
Getting Started with PIC18 Q10 Product Family

Introduction

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This application note outlines how to get started with the PIC18 Q10 Family devices.

Refer to the data sheet for further information on the differences between the PIC18 Q10 Family devices.

Features

- Getting Started with PIC18 Q10 Family Microcontrollers and Tools
- Getting Started with PIC18F47Q10 Curiosity Nano and MPLAB® X5.20

Table of Contents

Introduction.....	1
Features.....	1
1. Relevant Devices.....	3
1.1. PIC18FXXQ10 Family Table.....	3
2. Get the Device Data Sheet.....	4
3. Get the Tools.....	5
3.1. Get the PIC18F47Q10 Curiosity Nano Kit.....	5
3.2. Get the Curiosity Nano Base for Click boards™.....	6
3.3. Get the HPC Development Board.....	7
3.4. Get MPLAB X® IDE and Code Configurator (MCC®).....	7
3.5. Get Source Code from Microchip MPLAB® Xpress.....	9
4. MPLAB® X Users Getting Started.....	11
4.1. MPLAB® X and MCC® with PIC18F47Q10 Curiosity Nano.....	11
5. What's Next.....	23
6. Revision History.....	24
The Microchip Website.....	25
Product Change Notification Service.....	25
Customer Support.....	25
Microchip Devices Code Protection Feature.....	25
Legal Notice.....	25
Trademarks.....	26
Quality Management System.....	26
Worldwide Sales and Service.....	27

1. Relevant Devices

This chapter lists the relevant devices for this document.

1.1 PIC18FXXQ10 Family Table

The figure below shows the PIC18FXXQ10 devices, laying out pin count variants, memory sizes, and peripherals:

Table 1-1. Devices included in this family

Device	Program Memory Flash (bytes)	Data SRAM (bytes)(2)	Data EEPROM (bytes)	I/O Pins	16-bit Timers	Comparators	10-bit ADC ² with Computation (ch)	5-bit DAC	Zero-Cross Detect	CCP/10-bit PWM	CWG	CLC	Low Voltage Detect (LVD)	8-bit TMR with HLT	Windowed Watchdog Timer	CRC with Memory Scan	EUSART	I ² C/SPI	PPS	Peripheral Module Disable	Temperature Indicator	Debug ⁽¹⁾
PIC18F24Q10	16k	1280	256	25	4	2	24	1	1	2/2	1	0	1	3	Y	Y	1	1	Y	Y	Y	I
PIC18F25Q10	32k	2304	256	25	4	2	24	1	1	2/2	1	0	1	3	Y	Y	1	1	Y	Y	Y	I
PIC18F26Q10	64k	3615	1024	25	4	2	24	1	1	2/2	1	8	1	3	Y	Y	2	2	Y	Y	Y	I
PIC18F27Q10	128k	3615	1024	25	4	2	24	1	1	2/2	1	8	1	3	Y	Y	2	2	Y	Y	Y	I
PIC18F45Q10	32k	2304	256	36	4	2	35	1	1	2/2	1	8	1	3	Y	Y	2	2	Y	Y	Y	I
PIC18F46Q10	64k	3615	1024	36	4	2	35	1	1	2/2	1	8	1	3	Y	Y	2	2	Y	Y	Y	I
PIC18F47Q10	128k	3615	1024	36	4	2	35	1	1	2/2	1	8	1	3	Y	Y	2	2	Y	Y	Y	I

Note:

- Debugging Methods: (I) – Integrated on-chip.
- SRAM includes 256 bytes of SECTOR space which is not included in the data size displayed by MPLAB X.

2. Get the Device Data Sheet

Web Pages:

- <https://www.microchip.com/wwwproducts/en/PIC18F24Q10>
- <https://www.microchip.com/wwwproducts/en/PIC18F25Q10>
- <https://www.microchip.com/wwwproducts/en/PIC18F26Q10>
- <https://www.microchip.com/wwwproducts/en/PIC18F27Q10>
- <https://www.microchip.com/wwwproducts/en/PIC18F45Q10>
- <https://www.microchip.com/wwwproducts/en/PIC18F46Q10>
- <https://www.microchip.com/wwwproducts/en/PIC18F47Q10>

Documents/Files:

- Data Sheet:
 - PIC18F24/25Q10 28-Pin, Low-Power, High-Performance Microcontrollers (.pdf)
 - PIC18F26/45/46Q10 28/40-Pin, Low-Power, High-Performance Microcontrollers (.pdf)
 - PIC18F27/47Q10 Data Sheet (.pdf)
- Errata:
 - PIC18F24/25Q10 Family Silicon Errata (.pdf)
 - PIC18F26/45/46Q10 Family Silicon Errata and Data Sheet (.pdf)
 - PIC18F27/47Q10 Family Silicon Errata and Data Sheet Clarifications (.pdf)
- Programming Specification:
 - PIC18F2X/4XQ10 Memory Programming (.pdf)

The documentation for the PIC18 Q10 Family is split into four document types:

- Data Sheet¹ (includes all device dependent descriptions of the device, number of peripherals, pinout and electrical characteristics)
- Errata (includes all known errata issues for the device)
- Programming Specification (describes interface, algorithms and electrical specifications for programming devices in family)

Help Links:

Table 2-1. Documents

Documents			
PIC18F24/25Q10	Datasheet	Errata	Programming Specification
PIC18F26/45/46Q10	Datasheet	Errata	
PIC18F27/47Q10	Datasheet	Errata	

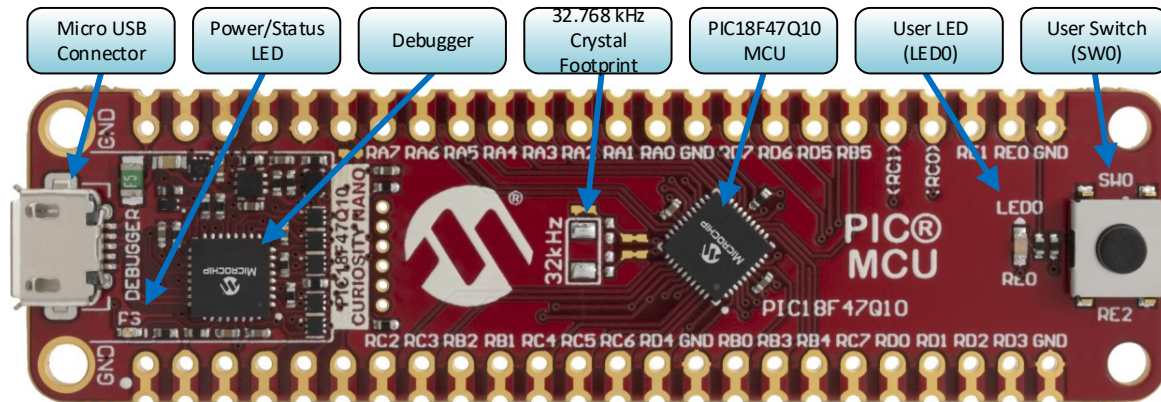
¹ For devices that are future products, the product brief is available instead of the data sheet.

3. Get the Tools

MPLAB® X IDE which uses the XC8 compiler, with MPLAB Code Configurator, is the preferred IDE to get started with PIC18 Q10 Family.

