# Reference Manual

## Mpression Cyclone 10 LP Starter Kit

Revision 1.0

2017/12

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# Index

# 1. For Ensuring Safe Use

Be sure to follow the instructions given in this Manual which are intended to prevent harm to the user and others as well as material damage.

## 1.1 Legend

| | |
|---|---|
| **Danger** | Indicates an imminent hazardous situation which if not avoided will result in death or serious injury. |
| **Warning** | Indicates a potentially hazardous situation which if not avoided could result in death or serious injury. |
| **Caution** | Indicates a potentially hazardous situation which if not avoided may result in minor or moderate injury or in property damage. |

## 1.2 Cautions

| | |
|---|---|
| **Danger** | Make sure to use the AC adapter (included in package) that is specified in this Manual.<br>Using an AC adapter not meeting the specifications described in this Manual will cause the kit to emit heat, explode, or ignite. |
| **Warning** | Do not apply strong impacts or blows to the kit.<br>Doing so may cause the kit to emit heat, explode, or ignite, or the equipment in the kit to fail or malfunction. This may also cause fire. |
| | Do not put the main unit or the AC adapter in cooking appliances such as microwave ovens, or high-pressure containers.<br>Doing so might cause the main unit or AC adapter to emit heat, explode, ignite, or emit smoke, or its parts to break or warp. |
| | Do not wrap the main unit that is in use with cloth or other materials that are likely to allow heat to build up inside the wrapping.<br>This will cause heat to build up inside the wrapping which may cause the main unit to ignite or malfunction. |
| | When disposing of the main unit, do not dispose of it along with general household waste.<br>Throwing the main unit into fire may cause it to explode. Dispose of the main unit following the laws, regulations, and ordinances governing waste disposal.<br>Do not use the kit in places subject to extremely high or low temperatures or severe temperature changes.<br>Doing so may cause the kit to fail or to malfunction.<br>Always be sure to use the kit in a temperatures ranging from 5°C to 35°C and a humidity range of 0% to 85%. |

| | |
|---|---|
| **Warning** (Continued from previous page) | Do not pull the power supply cable with excessive force or place heavy items on it.<br>Do not damage, break, bundle, or tamper with the power supply cable.<br>Damaged parts of the power supply cable might cause a short circuit resulting in fire or accidents involving electrical shock. |
| | Do not unplug the power plug with wet or moist hands.<br>This might cause injuries or equipment malfunctions or failures due to electrical shock. |
| | Plug the power plug securely into the outlet.<br>If the power plug is not securely plugged into the outlet, it may cause accidents involving electrical shock or fire due to heat emitted. |
| | Do not connect many electrical cords to a single socket or connect an AC adapter to an outlet that is not rated for the specified voltage.<br>Failing to do so may cause the equipment to malfunction or fail, or lead to accidents involving electrical shock or fire due to heat emitted. |
| | Periodically remove any dust accumulated on the power plug and around the outlet (socket).<br>Do not use a power plug with dust accumulated on it because doing so will lead to insulation failure due to moisture which may lead to fire.<br>Remove any dust on the power plug and around the outlet with dried cloth. |
| | Do not place any containers such as cups or vases filled with water or other liquid on this Board.<br>If this Board is exposed to water or other liquids it may cause the Board to malfunction or lead to accidents involving electrical shock. If you spilled water or other liquid on this Board, immediately stop using the Board, turn off the power, and unplug the power plug. If you have any requests for repairs or technical consultation, please contact the Manufacturer. |
| **Caution** | Do not place the kit on unstable places such as shaky stands or tilted locations.<br>Doing so may cause injuries or cause this Board to malfunction if the Board should fall. |
| | Do not attempt to use or leave the kit in places subject to strong direct sunlight or other places subject to high temperatures such as in cars in hot weather.<br>Doing so might cause the kit to emit heat, break, ignite, run out of control, warp, or malfunction.<br>Also, some parts of the equipment might emit heat causing burn injuries. |
| | Unplug the power supply cable when carrying out maintenance of devices in which the main unit is embedded.<br>Failure to do so may lead to accidents involving electrical shock. |
| | Do not place this Board in locations where excessive force is applied to the Board.<br>Failure to do so may cause the PC board to warp, leading to breakage of the PC board, missing parts or malfunctioning parts. |
| | When using the kit together with expansion boards or other peripheral devices, be sure to carefully read each of their manuals and to use them correctly.<br>Manufacturer does not guarantee the operation of specific expansion boards or peripheral devices when used in conjunction with this Board unless they are specifically mentioned in this Manual or their successful operation with this Board has been confirmed in separate documents. |

| | |
|---|---|
| **Caution** (Continued from previous page) | Be sure to turn off the power switch when moving this Board to connect to other devices.<br>Failure to do so may cause this Board to fail or lead to accidents involving electrical shock. |
| | Do not clean this Board by using a rag containing chemicals such as benzine or thinner.<br>Failure to do so will likely to cause this Board to deteriorate. When using a chemical cloth be sure to comply with any directions or warnings. |
| | Do not immediately turn on the power if you find that water or moisture had condensed onto the main unit after removing the board from the package.<br>Condensation might occur on this Board when taking it out of the box, if the board is cool yet the room temperature is warm.<br>Do not apply power to the Board while water or moisture has condensed on it because the moisture may cause the Board to break or may shorten the service life of the parts.<br>When you first take this Board out of the box be sure to leave it at room temperature for a while before using it. If condensation or moisture has occurred on this Board, first wait for the moisture to fully evaporate before installing or connecting the Board to other devices. |
| | Do not disassemble, dismantle, modify, alter, or recycle parts unless they are clearly described as customizable in this Manual.<br>Although this kit is customizable, if parts not specified in this Manual as customizable are modified in any way, then the overall product operation cannot be guaranteed.<br>Please consult with Manufacturer beforehand if you wish to customize or modify any parts that are not described in this Manual as customizable. |

## 1.3 Developer Information

The Developer of this product is:
Macnica Galaxy.
14F, 207-5, Sec. 3, Peihsin Rd., Hsintien Dist., New Taipei, Taiwan, R.O.C.
http://www.gfec.com.tw/

## 1.4 Inquiries

In case you have any inquiries about the use this product, please contact your local Macnica company or make inquiries through the contact form in the following web site:
http://www.m-pression.com/contact

Macnica companies:

- China & HK: Cytech Technology http://www.cytech.com/
- ASEAN & India: Cytech Global http://www.cytechglobal.com/
- Taiwan: Galaxy Far East Corp. http://www.gfec.com.tw/
- North America: Macnica Americas http://www.macnica-na.com/
- Brazil: Macnica DHW http://www.macnicadhw.com.br/en/
- Japan: Altima http://www.altima.co.jp
  Elsena http://www.elsena.co.jp

# 2. 使用簡介

## 2.1 Content

- Altera Cyclone 10 LP Starter Kit
- Mini USB Power Cable
- USB Download Cable (選購)

## 2.2 Attention

- 當您拿到本實驗板後，請確認盒內東西是否完整
- 本實驗板擴充 I/O 電壓最多只能接受 3.3V 的信號，若不甚燒毀 IC（10CL010U256C8N），需向本公司購買此 IC 並自行焊接處理

## 2.3 Feature

本實驗板是專門為 Altera Cyclone 10 LP Device Family 訂製的模擬板，若針對數位設計有興趣者可利用此實驗板模擬與實現自己想要的東西，本實驗板內建的 FPGA 為 10CL010U256C8N，此 IC 提供 10K LEs，46 Block M9K memory，18 x 18 Multiplier，2 個 PLL。詳細的資料與規格可至 Altera Web Sit 取得 (http://www.altera.com)。

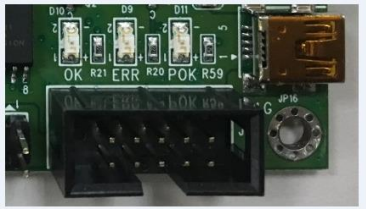
除了 10CL010U256C8N 這顆 IC 之外，本實驗板還有提供一些週邊零件連接至 10CL010U256C8N 供大家使用，使用者可配合這些零件快速的完成一個數位邏輯設計。

