



MICROCHIP

Regional Training Centers

Section 2

IDE, Compiler, MCC & Development Tools Introduction

MPLAB® X IDE

- ◆ New generation integrated Development Tools, Support PIC Series MCU, Provide Plug-in function to extend more advance function. Java Based, Cross platform, Current version is v5.10.
- ◆ The newest version (5.x) getting started to support AVR and SAM families. and newest tools, like ICD4, PICkit4 & Atmel ICE.



MPLAB XC16

- ◆ New Generation Compiler, Support all 16 Bits MCU (PIC24, dsPIC).
- ◆ Base on GNU C, apply GPL License (GNU General Public License).
- ◆ Provide standard C libraries (printf, strlen, etc..) and Peripheral Libraries (old versions).
- ◆ All version you can download from www.microchip.com/xc16



About XC Compiler Version

◆ There 4 different versions for XC Compiler:

◆ **Standard** (Standard Compiler Workstation License)

Charge. Provide Standard Optimizations function.
Save 20%~25% memory size (Max.).

◆ **Pro** (Pro Compiler Workstation License)

Charge. Provide Standard Optimizations function.
Save 50% memory size (Max.).

◆ **Lite**

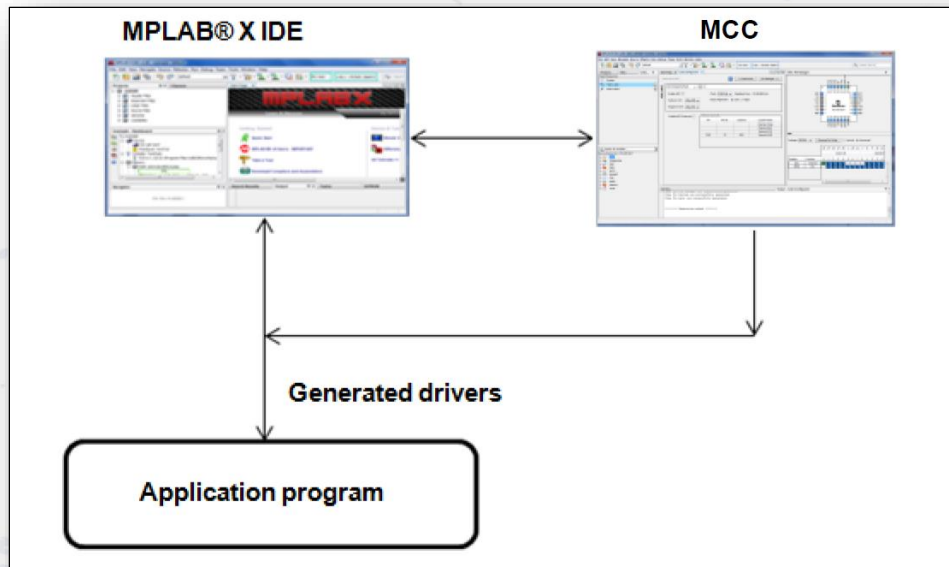
Free. Provide Basic Optimizations function (Level 1).

◆ **Evaluation**

Free. Provide Standard Optimizations function if you apply trial license.
Change to Lite version when license expires, automatically.