3.1 Get the PIC18F47Q10 Curiosity Nano Kit

Figure 3-1. PIC18F47Q10 Curiosity Nano Kit



Web Page: <http://www.microchip.com/DevelopmentTools/ProductDetails/PartNO/DM182029>

Get the Kit: <https://www.microchipdirect.com/product/search/all/DM182029>

Document/Files:

- PIC18F47Q10 Curiosity Nano Hardware User Guide (.pdf)
- PIC18F47Q10 Curiosity Nano Design Documentation (.zip)
- PIC18F47Q10 Curiosity Nano Schematics (.pdf)

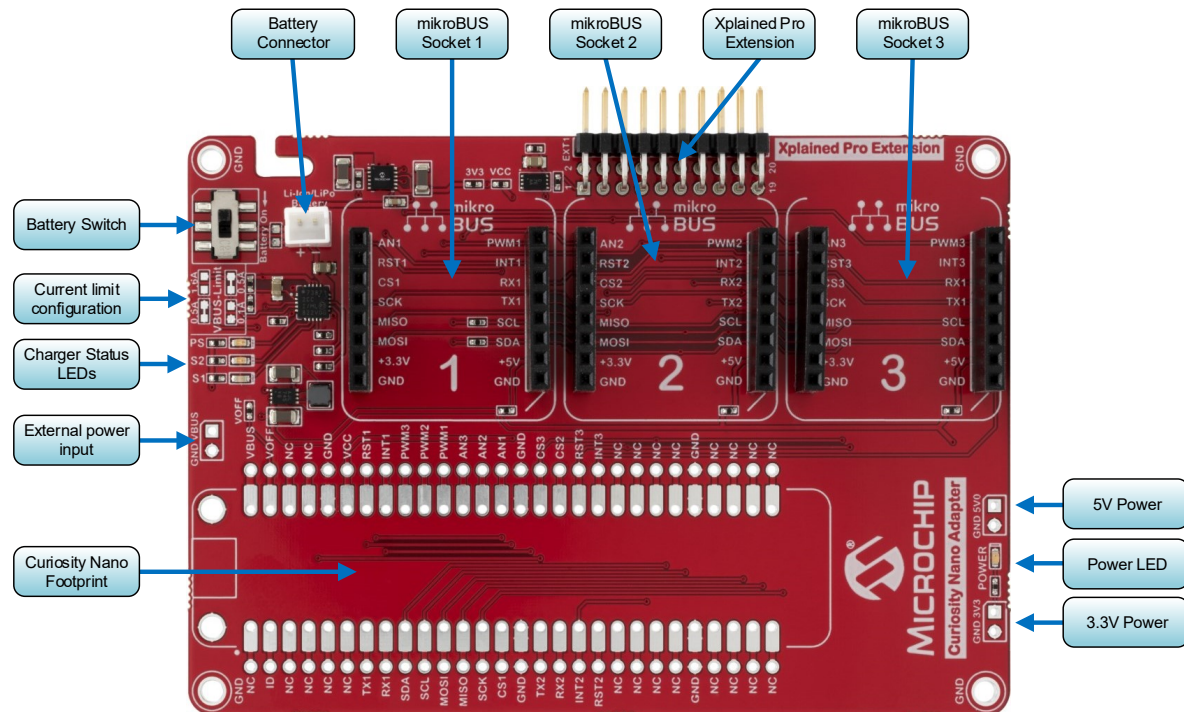
Key Features:

- PIC18F47Q10 Microcontroller
- One Yellow User LED
- One Mechanical User Switch
- On-Board Debugger:
 - Board identification in MPLAB® X
 - One green power and status LED
 - Programming and debugging
 - Virtual COM port (CDC)
 - One logic analyzer channel (DGI GPIO)
- USB Powered
- Adjustable Target Voltage:
 - MIC5353 LDO regulator controlled by the on-board debugger
 - 1.8-5.1V output voltage (limited by USB input voltage)
 - 500 mA maximum output current (limited by ambient temperature and output voltage)

The PIC18F47Q10 User Guide covers how to power the kit and includes detailed information about board components, extension interface, and the hardware user guide.

3.2 Get the Curiosity Nano Base for Click boards™

Figure 3-2. Curiosity Nano Base for Click boards™



Web Page: <http://www.microchip.com/DevelopmentTools/ProductDetails/PartNO/AC164162>

Get the Kit: <https://www.microchipdirect.com/product/search/all/AC164162>

Document/Files:

- Curiosity Nano Base for Click boards Hardware User's Guide (.pdf)
- Curiosity Nano Base for Click boards Design Documentation (.zip)
- Curiosity Nano Base for Click boards Schematics (.pdf)

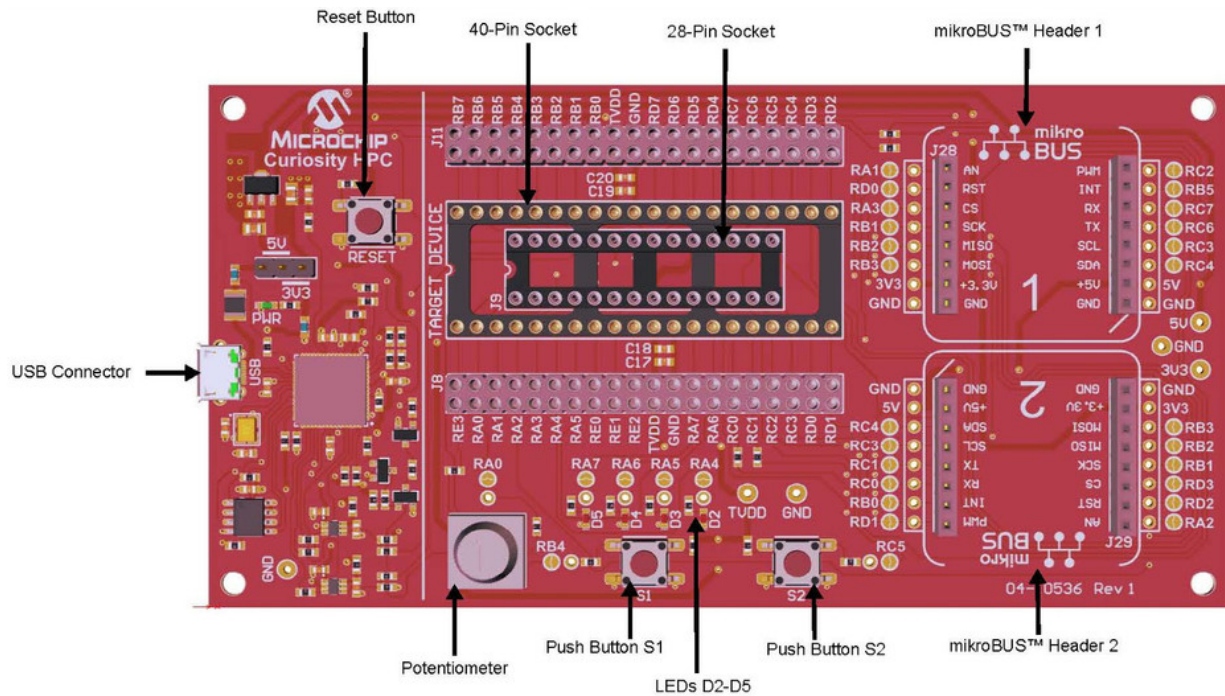
Key Features:

- Curiosity Nano Footprint
- One Power LED
- Three mikroBUS™ Sockets
- One Xplained Pro Extension Header
- Power:
 - USB powered from the Curiosity Nano kit
 - Alternative external power input
 - Option to power from, and charge, 4.20V Li-Ion/LiPo batteries
 - Fixed 3.3V PSU for target and mikroBUS sockets
 - Fixed 5.0V Boost converter for 5V mikroBUS sockets

The Curiosity Nano Base for Click boards User Guide covers how to power the kit and includes detailed information about board components, extension interface, and the hardware user guide.

3.3 Get the HPC Development Board

Figure 3-3. Curiosity High Pin Count (HPC) Development Board



Web Page: <http://www.microchip.com/DevelopmentTools/ProductDetails/PartNO/DM164136>

Get the Kit: <https://www.microchipdirect.com/product/search/all/DM164136>

Document/Files:

- Curiosity High Pin Count (HPC) Development Board User's Guide (.pdf)
- Curiosity HPC Demo Code (.zip)

Key Features:

- MPLAB® X Compatible.
- Programming and Debugging Support.
- Powered from USB, with Option Jumper for 3.3/5V
- Master Clear Reset
- Dual-Row Expansion Headers
- PIC® MCU Socket for 28/40-Pin Microcontrollers
- 2 mikroBUS™ Click board Sockets
- 4 Indication LEDs
- 2 Push Buttons
- 1 Potentiometer

The HPC User Guide describes how to power the kit and includes detailed information about board components, extension interface, and the hardware description.

3.4 Get MPLAB X® IDE and Code Configurator (MCC®)

MPLAB® X Integrated Development Environment (IDE) is a software program that runs on a PC (Windows®, Mac OS®, Linux®) to develop applications for Microchip microcontrollers and digital signal controllers. It is called an Integrated Development Environment because it provides a single integrated “environment” to develop code for embedded microcontrollers.

Table 3-1. Get MPLAB X

https://www.microchip.com/mplab/mplab-x-ide
Windows Linux Mac OSX Release Notes

MPLAB® Code Configurator (MCC) is a free, graphical programming environment that generates seamless, easy-to-understand C code to be inserted into your project. Using an intuitive interface, it enables and configures a rich set of peripherals and functions specific to your application.

