

Micro Controller Unit and Motor Driver Board

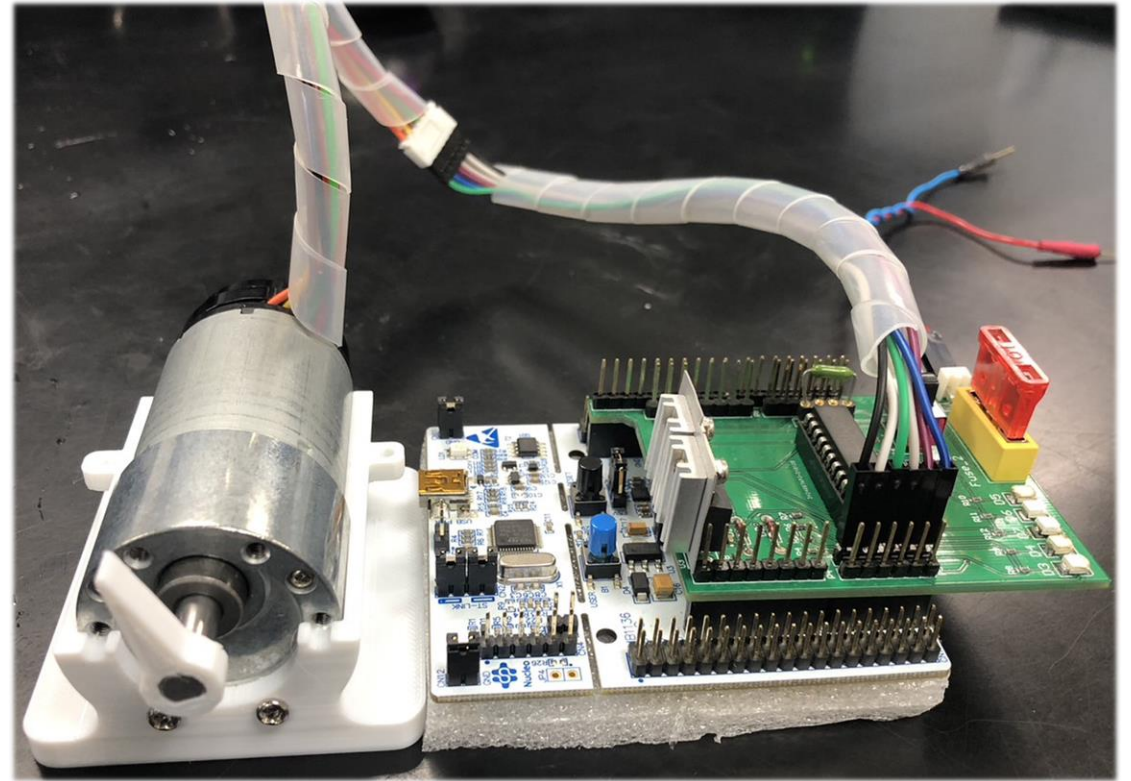
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日期：2023/09/20

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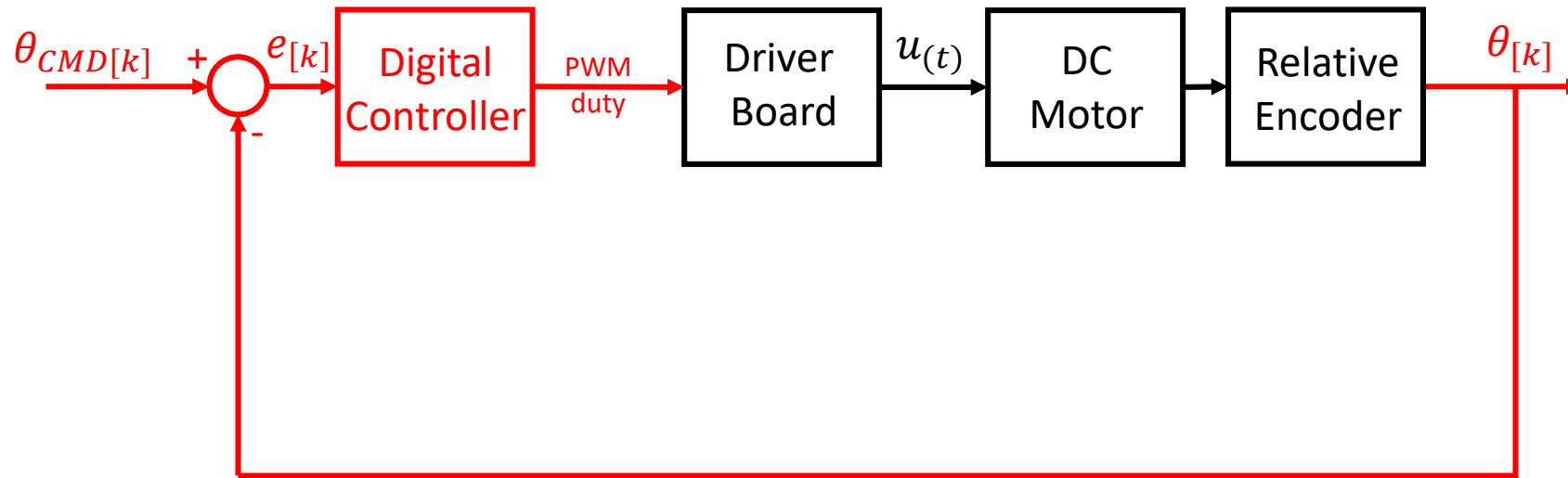
1. [MCU](#)
2. [Motor Driver Board](#)
3. [Lab1 Check](#)



1. MCU

- Introduction
- STM32 F446RE
- Arm Keil Studio
- Instruction

1-1. Introduction



The red part is the job that MCU does.