## 2.4 週邊零件

- 8 Bits DIP Switch
- 4 Push Buttons
- 8 LEDs
- 1 Oscillator IC ( 100MHz，50MHz，24MHz )
- 2 Extension I/O Connectors
- 4 個七段顯示器
- 72 GPIO

## 2.5 Power Up

將 Mini USB Power Cable 插至 JP16 , LED D11 將亮起



## 2.6 軟體安裝

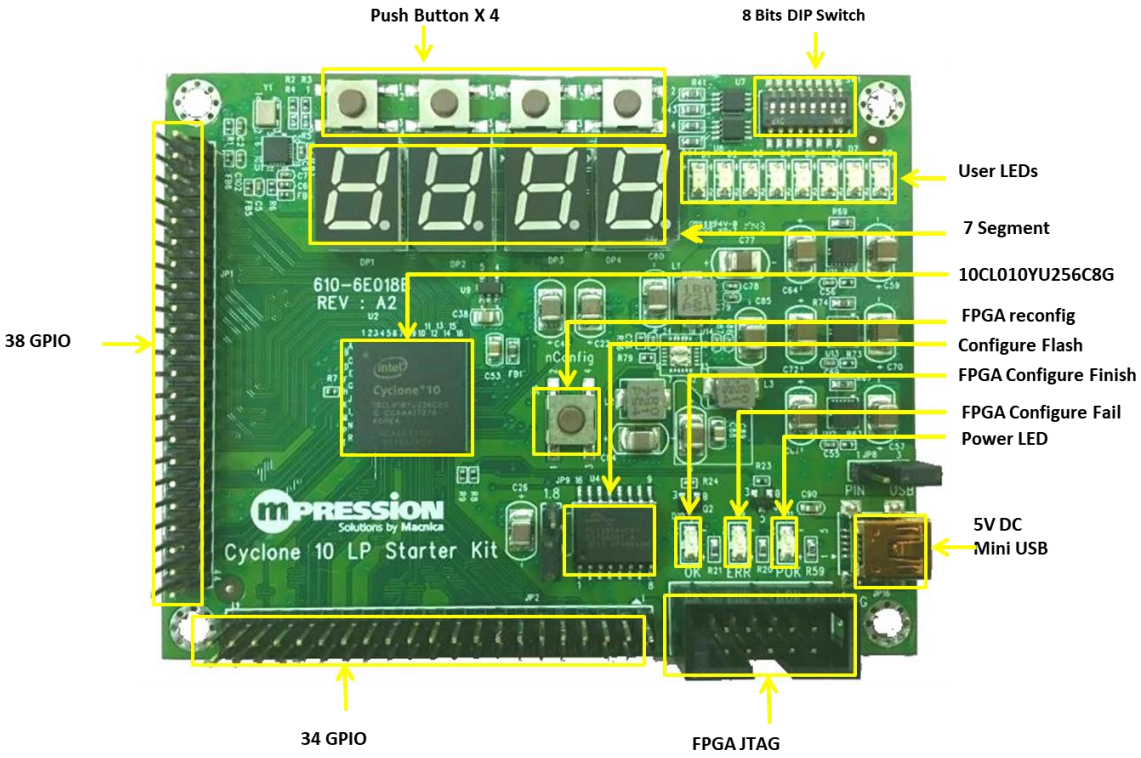
本實驗板需使用 Intel Quartus Prime Lite Edition 17.0 之後的版本 ,軟體可至 Altera 網頁下載
詳細之軟體操作步驟可參考 Quartus Prime Handbook

## 2.7 保固

在正常使用下，本實驗板提供 30 天的保固期

# 3. 周邊配備之詳細資料

## 3.1 外觀圖




## 3.2 8 Bits DIP Switch (SW1)

本實驗板提供 8 bits DIP Switch，當 Switch 切至"ON"時，Cyclone 10 LP Device I/O 將為 Low，其中 8 bits DIP Switch 的信號接腳和 Cyclone 10 LP Device 的 I/O 關係可參考下表

| 裝置 | 8 Bits DIP Switch | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Switch 代號 | DIP1 | DIP2 | DIP3 | DIP 4 | DIP 5 | DIP 6 | DIP 7 | DIP 8 |
| Cyclone 10 LP 腳位 | R16 | P15 | P16 | N16 | L13 | M12 | K12 | L14 |

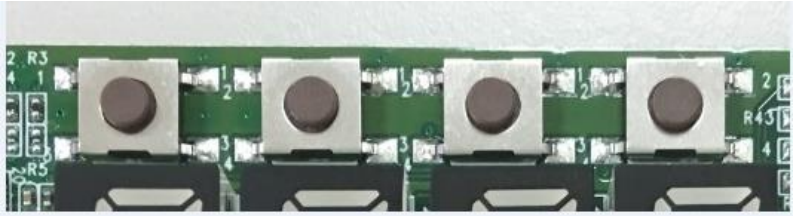
備註：ON 為低準位，OFF 為高準位

## 3.3 Push Button (S1 , S3 , S2 , S1)

本實驗板提供 4 個 Push button 當按下此按鍵時，將提供 Low 的信號給 Cyclone 10 LP，不按時，此接腳將 Pull-High，其中 Push Button 的信號接腳和 Cyclone 10 LP Device 的 I/O 關係可參考下表

| 裝置 | 4 Push Button | | | |
|---|---|---|---|---|
| Push Button 代號 | S1 | S3 | S2 | S4 |
| Cyclone 10 LP 腳位 | L16 | K15 | J11 | J16 |

備註：按下時為低準位，不按時為高準位

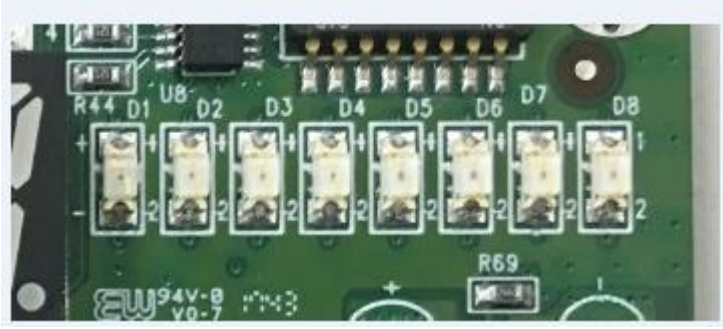



## 3.4 LED (D1~D8)

當 Cyclone 10 LP 送出 Low 的信號時，LED 將亮起 ,其中 8 個 LED 的信號接腳和 Cyclone 10 LP Device 的 I/O 關係可參考下表。

| 裝置 | 8 LEDs | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LED 代號 | D1 | D2 | D3 | D 4 | D 5 | D 6 | D 7 | D 8 |
| Cyclone 10 LP 腳位 | J15 | J12 | J13 | D16 | G16 | F13 | F15 | B16 |

備註：低準位 LED 亮，高準位 LED 不亮

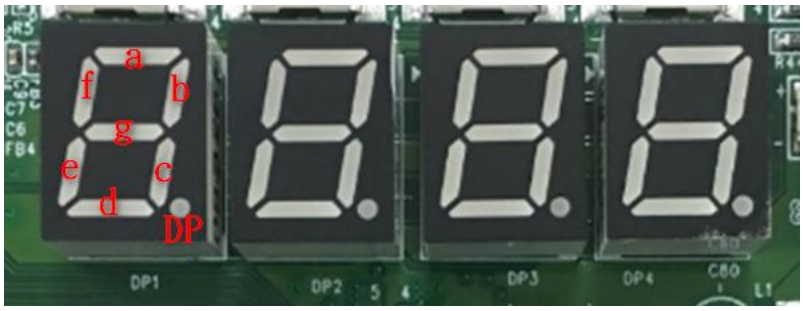


## 3.5 七段顯示器

| 裝置 | 七段顯示器 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Segment pin 代號 | A | B | C | D | E | F | G | DP |
| Cyclone 10 LP 腳位 | A2 | A5 | E8 | D14 | E6 | D8 | F10 | F9 |

| 裝置 | 七段顯示器 | | | |
|---|---|---|---|---|
| Common pin 代號 | DP1 | DP2 | DP3 | DP4 |
| Cyclone 10 LP 腳位 | F11 | D9 | F7 | D3 |