Table 3-2. Get MCC

https://www.microchip.com/mplab/mplab-code-configurator
Latest Plugin Latest Release Notes

The optimizations found on MPLAB® XC C Compilers provide code size reductions and speed enhancements that benefit your design projects. PRO license is available for designs that require maximum code reductions and best performance. The MPLAB® XC C Compiler contains a free, 60-day trial of a PRO license for evaluation when activated.

Table 3-3. Get XC Compiler

https://www.microchip.com/mplab/compilers
--

Download Tab → Select OS → MPLAB® XC8 Compiler

[Installing and Licensing XC Compilers](#)

[Download Archive](#)

3.5 Get Source Code from Microchip | MPLAB® Xpress

Example codes are available in MPLAB® Xpress Cloud-based IDE, which is a web-based tool that enables configuration, compilation and simulation of application code through a Graphical User Interface (GUI). Registered [myMicrochip](#) can also share saved projects on the platform.

Table 3-4. Get Source Code Examples | MPLAB® Xpress

MPLAB Xpress Code Examples
 https://www.microchip.com/mplab/mplab-xpress PIC18 Q10 Examples

The tool allows users access to projects developed by Microchip and other community users.

Example projects can be viewed and either edited in MPLAB Xpress IDE, and downloaded for usage on MPLAB X IDE.

Figure 3-4. MPLAB® Xpress Examples



English ▼ **MPLAB® XPRESS**

[INTRODUCTION](#) | [EXAMPLES](#) | [IDE](#) | [FORUM](#) | [WIKI](#) | [DESIGN SUPPORT](#) | [DOWNLOAD MPLABX](#) | [myMicrochip Login](#)

MPLAB Xpress Code Examples




Title	Author	Like	Watch	Import	Tags	Board	Device	Updated	Open	
Search		From	From	From	☐ #Getting Started ☐ ADC ☐ ADCC	Curiosity HPC Boar	q10	From		
		To	To	To				To		
Sensor Data Acquisition using ADCC		1	2	133	ADCC, Bluetooth, Mikro...	Curiosity HPC B...	PIC18F25Q10	01/11/2019	IDE	
LED Control using BLE Mobile App		0	2	80	#Getting Started, Blueto...	Curiosity HPC B...	PIC18F25Q10	01/11/2019	IDE	
RGB LED Control using Touch		1	2	89	ADCC, Capacitive Touc...	Curiosity HPC B...	PIC18F25Q10	07/16/2018	IDE	
ADC with Computational modes		0	1	75	ADCC, Hardware Limit T...	Curiosity HPC B...	PIC18F25Q10	07/16/2018	IDE	
How To Use the ADCC, Episode 1: Pot...		0	1	23	#Getting Started, ADC, ...	Curiosity HPC B...	PIC18F25Q10	06/13/2019	IDE	
Noise Suppression and ADCC Comput...		0	1	16		Curiosity HPC B...	PIC18F45Q10	06/18/2019	IDE	
DC motor control with capacitive touch...		0	0	15	ADCC, Capacitive Touc...	Curiosity HPC B...	PIC18F47Q10	06/06/2019	IDE	
How To Use the ADCC, Episode 2: Joys...		0	1	16	#Getting Started, ADC, ...	Curiosity HPC B...	PIC18F25Q10	06/13/2019	IDE	
IR communication using Core Indepen...		0	0	16	Configurable Logic Cell,...	Curiosity HPC B...	PIC18F47Q10	06/07/2019	IDE	
Vending machine using Configurable ...		0	0	10	Configurable Logic Cell,...	Curiosity HPC B...	PIC18F47Q10	06/06/2019	IDE	
IR communication using Core Indepen...		0	0	12	Configurable Logic Cell,...	Curiosity HPC B...	PIC18F47Q10	06/07/2019	IDE	
Gray code decoder		0	0	7	Configurable Logic Cell,...	Curiosity HPC B...	PIC18F47Q10	06/06/2019	IDE	

4. MPLAB® X Users Getting Started

4.1 MPLAB® X and MCC® with PIC18F47Q10 Curiosity Nano

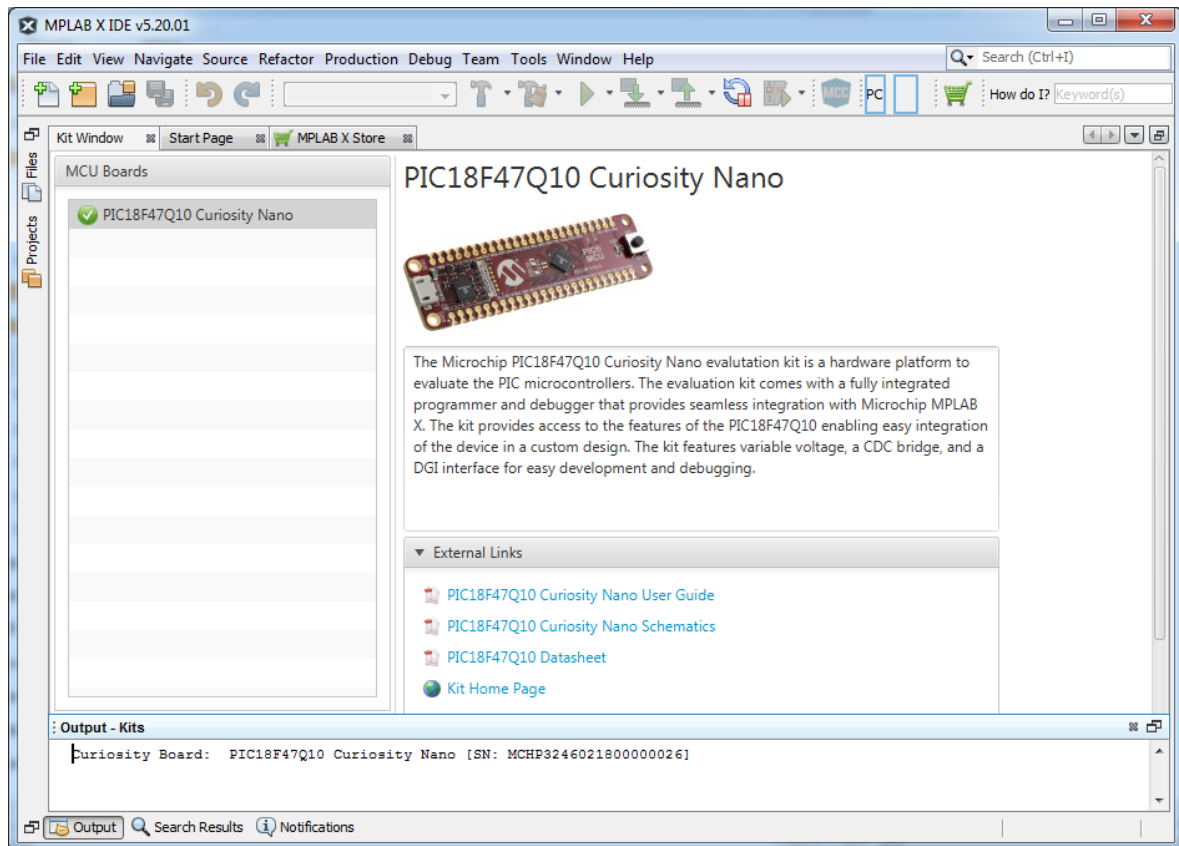
Prerequisites

- MPLAB® X IDE 5.20 or above installed
- Microchip Code Configurator (MCC®) 3.75 or above installed
- MPLAB XC8 Compiler 2.00 or above installed
- The PIC18F47Q10 Curiosity Nano Board connected to MPLAB X via the on-board USB connector, which is connected to the embedded debugger. The kit will be powered by the USB, and the embedded debugger will enable debugging and programming via the USB.

