

# PIC18F26/45/46Q10 Silicon Errata and Data Sheet Clarifications

## PIC18F26/45/46Q10



The PIC18F26/45/46Q10 devices you have received conform functionally to the current device data sheet (DS40001996F), except for the anomalies described in this document.

The silicon issues discussed in the following pages are for silicon revisions with the Device and Revision IDs listed in the table below.

The errata described in this document will be addressed in future revisions of the PIC18F26/45/46Q10 silicon.

**Note:** This document summarizes all silicon errata issues from all silicon revisions, previous and current.

**Table 1.** Silicon Device Identification

| Part Number | Device ID | Revision ID |        |        |
|-------------|-----------|-------------|--------|--------|
|             |           | A5          | B0     | B2     |
| PIC18F26Q10 | 0x7180    | 0xA045      | 0xA0C0 | 0xA0C2 |
| PIC18F45Q10 | 0x7140    | 0xA045      | 0xA0C0 | 0xA0C2 |
| PIC18F46Q10 | 0x7120    | 0xA045      | 0xA0C0 | 0xA0C2 |



**Important:** Refer to the **Device/Revision ID** section in the current “**PIC18F2X/4XQ10 Memory Programming Specification**” (DS40001874) for more detailed information on Device Identification and Revision IDs for your specific device.

**Table 2. Silicon Issue Summary**

| Module                                                                                       | Feature                | Item No.                                                                           | Issue Summary                                                                 | Affected Revisions |    |    |
|----------------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------|----|----|
|                                                                                              |                        |                                                                                    |                                                                               | A5                 | B0 | B2 |
| Electrical Specifications                                                                    | Sleep current          | Sleep Current - Higher Sleep Current After Data Flash Memory (DFM) Write Operation | Higher current after DFM write                                                | X                  |    |    |
| Resets                                                                                       | RMCLR flag             | The RMCLR Flag in the PCON0 Register Cleared by Mistake                            | POR may clear the RMCLR bit by mistake                                        | X                  | X  | X  |
|                                                                                              | LPBOR                  | Low-Power Brown-out Reset (LPBOR) Mode                                             | Trip point rises with temperature                                             |                    | X  |    |
| Complementary Waveform Generator (CWG)                                                       | Auto-shutdown sources  | CWG Auto-Shutdown Sources                                                          | CLC2 and CLC6 not available                                                   | X                  |    |    |
| Analog-to-Digital Converter with Computation (ADCC)                                          | FVR reference          | Missing Codes with FVR Reference                                                   | Missing codes when using FVR as reference                                     | X                  | X  | X  |
|                                                                                              | Burst average          | ADCC Burst Average Mode                                                            | ADCNT may not increment                                                       | X                  |    |    |
|                                                                                              | ADCRC (FRC) oscillator | ADCRC (FRC) Oscillator Operation in Sleep Mode                                     | Oscillator continues to run in Sleep mode after conversion                    | X                  |    |    |
|                                                                                              | Input slew rate        | Unreliable Conversion Results with Fast Falling Slew Rate                          | Unreliable conversion results with fast falling slew rate                     | X                  | X  | X  |
| Windowed Watchdog Timer (WWDT)                                                               | Window operation       | Window Operation in Doze Mode                                                      | The window feature of WWDT does not operate correctly in Doze mode            | X                  |    |    |
| Non-Volatile Memory (NVM)                                                                    | NVMERR                 | NVMERR                                                                             | The NVMERR bit is set by the device Reset after being cleared by the software | X                  |    |    |
|                                                                                              | Self-write             | PFM Writes Above 85° Celsius                                                       | Do not write above 85°C                                                       | X                  |    |    |
| Host Synchronous Serial Port (MSSP)                                                          | SPI                    | MSSP SPI Client Mode                                                               | SSPBUF may be corrupted by writes to other GPR/SFRs                           | X                  |    |    |
| Oscillator                                                                                   | HFINTOSC               | Internal HFINTOSC Oscillator Varies up to 5%                                       | 5% variation over temperature range                                           | X                  |    |    |
|                                                                                              | XT mode                | Maximum Clock Frequency Limited to 2 MHz for XT Mode                               | Maximum clock frequency limited to 2 MHz for XT mode                          | X                  | X  |    |
| In-Circuit Debugging                                                                         | Software breakpoints   | Software Breakpoints Are Not Available                                             | Software breakpoints are not available                                        | X                  | X  | X  |
| Program Flash Memory (PFM)                                                                   | Self-write             | The First Instruction Following a Self-Write Instruction May Not Execute           | The first instruction following a self-write instruction may not execute      | X                  | X  | X  |
| <b>Note:</b> Only issues indicated in the last column apply to the current silicon revision. |                        |                                                                                    |                                                                               |                    |    |    |