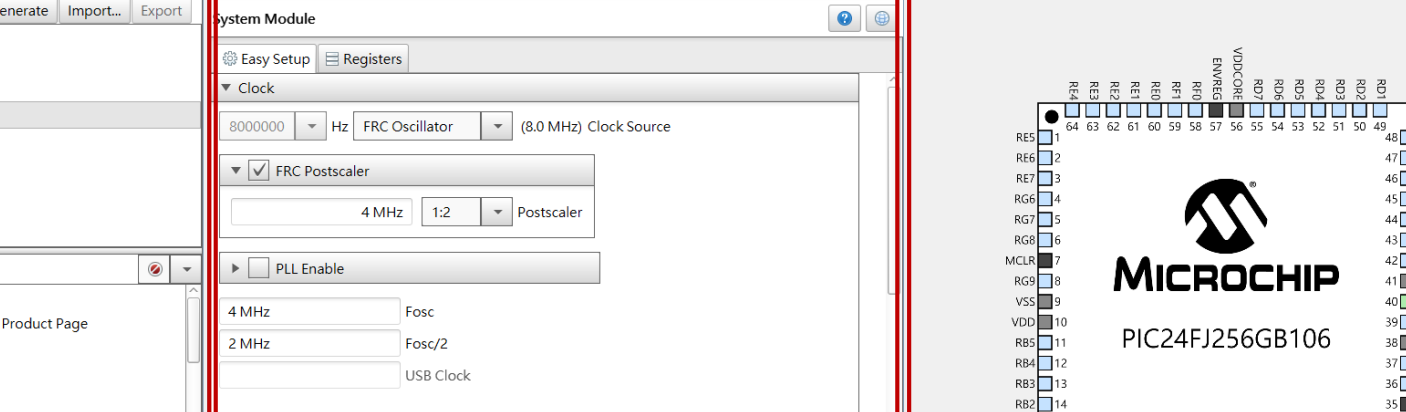
MPLAB® Code Configurator

- ◆ MCC (MPLAB Code Configurator) is a free, graphical programming environment that generates seamless, easy-to-understand C code to be inserted into your project.
- ◆ Supports 8-bit, 16-bit and 32-bit PIC® microcontrollers.



MCC Quick View

Operating Areas



The screenshot displays the MPLAB IDE interface with three main windows highlighted by red boxes and labeled with yellow callouts:

- Resources:** The left-hand pane shows the "Project Resources" tree. Under "Device Resources", the "PIC24FJ256GB106 Product Page" is selected. Below this, the "Versions" pane lists the "MPLAB® Code Configurator (Plugin) v3.66" and a list of libraries, including "Microchip Technology, Inc." and "Microcontrollers and Peripherals".
- Composer:** The central window displays the "System Module" configuration. The "Clock" section is expanded, showing the "FRC Oscillator" set to 8,000,000 Hz (8.0 MHz). The "FRC Postscaler" is set to 4 MHz with a 1:2 ratio. The "PLL Enable" checkbox is checked. The "Clock Output Pin Configuration" is set to "OSCO functions as CLKO (FOSC/2)".
- Pin Manager:** The right-hand pane shows the "Pin Manager: Package View" for the PIC24FJ256GB106. It displays a pin diagram with pin numbers and names, including VDDCORE, ENVBREG, RD0, RD1, RD2, RD3, RD4, RD5, RD6, RD7, RD8, RD9, RD10, RD11, RD12, RD13, RD14, RD15, RD16, RD17, RD18, RD19, RD20, RD21, RD22, RD23, RD24, RD25, RD26, RD27, RD28, RD29, RD30, RD31, RD32, RD33, RD34, RD35, RD36, RD37, RD38, RD39, RD40, RD41, RD42, RD43, RD44, RD45, RD46, RD47, RD48, RD49, RD50, RD51, RD52, RD53, RD54, RD55, RD56, RD57, RD58, RD59, RD60, RD61, RD62, RD63, RD64, RD65, RD66, RD67, RD68, RD69, RD70, RD71, RD72, RD73, RD74, RD75, RD76, RD77, RD78, RD79, RD80, RD81, RD82, RD83, RD84, RD85, RD86, RD87, RD88, RD89, RD90, RD91, RD92, RD93, RD94, RD95, RD96, RD97, RD98, RD99, RD100, RD101, RD102, RD103, RD104, RD105, RD106, RD107, RD108, RD109, RD110, RD111, RD112, RD113, RD114, RD115, RD116, RD117, RD118, RD119, RD120, RD121, RD122, RD123, RD124, RD125, RD126, RD127, RD128, RD129, RD130, RD131, RD132, RD133, RD134, RD135, RD136, RD137, RD138, RD139, RD140, RD141, RD142, RD143, RD144, RD145, RD146, 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RD290, RD291, RD292, RD293, RD294, RD295, RD296, RD297, RD298, RD299, RD300, RD301, RD302, RD303, RD304, RD305, RD306, RD307, RD308, RD309, RD310, RD311, RD312, RD313, RD314, RD315, RD316, RD317, RD318, RD319, RD320, RD321, RD322, RD323, RD324, RD325, RD326, RD327, RD328, RD329, RD330, RD331, RD332, RD333, RD334, RD335, RD336, RD337, RD338, RD339, RD340, RD341, RD342, RD343, RD344, RD345, RD346, RD347, RD348, RD349, RD350, RD351, RD352, RD353, RD354, RD355, RD356, RD357, RD358, RD359, RD360, RD361, RD362, RD363, RD364, RD365, RD366, RD367, RD368, RD369, RD370, RD371, RD372, RD373, RD374, RD375, RD376, RD377, RD378, RD379, RD380, RD381, RD382, RD383, RD384, RD385, RD386, RD387, RD388, RD389, RD390, RD391, RD392, RD393, RD394, RD395, RD396, RD397, RD398, RD399, RD400, RD401, RD402, RD403, RD404, RD405, RD406, RD407, RD408, RD409, RD410, RD411, RD412, RD413, RD414, RD415, RD416, RD417, RD418, RD419, RD420, RD421, RD422, RD423, RD424, RD425, RD426, RD427, RD428, RD429, RD430, RD431, RD432, RD433, RD434, RD435, RD436, RD437, RD438, RD439, RD440, RD441, RD442, RD443, RD444, RD445, RD446, RD447, RD448, RD449, RD450, RD451, RD452, RD453, RD454, RD455, RD456, RD457, RD458, RD459, RD460, RD461, RD462, RD463, RD464, RD465, RD466, RD467, RD468, RD469, RD470, RD471, RD472, RD473, RD474, RD475, RD476, RD477, RD478, RD479, RD480, RD481, RD482, RD483, RD484, RD485, RD486, RD487, RD488, RD489, RD490, RD491, RD492, RD493, RD494, RD495, RD496, RD497, RD498, RD499, RD500, RD501, RD502, RD503, RD504, RD505, RD506, RD507, RD508, RD509, RD510, RD511, RD512, RD513, RD514, RD515, RD516, RD517, RD518, RD519, RD520, RD521, RD522, RD523, RD524, RD525, RD526, RD527, RD528, RD529, RD530, RD531, RD532, RD533, RD534, RD535, RD536, RD537, RD538, RD539, RD540, RD541, RD542, RD543, RD544, RD545, RD546, RD547, RD548, RD549, RD550, RD551, RD552, RD553, RD554, RD555, RD556, RD557, RD558, RD559, RD560, RD561, RD562, RD563, RD564, RD565, RD566, RD567, RD568, RD569, RD570, RD571, RD572, RD573, RD574, RD575, 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RD719, RD720, RD721, RD722, RD723, RD724, RD725, RD726, RD727, RD728, RD729, RD730, RD731, RD732, RD733, RD734, RD735, RD736, RD737, RD738, RD739, RD740, RD741, RD742, RD743, RD744, RD745, RD746, RD747, RD748, RD749, RD750, RD751, RD752, RD753, RD754, RD755, RD7

MCC Quick View

System Module

Easy Setup | Registers

▼ Clock

8000000 Hz FRC Oscillator (8.0 MHz) Clock Source

☒ FRC Postscaler

4 MHz 1:2 Postscaler

☐ PLL Enable

4 MHz Fosc

2 MHz Fosc/2

USB Clock

Clock Output Pin Configuration OSCO functions as CLKO (FOSC/2)

☐ Use Secondary Oscillator (31 - 33) kHz

Enable Clock Switching

Pin Manager: Package View

PIC24FJ256GB106

System clock Graphically.
Configuration Word settings
are more clear and simple.