備註：當 Common pin 為高準位時，表示啟動其中一組七段顯示器
當 Segment pin 為低準位時，表示點亮那一段 LE




## 3.6 Clock

本實驗板提供 1 個 IDT 的振盪器 IC，此 IC 可輸出 clock 24MH，50MHz，100MHz 送至 Cyclone 10 LP Device.

| Clock | 24 MHz | 50 MHz | 100 MHz |
|---|---|---|---|
| Cyclone 10 LP 腳位 | M16 | M15 | E2 |

## 3.7 JP9 Vcc I/O Voltage

本實驗板提供 2 個 I/O 擴充連接器，其中有些 I/O Pin 的 VCC I/O 是可調的(3.3V or 1.8V )。I/O Pin 的輸出電壓配合使用者的需求，這些 Pin 分別是 Cyclone 10 LP Bank 2，Bank 3，Bank 4，可調電壓的範圍為，1.8V ，3.3V 。其它的 I/O Bank 是固定的 VCC I/O，電壓為 3.3V

# 3.8 Extension I/O Connectors(JP1 , JP2)

Cyclone 10 LP 提供一般 I/O pin，本實驗板擴充 I/O 部分分別連接 JP1，JP2
，禁止最高超過 3.3V 的信號連接至此連接器

| JP1 | Cyclone 10 LP Pin | JP1 | Cyclone 10 LP Pin |
|---|---|---|---|
| 1(GND) | | 2(GND) | |
| 3 | E16 | 4 | A13 |
| 5 | E15 | 6 | B13 |
| 7 | A12 | 8 | A11 |
| 9 | B12 | 10 | B11 |
| 11 | A10 | 12 | A9 |
| 13 | B10 | 14 | B9 |
| 15 | A8 | 16 | A7 |
| 17 | B8 | 18 | B7 |

| JP1 | Cyclone 10 LP Pin | JP1 | Cyclone 10 LP Pin |
|---|---|---|---|
| 19 | A6 | 20 | A4 |
| 21 | B6 | 22 | B4 |
| 23(GND) | | 24(GND) | |
| 25 | B1 | 26 | C2 |
| 27 | D4 | 28 | F5 |
| 29 | D1 | 30 | F3 |
| 31 | G2 | 32 | J1 |
| 33 | K2 | 34 | K1 |
| 35 | L2 | 36 | K6 |
| 37 | L4 | 38 | L3 |
| 39 | N2 | 40 | N1 |
| 41 | P1 | 42 | R1 |
| 43(GND) | | 44(GND) | |

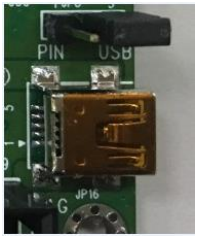
| JP2 | Cyclone 10 LP Pin | JP2 | Cyclone 10 LP Pin |
|---|---|---|---|
| 1(5V Power input) | | 2(5V Power input) | |
| 3(GND) | | 4(GND) | |
| 5 | L10 | 6 | T15 |
| 7 | M10 | 8 | P14 |
| 9 | L9 | 10 | R13 |

| | | | |
|---|---|---|---|
| 11 | N11 | 12 | T12 |
| 13 | N9 | 14 | R12 |
| 15 | K9 | 16 | T11 |
| 17 | K8 | 18 | P11 |
| 19 | L8 | 20 | T10 |
| 21(GND) | | 22(GND) | |
| 23 | M8 | 24 | R10 |
| 25 | L7 | 26 | R9 |
| 27 | P6 | 28 | N8 |
| 29 | N5 | 30 | R7 |
| 31 | M6 | 32 | R6 |
| 33 | R4 | 34 | R5 |
| 35 | P3 | 36 | T3 |

| JP2 | Cyclone 10 LP Pin | JP2 | Cyclone 10 LP Pin |
|---|---|---|---|
| 37 | N3 | 38 | T2 |
| 39 | M2 | 40 | M1 |
| 41(GND) | | 42(GND) | |

## 3.9 Power

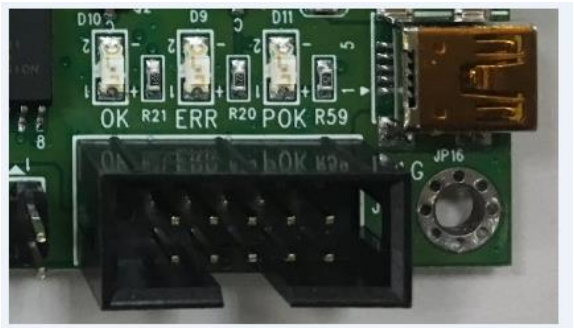
本實驗板已經內建的電壓調節器，電源部分可利用本實驗板所提供的 Mini USB Cable 直接插入 JP16 即可，當您有電源輸入時， LED D11(POK)將同時亮起。




另外使用者也可從 JP2 輸入外接工作電源(5V)，只要將 JP8 切到 PIN(JP2 的 Pin 1、2，為 EXT_Power 的輸入 Pin)

## 3.10 JTAG Connector

Altera Cyclone 10 LP Device 有提供 ISP (In System Programming) 功能，您可加購本公司的 USB DownLoad Cable，一邊插至電腦的 USB 埠，另一邊插至 J2，再利用 Altera 專用軟體 Quartus Prime，即可將資料下載至本實驗板。