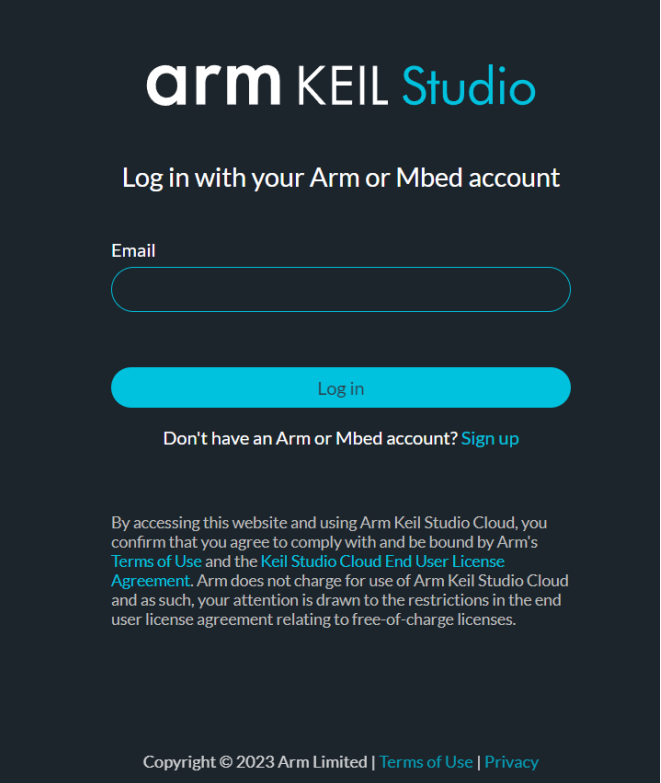
1-2. STM32 F446RE

- MCU Tutorial: [Link](#) (主要使用Serial, Timer, Interrupt, PWM, Digital I/O)
- Spec: [Link](#)
- USB driver update: [Link](#) (若第一次燒錄程式失敗，可嘗試更新)



1-3. Arm Keil Studio

- 由ARM公司官方開發的線上開發環境
- 可用C/C++編寫程式
- 支援git版本管理
- 註冊帳號 (需等待5天審核，盡快申請)

The image shows the login page for Arm Keil Studio. It has a dark blue background. At the top, the logo 'arm KEIL Studio' is displayed in white and light blue. Below the logo, the text 'Log in with your Arm or Mbed account' is centered. There is an input field for 'Email' with a light blue border. Below the input field is a large, rounded, light blue button with the text 'Log in' in dark blue. Underneath the button, there is a link that says 'Don't have an Arm or Mbed account? Sign up' in light blue. At the bottom of the page, there is a small paragraph of text in light blue, followed by a footer line with 'Copyright © 2023 Arm Limited | Terms of Use | Privacy' in light blue.

arm KEIL Studio

Log in with your Arm or Mbed account

Email

Log in

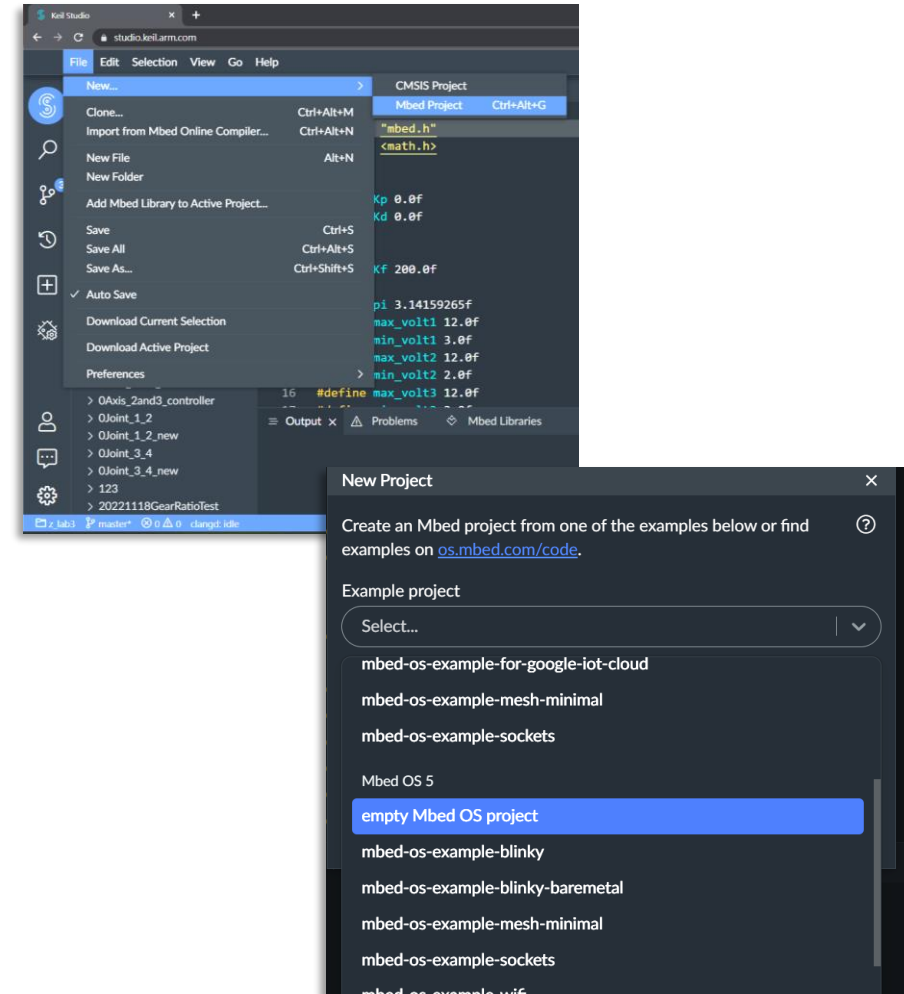
Don't have an Arm or Mbed account? [Sign up](#)