MCC Quick View

MPLAB X IDE v5.10 - test : default

File Edit View Navigate Source Refactor Production Debug Team Tools Window Help

Project Resources Generate Import... Export

▼ System

- Interrupt Module
- Pin Module
- System Module

Device Resources

▼ Documents

- PIC24FJ256GB106 Product Page

▼ Peripherals

- ADC
- CTMU
- CVR
- Comparator

test - Dashboard Navigator Versions [MCC] x

Versions

- MPLAB® Code Configurator (Plugin) v3.66

▼ Libraries

- Microchip Technology, Inc.
 - Microcontrollers and Peripherals
 - 8-bit AVR MCUs (v1.1.0)
 - AVR-IoT WG Sensor Node (v1.0.0)
 - MCP19XXX (v1.1)
 - PIC10 / PIC12 / PIC16 / PIC18 MCUs (v1.75)
 - PIC24 / dsPIC33 / PIC32MM MCUs (v1.85)
 - PIC32MX MCUs (v1.35)

Pin Manager: Grid View x Start Page x Pin Module x Interrupt Module x System Modu... Pin Manager: Package View x

Package: QFN64 Pin No: 16 15 14 13 12 11 17 18 21 22 23 24 27 28 29

Module	Function	Direction	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Clock ▼	CLKI	input															
	CLKO	output															
	OSCI	input															
	OSCO	output															
	SOSCI	input															
ICD ▼	PGCx	input															
	PGDx	input															
Pin Module ▼	GPIO	input															
	GPIO	output															

Port B ▼

Package View

MICROCHIP

PIC24FJ256GB106

Pin assign Graphically.
PPS Code generate automatically.

MCC Quick View

Interrupt Manager

Module	Interrupt	Description	IRQ Nu...	Enabled	Priority
Pin Module	CNI	CN - Change Notifica...	19	<input type="checkbox"/>	1
TMR2	T1	T2 - Timer2	7	<input checked="" type="checkbox"/>	1
TMR2	TNI	T3 - Timer3	8	<input type="checkbox"/>	1
TMR1	T1	T1 - Timer1	3	<input checked="" type="checkbox"/>	1
ADC1	ADI	ADC1 - A/D Converte...	13	<input checked="" type="checkbox"/>	1

Interrupt assign Graphically.
ISR related code generate automatically.

MCC Quick View

More ?

www.microchip.com/mcc

MPLAB® PICKit™ 4

Debugger/Programmer Probe

- ◆ Fast programming, increased functionality, at the same price as its predecessor.
- ◆ The MPLAB® PICKit™ 4 In-Circuit Debugger/Programmer allows fast and easy debugging and programming of **PIC®**, **dsPIC®**, and **CEC** flash microcontrollers.
- ◆ An additional **micro SD** card slot and the ability to be self-powered from the target means you can take your code with you and **Program on To Go**.



Tools Download

- At this courses, you should install MPLAB X IDE, MCC & XC16 Compiler for all hands-on exercises.

✎ MPLAB X IDE v5.10, MCC v3.66, XC16 v1.35.

- You can download development tools from below link.

http://www.microchip.com.tw/Data_CD/

開發軟體, 編譯器

MPLAB® X IDE	v5.10 Windows(Local) Windows Version Linux Version Mac Version Detail Info.
MPLAB® IDE	v8.92(Local)
MPLAB® XC8	v1.45(Local) *Peripheral libraries not include
• Part Support Patch Files	v1.45b(Local)
• Peripheral Libraries	v2.00RC3(Local) v1.34(Local)
MPLAB® XC16	v1.35(Local) *Peripheral libraries not include
• Part Support Patch Files	v1.35(Local)
• Peripheral Libraries	v2.00(Local)
MPLAB® XC32	v1.34(Local)
• Part Support Patch Files	
• Peripheral Libraries	

