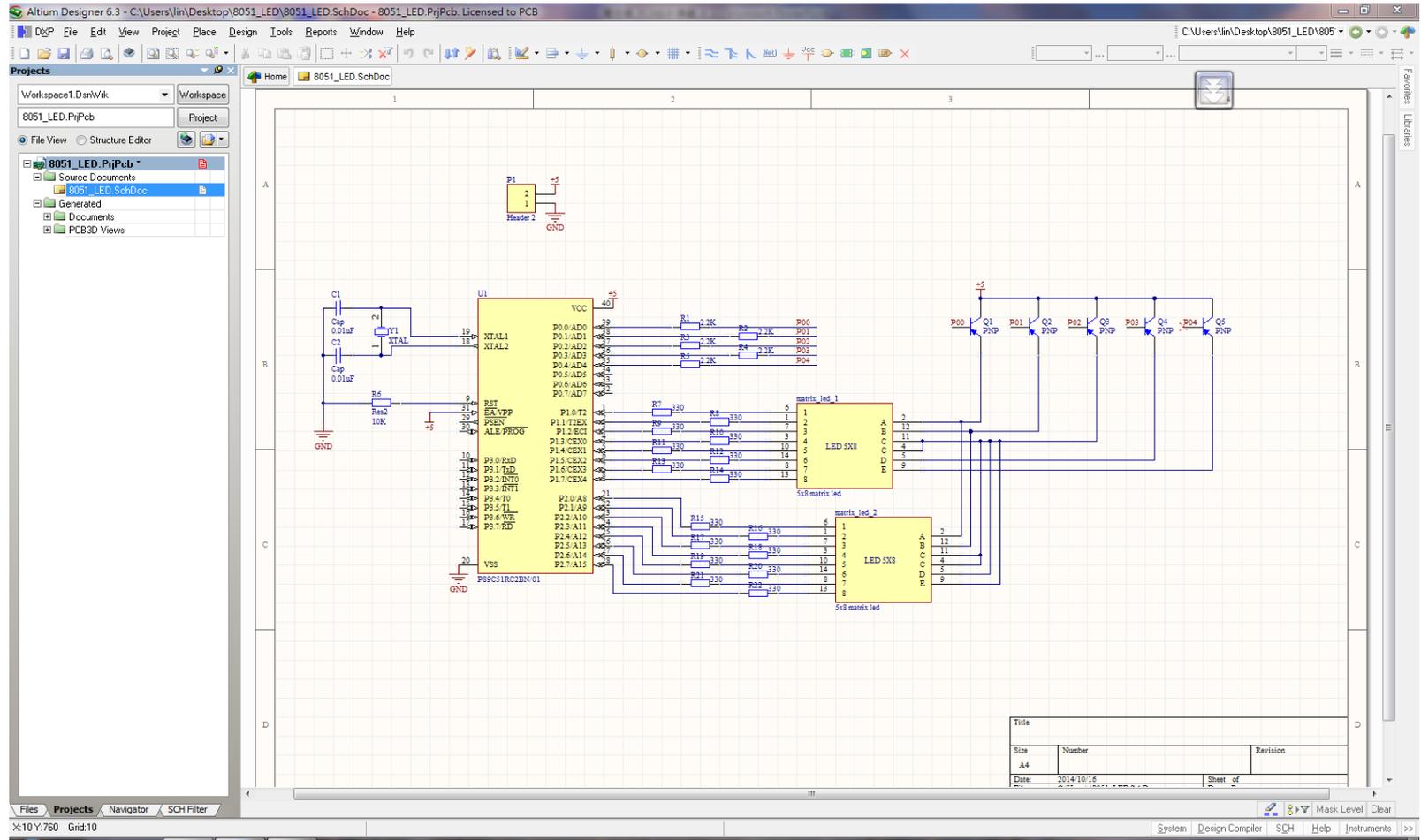


# 建立PCB 與輸出

# 大綱

- 建立PCB檔案
- 電路圖檔與PCB轉換
- PCB 佈線
- PCB 規則(Rules)
- PCB外型(Shape)
- PCB輔助製造輸出
- 範例練習

# 完成 8051\_led.schdoc



# 專案 添加pcb檔案

The screenshot shows the Altium Designer 6.3 interface. The main workspace displays a schematic capture of a PCB project. The circuit includes a microcontroller (U1) with pins connected to various components: resistors (R1-R22), capacitors (C1, C2), and LEDs (LED 5X8). A context menu is open over the schematic, with 'PCB' selected. The interface includes a Project panel on the left, a Title block at the bottom right, and a Windows taskbar at the bottom.

**Project Panel:**

- Workspace1.DsnWk
- Workspace
- 8051\_LED.PriPcb
- Project

**Context Menu:**

- Other Ctrl+N
- Schematic
- PCB**
- Schematic Library
- PCB Library
- CAM Document
- Output Job File
- Database Link File
- Text Document