# 1. Silicon Errata Issues

## NOTICE

This document summarizes all silicon errata issues from all revisions of silicon, previous and current. Only the issues indicated by the bold font in the following tables apply to the current silicon revision.

## 1.1 Module: Electrical Specifications

### 1.1.1 Sleep Current - Higher Sleep Current After Data Flash Memory (DFM) Write Operation

During a DFM write operation while in Sleep mode, the system clock will remain in the Active state. Consequently, once the write operation is completed, the device will exhibit an increased Sleep current if it continues to stay in this state.

#### Work around

Upon completing the DFM write operation, wake the device up from Sleep mode and re-execute a new Sleep command.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

## 1.2 Module: Resets

### 1.2.1 The $\overline{\text{RMCLR}}$ Flag in the PCON0 Register Cleared by Mistake

On an initial power-up of the device or when executing a software Reset, the  $\overline{\text{RMCLR}}$  flag in the PCON0 register may be improperly cleared by a Power-on Reset (POR) or software Reset ( $\overline{\text{RI}}$ ), thereby indicating a false  $\overline{\text{MCLR}}$  event.

#### Work around

None.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  | X  | X  |

### 1.2.2 Low-Power Brown-out Reset (LPBOR) Mode

The Brown-out Reset trip level increases proportionally with temperature to a level where BOR is never released. LPBOR cannot be used reliably because the trip level relative to temperature is indeterminate.

#### Work around

Use the Normal-Power BOR mode.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
|    | X  |    |

## 1.3 Module: Complementary Waveform Generator (CWG)

### 1.3.1 CWG Auto-Shutdown Sources

Shutdown sources AS6E (CLC2\_out) and AS7E (CLC6\_out) are unavailable.

#### Work around

Route the Configurable Logic Cell (CLC) output through Peripheral Pin Select (PPS) to an output pin, and use the AS0E source selection (the pin selected by CWGxPPS) and PPS controls to select the same pin as the shutdown source.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

## 1.4 Module: Analog-to-Digital Converter with Computation (ADCC)

### 1.4.1 Missing Codes with FVR Reference

Using the FVR as the positive voltage reference for the ADC can cause an increase in missing codes.

#### Work around

##### Method 1:

Increase the bit conversion time, known as  $T_{AD}$ , to 8  $\mu$ s or higher.

##### Method 2:

Use  $V_{DD}$  as the positive voltage reference to the ADC.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  | X  | X  |

### 1.4.2 ADCC Burst Average Mode

When the ADCC is operated in Burst Average mode ( $ADMD = 0b011$  in the  $ADCON2$  register) while enabling noncontinuous operation and double-sampling ( $ADCONT = 0$  in the  $ADCON0$  register and  $ADDSEN = 1$  in the  $ADCON1$  register), the value in the  $ADCNT$  register does not increment beyond '0b1' toward the value in the  $ADRPT$  register.

#### Work around

When operating the ADCC in Burst Average mode with double-sampling, enable continuous module operation ( $ADCONT = 1$  in the  $ADCON0$  register) and set the Stop-on-Interrupt bit (the  $ADSOI$  bit in the  $ADCON3$  register). After the interrupt occurs, perform appropriate threshold calculations in the software and retrigger ADCC as necessary.

