the following forms:

- if fixes are made to the existing bus master peripherals,
- if improvements are made to the existing bus master peripherals,
- if new peripherals are added, e.g., CAN, Ethernet, DMA, USB, ICD, etc.

As a result, applications requiring hard timing delays should use the core timer or any of the available peripheral timers.

A specific delay can be created through various practices. A common practice, which is not recommended, and the two recommended practices are described in this document.

EXAMPLE 1: COMMON PRACTICE (NOT RECOMMENDED)

```
while(1)
{
        for (i = 0; i < 10000; i++);          // Achieve X ms of delay @ Y MHz
        mPORTAToggleBits(BIT_2);              // Toggle the pin
}
```

Common Practice (Not Recommended)

The common practice to achieve a specific delay is shown in Example 1. This is not recommended since the delay varies when the bus matrix changes.

Recommended Practices

The following practices are recommended for achieving a specific delay:

- Configure the core timer or a peripheral timer to generate the required delay (see Example 2) or
- Enable the interrupt and perform the necessary action in the interrupt handler (see Example 3)

EXAMPLE 2: USING CORE TIMER

```
#define CORE_TIMER_PERIOD     (0xFFEF)

OpenCoreTimer(CORE_TIMER_PERIOD);     //Open the core timer with desired period

while(1)
{
        while(mCTGetIntFlag() == 0);              // Wait for the coretimer compare
        mCTClearIntFlag();                        // Clear the interrupt flag
        mPORTAToggleBits(BIT_2);                  // Toggle the pin
        UpdateCoreTimer(CORE_TIMER_PERIOD);       // update the period
}
```

EXAMPLE 3: USING CORE TIMER WITH INTERRUPT ENABLED

```
#define CORE_TIMER_PERIOD     (0xFFEF)

OpenCoreTimer(CORE_TIMER_PERIOD);     //Open the core timer with desired period
mConfigIntCoreTimer((CT_INT_ON | CT_INT_PRIOR_2 | CT_INT_SUB_PRIOR_0));

// Interrupt Handler
void __ISR(_CORE_TIMER_VECTOR, ipl2) CoreTimerHandler(void)
{
            mCTClearIntFlag();                    // clear the interrupt flag
            mPORTAToggleBits(BIT_2);              // Toggle the pin
            UpdateCoreTimer(CORE_TIMER_PERIOD);   // update the period
}
```

CASE 4: USING COMPILER SUPPLIED SUPPORTING FILES

Always use the processor header files, peripheral libraries and other support files that are supplied with the compiler.

The processor header files abstract the underlying register address values and bit positions. As a result, changes to source code are not required to compile on different compiler versions or for different PIC32 families.

The peripheral libraries abstract the exact programming sequences and any variations that exist in different revisions or families.

In Example 4, the processor header file `p32xxxx.h` and peripheral library header file `plib.h` have been included to achieve compatibility.

EXAMPLE 4: USING PROCESSOR AND LIBRARY HEADER FILES

```
#include <p32xxxx.h>
#include <plib.h>

int main(void)
{
        mPORTDSetPinsDigitalOut(BIT_2);   // configure the port register
        mPORTDClearBits(BIT_2);           // Initialize the port pin to low

        while(1)
        {
            mPORTDToggleBits(BIT_2);  // Toggle the pin
            // user code
        }

return (0);
}
```

NOTES:

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