Workflow

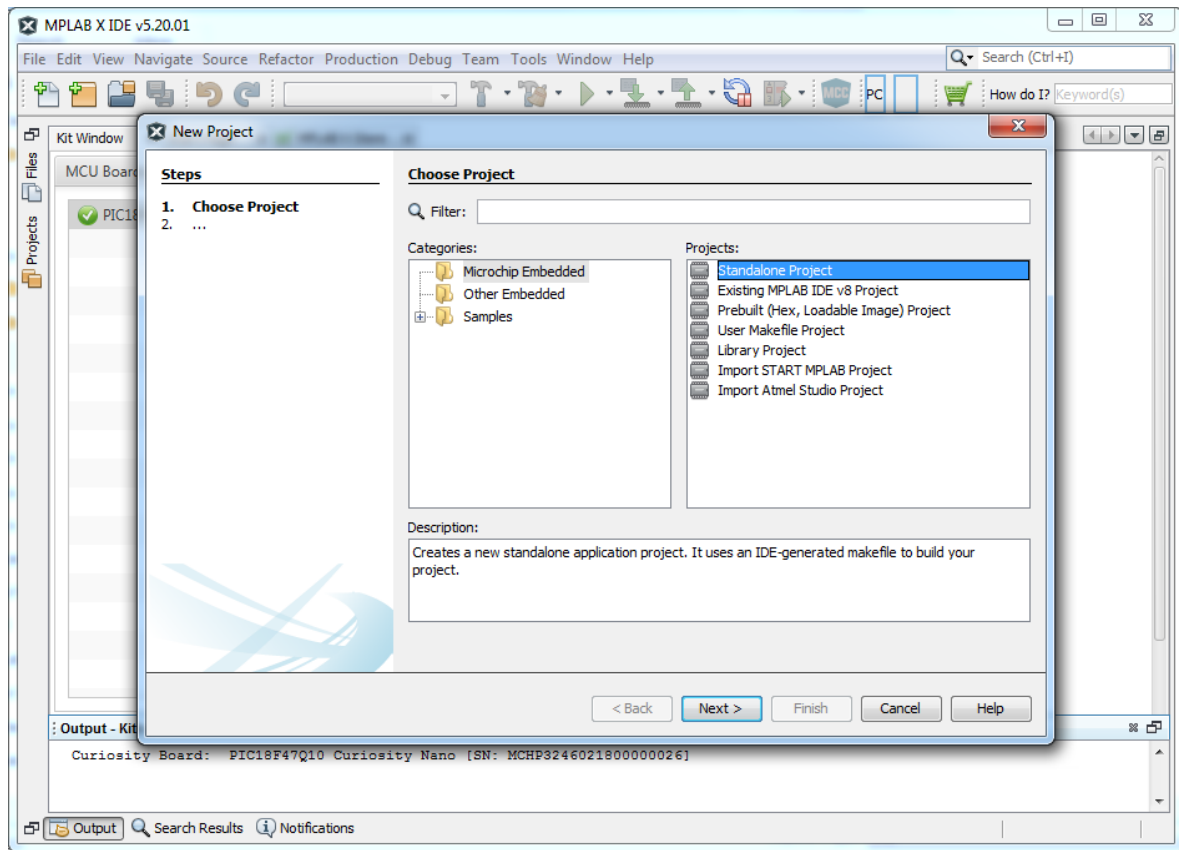
1. Launch MPLAB X.
2. The page shown in the figure below will appear in MPLAB X, when PIC18F47Q10 Curiosity Nano is connected via USB to the computer.

Figure 4-1. PIC18F47Q10 Curiosity Nano Page in MPLAB® X



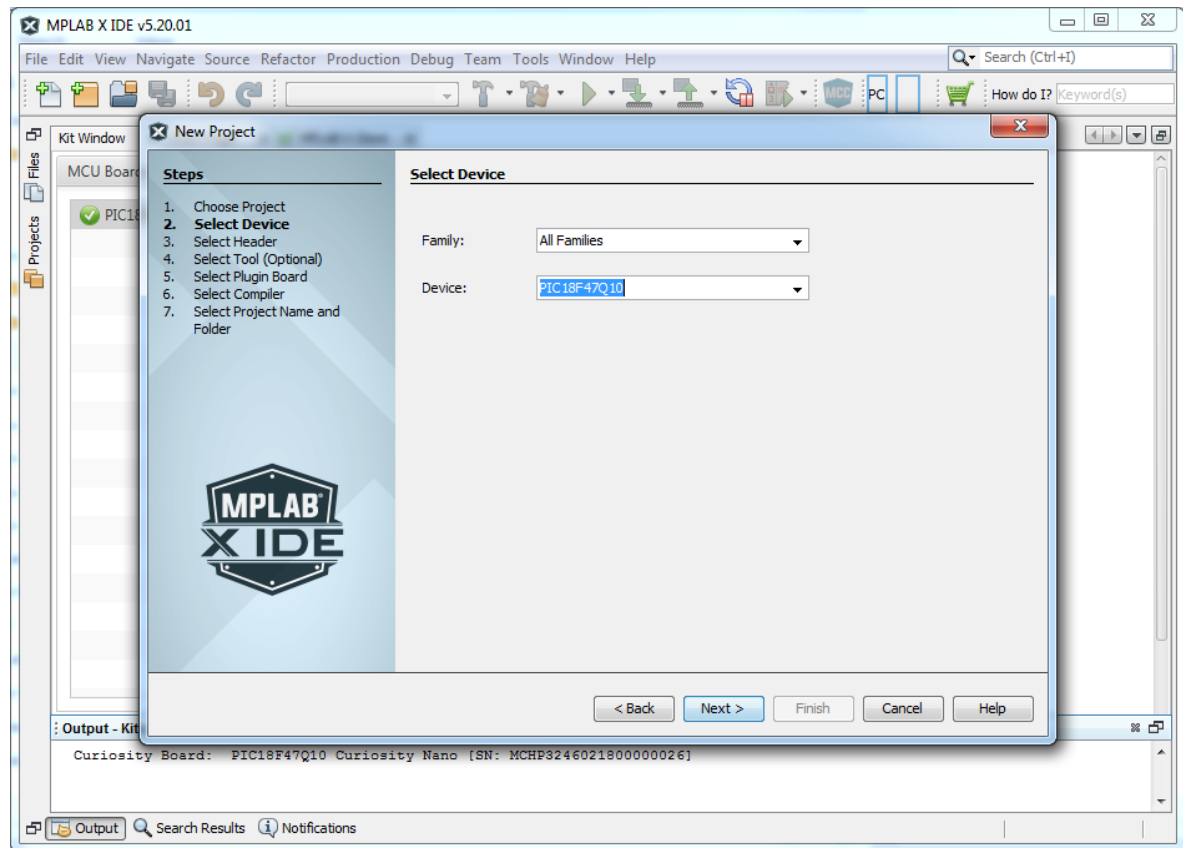
3. Start creating a new project by clicking *New* → *Project...* or by using the shortcut *Ctrl+Shift+N*, select *Standalone Project* and click **Next** as shown in the figure below.

Figure 4-2. Create New Project



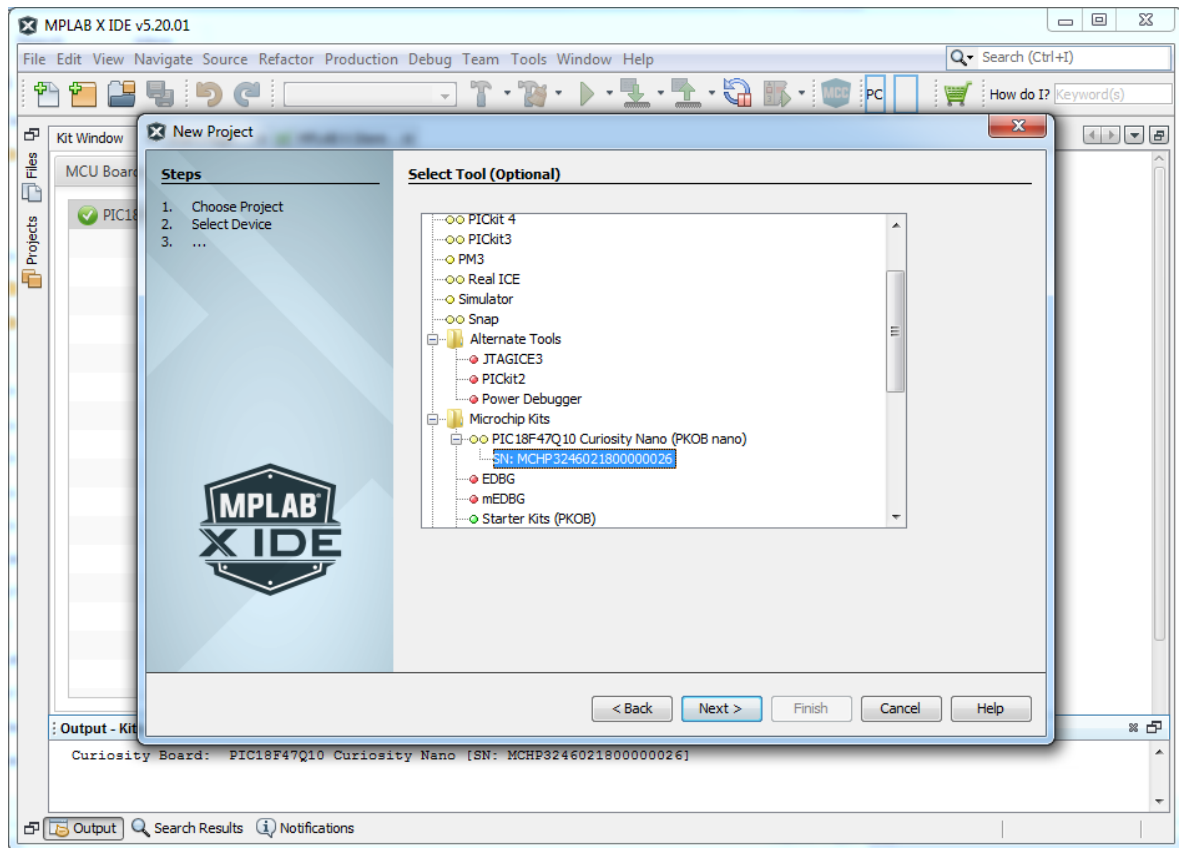
4. Enter the device, PIC18F47Q10, and click **Next**.