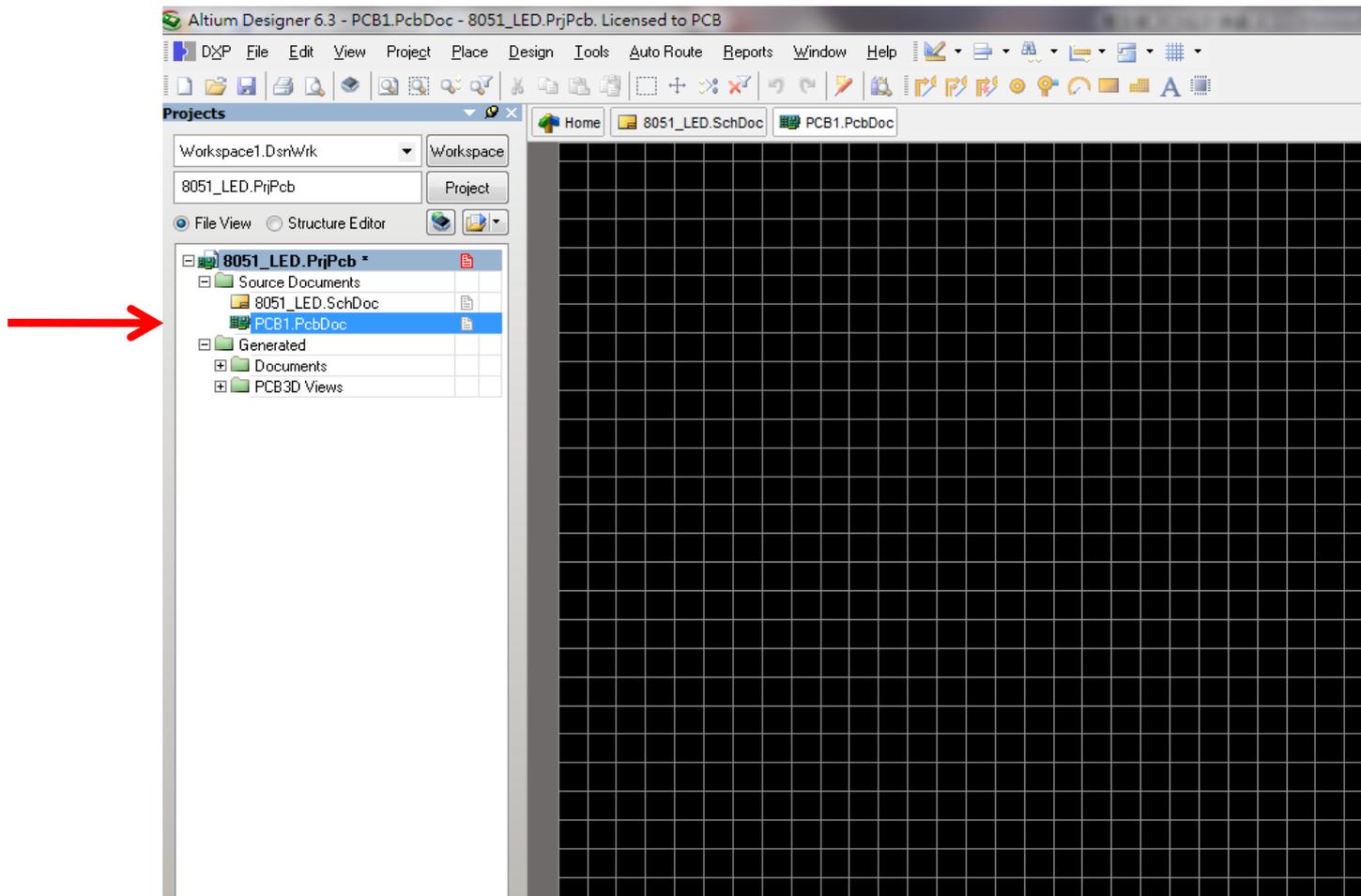
**Title Block:**

Title		
Size	Number	Revision
A4		
Date: 2014/10/16	Sheet of	

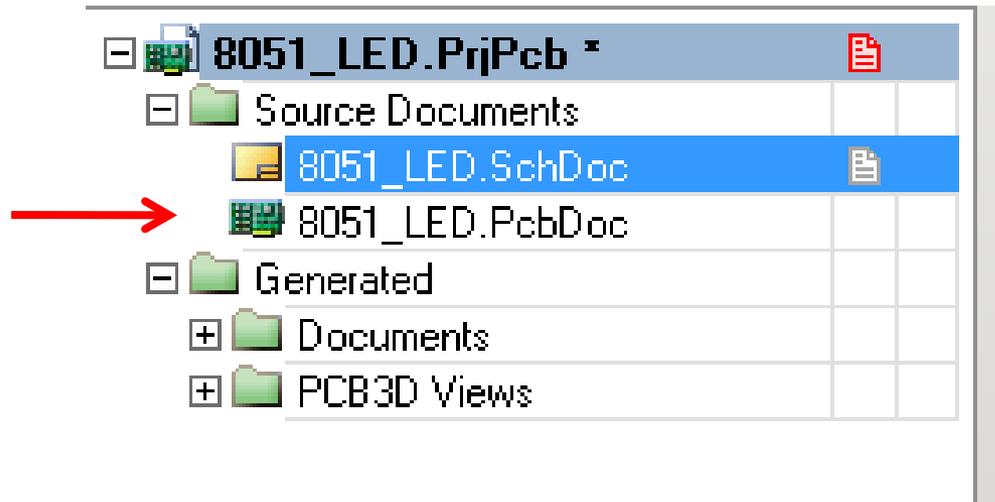
**Windows Taskbar:**

System Design Compiler SCH Help Instruments >>  
上午 12:42  
2014/10/16

# 完成 添加pcb檔案

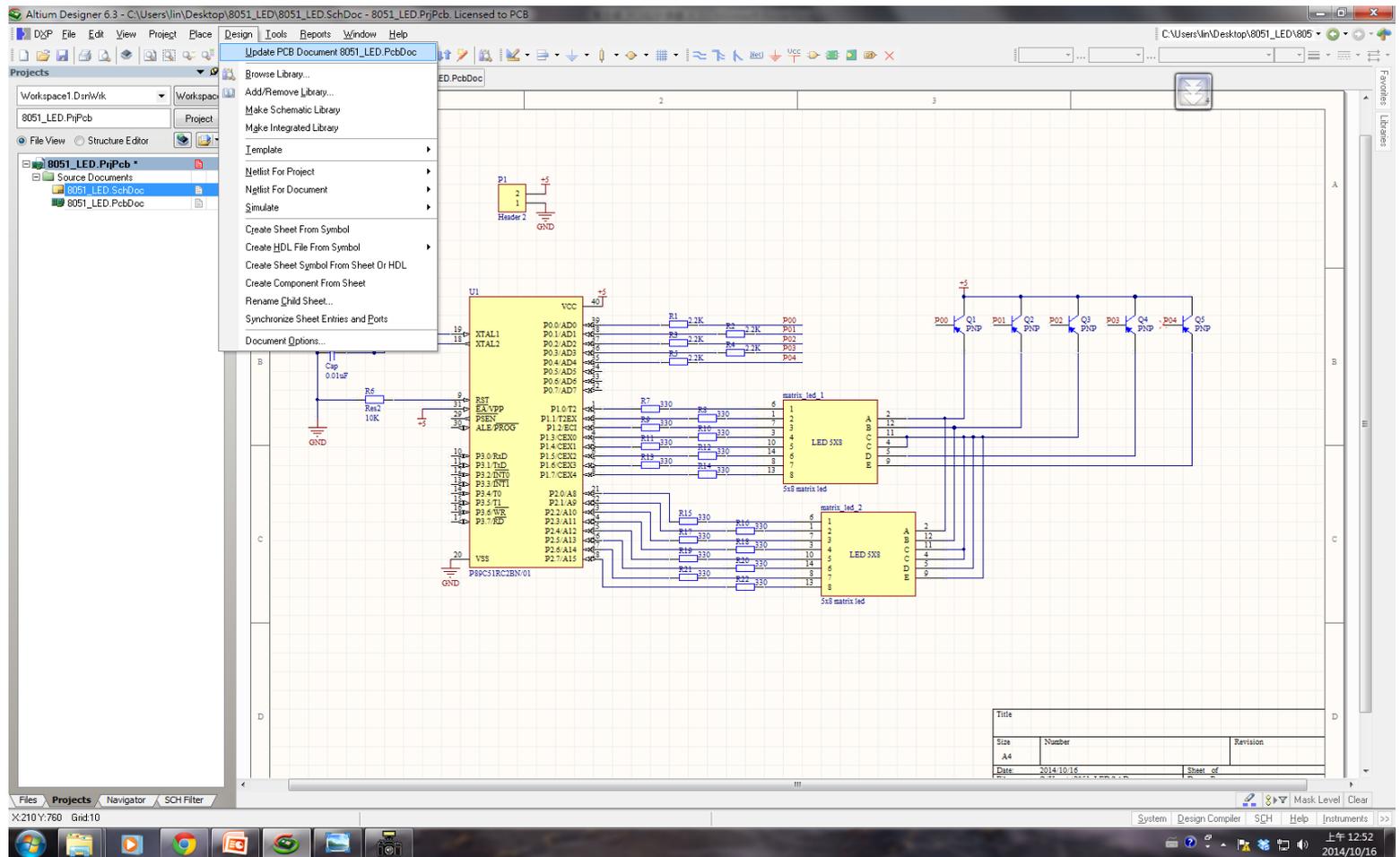


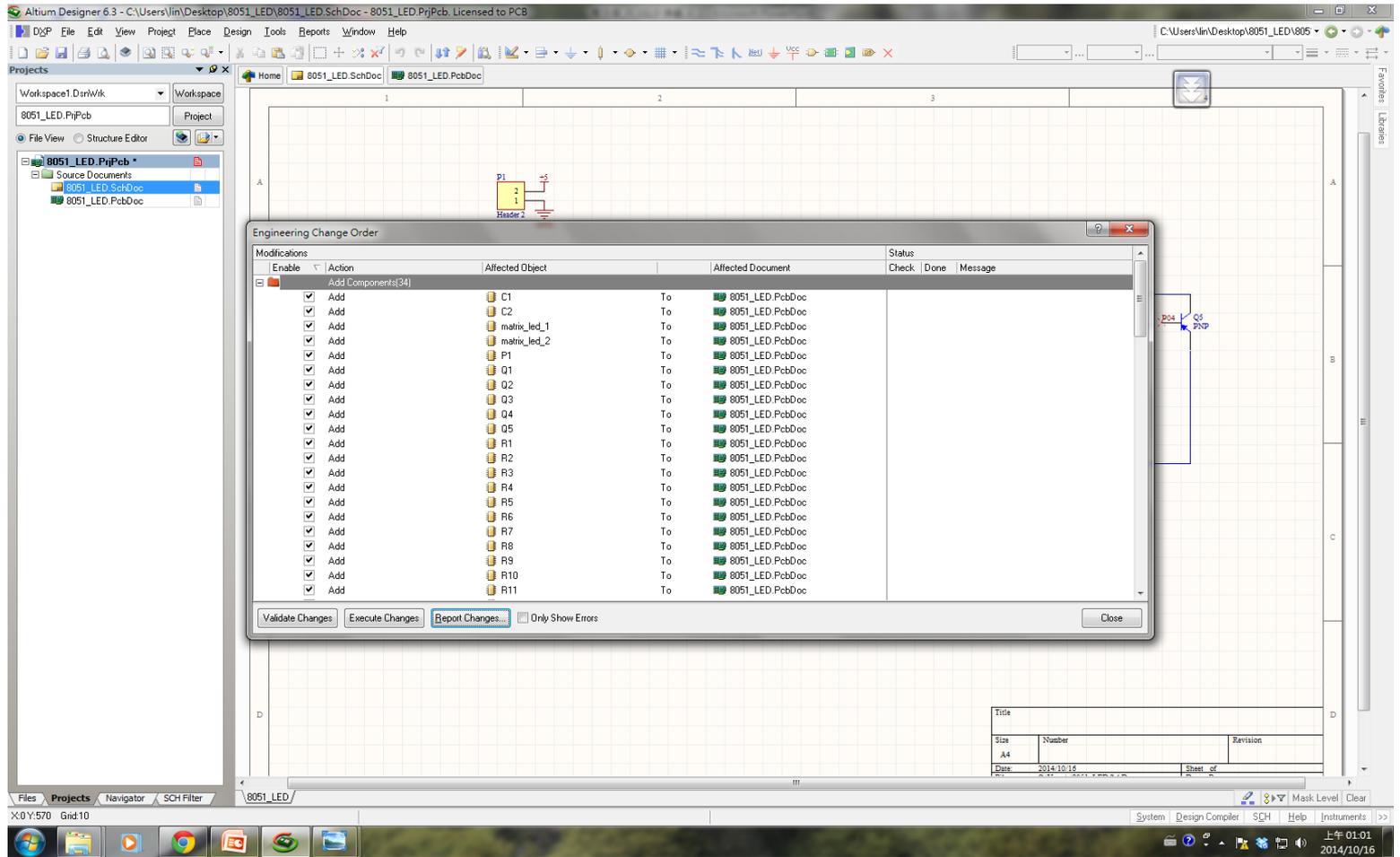
更名/存檔 → 8051\_led.pcbdoc



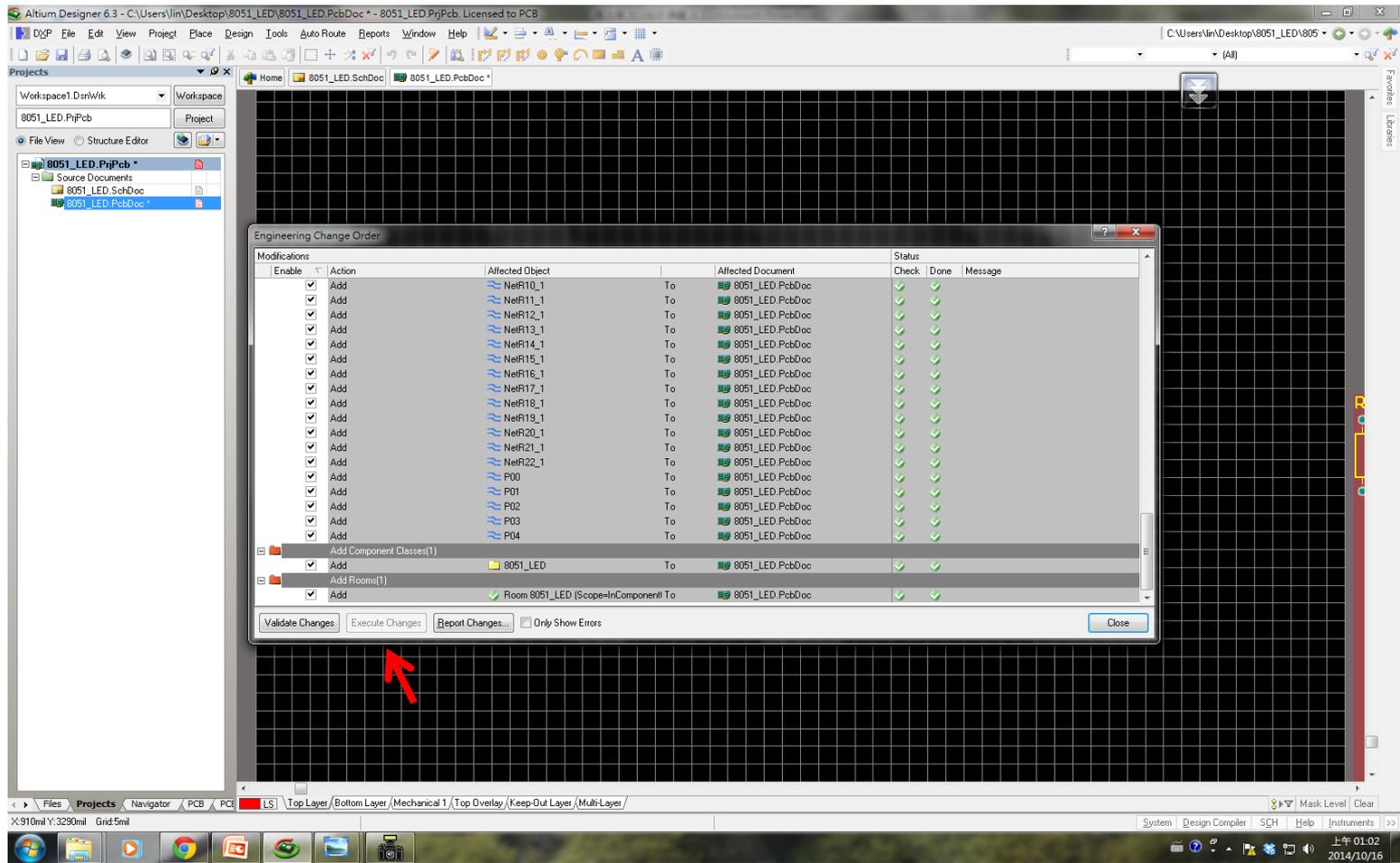
# 電路圖檔 → PCB轉換

Design → UpData PCB document  
8051\_led.PcbDoc

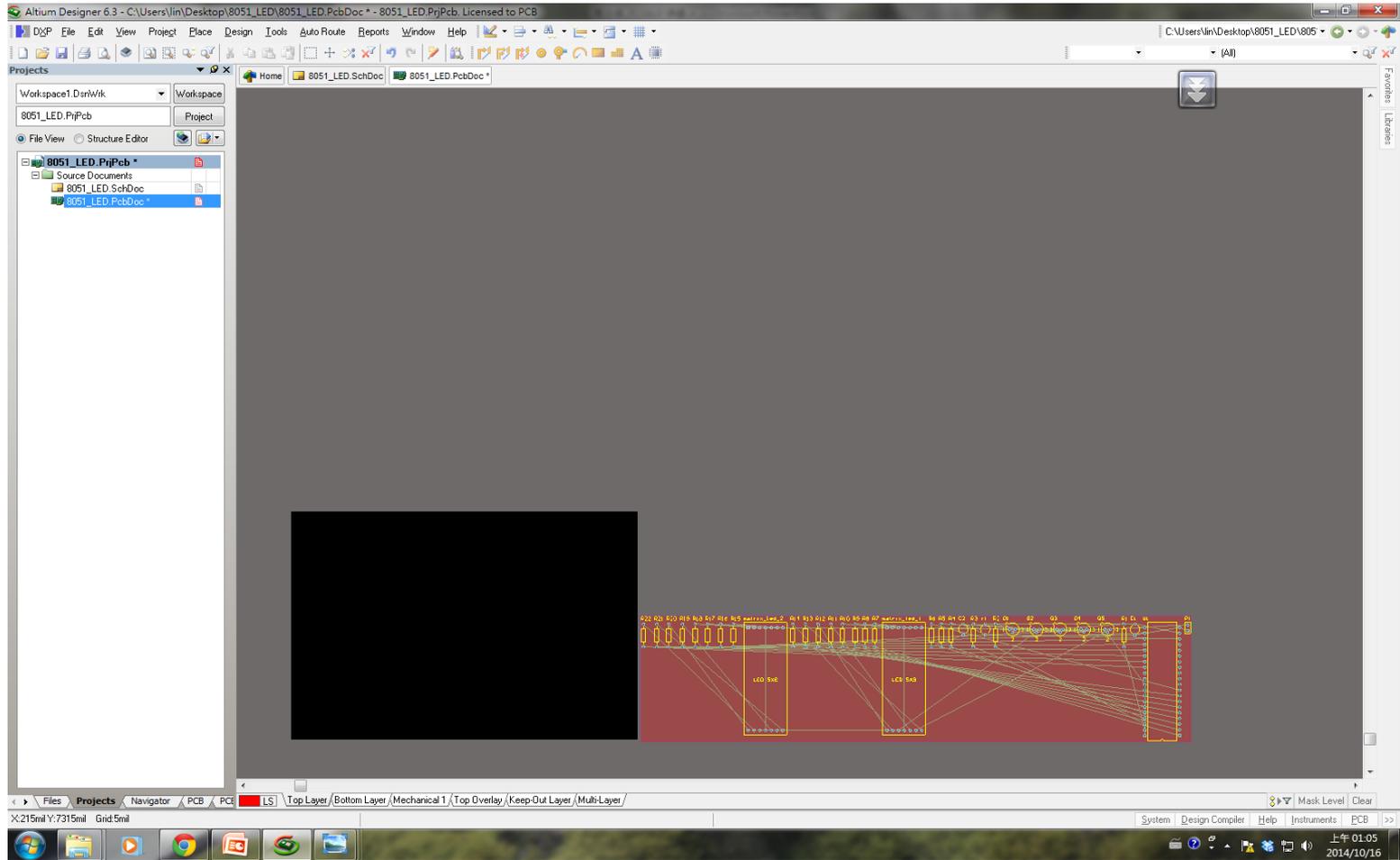




# 按下 Execute Changes

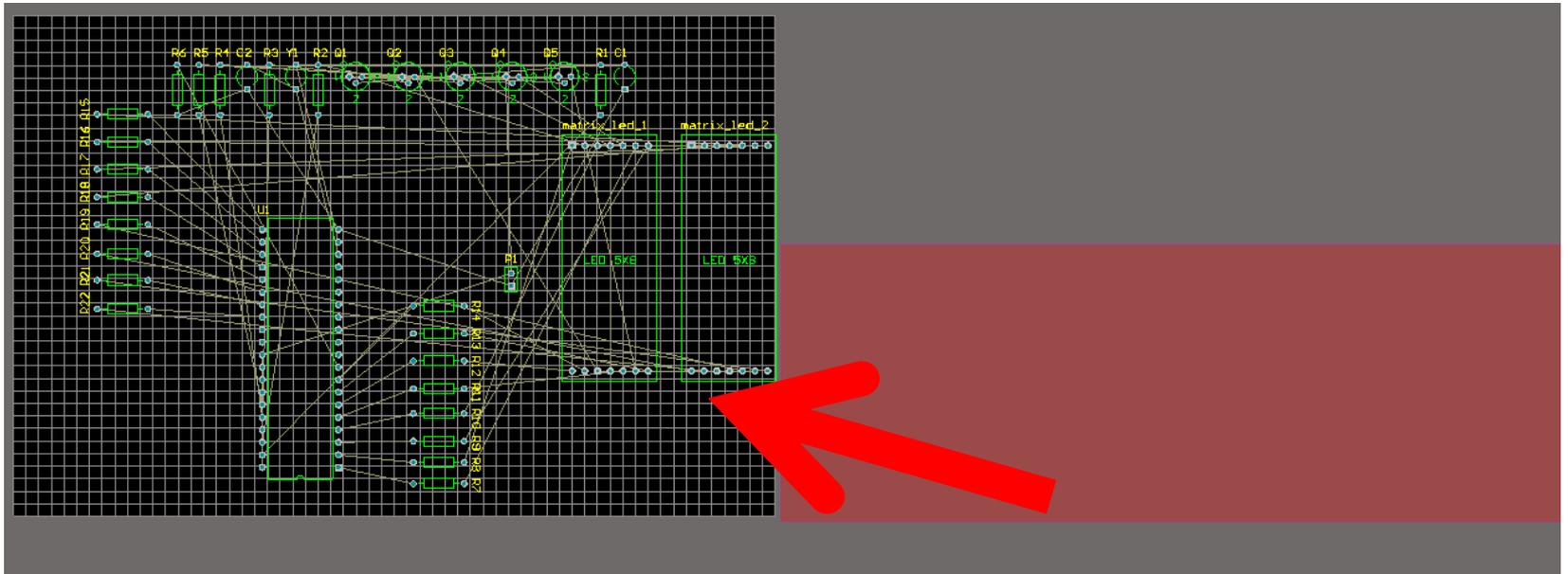


# 完成 電路圖檔 → PCB轉換



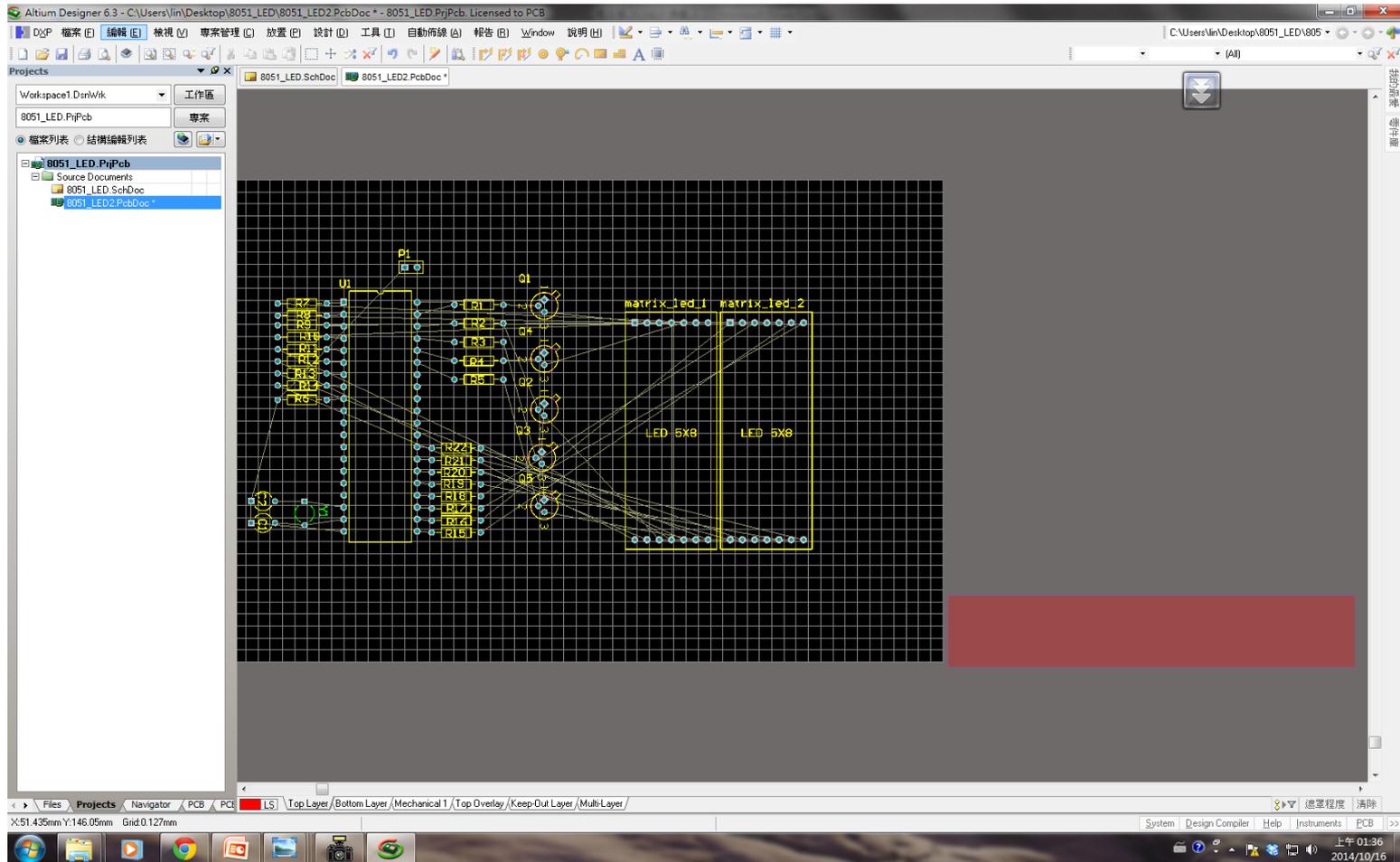
# PCB 佈線

- 將元件移入佈線區



# PCB 佈線

- 將元件依設計排列
- 由大→小



# 按下 → 自動繞線

Altium Designer 6.3 - C:\Users\lin\Desktop\8051\_LED\8051\_LED2.PcbDoc - 8051\_LED.PrjPcb. Licensed to PCB

自動佈線 (A) 報告 (R) Window 說明 (H)

整塊电路板自动佈線 (A)...