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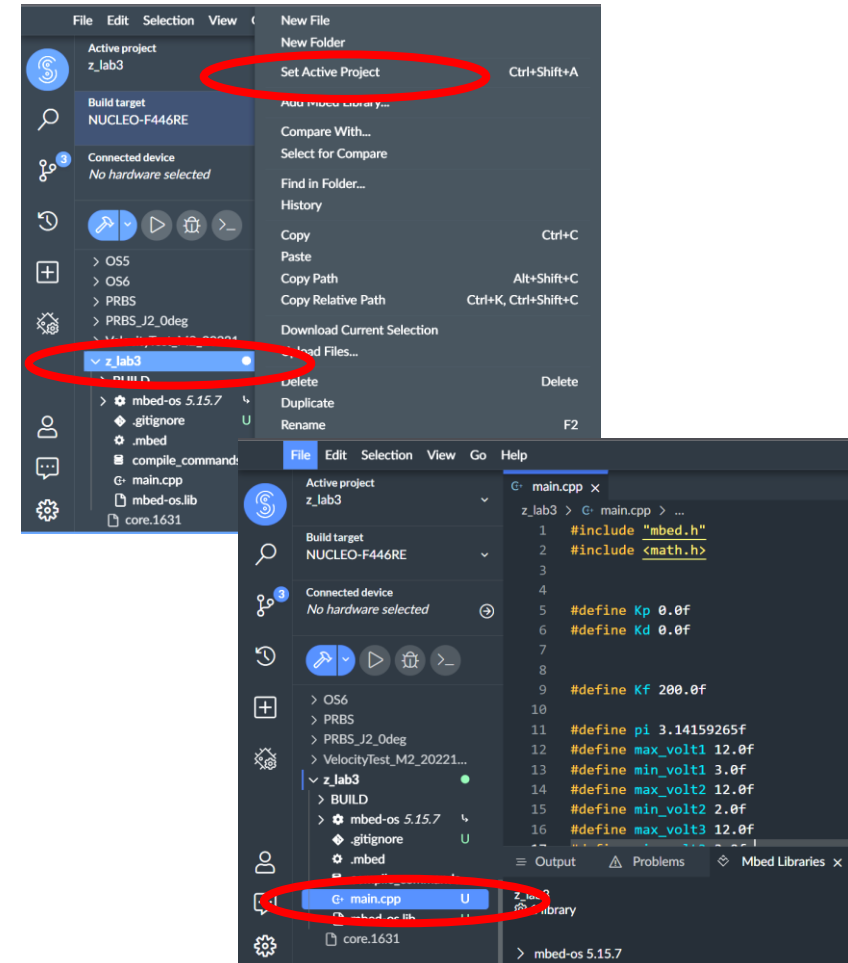
1-4. Instruction

1. Sign in
2. Click
>> **File**
>> **New**
>> **Mbed Project**
3. Select...
>> (Mbed OS5) **empty Mbed OS Project**
4. Change the “**Project name**” as you want



1-4. Instruction

5. Right click on the project
>>**Set Active Project**
6. Click “**main.cpp**” in the project
7. Copy paste the **given codes** on ppt/elearn
8. Modify the code as required.



1-4. Instruction

9. Connect ST with your PC

>>NOD_F446RE(E:) will show up

10. Turn back to Mbed

>>set **Build target** as **NUCLEO-F446RE**

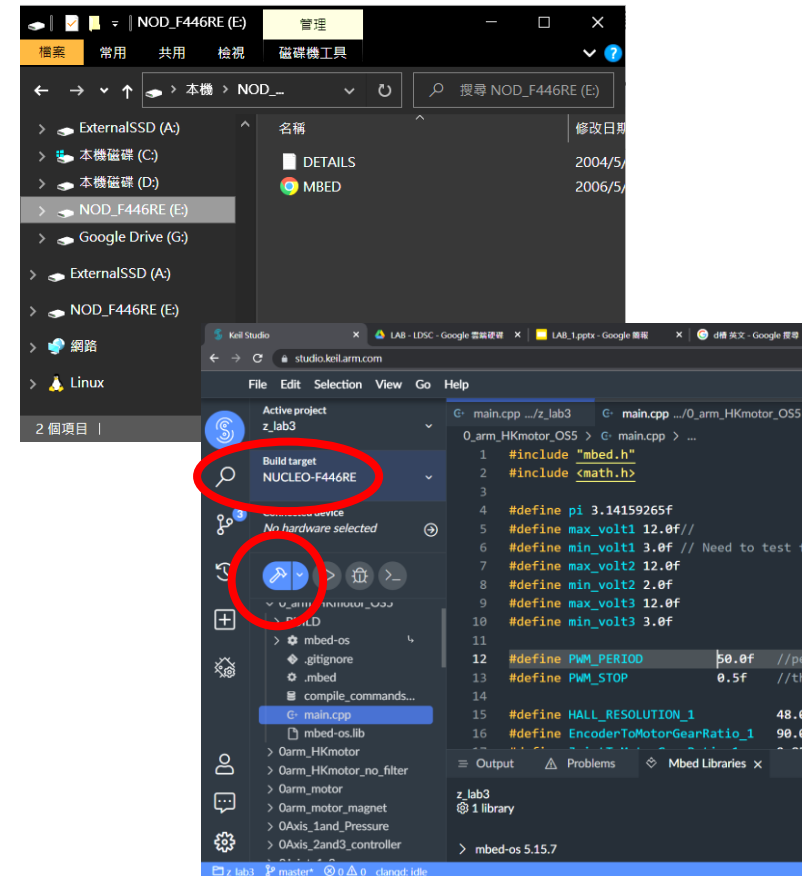
>>click on the **hammer mark**

>>wait until it build completely

11. Put the .bin file into **NOD_F446RE(E:)**

>>The .bin file will disappear.