Alternatively, if the CPU is in Low-Power Sleep mode, the ADCC in noncontinuous Burst Average mode can be operated with a single ADC conversion ( $ADDSEN = 0$  in the  $ADCON1$  register). Doing so compromises noise immunity for lower power consumption by preventing the device from waking up to perform threshold calculations in the software.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

### 1.4.3 ADCRC (FRC) Oscillator Operation in Sleep Mode

If the part is in Sleep mode and the ADCRC (FRC) oscillator is used as clock source to the ADC, the oscillator continues to run after the conversion is complete, increasing the current consumption in Sleep mode. The oscillator will stop after the device exits Sleep mode and resumes normal code execution.

#### Work around

None.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

### 1.4.4 Unreliable Conversion Results with Fast Falling Slew Rate

When the ADC input falls by greater than 3.2V, with a slew rate faster than  $-11 \text{ V}/\mu\text{s}$ , the following ADC conversion will have the Most Significant bit (MSb) improperly set. This is likely to happen when the ADC input channel is switched from one with a high-level input to another with a low-level input.

#### Work around

When switching between input channels, discard the first conversion result after the switch. Subsequent conversions will not be affected.

#### Affected Silicon Revisions

| A4 | B0 | B2 |
|----|----|----|
| X  | X  | X  |

## 1.5 Module: Windowed Watchdog Timer (WWDT)

### 1.5.1 Window Operation in Doze Mode

When enabling the Windowed operation mode in Doze mode, a window violation error is issued even though the window is open and armed. This condition occurs only when the window size is set to a value other than 100% open.

#### Work around

##### Method 1:

Use the Windowed operation mode in any mode other than Doze. If disabling the Doze mode is not an option, use the WWDT module without enabling the window.

##### Method 2:

If the device is in Doze mode, perform the arming process for the window in Normal mode and return to the Doze mode.

##### Method 3:

If there is an Interrupt Service Routine (ISR) in the application code, the arming within the window can be done inside the ISR with the ROI bit of the CPUDOZE register being set.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

## 1.6 Module: Nonvolatile Memory (NVM)

### 1.6.1 NVMERR

When a Reset is issued while an NVM high-voltage operation is in progress, the NVMERR bit in the NVMCON0 register is set as expected. After clearing the NVMERR bit, if a Reset reoccurs, the NVMERR bit is set again regardless of whether an NVM operation is in progress or not. A successful write operation will clear the NVMERR condition.

#### Work around

None.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

### 1.6.2 PFM Writes Above 85° Celsius

Do not perform write operations on the Program Flash Memory (PFM) when the temperature exceeds 85°C.

#### Work around

Perform PFM writes below 85°C.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

## 1.7 Module: Host Synchronous Serial Port (MSSP)

### 1.7.1 MSSP SPI Client Mode

When operating in SPI Client mode, if the incoming SCK clock signal arrives during any of the conditions below, the SSPBUF Transmit Shift Register (TSR) may become corrupted. The byte transmitted to the client cannot be ensured to be correct, and the state of the WCOL bit may or may not indicate a write collision.

These conditions include:

- A write to an SFR
- A write to RAM following an SFR read
- A write to RAM before an SFR read

#### Work around

##### Method 1 (Interrupt based using $\overline{SS}$ ):

1. Connect the  $\overline{SS}$  line to both the  $\overline{SS}$  input and either an INT or IOC input pin.
2. Enable INT or IOC interrupts (interrupt on falling edge if available, otherwise, check that  $\overline{SS} == 0$  when the interrupt occurs).
3. Load SSPBUF with the data to be transmitted.
4. Continue program execution.
5. When invoking the Interrupt Service Routine (ISR), do either of the following:
  - a. Add a delay that ensures the first SCK clock will be complete, or
  - b. Poll SSPSTAT.BF (while(BF == 0)) and wait for the transmission/reception to complete.