指定網路自动佈線 (N)

按網路分類自动佈線 (E)...

指定连接線自动佈線 (C)

指定區塊內自动佈線 (R)

零件擺置區間內自动佈線 (M)

X:51.435mm Y:146.05mm Grid:0.127mm

System Design Compiler Help Instruments PCB >>

上午 01:36 2014/10/16

# 自動繞線完成

The screenshot displays the Altium Designer 6.3 interface. The main workspace shows a PCB layout with a grid and several traces in red and blue. A 'Messages' dialog box is open in the foreground, listing the routing process steps and their completion times. The messages include:

Class	Document	Source	Message	Time	Date	No.
Situs Event	8051_LED2.PcbDoc	Situs	Routing Started	上午 01:41:43	2014/10/16	1
Routing Status	8051_LED2.PcbDoc	Situs	Creating topology map	上午 01:41:43	2014/10/16	2
Situs Event	8051_LED2.PcbDoc	Situs	Starting Fan out to Plane	上午 01:41:43	2014/10/16	3
Situs Event	8051_LED2.PcbDoc	Situs	Completed Fan out to Plane in 0 Seconds	上午 01:41:43	2014/10/16	4
Situs Event	8051_LED2.PcbDoc	Situs	Starting Memory	上午 01:41:43	2014/10/16	5
Situs Event	8051_LED2.PcbDoc	Situs	Completed Memory in 0 Seconds	上午 01:41:43	2014/10/16	6
Situs Event	8051_LED2.PcbDoc	Situs	Starting Layer Patterns	上午 01:41:43	2014/10/16	7
Situs Event	8051_LED2.PcbDoc	Situs	Completed Layer Patterns in 0 Seconds	上午 01:41:43	2014/10/16	8
Situs Event	8051_LED2.PcbDoc	Situs	Starting Main	上午 01:41:43	2014/10/16	9
Routing Status	8051_LED2.PcbDoc	Situs	Calculating Board Density	上午 01:41:43	2014/10/16	10
Situs Event	8051_LED2.PcbDoc	Situs	Completed Main in 0 Seconds	上午 01:41:43	2014/10/16	11
Situs Event	8051_LED2.PcbDoc	Situs	Starting Completion	上午 01:41:43	2014/10/16	12
Situs Event	8051_LED2.PcbDoc	Situs	Completed Completion in 0 Seconds	上午 01:41:43	2014/10/16	13
Situs Event	8051_LED2.PcbDoc	Situs	Starting Straighten	上午 01:41:43	2014/10/16	14
Situs Event	8051_LED2.PcbDoc	Situs	Completed Straighten in 0 Seconds	上午 01:41:43	2014/10/16	15
Routing Status	8051_LED2.PcbDoc	Situs	70 of 70 connections routed (100.00%) in 0 Seconds	上午 01:41:44	2014/10/16	16
Situs Event	8051_LED2.PcbDoc	Situs	Routing finished with 0 contention(s). Failed to complete 0 connection(s) in 0 Seconds	上午 01:41:44	2014/10/16	17

The interface also shows the 'Projects' panel on the left, the 'Messages' dialog box, and the Windows taskbar at the bottom with the system clock showing 上午 01:41 on 2014/10/16.

# 繞線完成訊息

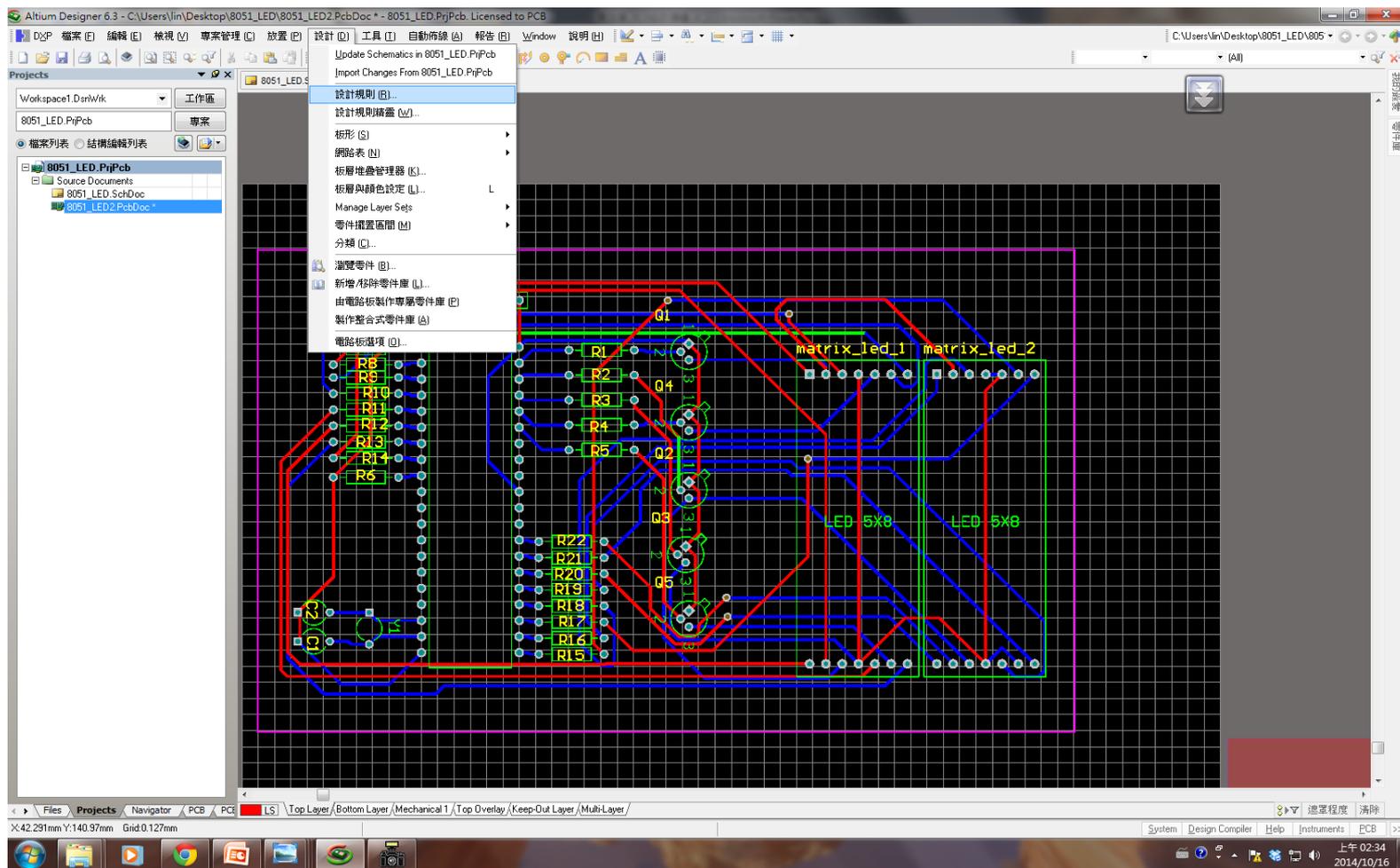
Class	Document	Source	Message	Time	Date	No.
Situs Event	8051_LED2.PcbDoc	Situs	Routing Started	上午 01:41:43	2014/10/16	1
Routing Status	8051_LED2.PcbDoc	Situs	Creating topology map	上午 01:41:43	2014/10/16	2
Situs Event	8051_LED2.PcbDoc	Situs	Starting Fan out to Plane	上午 01:41:43	2014/10/16	3
Situs Event	8051_LED2.PcbDoc	Situs	Completed Fan out to Plane in 0 Seconds	上午 01:41:43	2014/10/16	4
Situs Event	8051_LED2.PcbDoc	Situs	Starting Memory	上午 01:41:43	2014/10/16	5
Situs Event	8051_LED2.PcbDoc	Situs	Completed Memory in 0 Seconds	上午 01:41:43	2014/10/16	6
Situs Event	8051_LED2.PcbDoc	Situs	Starting Layer Patterns	上午 01:41:43	2014/10/16	7
Situs Event	8051_LED2.PcbDoc	Situs	Completed Layer Patterns in 0 Seconds	上午 01:41:43	2014/10/16	8
Situs Event	8051_LED2.PcbDoc	Situs	Starting Main	上午 01:41:43	2014/10/16	9
Routing Status	8051_LED2.PcbDoc	Situs	Calculating Board Density	上午 01:41:43	2014/10/16	10
Situs Event	8051_LED2.PcbDoc	Situs	Completed Main in 0 Seconds	上午 01:41:43	2014/10/16	11
Situs Event	8051_LED2.PcbDoc	Situs	Starting Completion	上午 01:41:43	2014/10/16	12
Situs Event	8051_LED2.PcbDoc	Situs	Completed Completion in 0 Seconds	上午 01:41:43	2014/10/16	13
Situs Event	8051_LED2.PcbDoc	Situs	Starting Straighten	上午 01:41:43	2014/10/16	14
Situs Event	8051_LED2.PcbDoc	Situs	Completed Straighten in 0 Seconds	上午 01:41:43	2014/10/16	15
Routing Status	8051_LED2.PcbDoc	Situs	70 of 70 connections routed (100.00%) in 0 Seconds	上午 01:41:44	2014/10/16	16
Situs Event	8051_LED2.PcbDoc	Situs	Routing finished with 0 contentions(s). Failed to complete 0 connection(s) in 0 Seconds	上午 01:41:44	2014/10/16	17

(有爭論)