>>The file is programmed into ST.



2. Motor Driver Board

- Material List
- Circuit Layout
- Description
- Reminders

2-1. Material List

數位控制驅動套件	
名稱/別名	需要?個/套件
電路板	1
L6225N(數控用)	1
20PIN IC插座	1
LM7805CT 線性電壓穩壓器	1
LM7812CT 線性電壓穩壓器	1
保險絲座(4pin)	1
251/253 Series 2A fuse	1
二極體 1N4148	2
2.54排針[兩端長(11mm)/25mm等長]	32
2.54排針[一長9mm一短2mm/不等長(14.2mm)]	22
SMD 0603電容 10nF	1
SMD 0603電容 5.6nF	2
SMD 0603電容 100nF	4
SMD 0603電容 220nF	1
SMD 0603電容 1uF	1
SMD 0603電阻 100歐姆	1
SMD 0603電阻 1k歐姆	13
SMD 0603電阻 100k歐姆	2
SMD 1210 LED	5
電源pin (90度)	1
開關	1

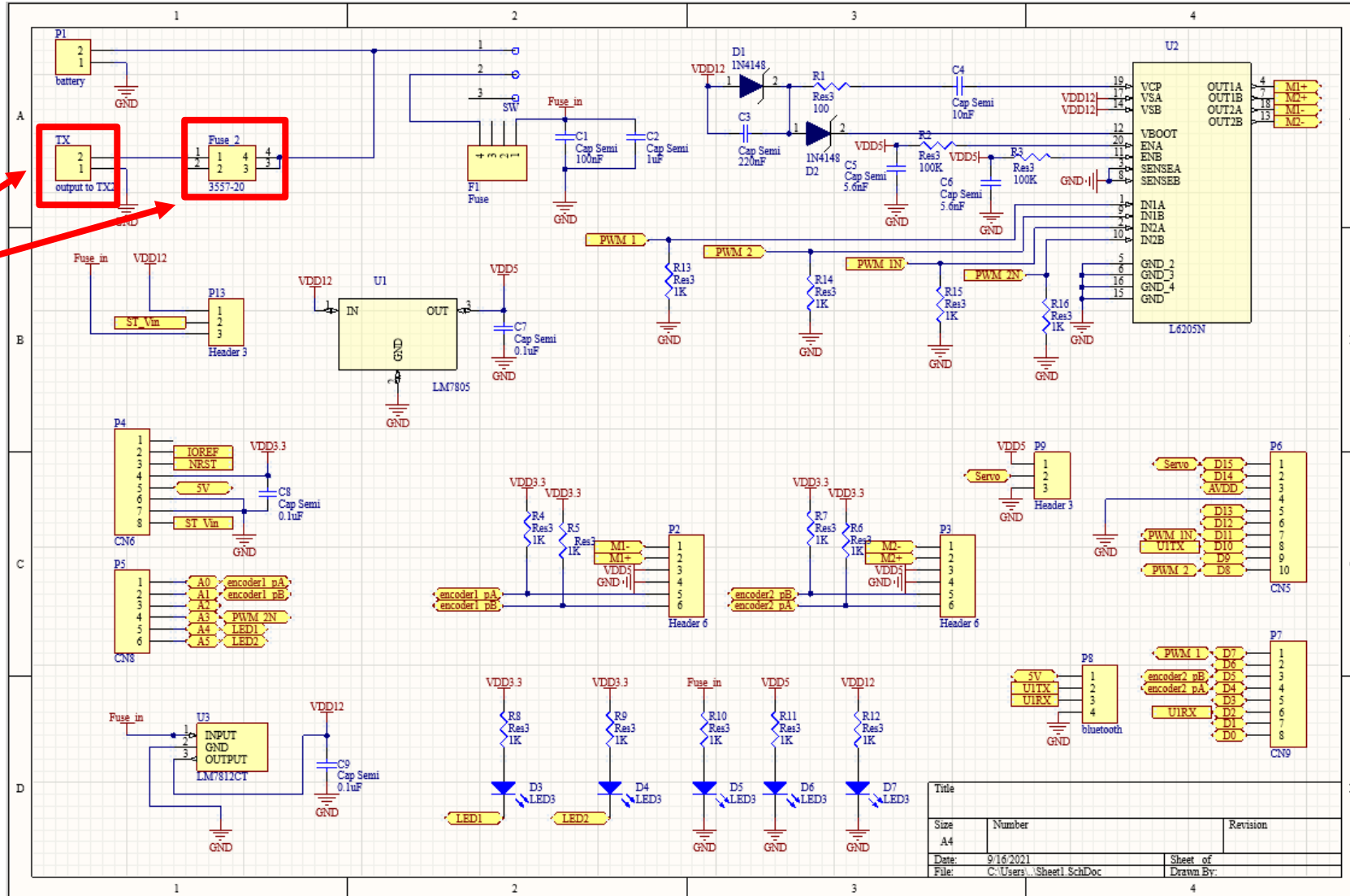
(或L6205N)