MPLAB® X IDE Plug-in

MPLAB® Code Configurator	v3.66(Local) v3.65.1(Local) v3.65(Local) v3.55.1(Local) v3.36(Local) v3.26.4(Local) v3.25(Local) v3.16(Local) v3.15(Local) v3.05(Local) v2.25.2(Local)
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Tools Install

- ◆ **For MPLAB X IDE & XC16 Compiler installation, it's very easy. You just need next, next, next then finished.**
- ◆ **For MCC installation, it's a X IDE plug-in, you need install MPLAB X IDE before MCC.**
- ◆ **There are two way to install MCC.**
 - ◆ On Line Installation.
 - ◆ Off Line Installation.

MCC Installation



On Line Installation

a Menu

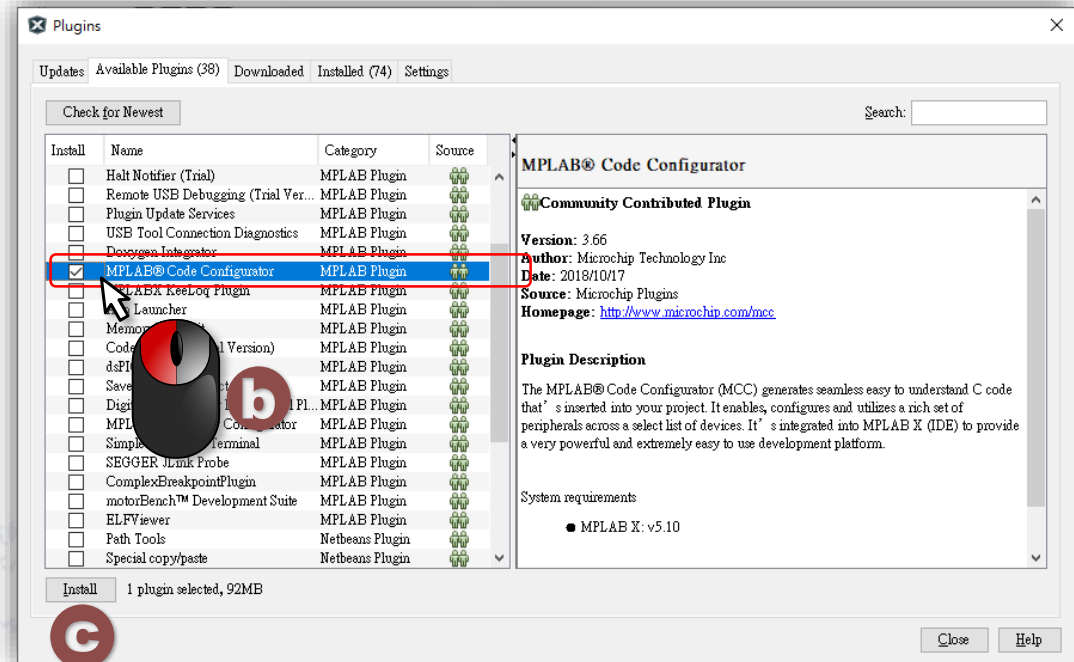
- Tools ► Plugins
- Available Plugins

b Select

- MPLAB Code Configurator

c Select ►

Install



MCC Installation



Off Line Installation

a Menu

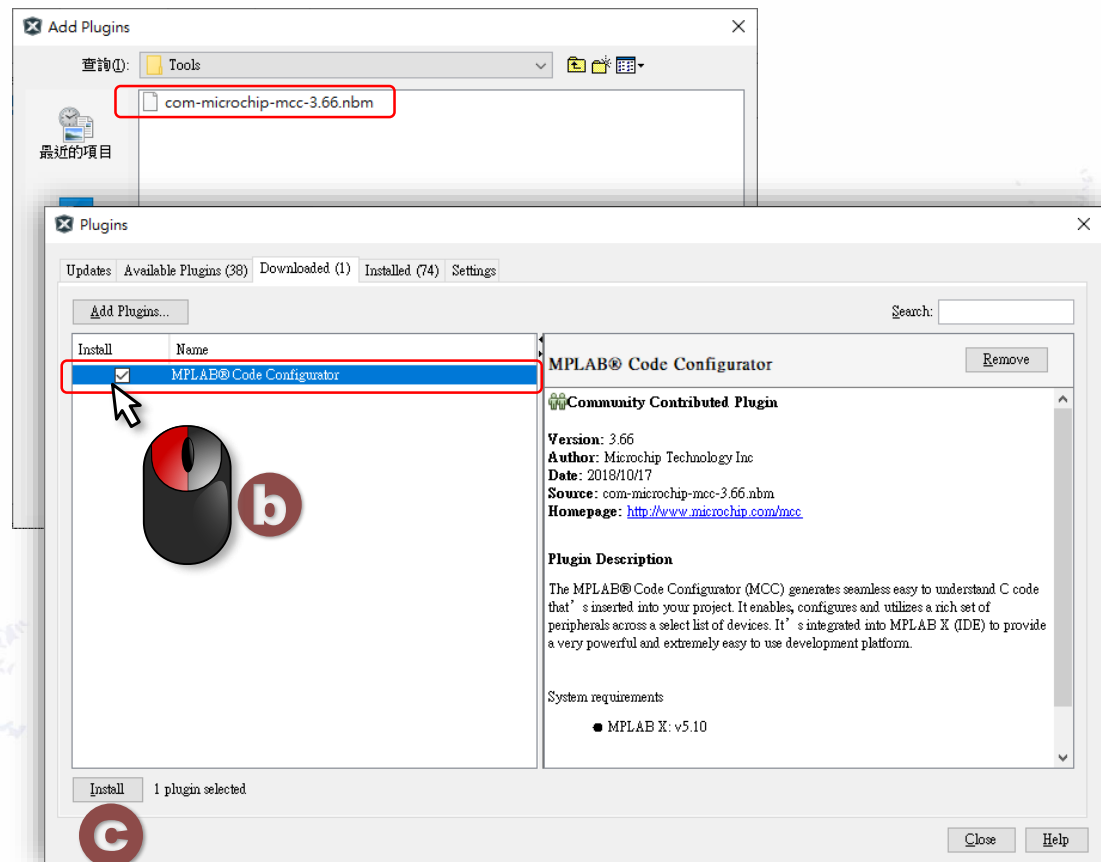
- Tools ► Plugins
- Download

b Select

- Add Plugins
- Select mccxxx.nbm

c Select►

Install



MPLAB XC16's Data Type

- ◆ Data type is first thing you need know, about compiler.
- ◆ **The same data type has different definition at different platforms.**

Integer Data Type

Type	Bits	Min	Max
char, signed char	8	-128	127
unsigned char	8	0	255
short, signed short	16	-32768	32767
unsigned short	16	0	65535
int, signed int	16	-32768	32767
unsigned int	16	0	65535
long, signed long	32	-2^{31}	$2^{31} - 1$
unsigned long	32	0	$2^{32} - 1$
long long**, signed long long**	64	-2^{63}	$2^{63} - 1$
unsigned long long**	64	0	$2^{64} - 1$
** ANSI-89 extension			

Float Data Type

Type	Bits	E Min	E Max	N Min	N Max
float	32	-126	127	2^{-126}	2^{128}
double*	32	-126	127	2^{-126}	2^{128}
long double	64	-1022	1023	2^{-1022}	2^{1024}

E = Exponent

N = Normalized (approximate)

* double is equivalent to long double if -fno-short-double is used.

Thinking !!

- What kind differ when same code execute at different platform?

```
unsigned int i = 0;  
main()  
{  
    for( i= 0 ; i < 100000 ; i++ );  
    // Here ?  
}
```



<http://www.qmo.tw/security20180108027>