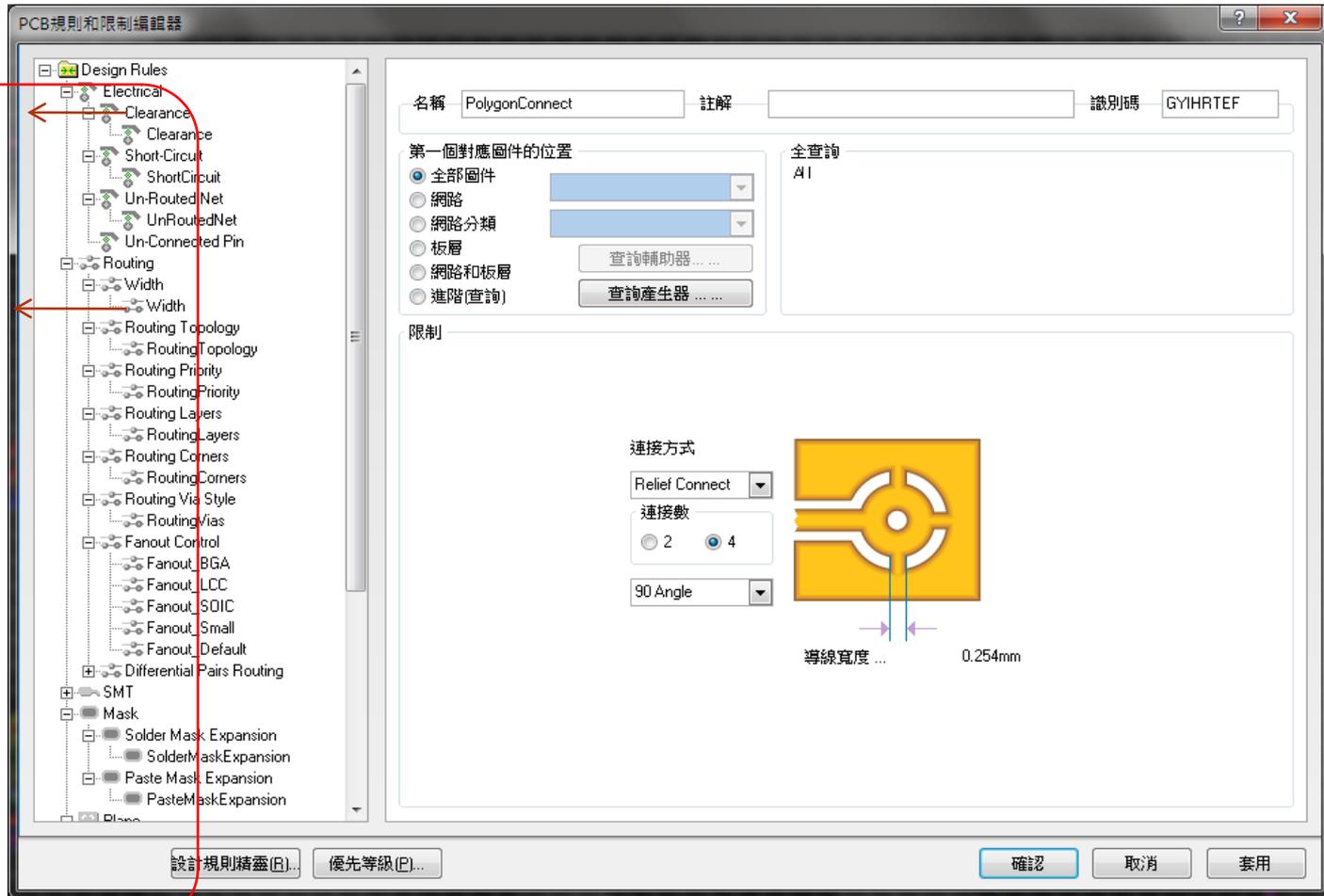
繞線完成，無未完成或錯誤

# PCB 規則(Rules)設定

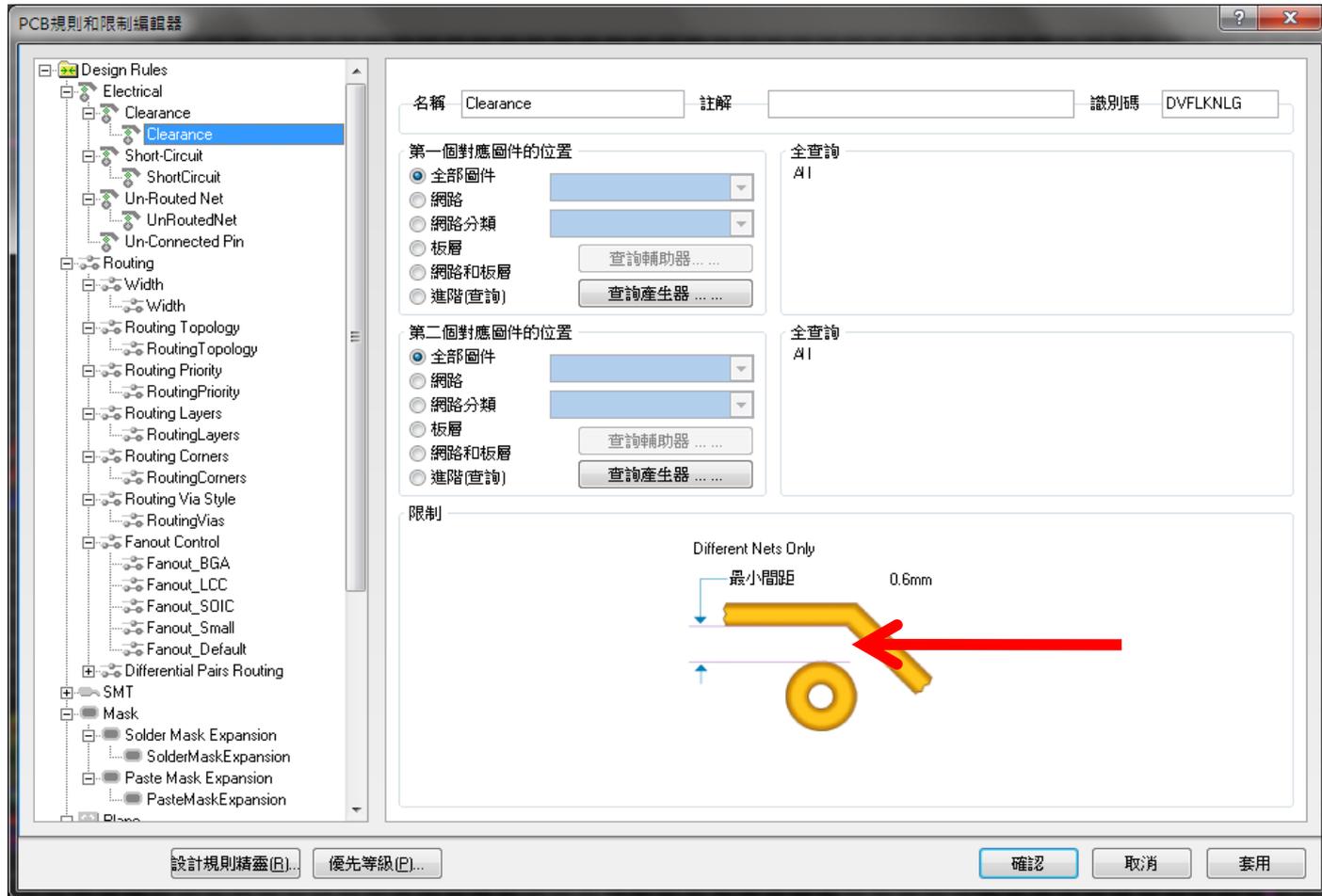
設計→設計規則



# PCB 規則



# PCB 規則-電器特性



# PCB 規則-繞線 線寬

PCB規則和限制編輯器

名稱: Width 註解: 識別碼: SLJMNGNQ

第一個對應固件的位置

- 全部固件
- 網路
- 網路分類
- 板層
- 網路和板層
- 進階(查詢)

查詢輔助器... 查詢產生器...

全查詢: All

限制

Preferred Width 0.5mm  
Min Width 0.5mm Max Width 0.5mm

特徵阻抗驅動寬度  
 只有板層堆疊中的板層

板層屬性			板層堆疊參考		絕對板層	
最小寬度	最適切尺寸	最大寬度	名稱	索引	名稱	索引
0.5mm	0.5mm	0.5mm	Top Layer	0	TopLayer	1
0.5mm	0.5mm	0.5mm	Bottom Layer	1	BottomLayer	32

設計規則精靈(B)... 優先等級(P)... 確認 取消 套用

# PCB 規則-繞線 拓撲(topology)

PCB規則和限制編輯器

名稱: RoutingTopology 註解: 識別碼: TYPJLOBW

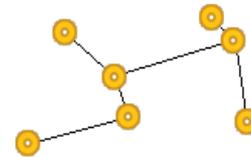
第一個對應元件的位置

- 全部圖件
- 網路
- 網路分類
- 板層
- 網路和板層
- 進階(查詢)

查詢輔助器...  
查詢產生器...  
全查詢: All

限制

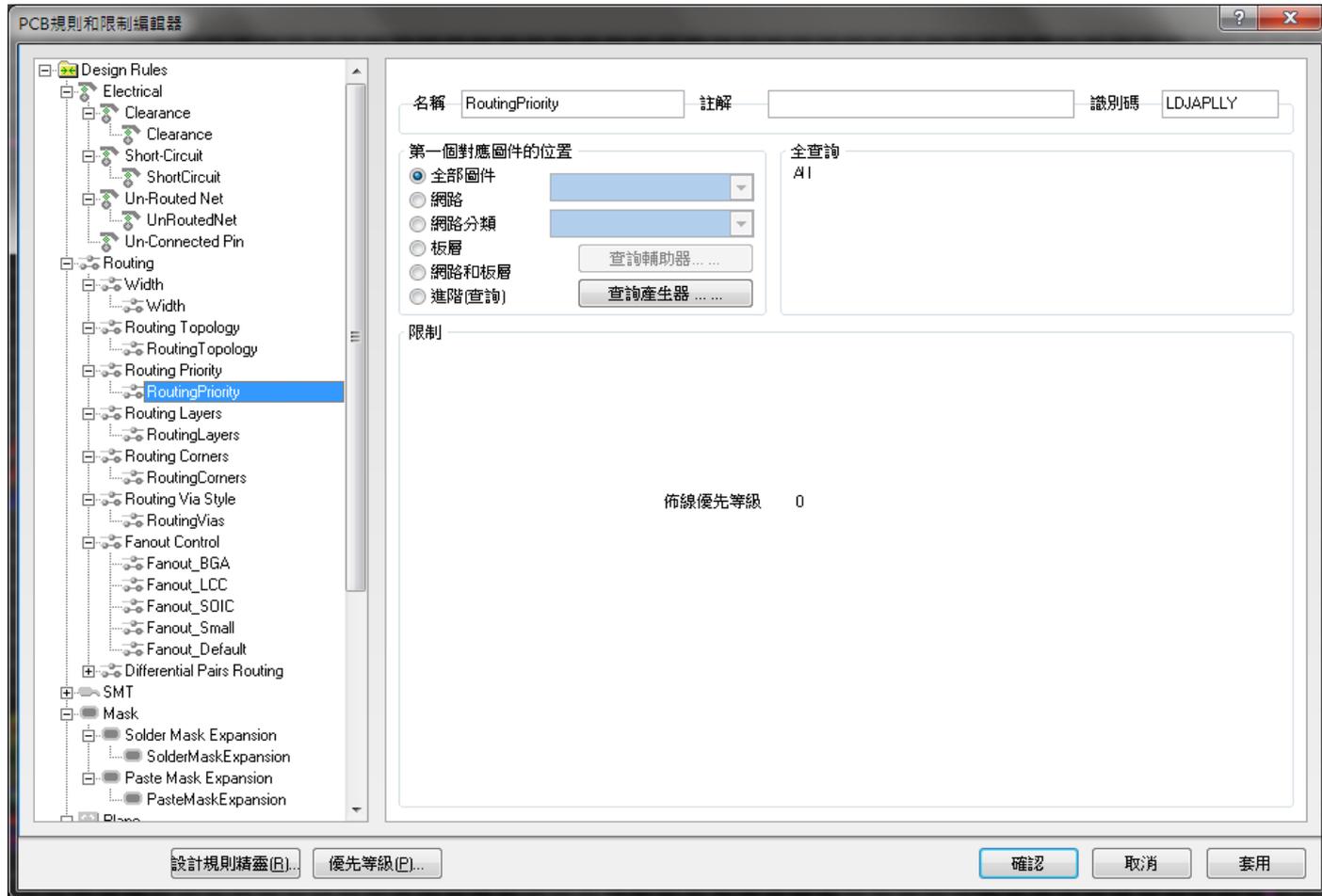
拓撲邏輯 Shortest



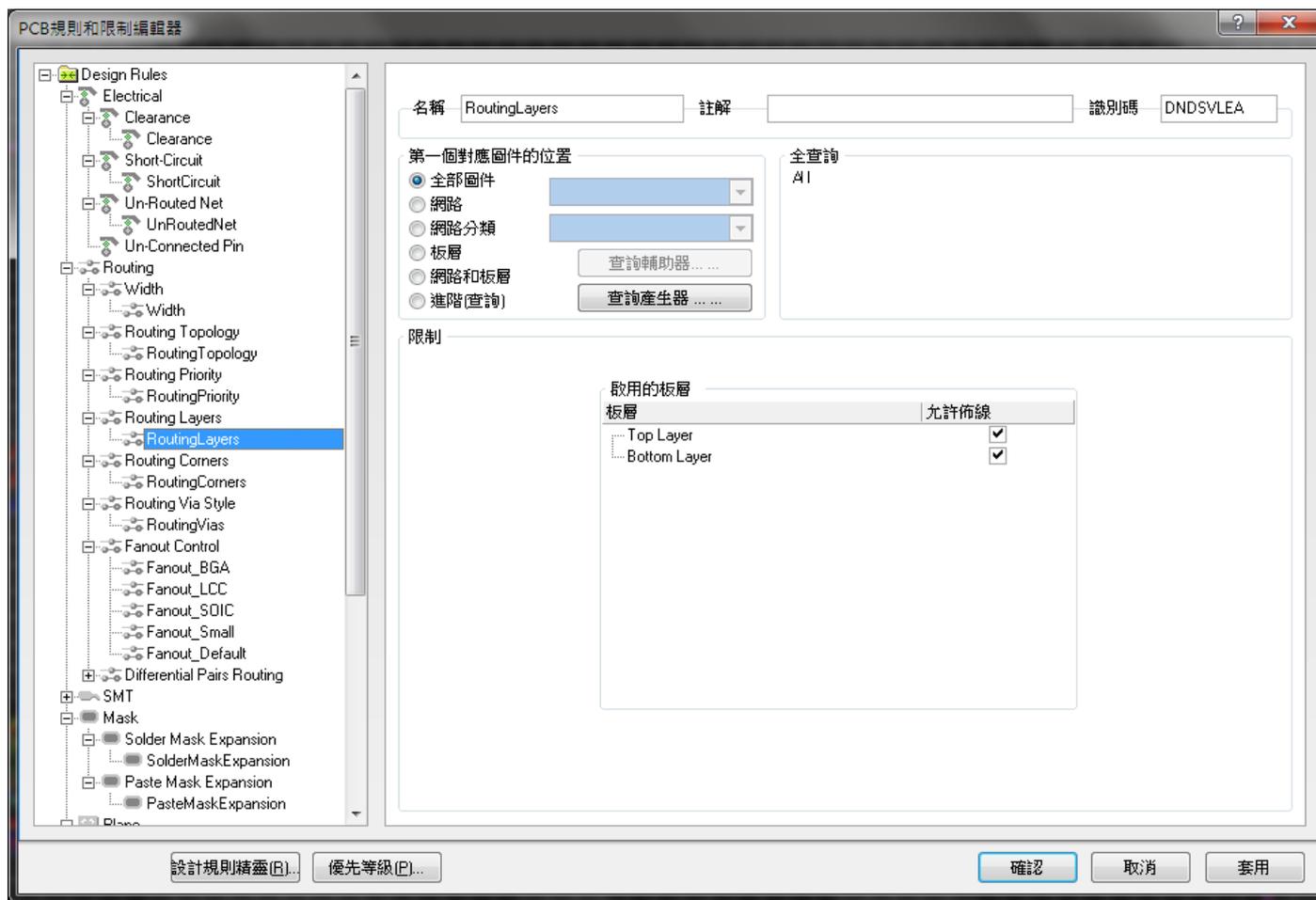
←(跑線的方式)