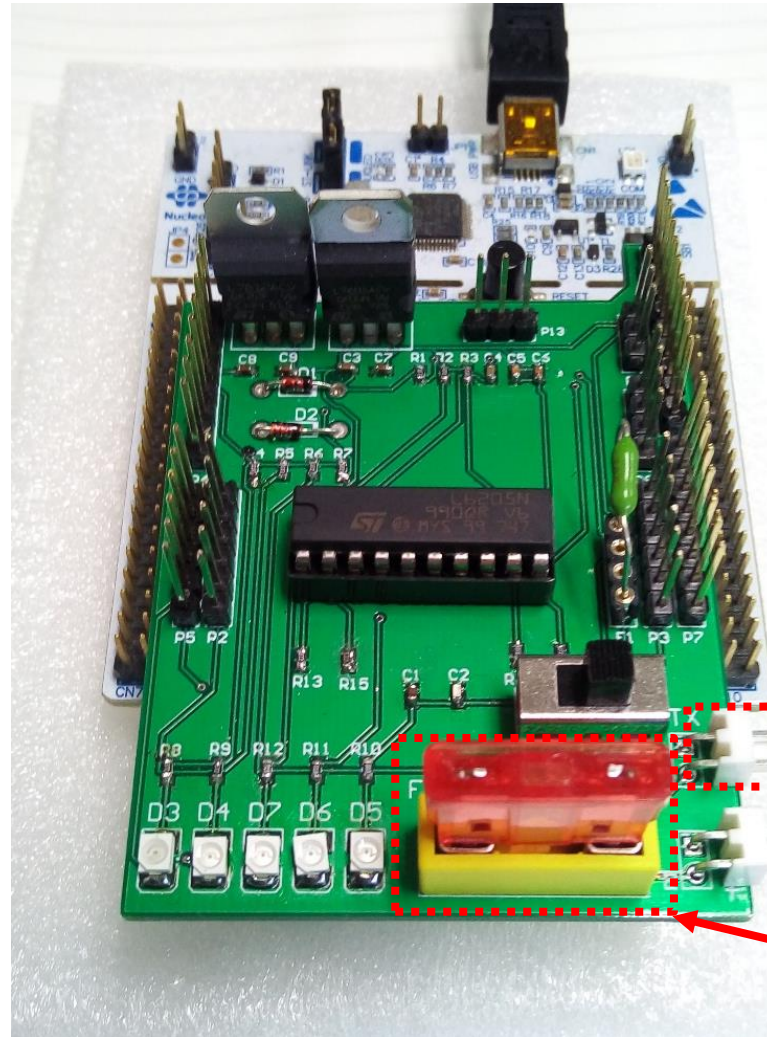
需自備一條USB A to mini B

2-2. Circuit Layout

不用焊



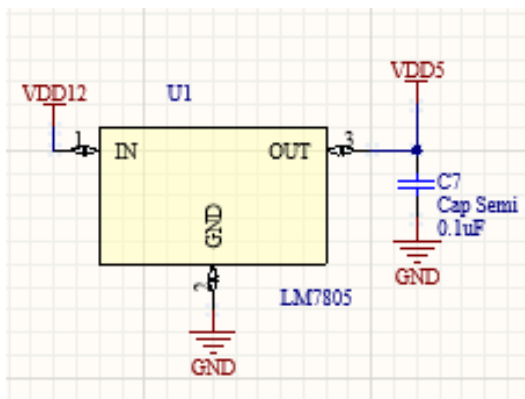
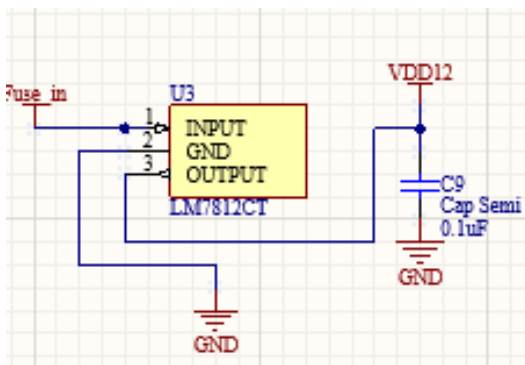
2-2. Circuit Layout