Figure 4-3. Select Device



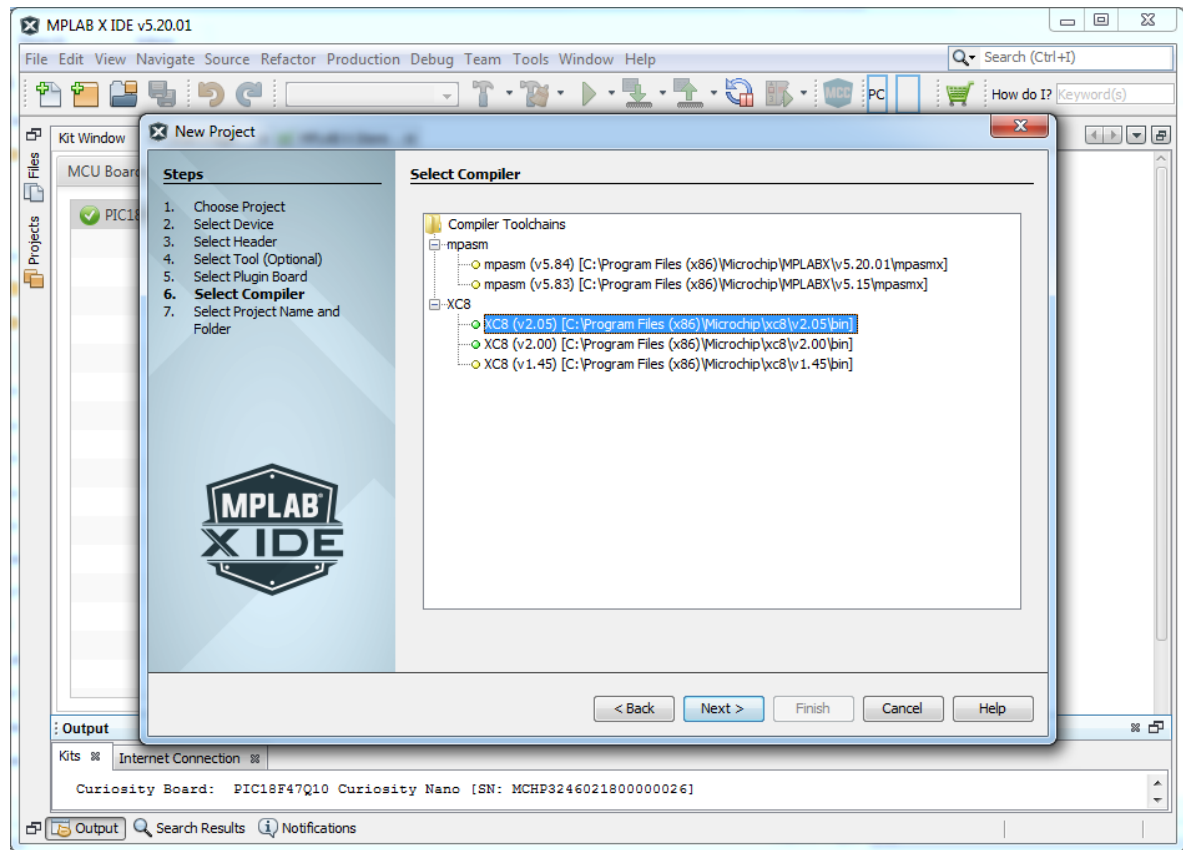
5. Select Tool by selecting PIC18F47Q10 Curiosity Nano under Microchip Kits, and click **OK**.
Note: The kit should be plugged in so the that this option is available.

Figure 4-4. Select Tool



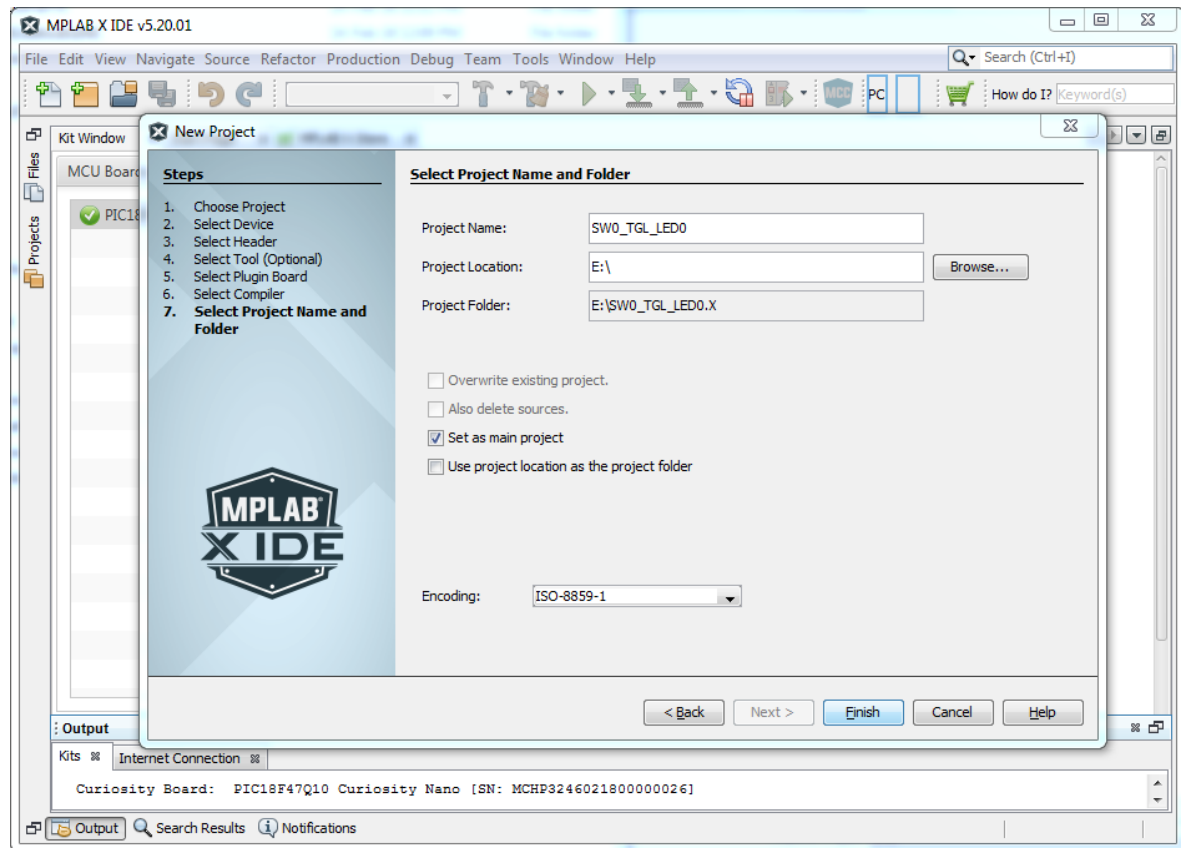
6. Select Compiler by selecting the appropriate XC8 compiler version, and click **OK**.