設計規則精靈(R)... 優先等級(P)... 確認 取消 套用

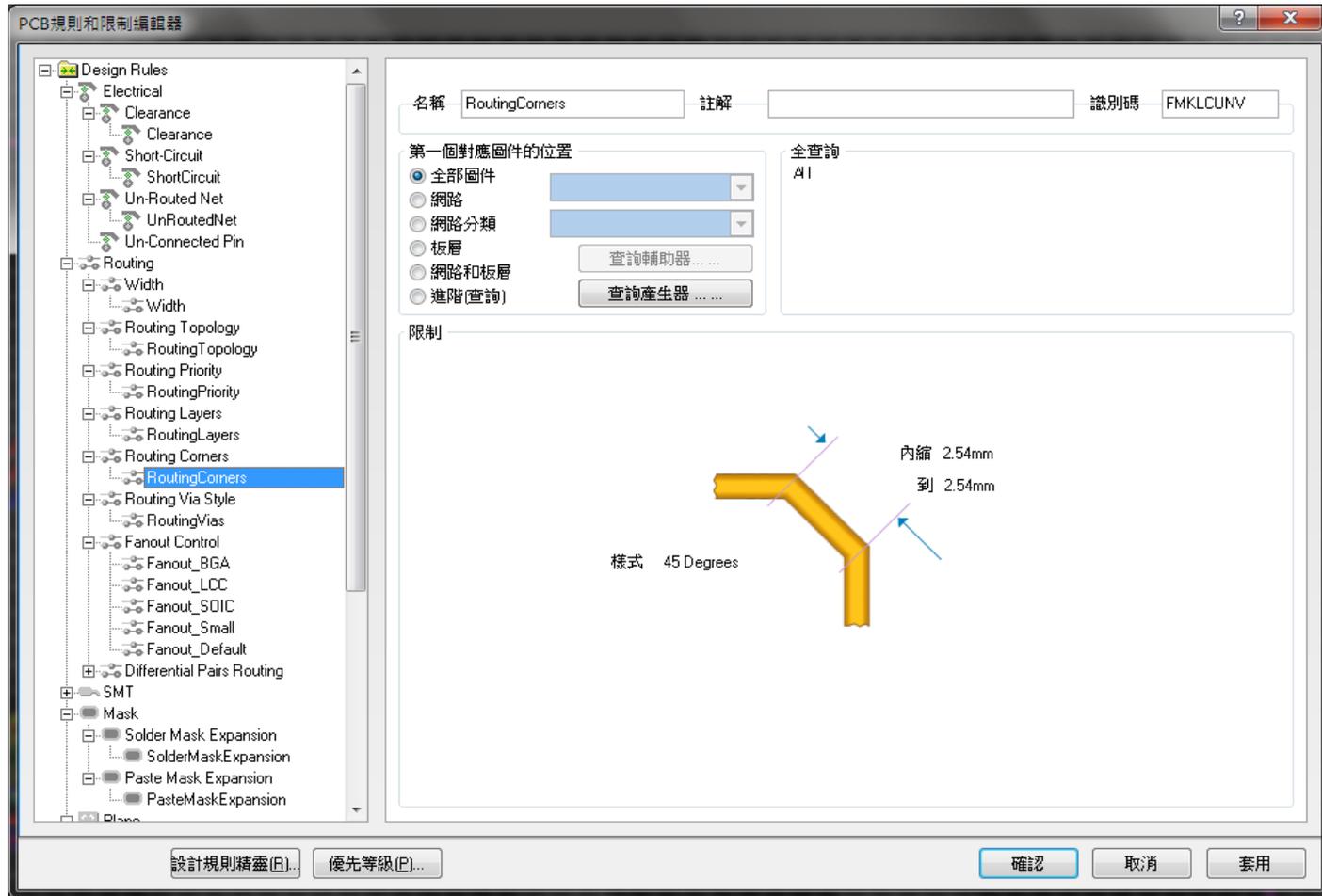
# PCB 規則-繞線 優先等級



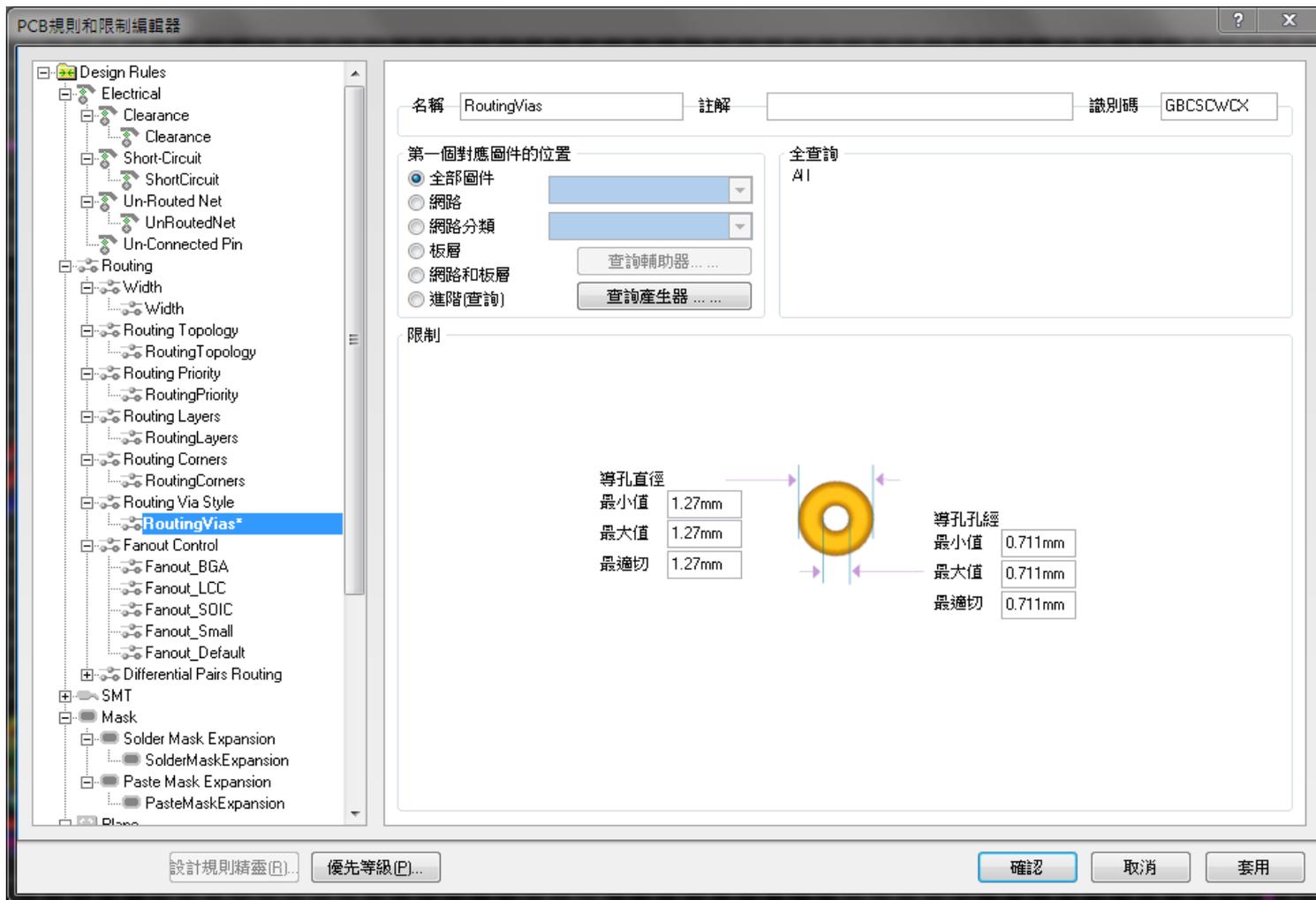
# PCB 規則-繞線 板層



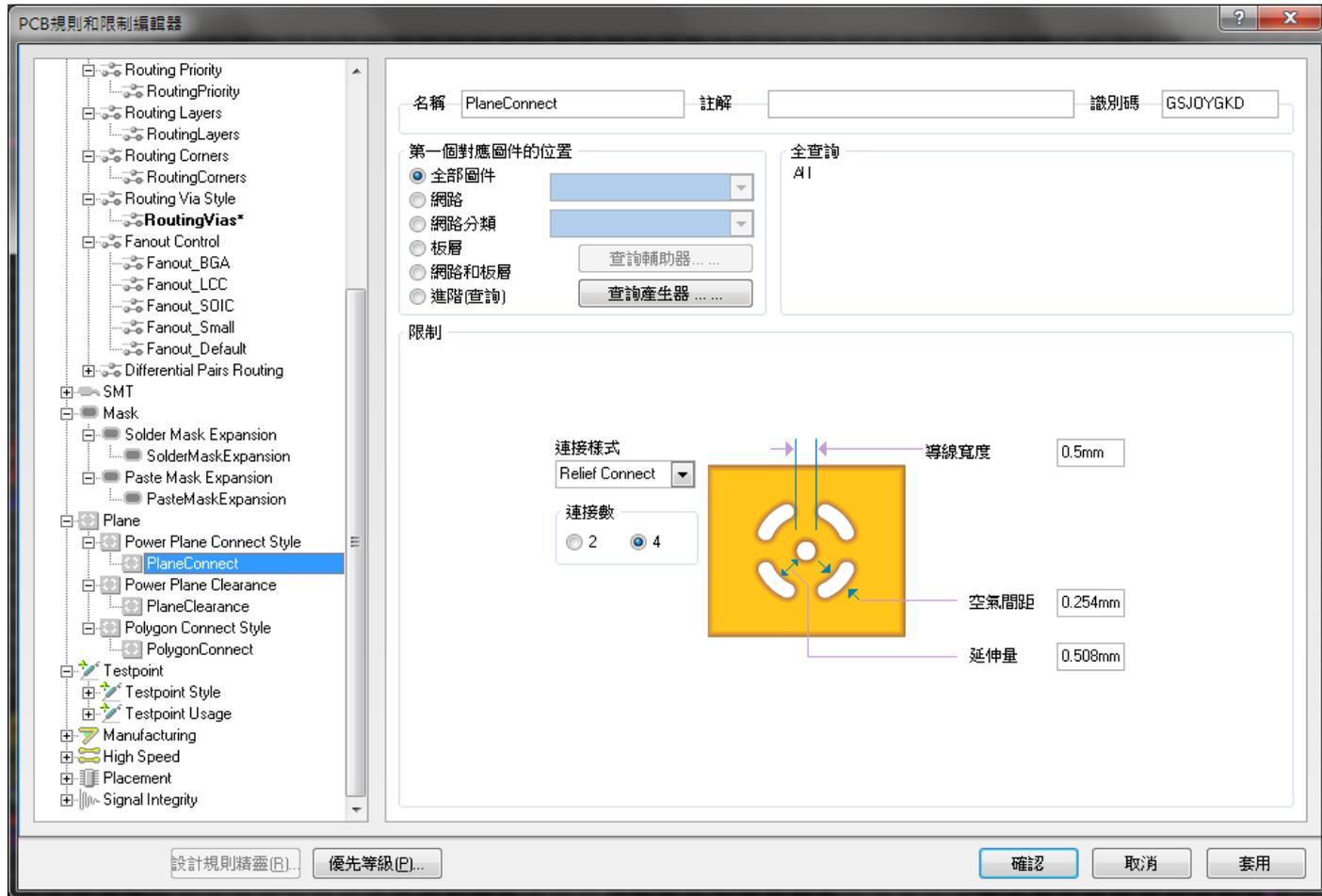
# PCB 規則-繞線 轉角



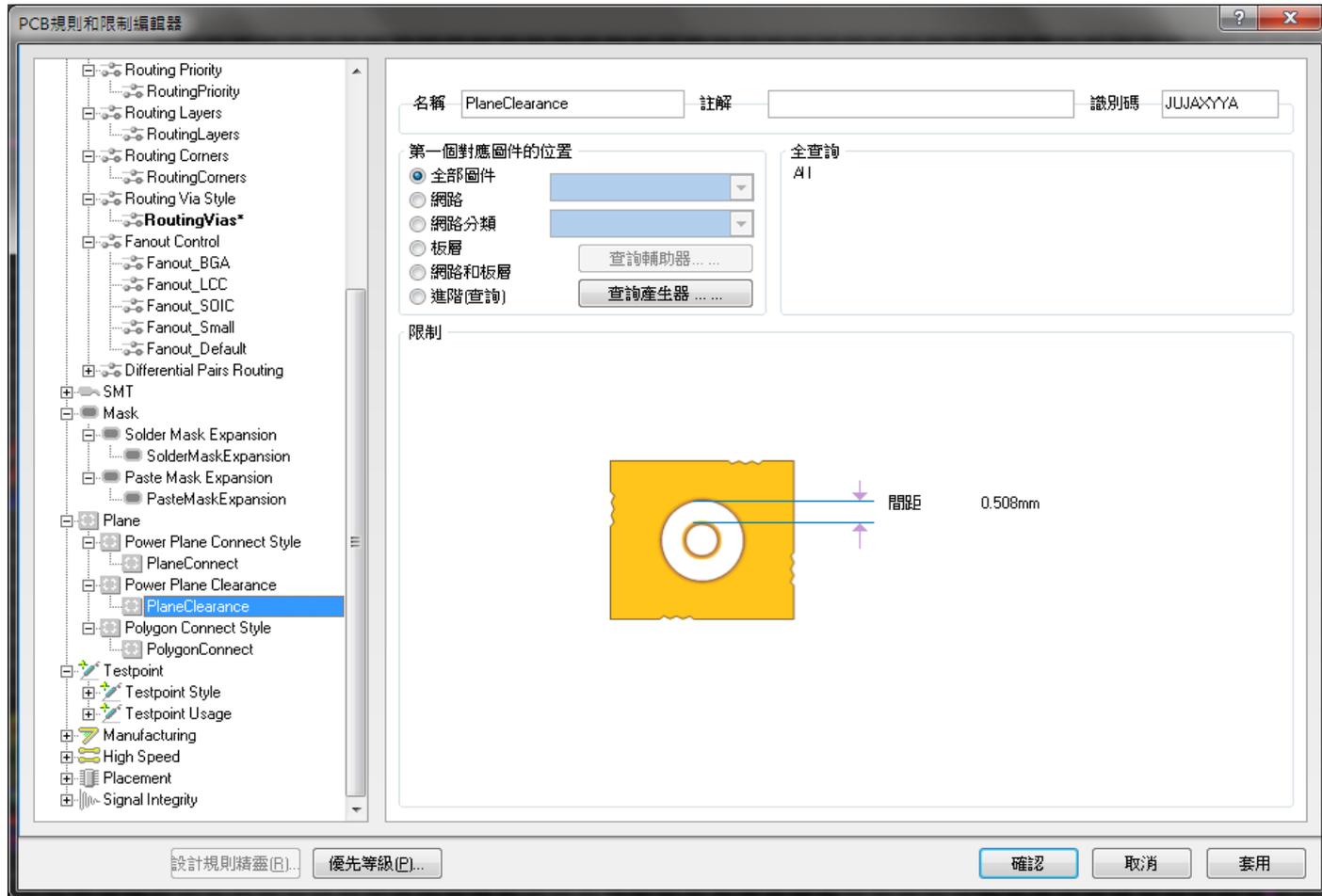
# PCB 規則-繞線 導孔



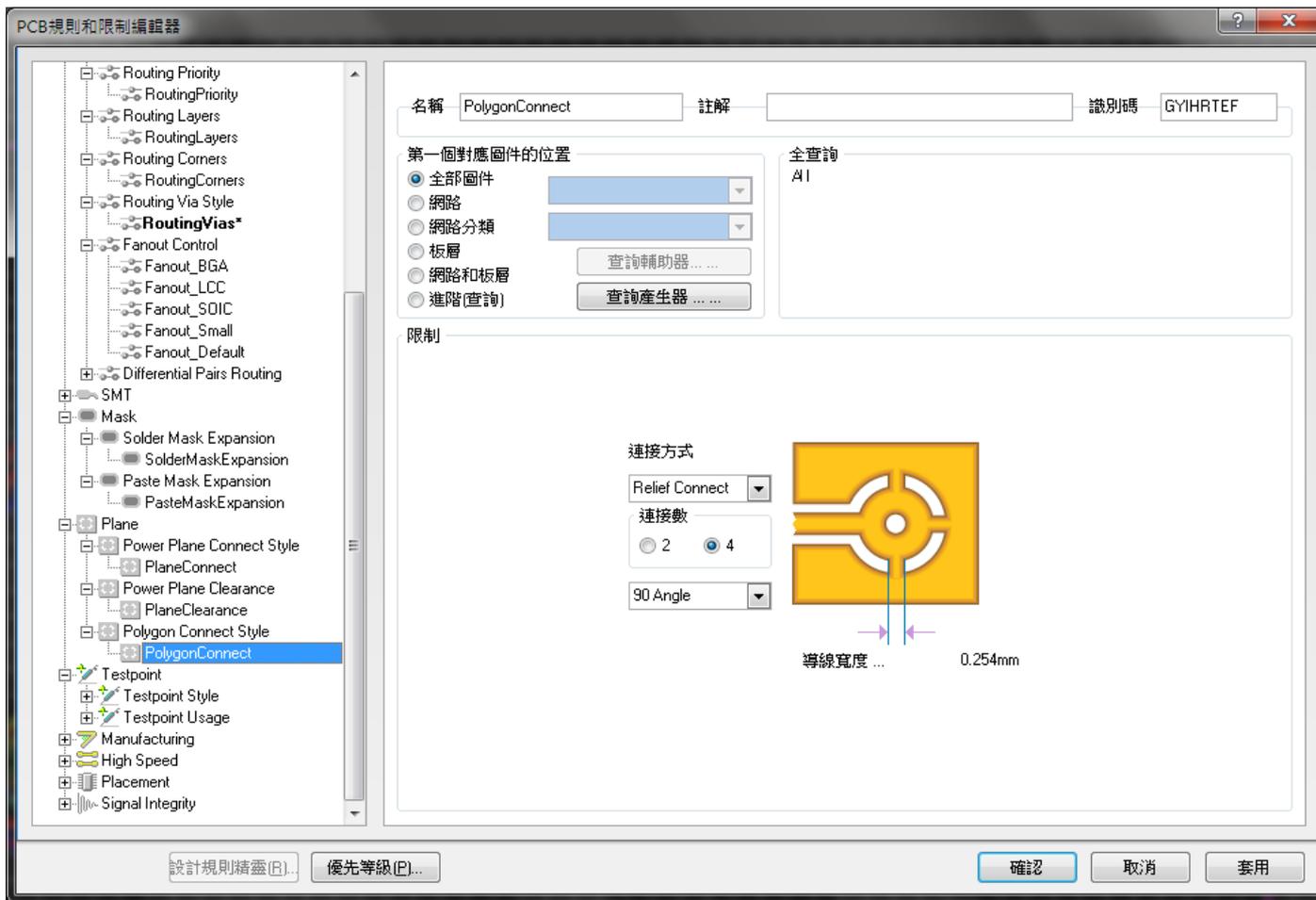
# PCB 規則-繞線 鋪銅



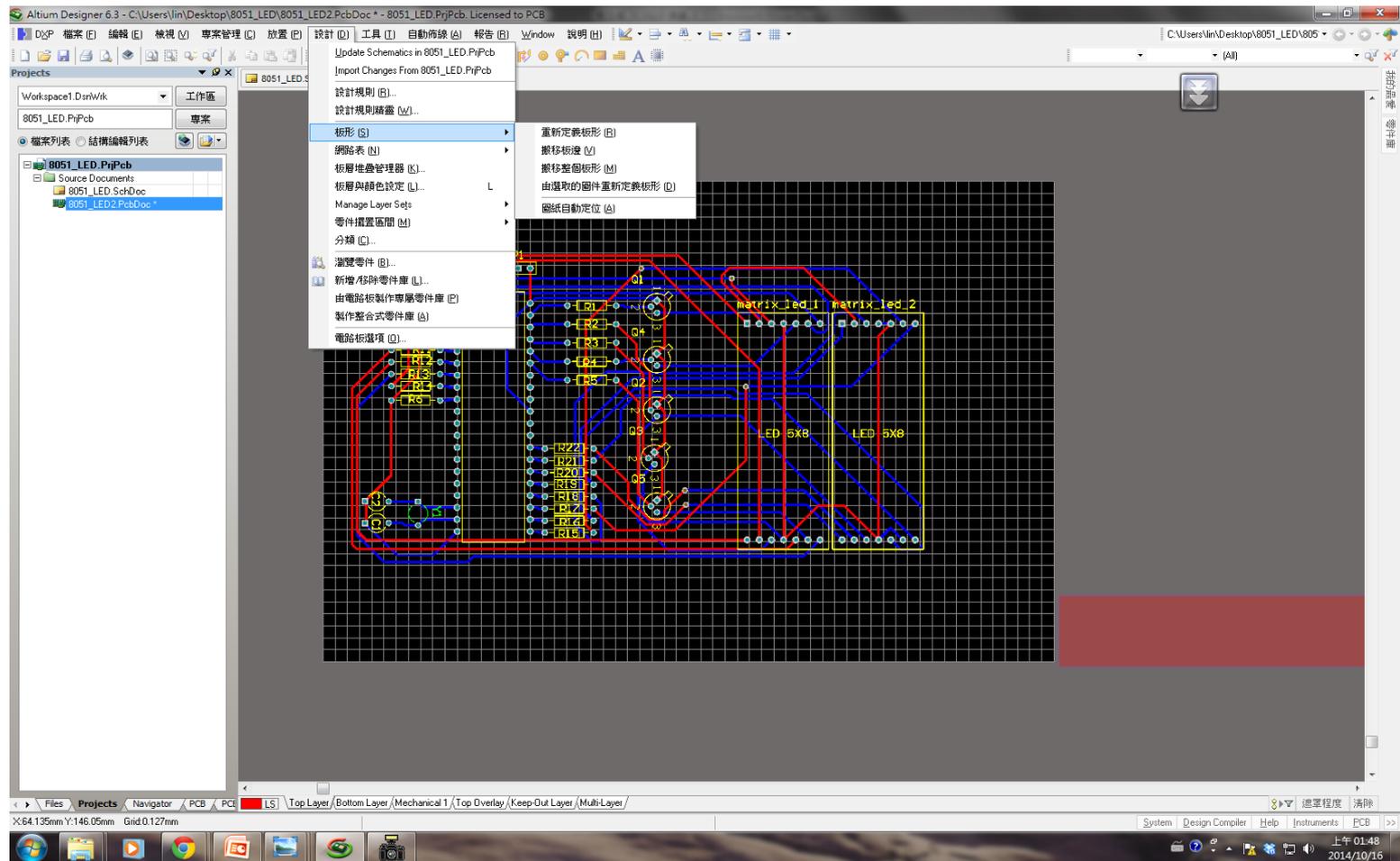
# PCB 規則-繞線 鋪銅



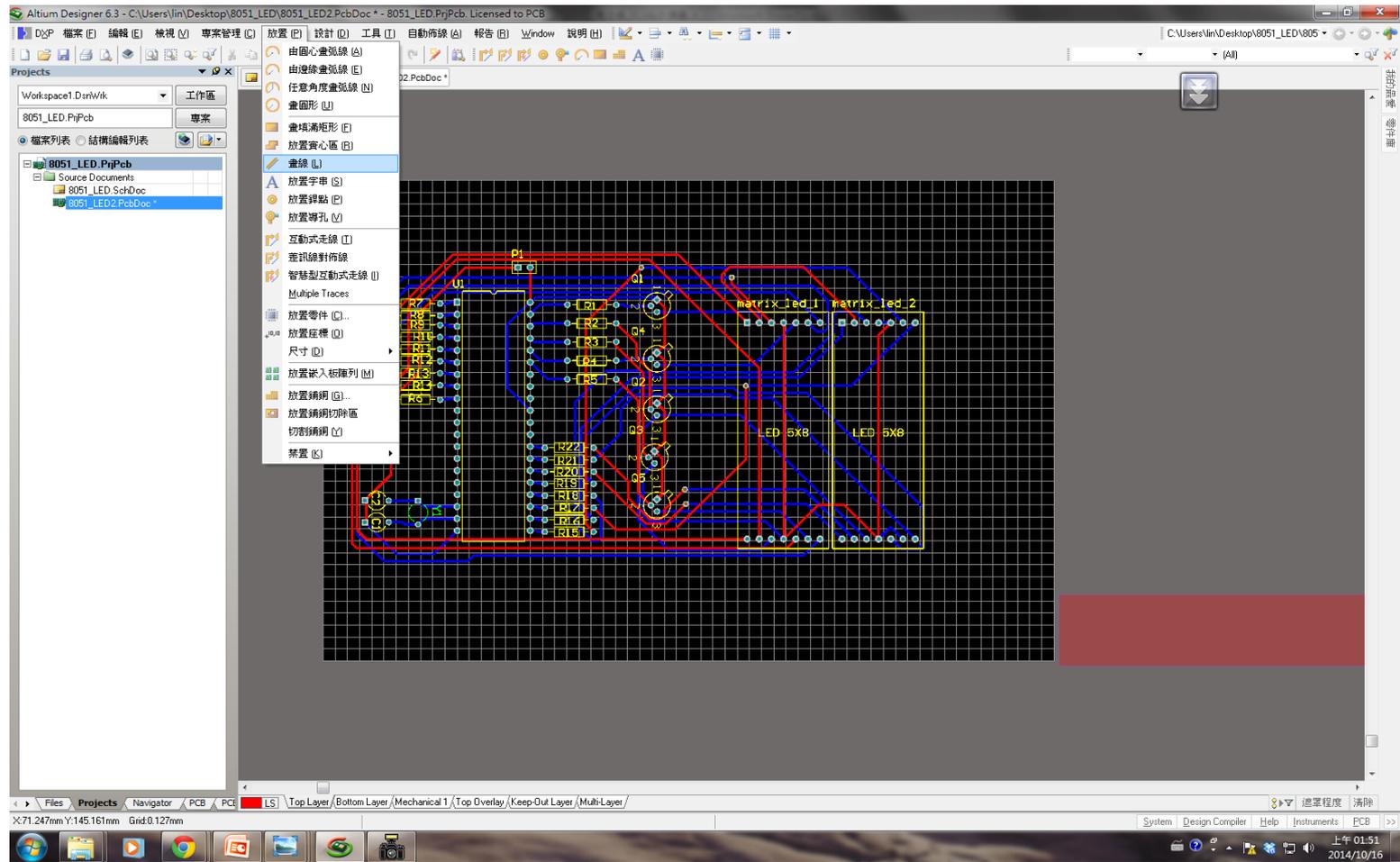
# PCB 規則-繞線 鋪銅



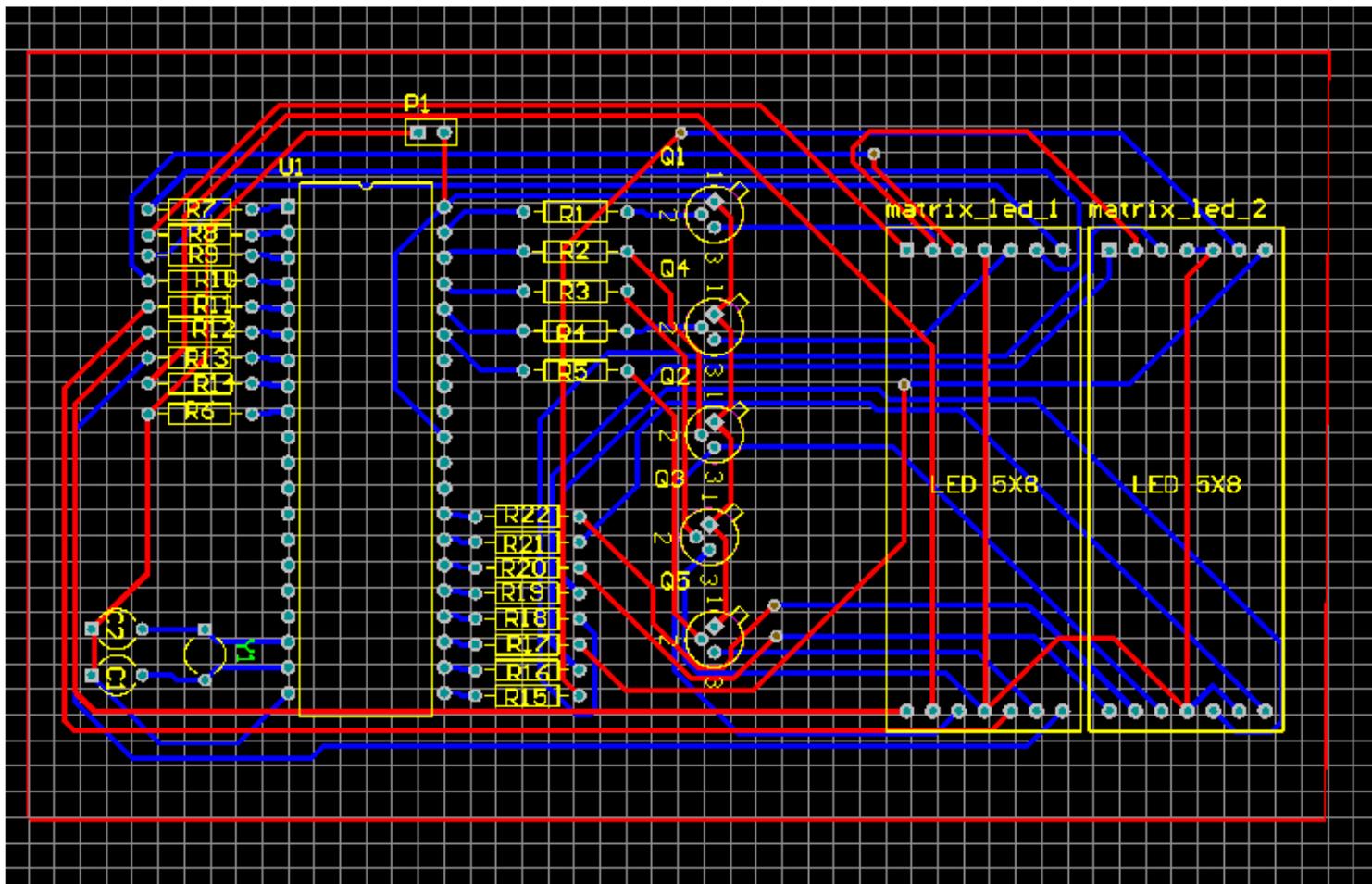
# PCB外型



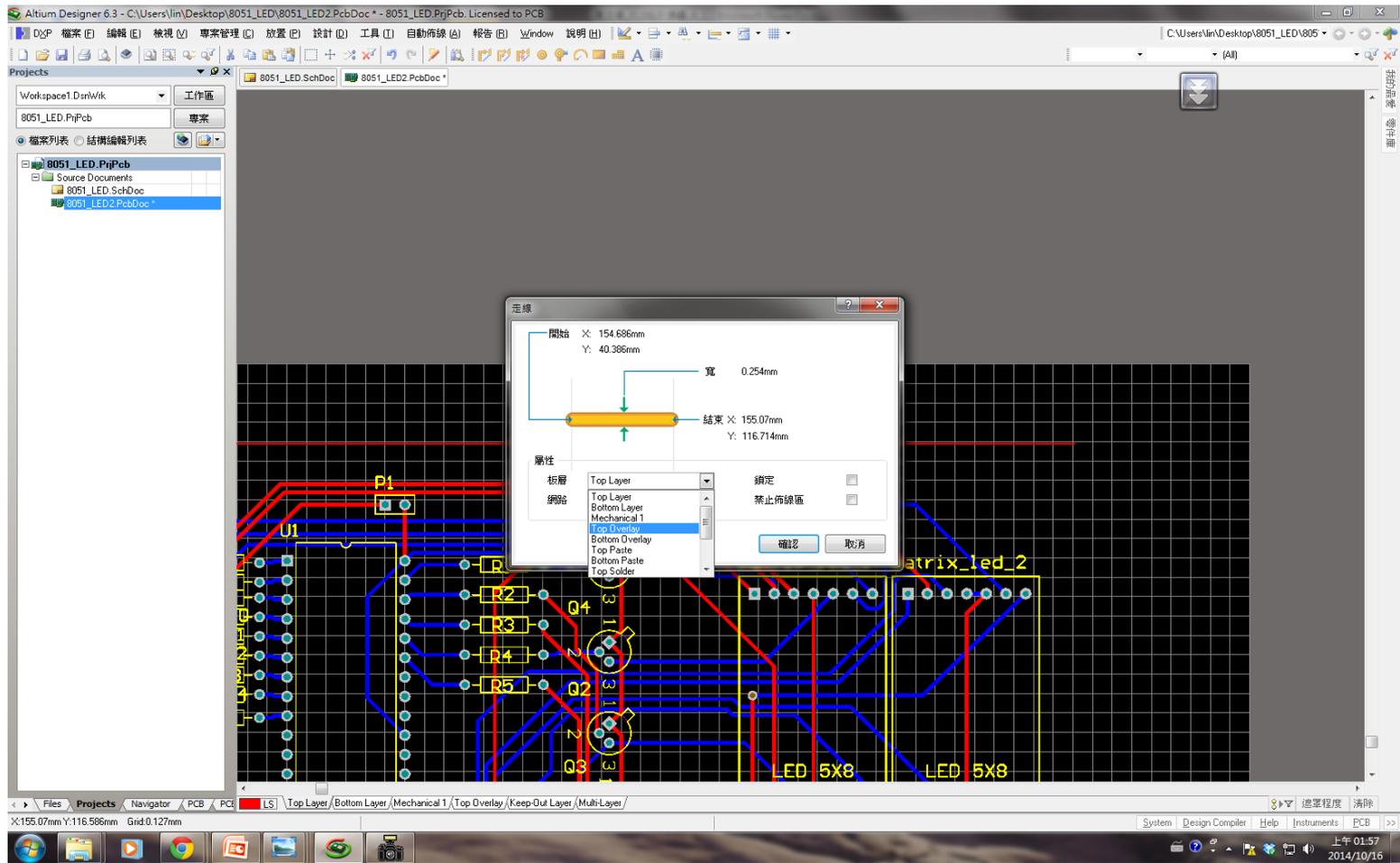
# 放置外框線



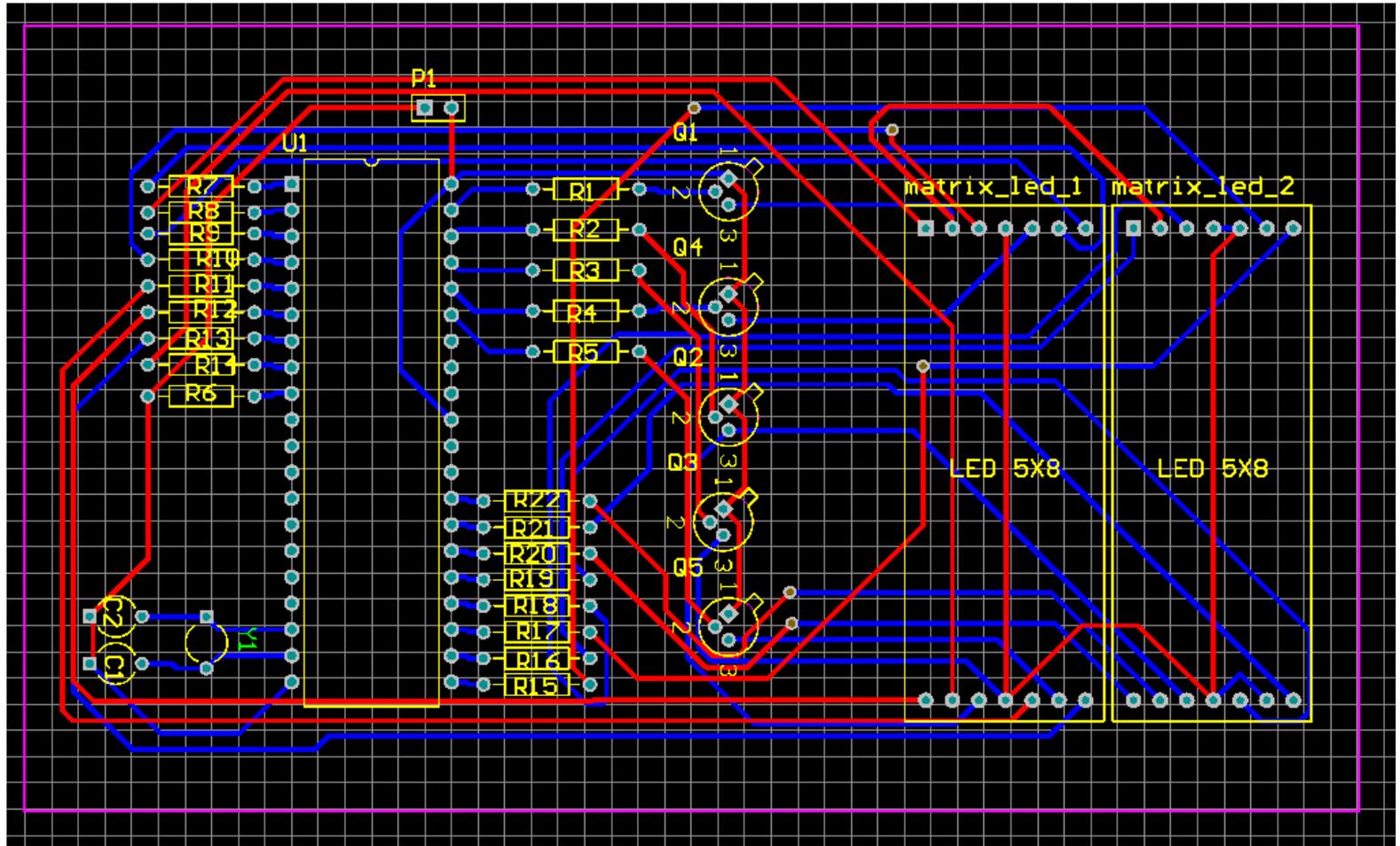