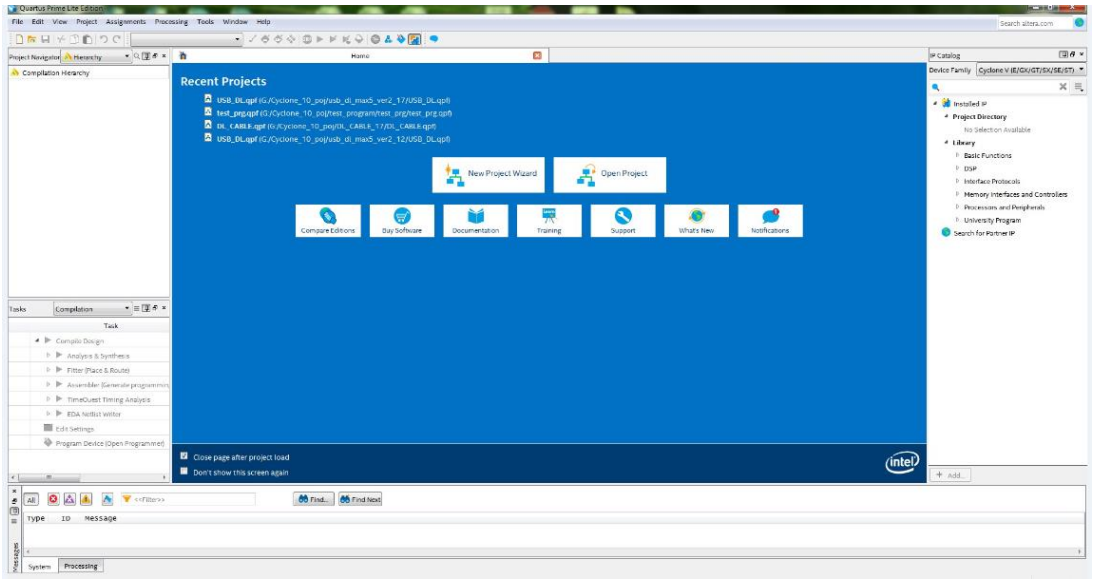



## 3.11 Status LED

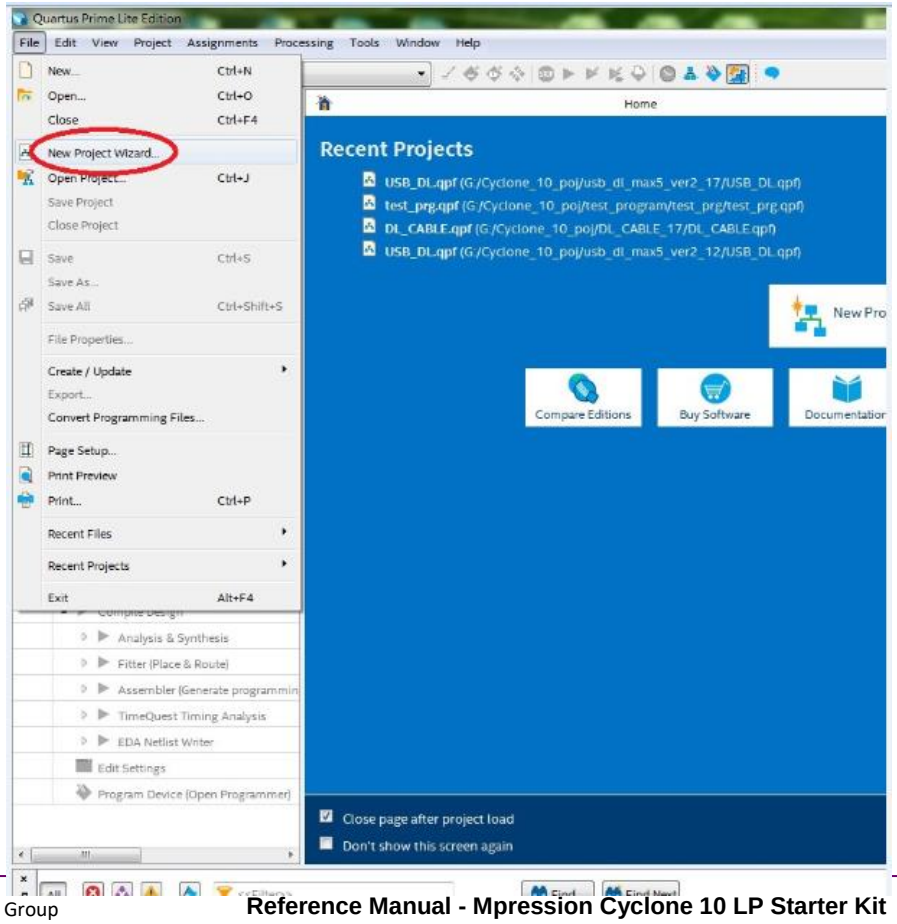
D10 ：FPGA Configure Finish
D9 ：Configure Fail
D11 ：Power LED