Figure 4-5. Select Compiler



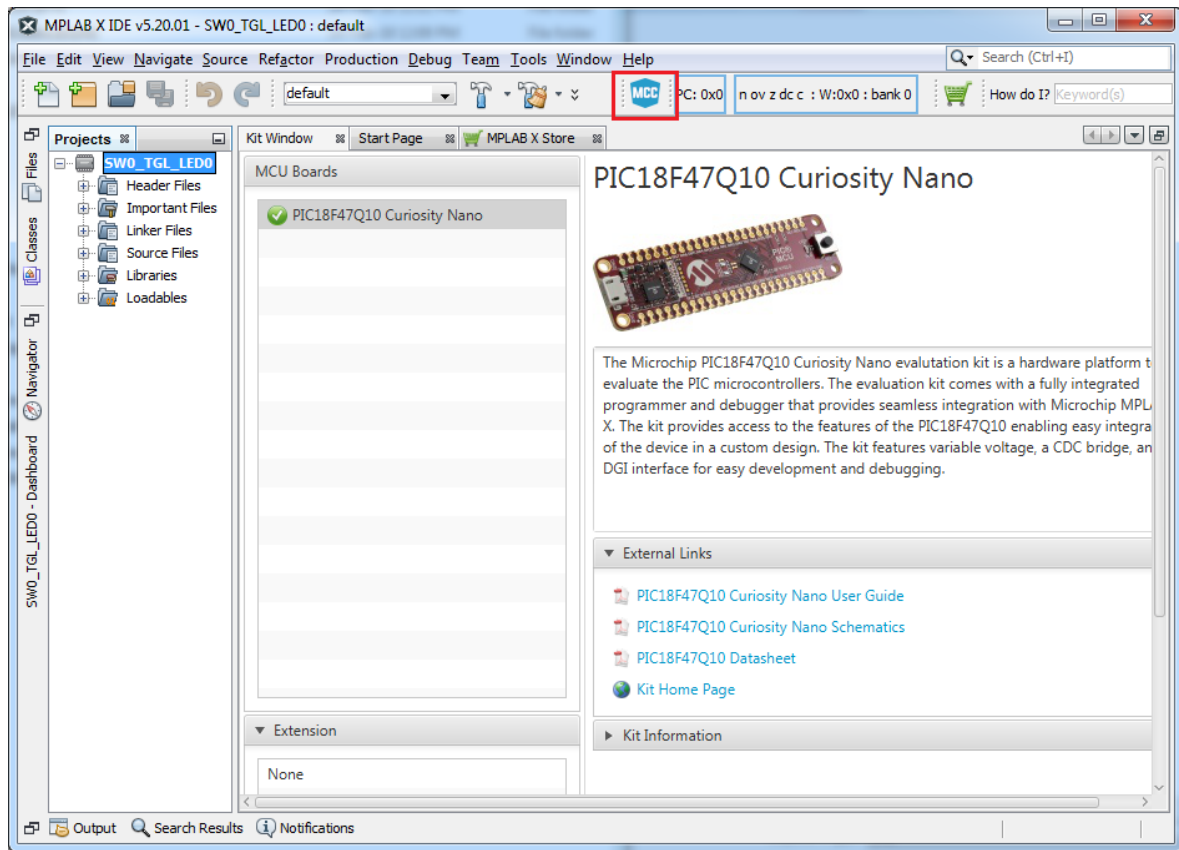
7. Provide the *Project Name* (for example **SW0_TGL_LED0**), *Project Location*, and click **OK**.

Figure 4-6. Project Name



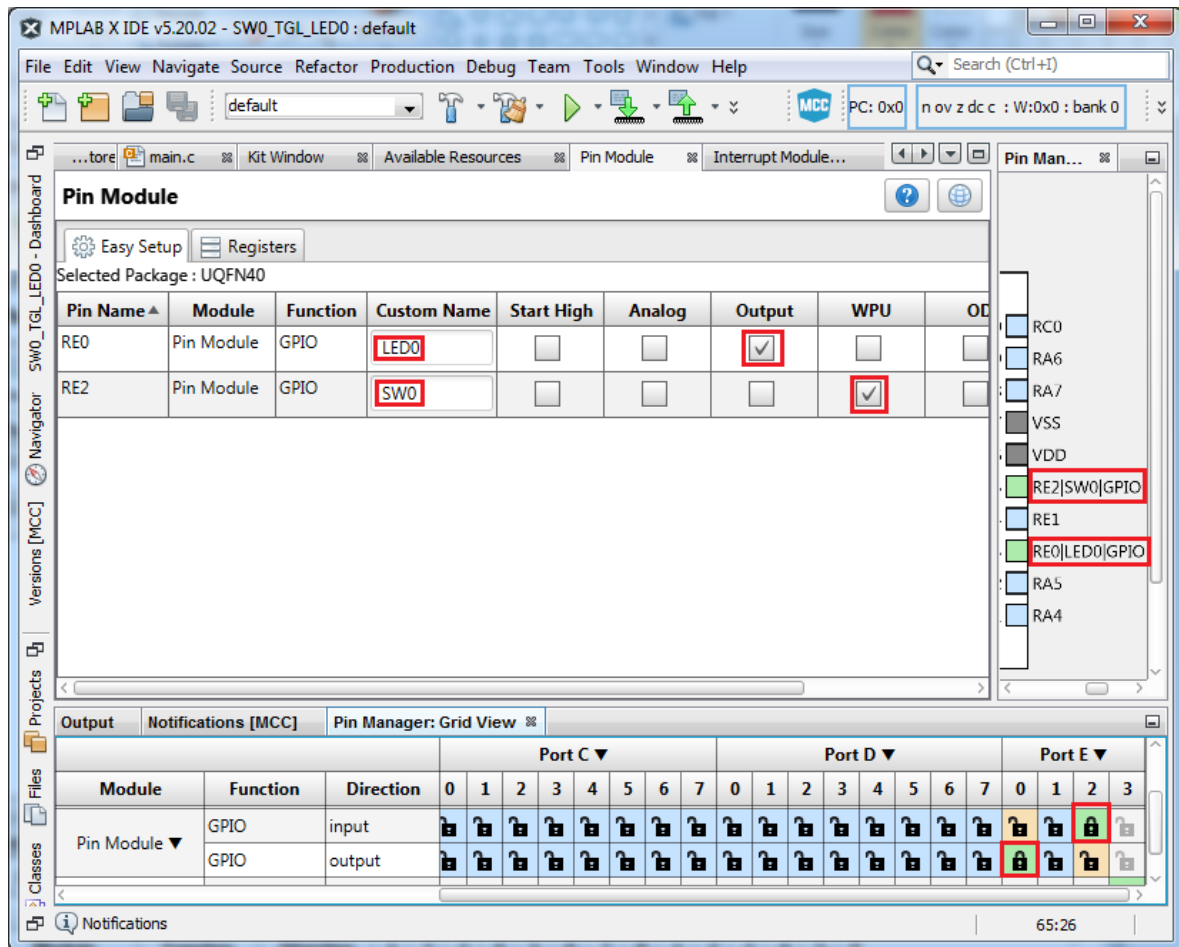
8. To initialize and configure the project, click on **MCC** icon as shown in the figure below.
Note: MCC is installed under *Tools* → *Plugin* → *Available Plugins*.