# 外框線



# 修改外框線 - 板層 → keep out layer

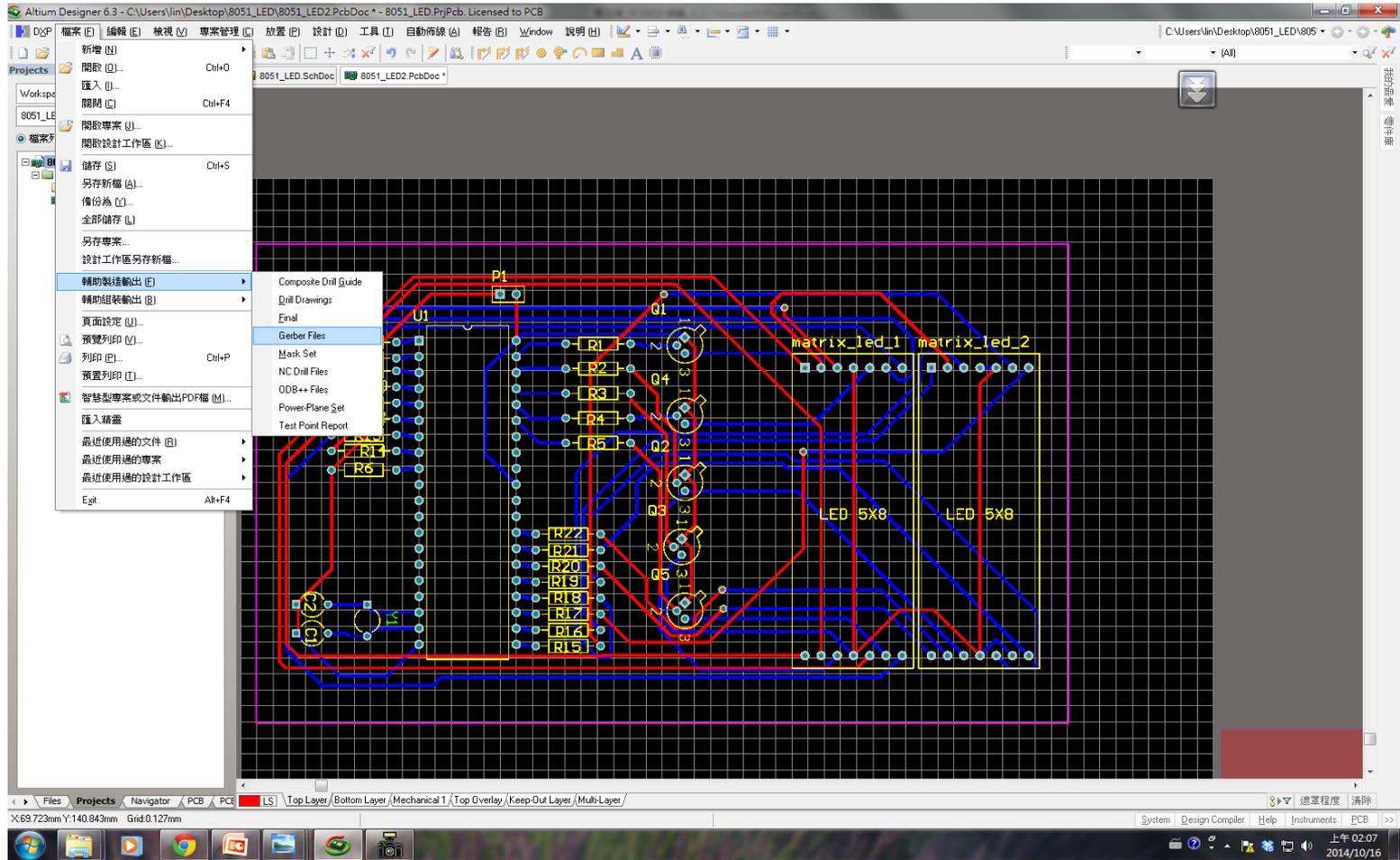


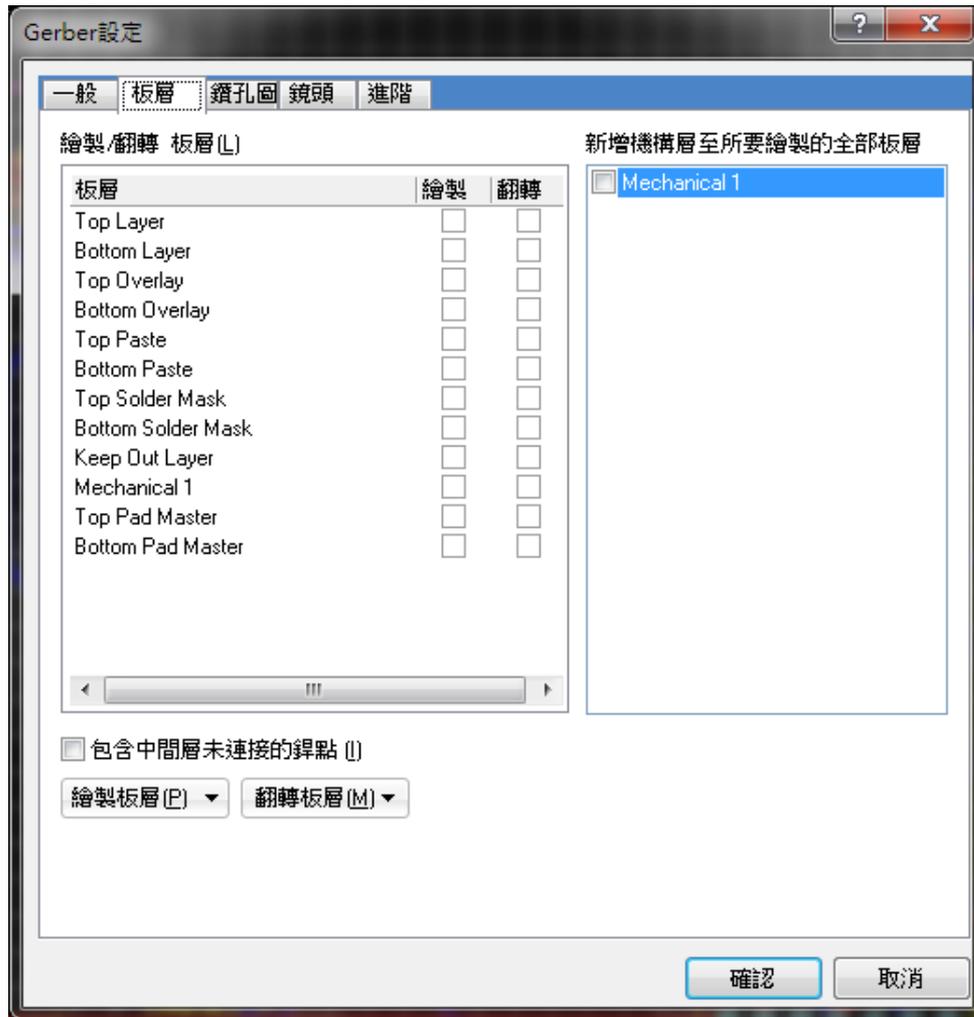
# 設定為裁切外框線



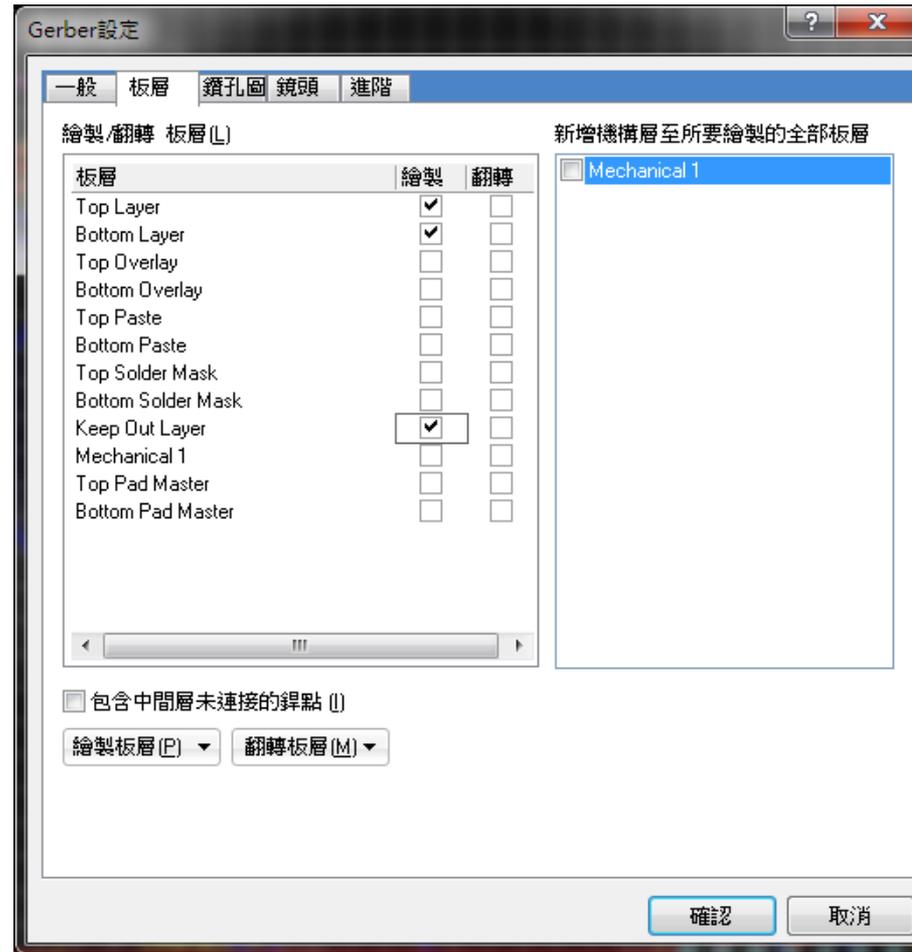
# PCB輔助製造輸出

檔案→輔助製造輸出→Gerber Files



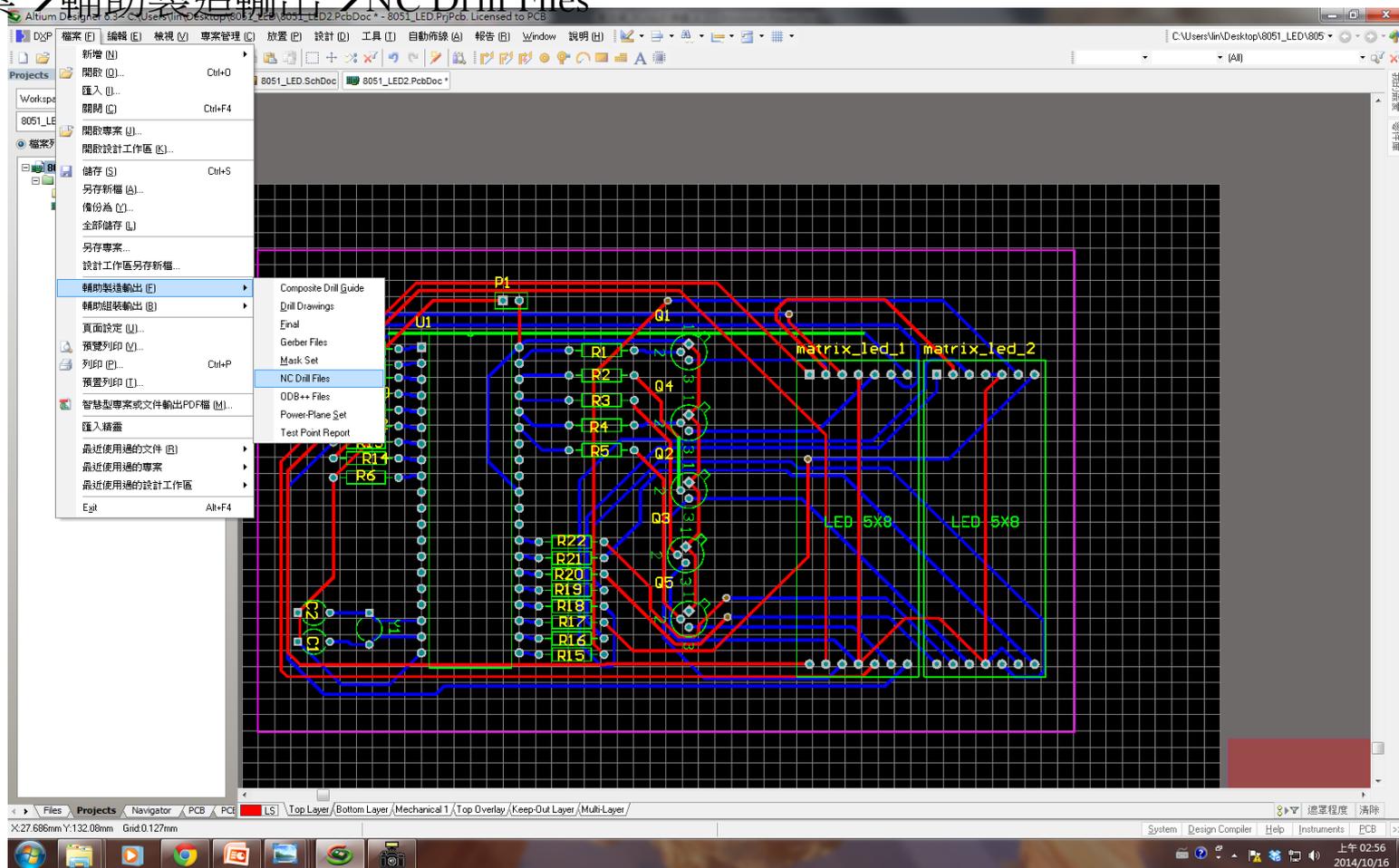


# 選擇輸出檔

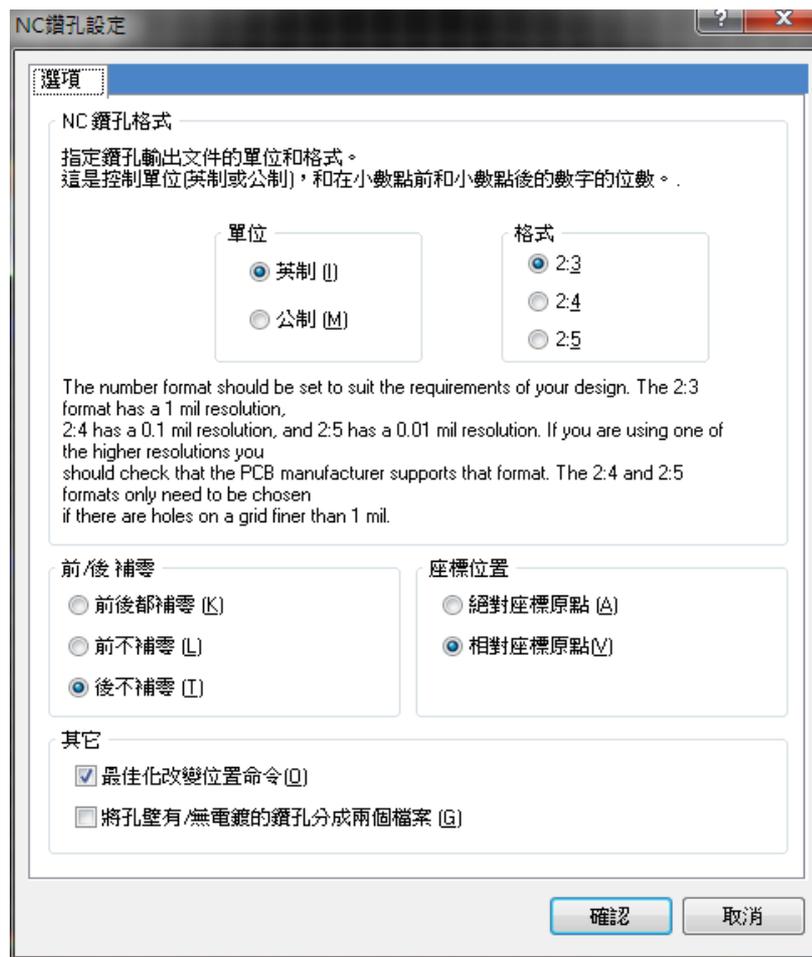


# PCB輔助製造輸出

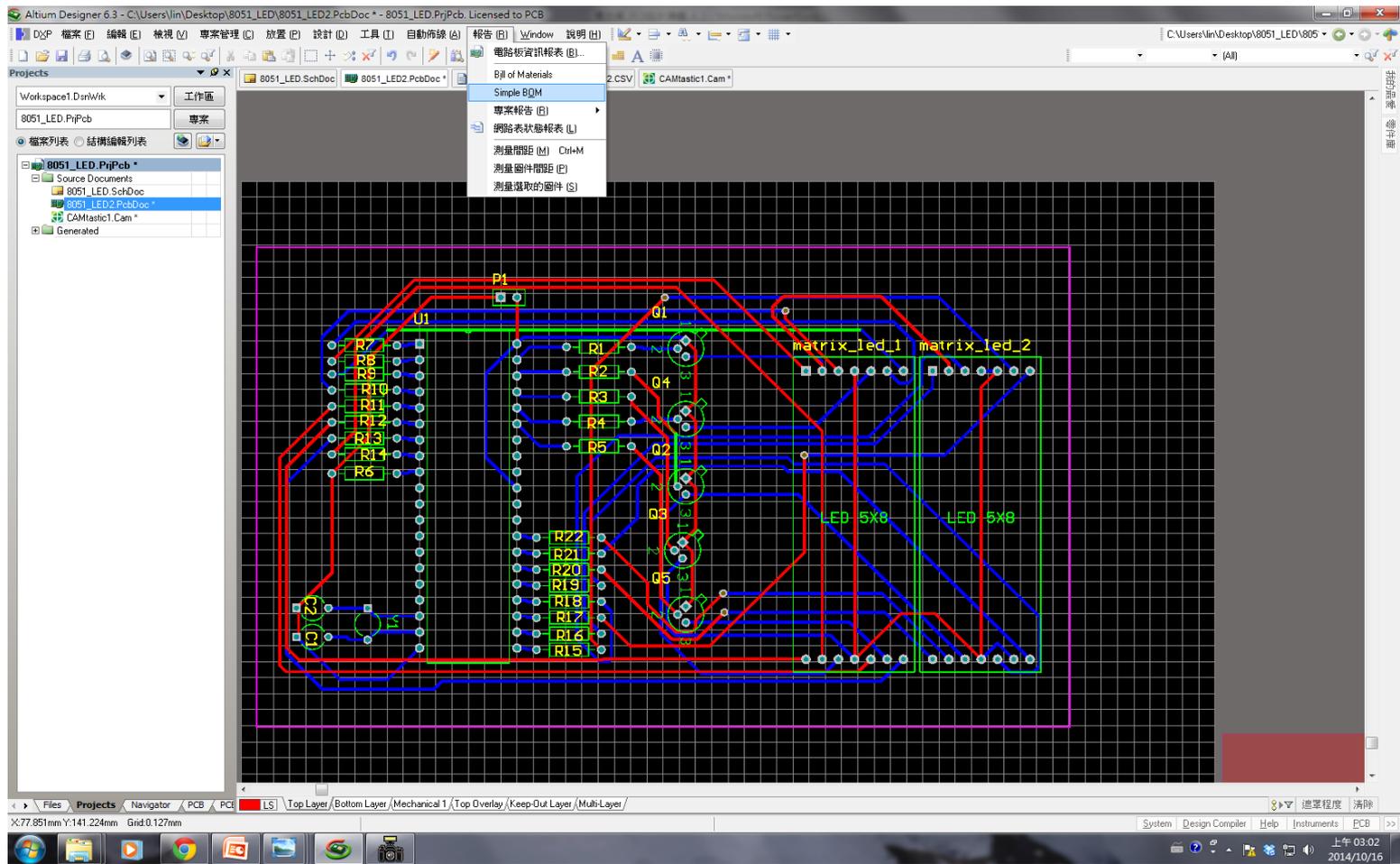
檔案 → 輔助製造輸出 → NC Drill Files



# NC鑽孔



# 報告輸出



# 零件表 BOM

Altium Designer 6.3 - C:\Users\lin\Desktop\8051\_LED\Project Outputs for 8051\_LED\8051\_LED2.CSV - 8051\_LED.PriPcb. Licensed to PCB

File (F) 檔案 (E) 編輯 (E) 檢視 (V) 專案管理 (C) 工具 (I) 視窗 (W) 說明 (H)