##### Method 2 (Bit polling based using $\overline{SS}$ ):

1. Load SSPBUF with the data to be transmitted.
2. Poll the  $\overline{SS}$  line and wait for the  $\overline{SS}$  to go active (`while(!PORTx. $\overline{SS}$  == 0)`).
3. When  $\overline{SS}$  is active ( $\overline{SS}$  == 0), do either of the following:
  - a. Add a delay that ensures the first SCK clock will be complete, or
  - b. Poll SSPSTAT.BF (`while(BF == 0)`) and wait for the transmission/reception to complete.

Once one of these two methods is complete, it is safe to return to program execution.

**Method 3 ( $\overline{SS}$  not available):**

1. Load SSPBUF with the data to be transmitted.
2. Poll SSPSTAT.BF (`while(BF == 0)`) and wait for the transmission/reception to complete.

**Affected Silicon Revisions**

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

## 1.8 Module: Oscillator (OSC)

### 1.8.1 Internal HFINTOSC Oscillator Varies up to 5%

The internal HFINTOSC oscillator frequency varies up to 5% over the voltage and temperature range.

**Work around**

For systems requiring more precision, use an external crystal or ceramic resonator in one of the external oscillator modes.

**Affected Silicon Revisions**

| A5 | B0 | B2 |
|----|----|----|
| X  |    |    |

### 1.8.2 Maximum Clock Frequency Limited to 2 MHz for XT Mode

The maximum clock frequency for the intermediate gain setting that supports quartz crystal and ceramic resonator operation (XT mode) is being reduced from 4 MHz to 2 MHz.

**Work around**

For crystal or resonator frequencies above 2 MHz, use HS mode.

**Affected Silicon Revisions**

| A5 | B0 | B2 |
|----|----|----|
| X  | X  |    |

## 1.9 Module: In-Circuit Debug

### 1.9.1 Software Breakpoints Are Not Available

When debugging code, software breakpoints will not be available.

**Work around**

None.

**Affected Silicon Revisions**

| A5 | B0 | B2 |
|----|----|----|
| X  | X  | X  |

## 1.10 Module: Program Flash Memory (PFM)

### 1.10.1 The First Instruction Following a Self-Write Instruction May Not Execute

When performing a self-write operation to Program Flash Memory, the first instruction following a self-write instruction may not execute.

#### Work around

Add two all-zero `NOP()` macros immediately after the self-write instruction. The all-zero `NOP()` macros are included automatically when the `#include <xc.h>` directive is used in user software.

#### Affected Silicon Revisions

| A5 | B0 | B2 |
|----|----|----|
| X  | X  | X  |

## 2. Data Sheet Clarifications

Note the following typographic corrections and clarifications for the latest version of the device data sheet (DS40001996F):

**Note:**

Corrections are shown in **bold**. Where possible, the original bold text formatting has been removed for clarity.

### 2.1 None

There are no known data sheet clarifications as of this publication date.

### 3. Appendix A: Revision History

| Doc Rev. | Date    | Comments                                                           |
|----------|---------|--------------------------------------------------------------------|
| J        | 09/2024 | Update data sheet revision letter.                                 |
| H        | 11/2022 | Added silicon erratum item 1.10.1.                                 |
| G        | 07/2021 | Removed silicon erratum item 1.4.5. Minor editorial corrections.   |
| F        | 02/2021 | Added silicon erratum items 1.4.5 and 1.9.1.                       |
| E        | 11/2020 | Updated the Revision ID for silicon Rev B0.                        |
| D        | 09/2020 | Added new silicon Rev B2.                                          |
| C        | 05/2020 | Added new silicon Rev B0. Added issue 1.2.2 and 1.8.2.             |
| B        | 05/2019 | Added oscillator drift erratum. Removed data sheet clarifications. |
| A        | 03/2019 | Initial document release.                                          |

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