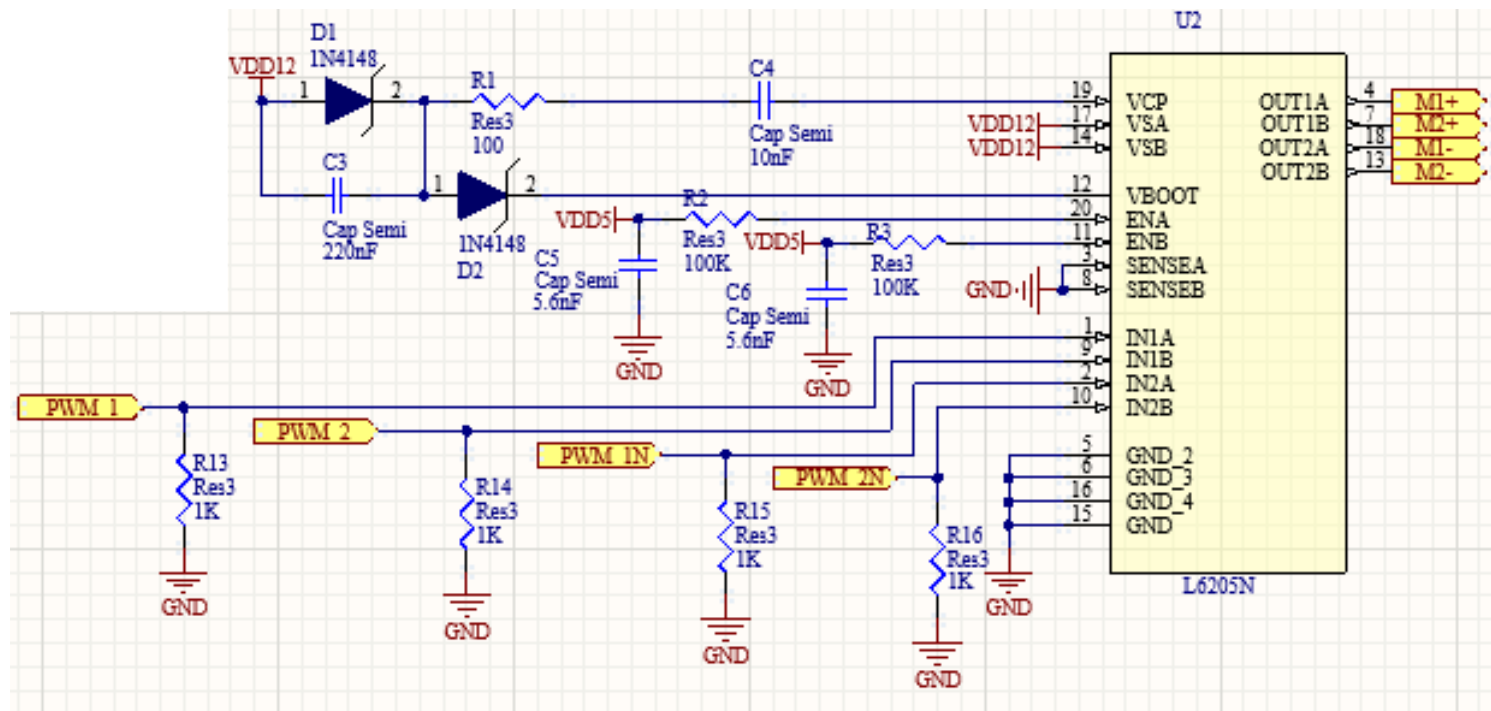
不用焊

2-3. Description

- 穩壓 / 降壓元件



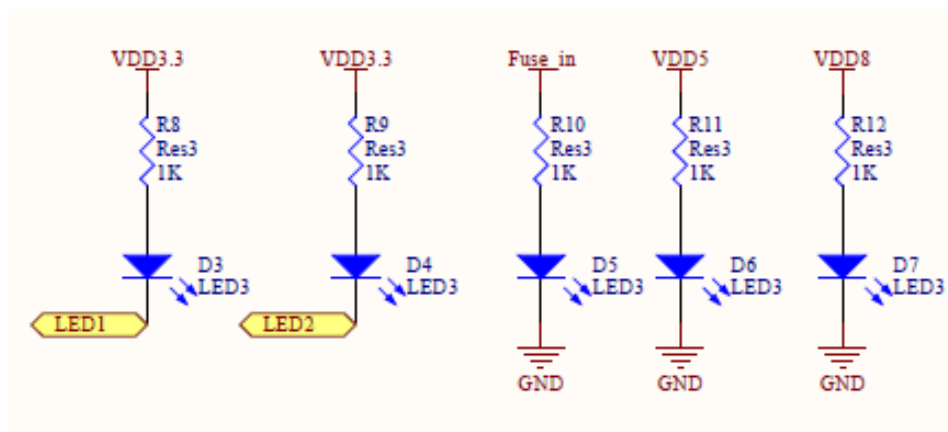
- 驅動器



請查看datasheet

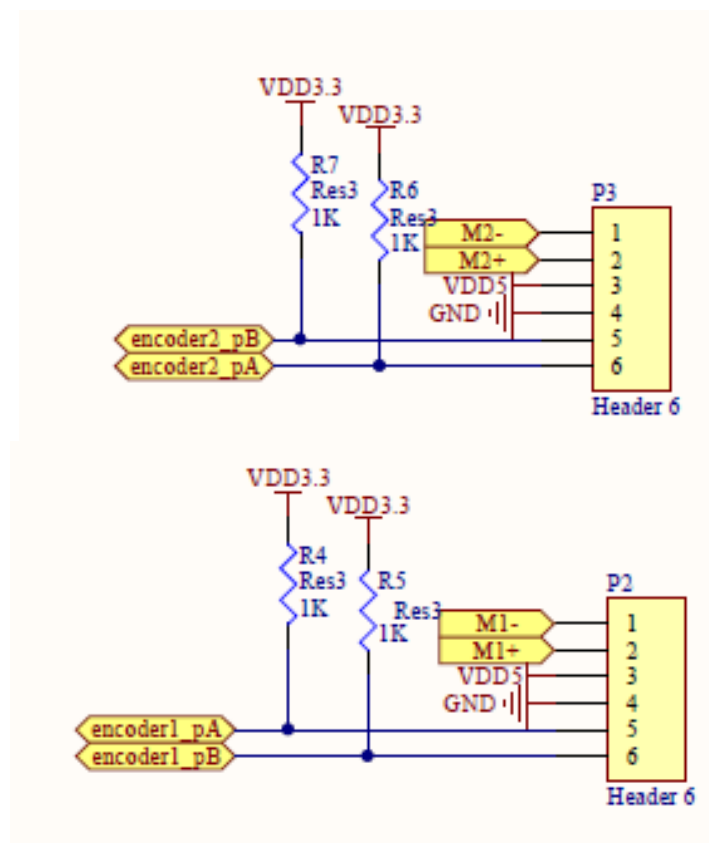
2-3. Description

- LED



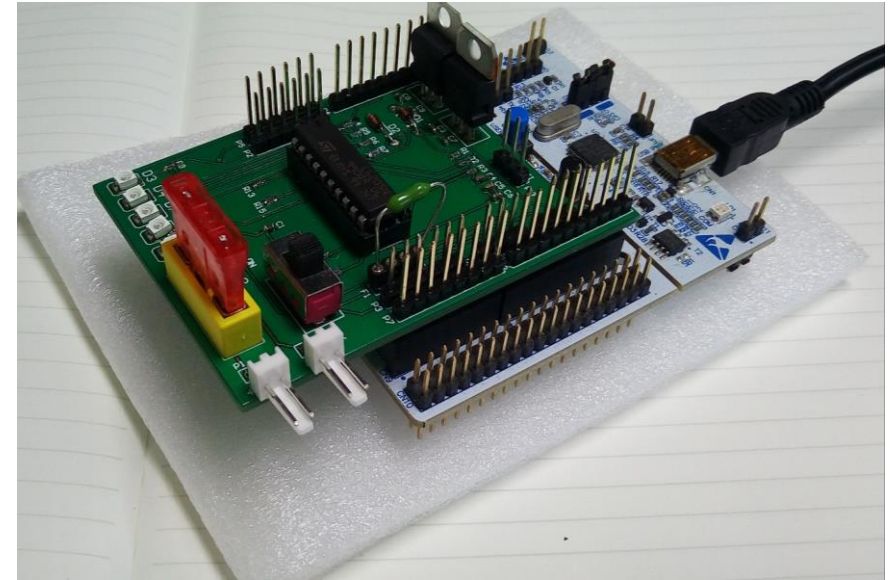
這裡是pull up, 寫程式的時候要注意

- 連接馬達



2-4. Reminders

- 由低(貼片電容、電阻、LED)而高(排針座、IC等)
 - 貼片電容焊接參考: [Link](#)
 - 排針焊接參考: [Link](#)
- 邊焊邊檢查是否短路、假焊
- 請在針腳下墊絕緣物預防短路
- 工一402有焊接設備，使用前一天寄信跟助教約時間(??)