# 4. 建立新的專案,程式編譯並進行 FPGA Configure

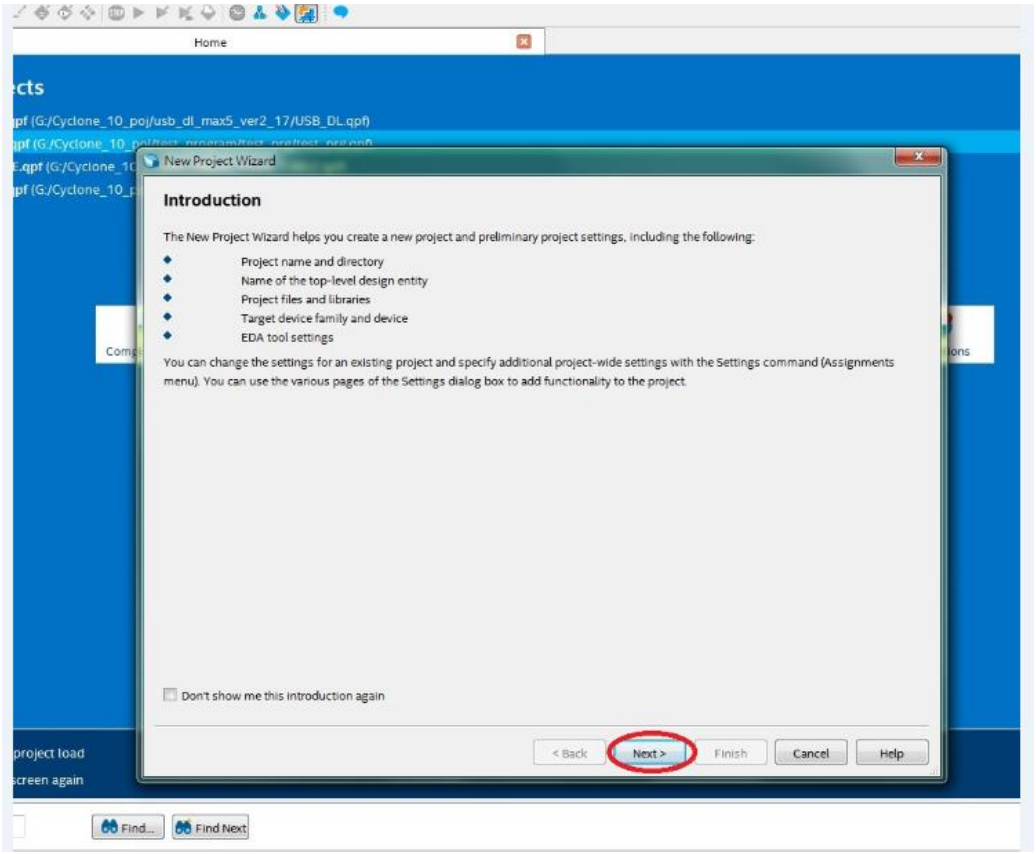
1. 打開 Quartus II prime Lite Edition



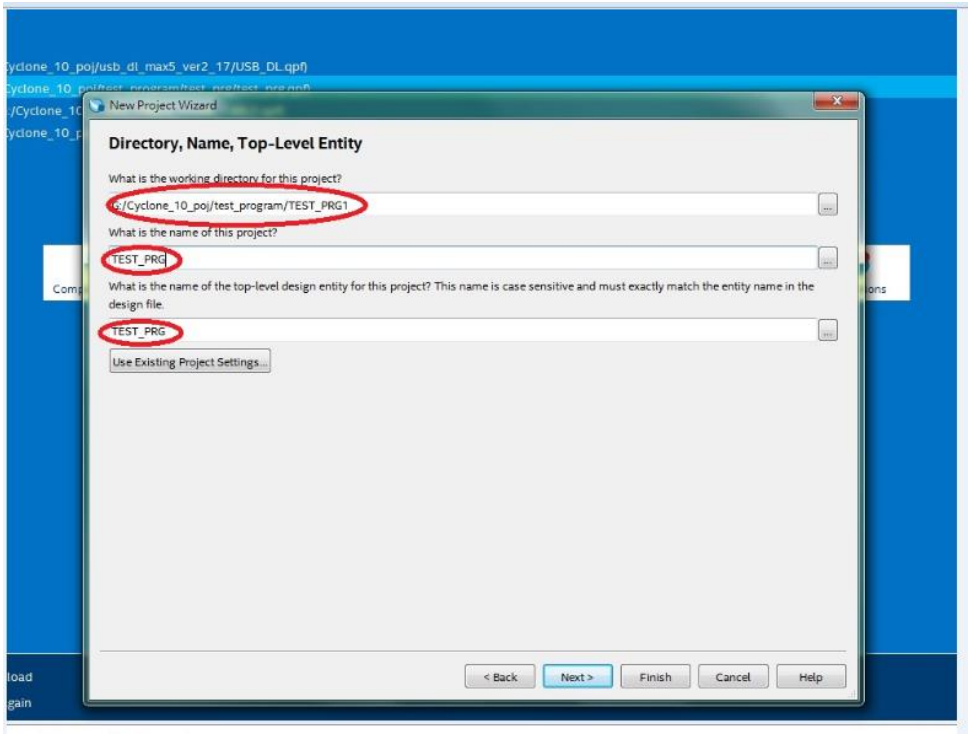

2. File -> New Project Wizard



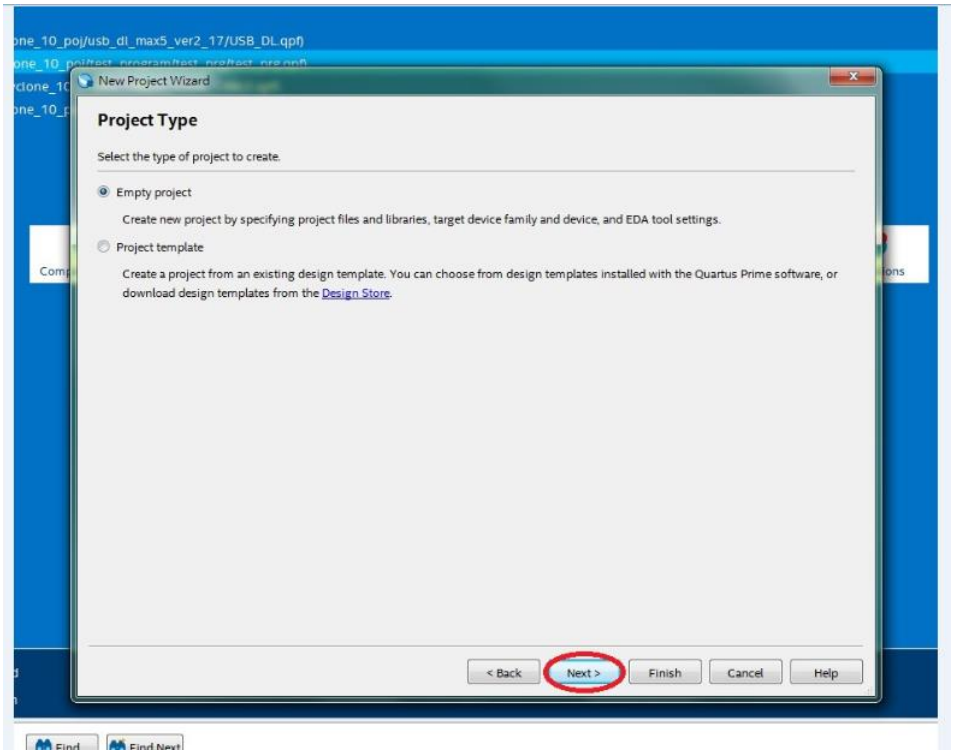
3. Next