projects

Workspace1.DsrWk 工作區  
8051\_LED.PriPcb 專案

檔案列表 結構編輯列表

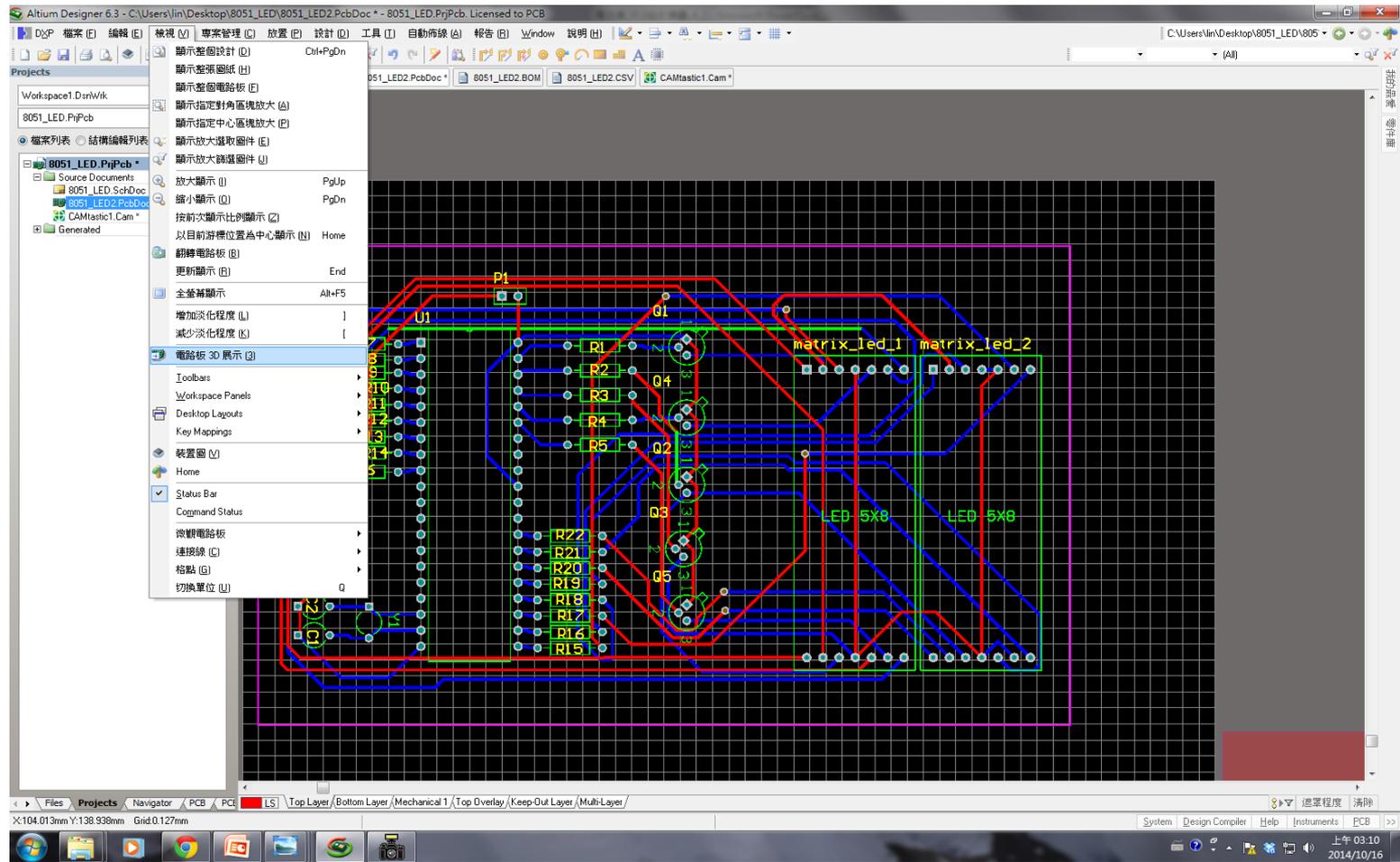
8051\_LED.PriPcb \*  
Source Documents  
8051\_LED.SchDoc  
8051\_LED2.PcbDoc \*  
CAMtastic1.Cam \*  
Generated

8051\_LED.SchDoc 8051\_LED2.PcbDoc \* 8051\_LED2.BOM 8051\_LED2.CSV CAMtastic1.Cam \*

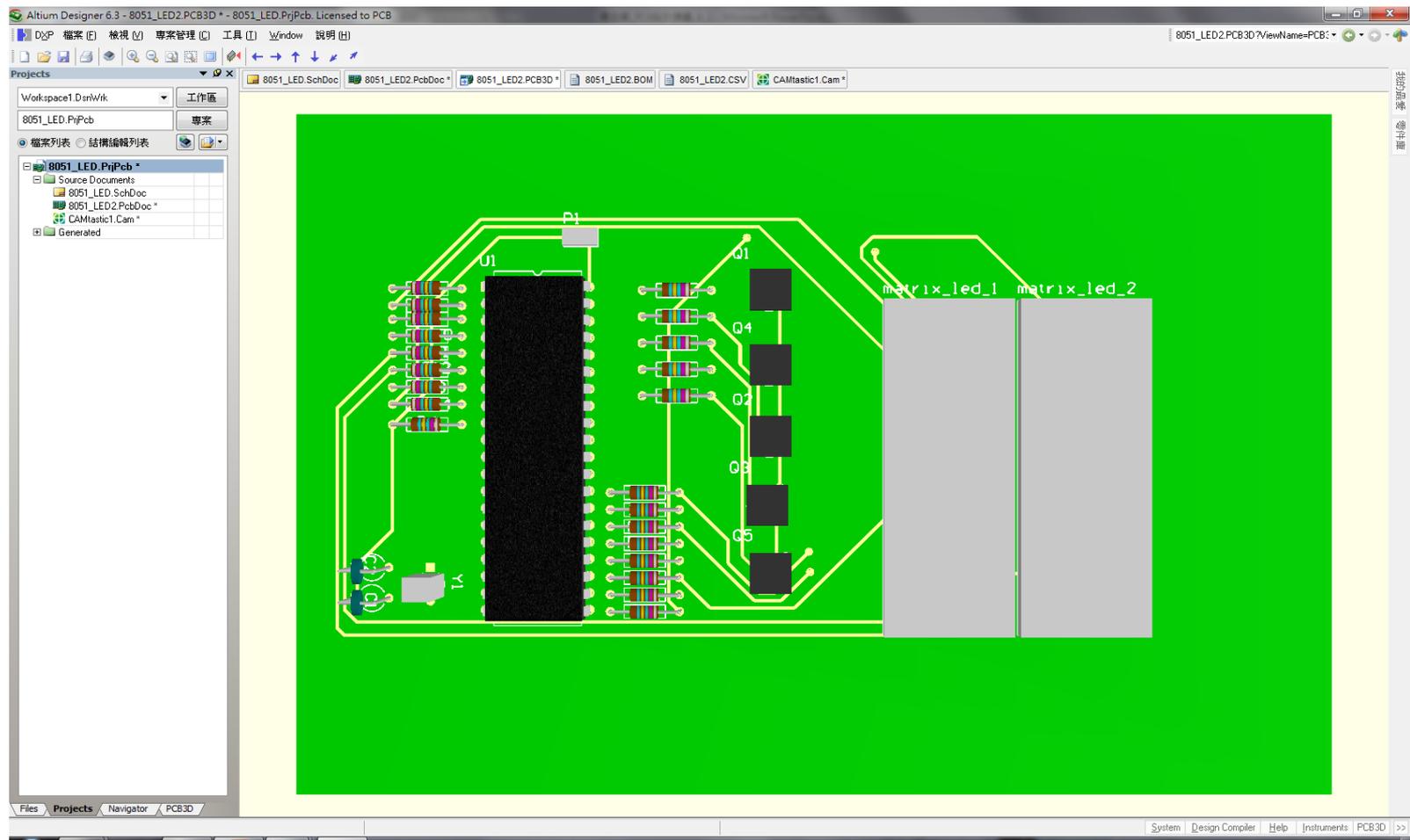
"Bill of Material for 8051\_LED2.PcbDoc"  
"On 2014/10/16 at 上午 03:01:13"  
"Comment", "Pattern", "Quantity", "Components"  
"5x8 matrix led", "matrix\_led\_5X8", "2", "matrix\_led\_1, matrix\_led\_2", ""  
"Cap", "CAPR5-4X5", "2", "C1, C2", "Capacitor"  
"Header 2", "HDR1X2", "1", "P1", "Header, 2-Pin"  
"P89C51RC2BN/01", "SOT129-1", "1", "U1", "80C51 8-Bit Flash Microcontroller Family, 32 kB ISP/IAP Flash with 512 B RAM."  
"FNP", "TO-52", "5", "Q1, Q2, Q3, Q4, Q5", "FNP Bipolar Transistor"  
"Res2", "AXIAL-0.4", "22", "R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22", "Resistor"  
"XTAL", "CAPR5-4X5", "1", "Y1", "Crystal Oscillator"

# 電路板展示

檢視 → 電路板3D展示



# 電路板3D展示



# 範例練習

- 完成 8051\_led專案-PCB
- 輸出 8051\_led專案 PCB 圖層  
(Top layer 、 Bottom layer 、 Keep out layer)
- 輸出 8051\_led專案 PCB --NC鑽孔檔