3. Acceptance Check

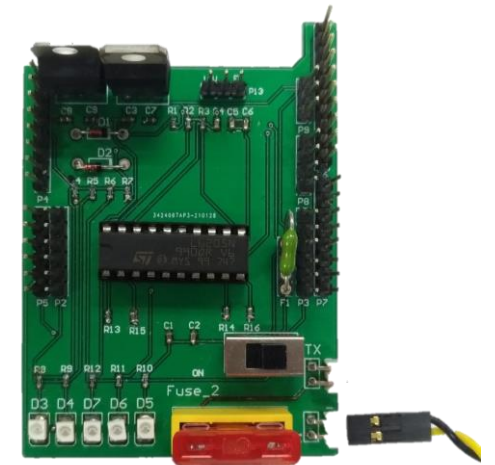
- Deadline
- Soldering (Req1)
- Serial Communication (Req2)
- LED Control (Req3)

Deadline

2023/10/25之前，至R503找助教驗收

Soldering

- 先不要接上ST
- (Req1)接上電源(20V, 1A)後確認D5、D6、D7發亮



- LM7812線性穩壓器的工作區間

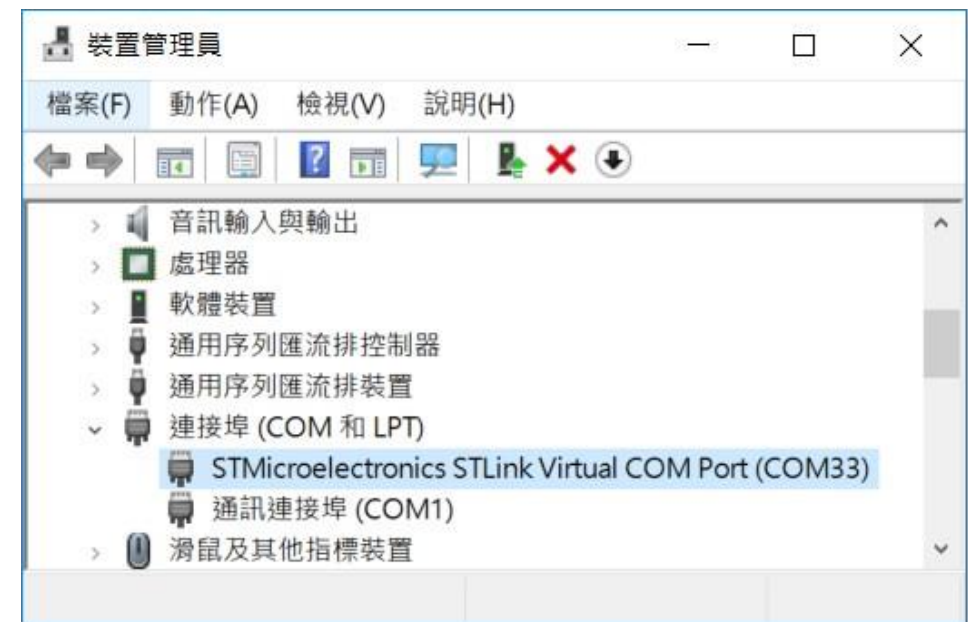
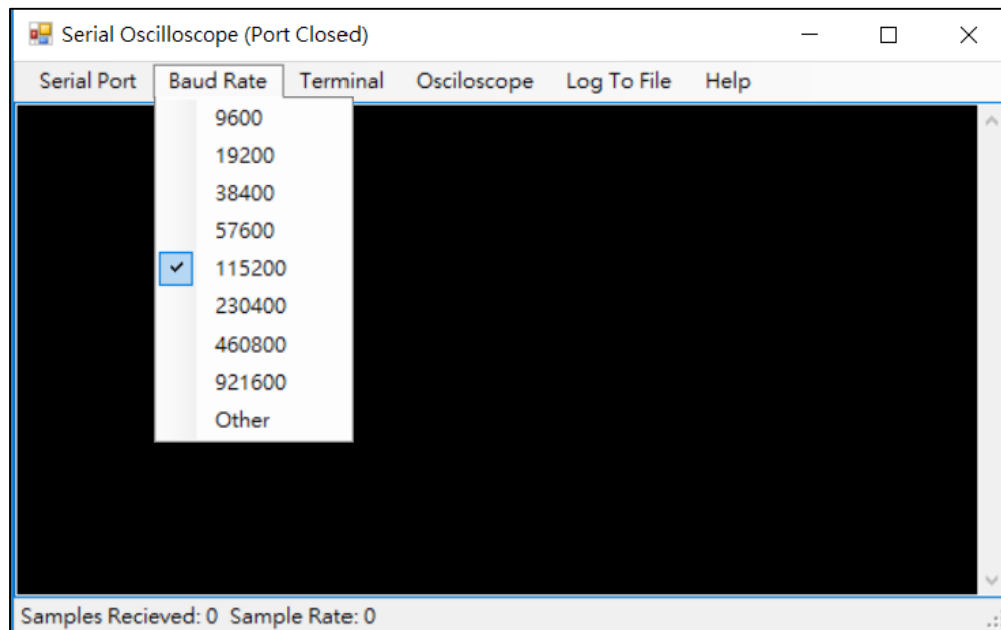
6.7 LM340 / LM7812 Electrical Characteristics, $V_O = 12\text{ V}$, $V_I = 19\text{ V}$