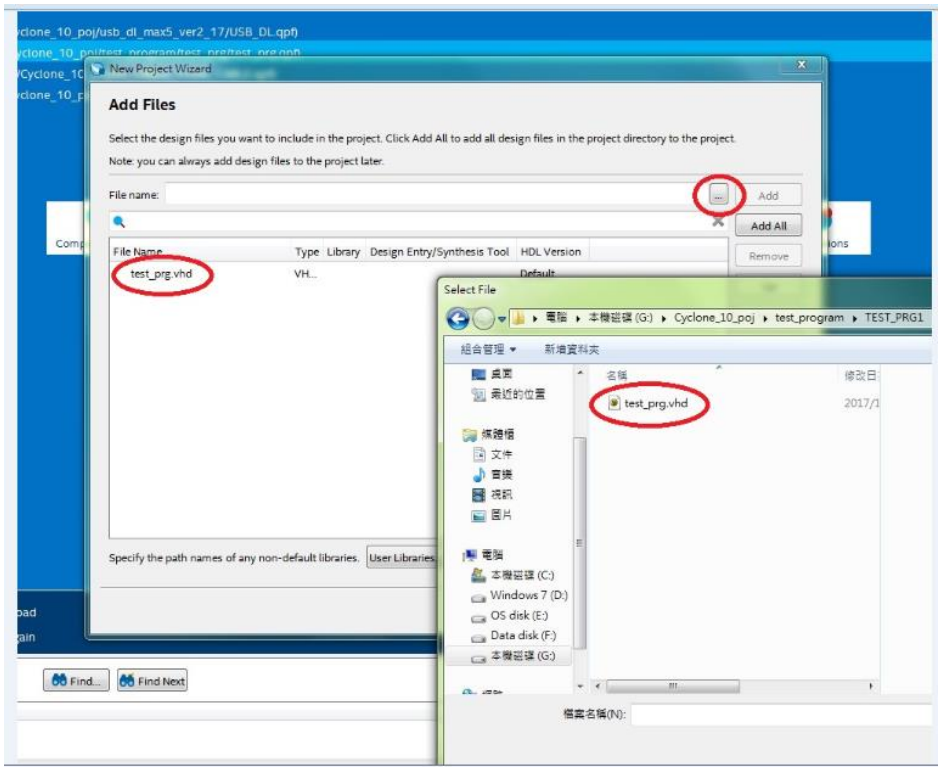

4. 選擇專案路徑及輸入專案名稱



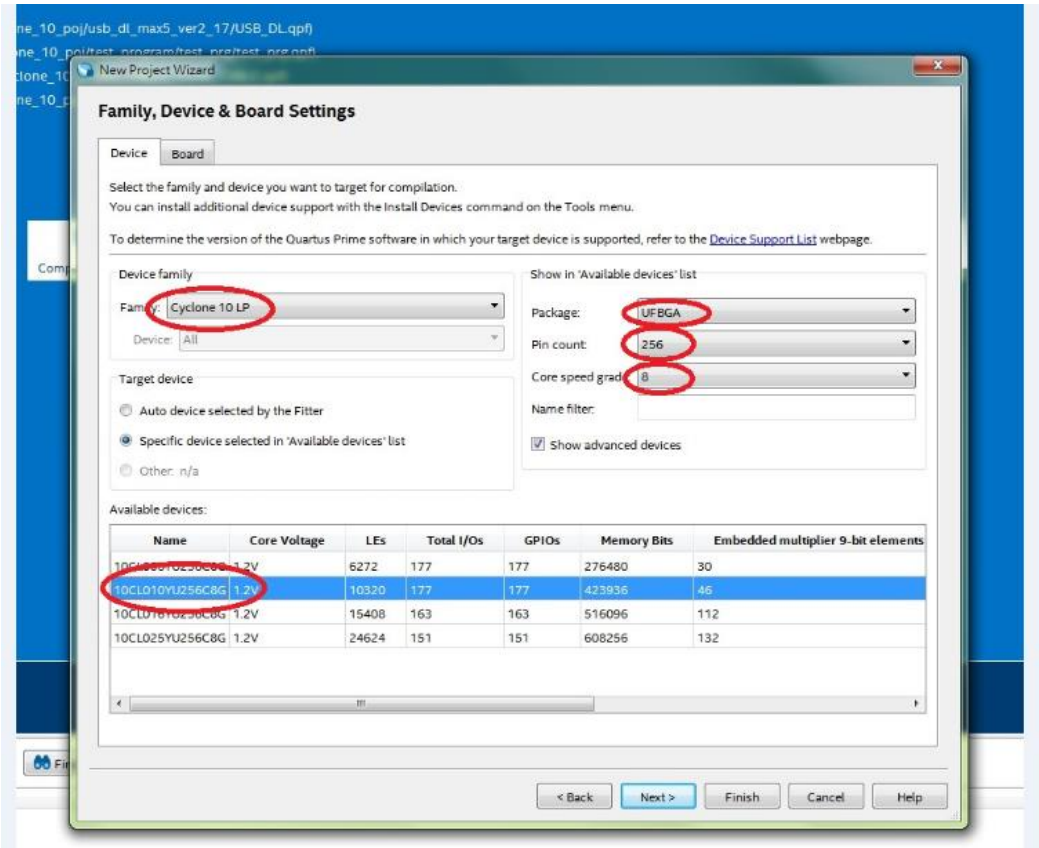
5. Empty project -> Next



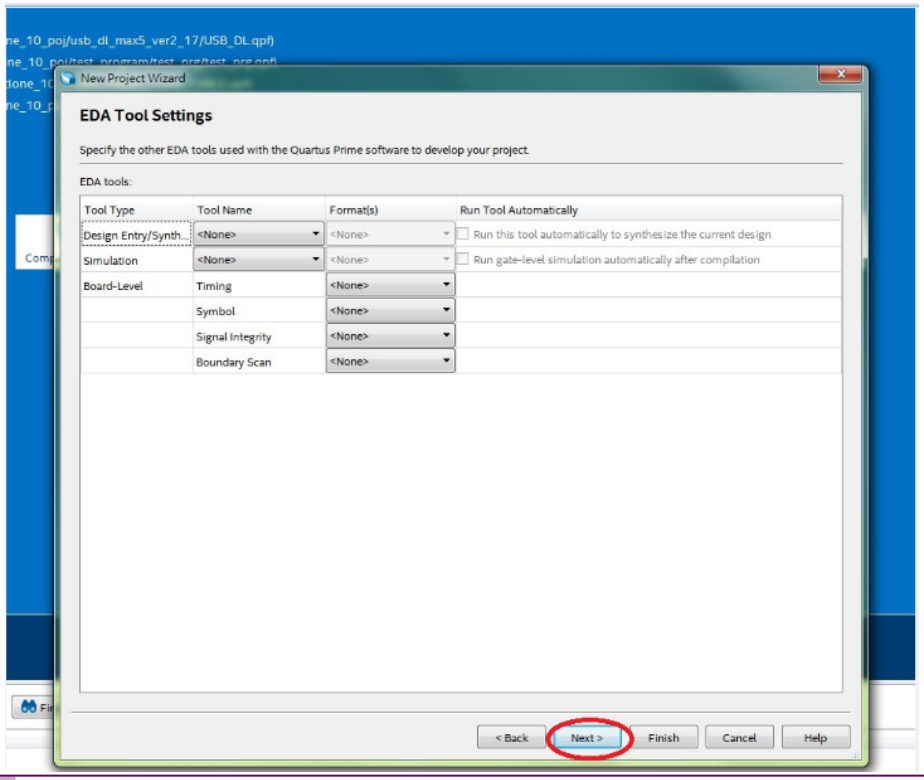

6. 加入專案的程式碼



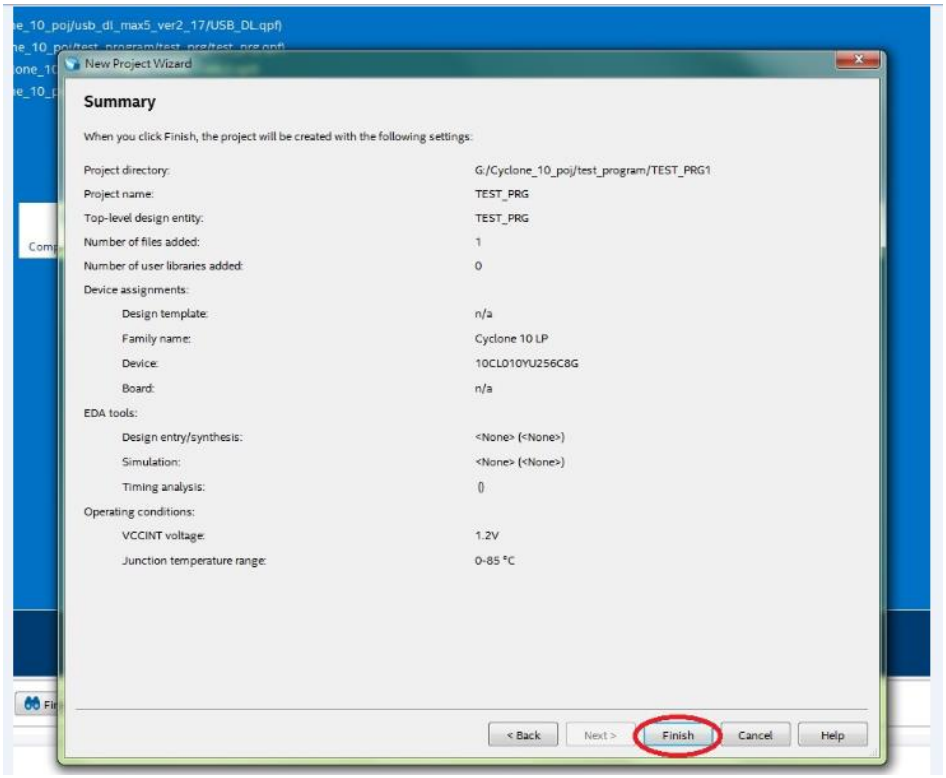
7. 選擇 Cyclone 10 LP IC 型號（10CL010YU256C8G）