Figure 4-7. MCC Project Configuration



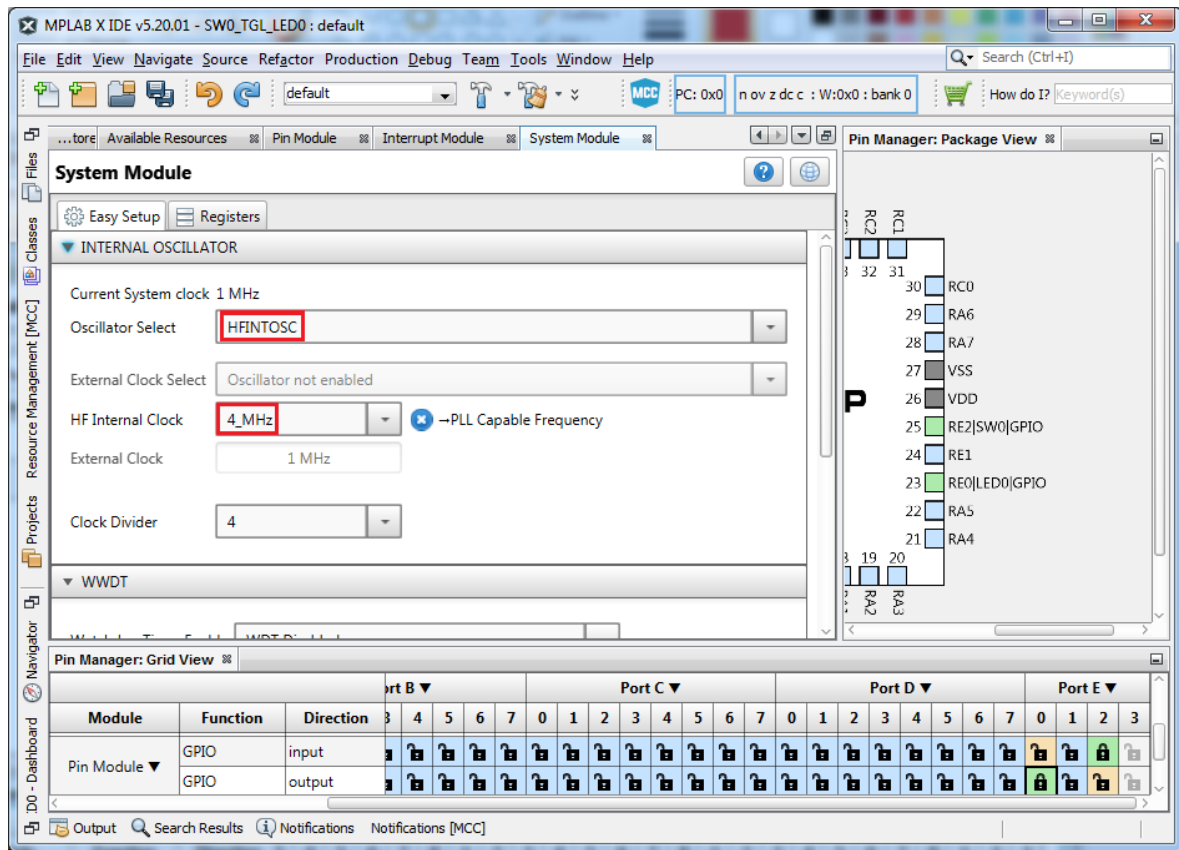
9. The GPIO configuration of the Button and LED with MCC are selected in the *Pin Manager* window and configured in the *Pin Module* window, as shown in the figure below. *Custom Name* for LED is **LED0**, and button is **SW0** - these names are used in the MCC generate function which will be called *main.c*
Note: The kit hardware user guide is used as reference where **RE0_LED0** pin is connected to *VCC* via diode and 1 k Ohm resistor, and **RE2_SW0** pin connected to *GND* via a switch and 1 k Ohm resistor.

Figure 4-8. MCC Pin Module



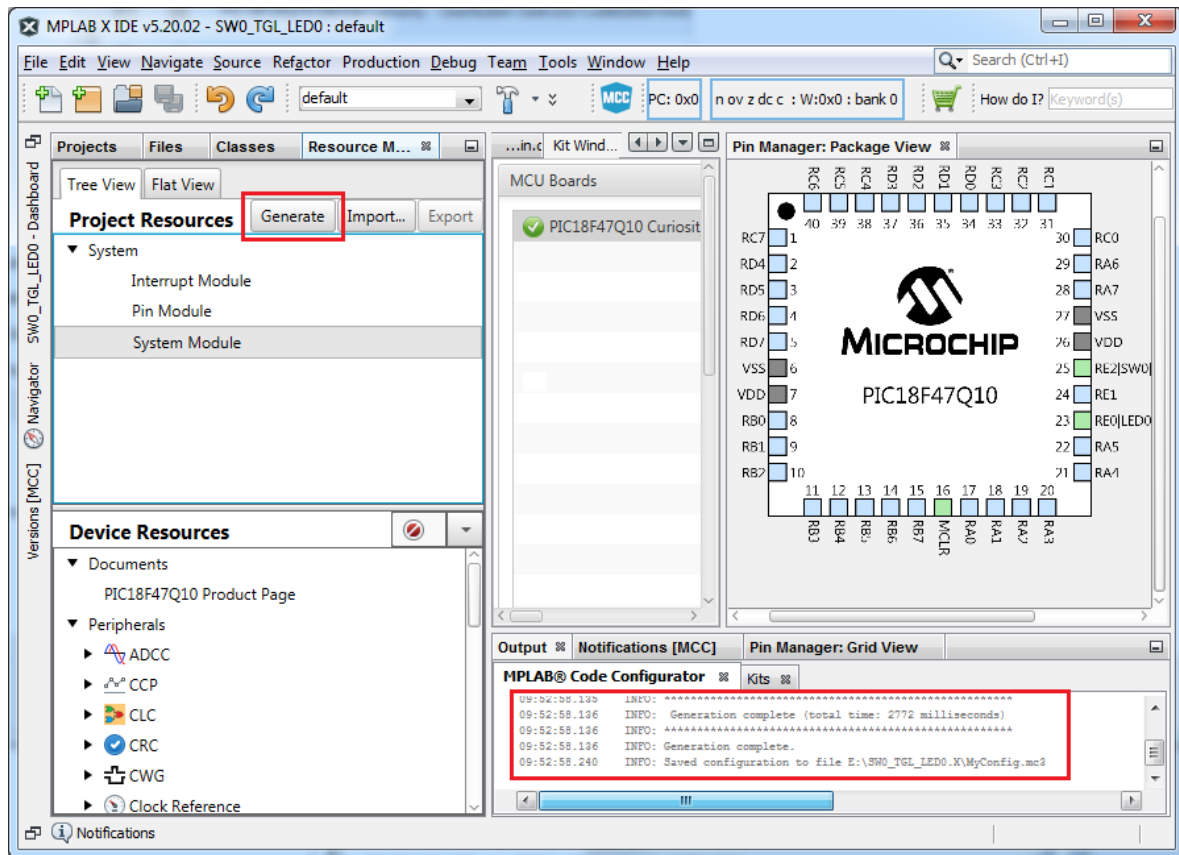
- The system clock configuration with MCC is set in the *System Module* window, by setting the *Oscillator Select* to **HFINTOSC** and *HF Internal Clock* to **4_MHz**, as shown in the figure below.

Figure 4-9. MCC Internal Oscillator



11. To generate the configured MCC project click on the **Generate** button under the *Resource Management* tab, as shown in the figure below. The output of the generate action is viewable in the *MPLAB Code Configurator* window.