$0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ unless otherwise specified⁽¹⁾

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_O	Output voltage	$T_J = 25^\circ\text{C}$, $5\text{ mA} \leq I_O \leq 1\text{ A}$	11.5	12	12.5	V
		$P_D \leq 15\text{ W}$, $5\text{ mA} \leq I_O \leq 1\text{ A}$ $14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$	11.4		12.6	V

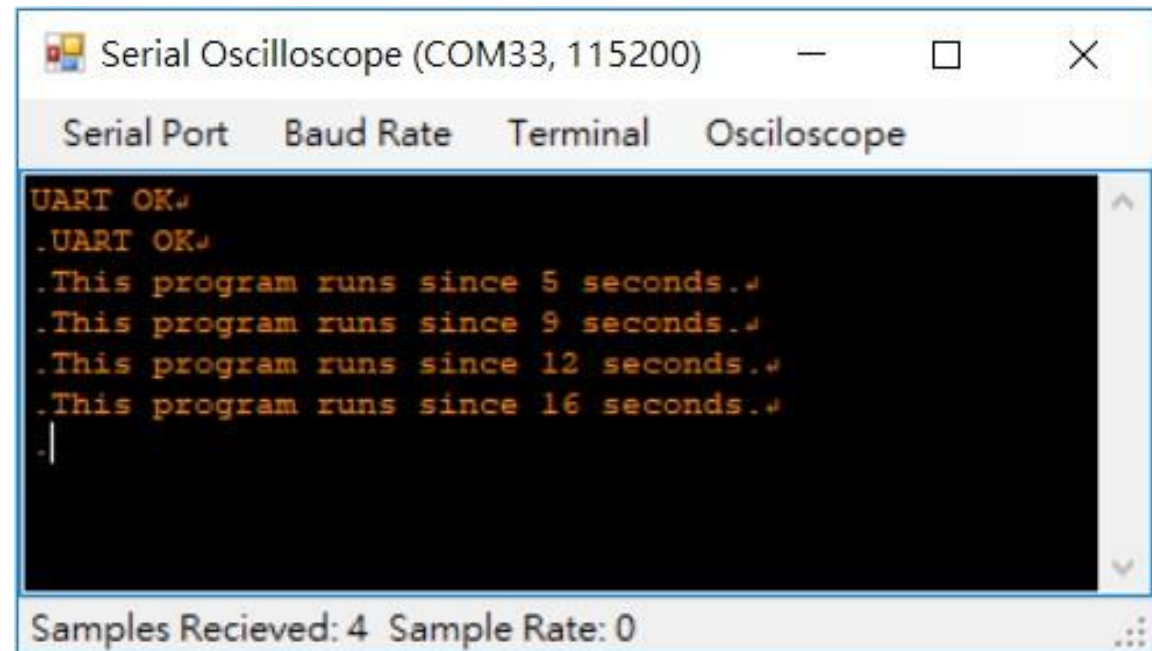
Serial Communication

- Download Serial Oscilloscope : [Link](#)
- 接上STM32開發板，再至裝置管理員確認連接埠編號
- 開啟Serial Oscilloscope，選取適當的serial port及baud rate
- 挖洞的程式請上elearn下載



Serial Communication

- (Req2)按下鍵盤(例如按 'a')，在Scope印出程式運行了幾秒(如下圖)
- 會用到的函式:
 serial.getc()
 serial.readable()



The screenshot shows a window titled "Serial Oscilloscope (COM33, 115200)". It has four tabs: "Serial Port", "Baud Rate", "Terminal", and "Oscilloscope". The "Terminal" tab is active, displaying the following text in a monospaced font:

```
UART OK␣  
.UART OK␣  
.This program runs since 5 seconds.␣  
.This program runs since 9 seconds.␣  
.This program runs since 12 seconds.␣  
.This program runs since 16 seconds.␣  
|
```

At the bottom of the window, a status bar displays "Samples Recieved: 4" and "Sample Rate: 0".

LED Control

- 練習使用Timer Interrupt, Memory
- (Req3)使驅動板上的LED持續閃爍:
 - D3 (亮0.5秒，暗0.5秒)
 - D4 (亮0.5秒，暗1.5秒)