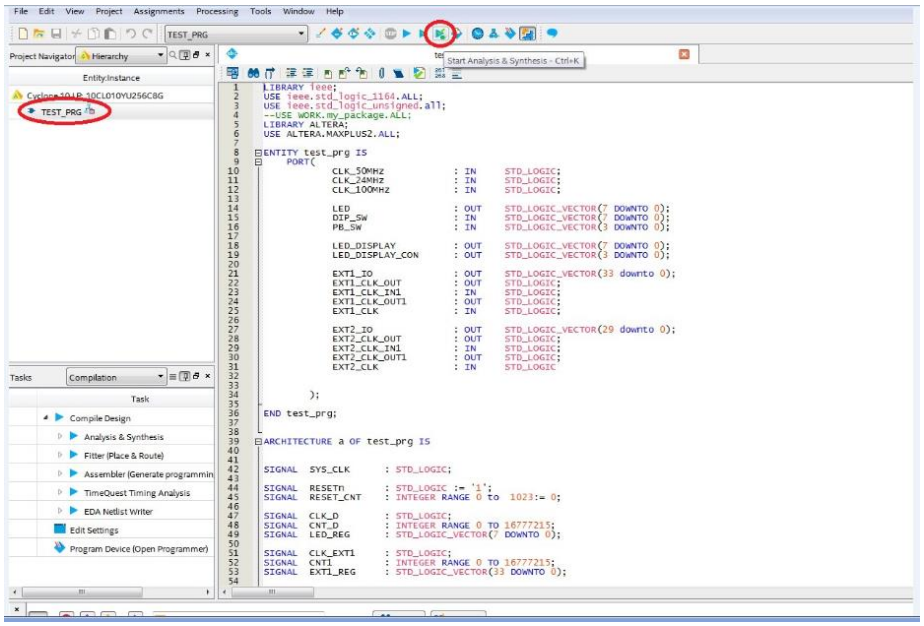

8. Next



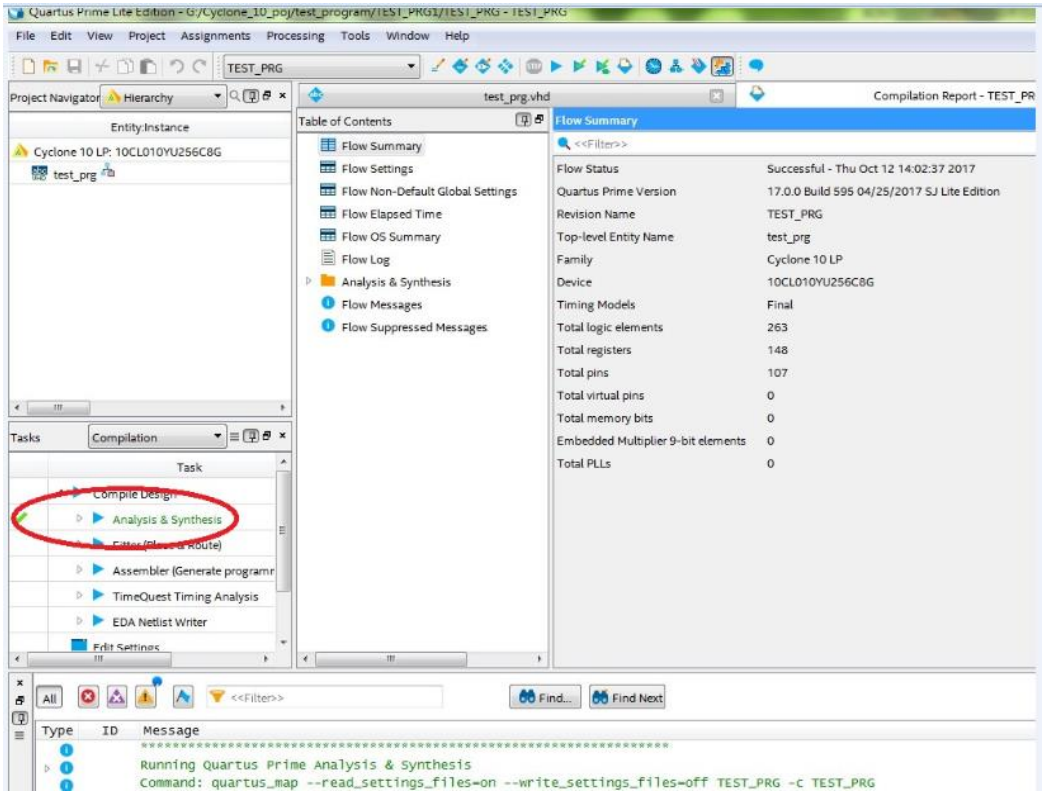
9. Next



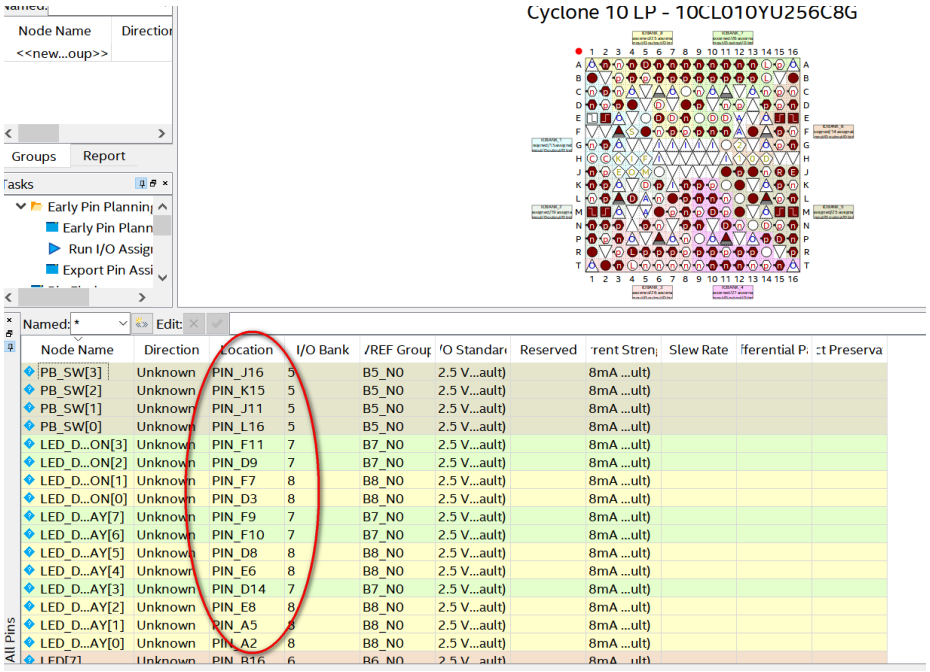

10. Start Analysis & Synthesis



11. 完成 Analysis & Synthesis

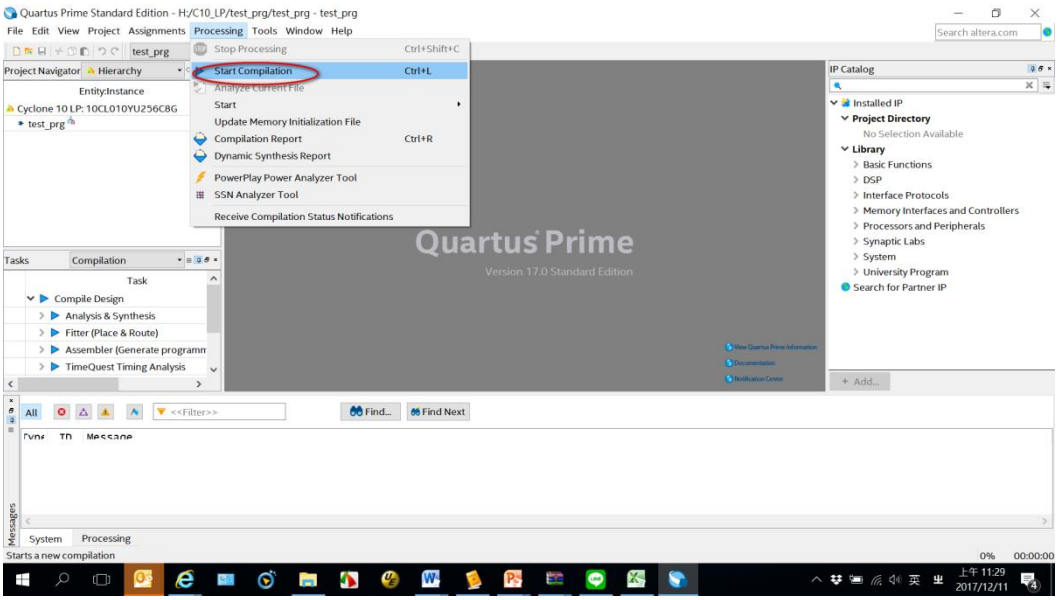



12. 設定 Cyclone 10 LP 各腳位 （Assignments -> Pin Planner）
再依據使用手冊將您的 pin#填進 Location

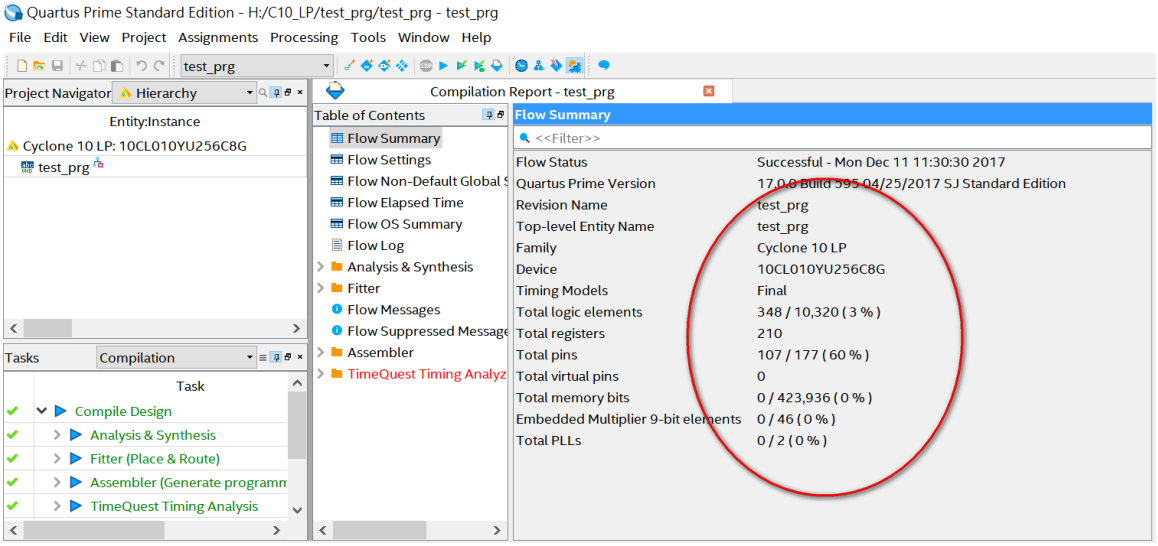


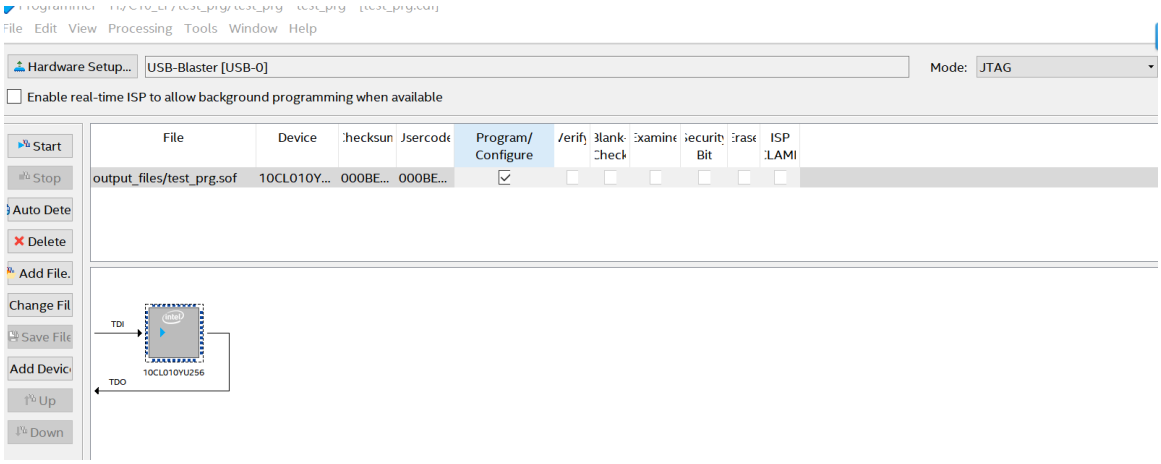
13. 程式編譯(Processing -> Start Compilation