Figure 4-10. MCC Generate Project

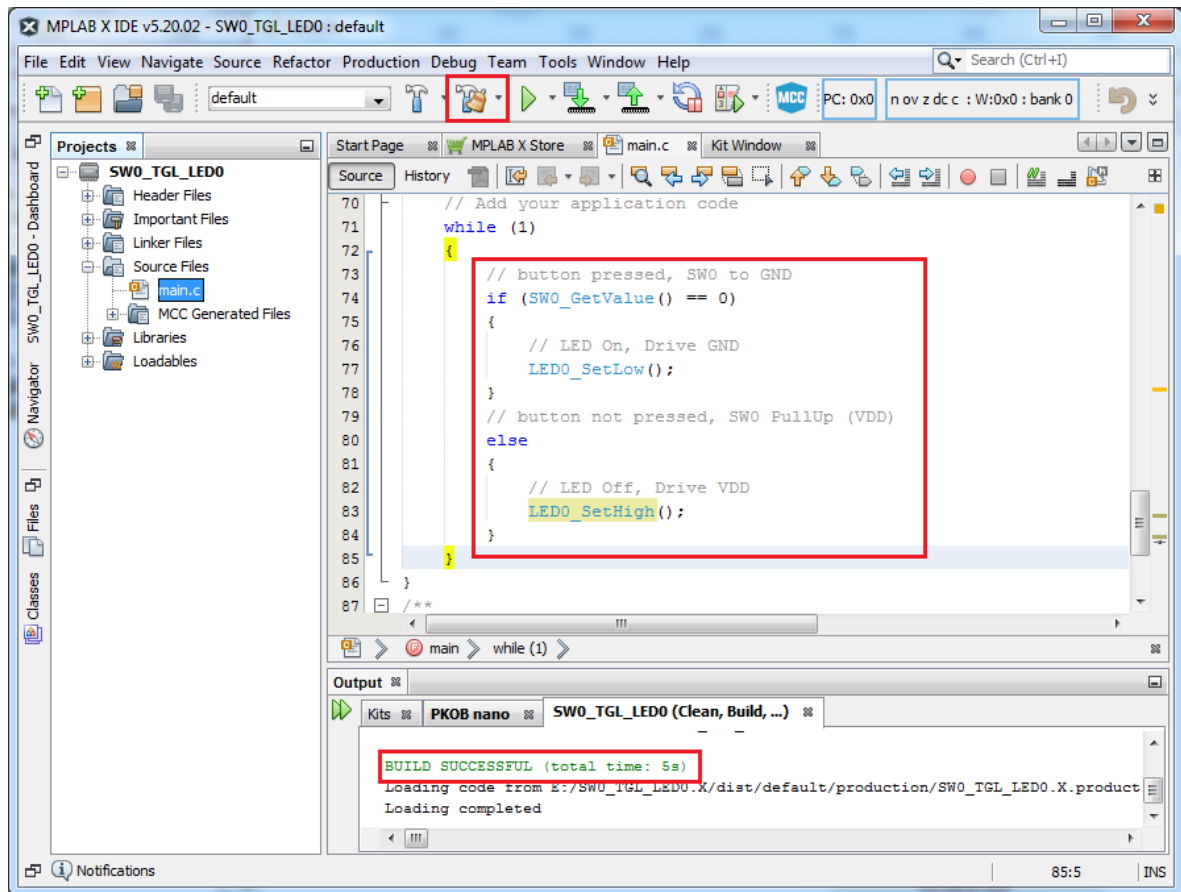


12. Adding the code to toggle the LED is done in the *main.c* file, located in the *Project* window under *Source Files* folder. Copy and paste the following code inside *While (1)* loop.

```
// button pressed, SW0 to GND
if (SW0_GetValue() == 0)
{
    // LED On, Drive GND
    LED0_SetLow();
}
// button not pressed, SW0 PullUp (VDD)
else
{
    // LED Off, Drive VDD
    LED0_SetHigh();
}
```

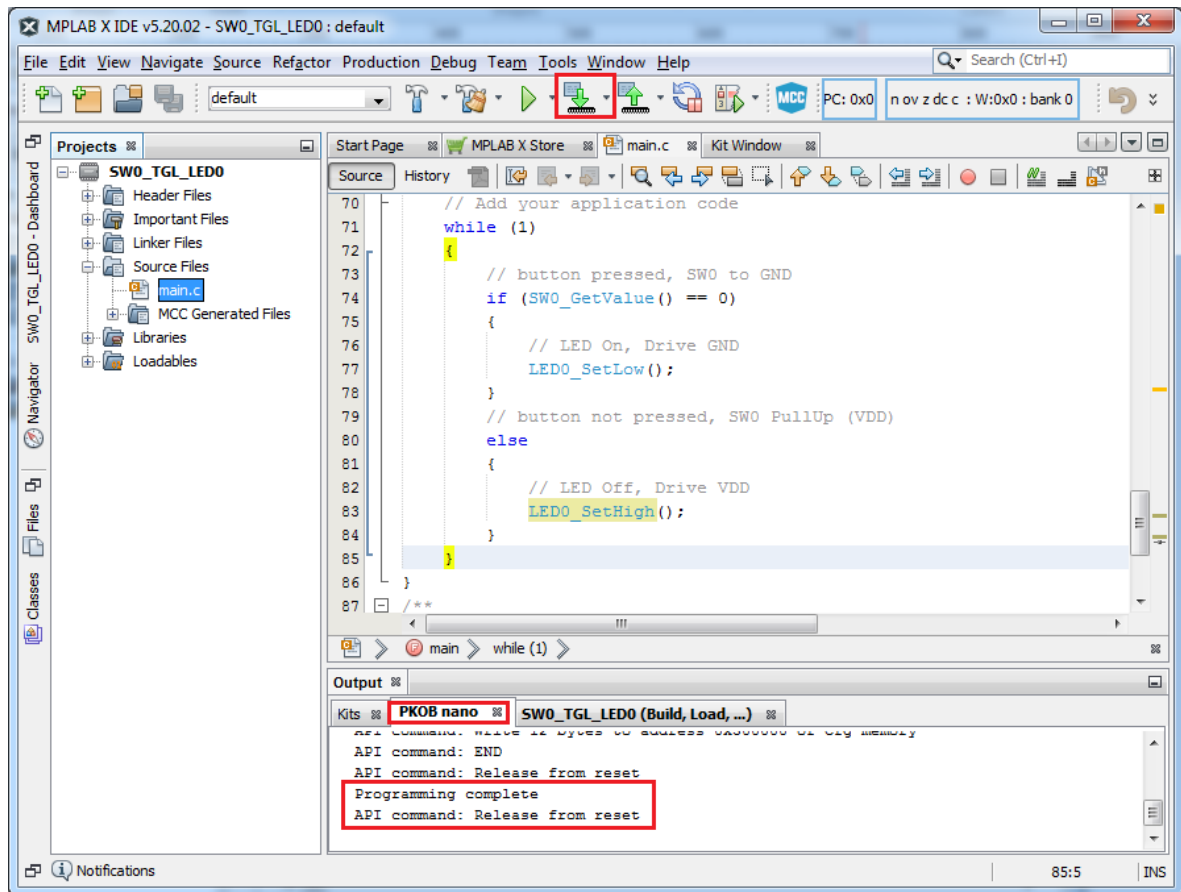
13. Build the project with the MCC changes, and *main.c*, by selecting *Production* → *Clean Build Main Project* or *shift + F11*, as show in the figure below.

Figure 4-11. MPLAB Project Build



14. Program the built project by right clicking on **SW0_TGL_LED0** and selecting *Make and Program Device*, or by selecting the *Make and Program Device Main Project*, as show in the figure below.

Figure 4-12. MPLAB Project Program



15. Verify that **LED0** is lit, and when **SW0** is pushed on the PIC18F47Q10 Curiosity Nano.

5. What's Next

For further information on related PIC® MCU products and Tools, refer to the links below:

<https://www.microchip.com/development-tools/>

IDE:

- MPLAB X IDE: <https://www.microchip.com/mplab/mplab-x-ide>
- MPLAB Xpress: <https://www.microchip.com/mplab/mplab-xpress>

Compilers:

- MPLAB XC: <https://www.microchip.com/mplab/compilers>

Configurators:

- MPLAB Code Configurator: <https://www.microchip.com/mplab/mplab-code-configurator>

Programmers/Debuggers:

- **MPLAB REAL ICD4:**
 - Documentation: <http://ww1.microchip.com/downloads/en/DeviceDoc/MPLAB%20ICD%204%20Users%20Guide%20DS50002596D.pdf>
 - Buy: <http://www.microchipdirect.com/product/search/all/DV164045>
- **MPLAB PICKit® 4:**
 - Documentation: <http://ww1.microchip.com/downloads/en/DeviceDoc/MPLAB%20PICKit%204%20ICD%20Users%20Guide%20DS50002751C.pdf>
 - Buy: <http://www.microchipdirect.com/product/search/all/PG164140>
- **MPLAB Snap:**
 - Documentation: <http://ww1.microchip.com/downloads/en/DeviceDoc/MPLAB%20Snap%20In-Circuit%20Debugger%20IS%20DS50002787A.pdf>
 - Buy: <http://www.microchipdirect.com/product/search/all/PG164100>

Production:

- MPLAB IPE: <https://www.microchip.com/IPE>

Other:

- Microchip Developers Help: <https://microchipdeveloper.com/8bit:start>
- Microchip Minutes MPLAB Xpress Editions: <https://www.youtube.com/playlist?list=PL9B4edd-p2ahx9dlcRqPndIWUDdDoi281>
- Application notes: Under device product page, application notes can be found under the documentation tab.
- Microchip Support Portal: <https://microchipsupport.force.com/>
 - Community Forum 8-bit PIC MCU: <https://www.microchip.com/forums/f515.aspx>
 - Technical Support Case : <https://microchipsupport.force.com/s/article/How-to-submit-a-case>
- Subscribe to Microchip YouTube channel: <https://www.youtube.com/user/MicrochipTechnology>
 - 8-bit PIC MCUs playlist: <https://www.youtube.com/playlist?list=PL1204684BD203E0DC>

6. Revision History

Doc. Rev.	Date	Comments
A	08/2018	Initial document release

The Microchip Website

Microchip provides online support via our website at <http://www.microchip.com/>. This website is used to make files and information easily available to customers. Some of the content available includes:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

Product Change Notification Service

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to <http://www.microchip.com/pcn> and follow the registration instructions.

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: <http://www.microchip.com/support>

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

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