14. 完成編譯



15. Configure FPGA
    A. Tool->programmer
    B. **點選 Add File 並打開 sof file**
    C. 如下圖所示將 **Program/Configure** 打勾

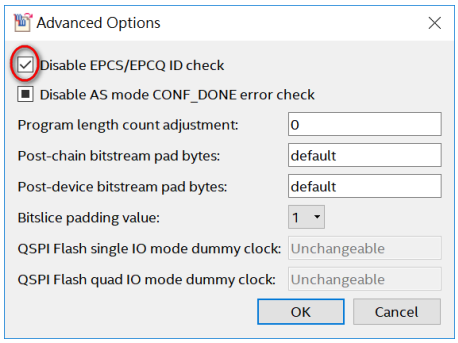



    D. 如上圖所示確定 USB Download Cable 插至 PC,另一端插至 J2 ,**Hardware Setup** 選擇 USB Blaster[USB-1],然後再點選 **Start,**即可開始燒錄
    E. 燒錄完成,LED D10 將亮起

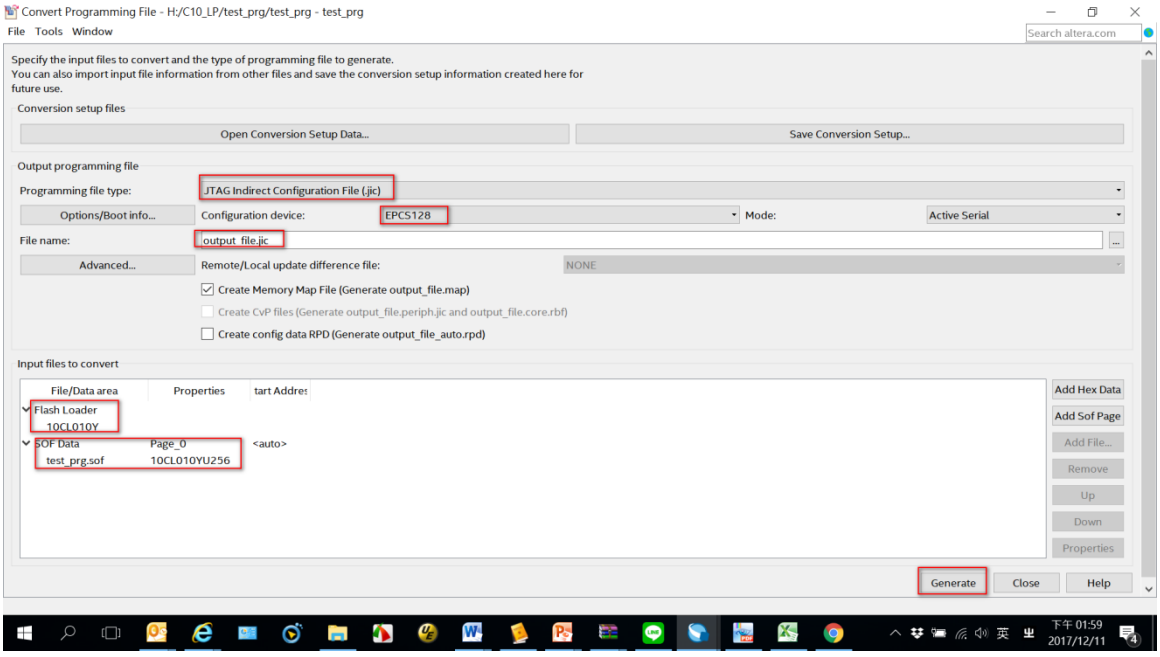
# 5. 轉換 sof to jic

在本章節中將使用上一章編譯完成後的.SOF 檔，將它轉換為可燒錄至 Flash 的檔案，並示範如何燒錄至 Flash

1. File -> Convert Programming File
2. **Programming file type** ,選擇 JTAG Indirect Configuration File (.jic)
3. **在 Configuration device**, 選擇.EPCS128
4. 在 File name, 指定 directory 和 output file name.
5. 點選 Advanced.. , 將 **Disable EPCS/EPCQ ID check** 打勾

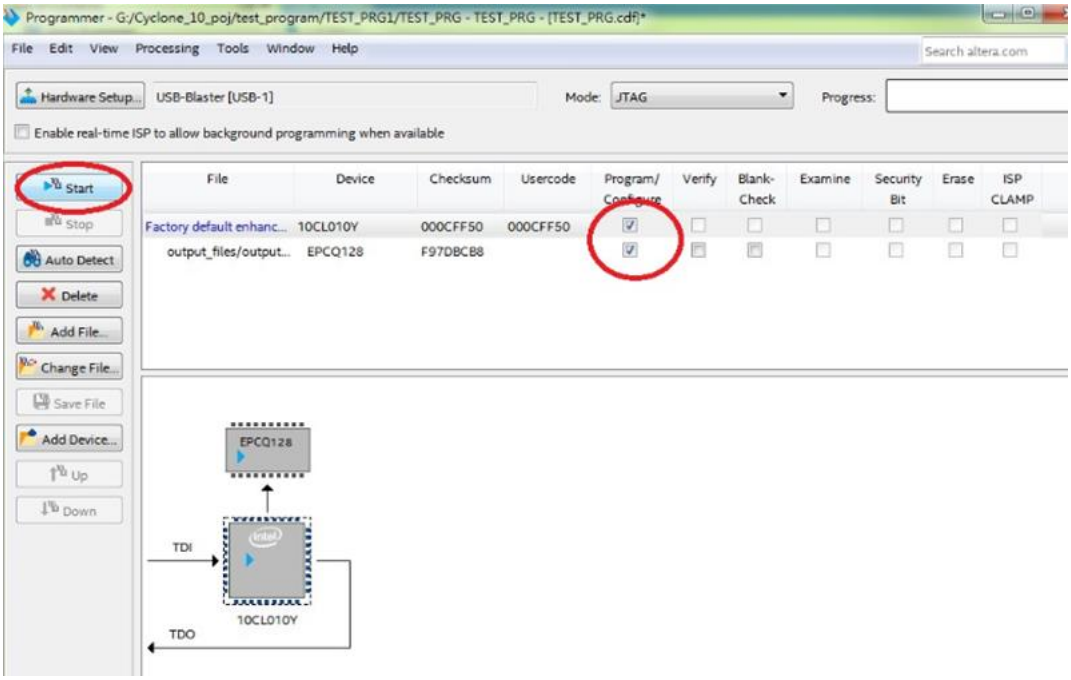



6. 在 **Input files to convert window** ,Highlight the **SOF Data**
7. 點選 **Add File**.並選擇您的.sof file
8. 將您的 .sof file that you want to convert to a .jic file.
9. Highlight Flash Loader 再點選 Add Device.
10. 在 Select Devices 視窗, Device Family 選擇 Cyclone 10 LP ,Device Name 選擇 10CL010Y 再選擇 OK
11. 最後點選 **Generate**



# 6. 如何將 jic file 下載至 Serial Flash

2. Tool->programmer
3. **點選 Add File 並打開 jic file**
4. 如下圖所示將 **Program/Configure** 打勾




5. 如上圖所示確定 USB Download Cable 插至 PC,另一端插至 J2 ,**Hardware Setup** 選擇 USB Blaster[USB-1],然後再點選 **Start,**即可開始燒錄
6. 此方法是針對 Flash 進行燒錄 ,所以燒錄完後需重新上電或再按一次 S5,當 LED D10 亮起時,表示已經將新的 image configure 到 FPGA

# 7. Document Revision History

| Date | Revision | Changes |
|---|---|---|
| December12, 2017 | 0.1 | • Document created |
| | | • |
| | | • |