Micro Controller Unit
and
Motor Driver Board

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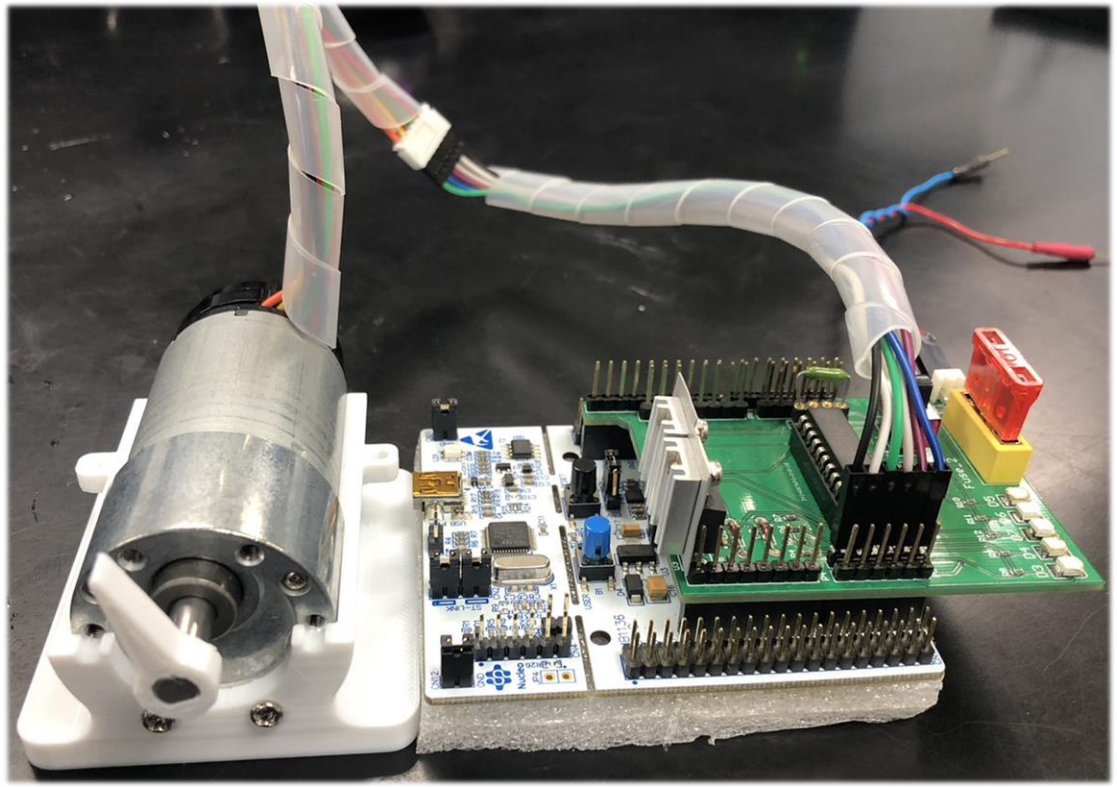
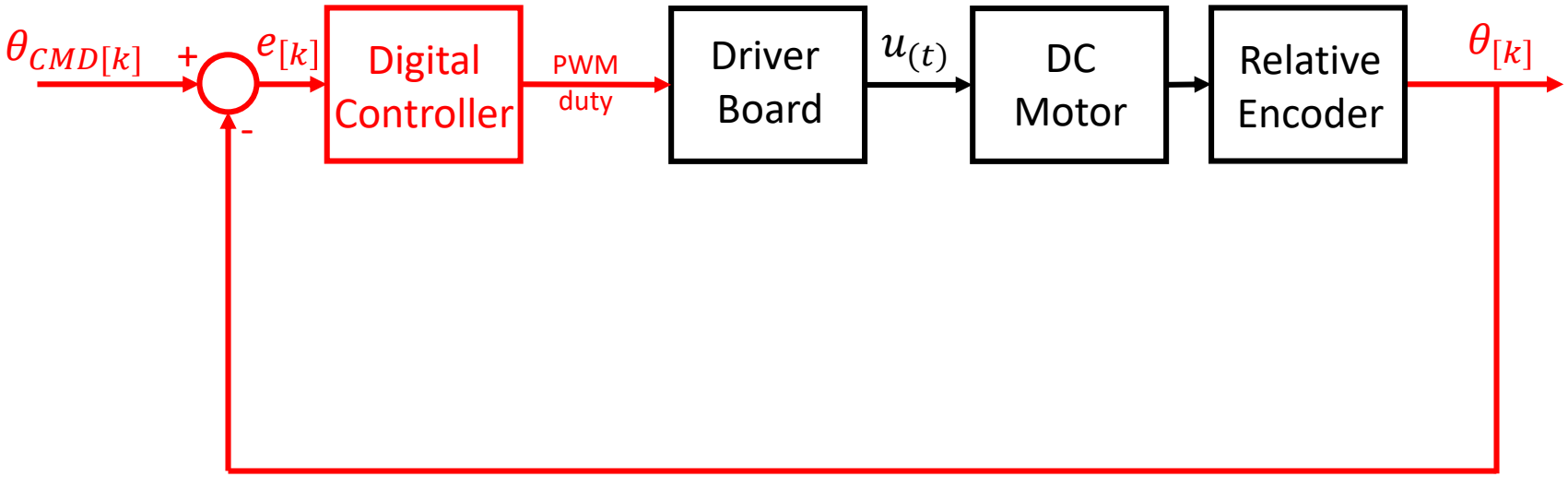


1. MCU

- Introduction
- STM32 F446RE
- Arm Keil Studio
- Instruction

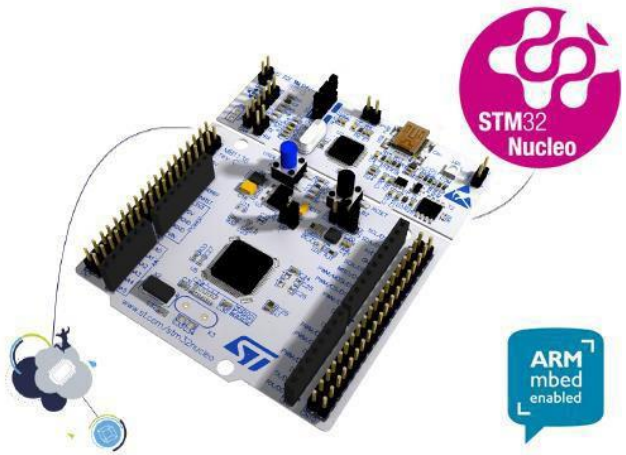
1-1. Introduction



The red part is the job that MCU does.

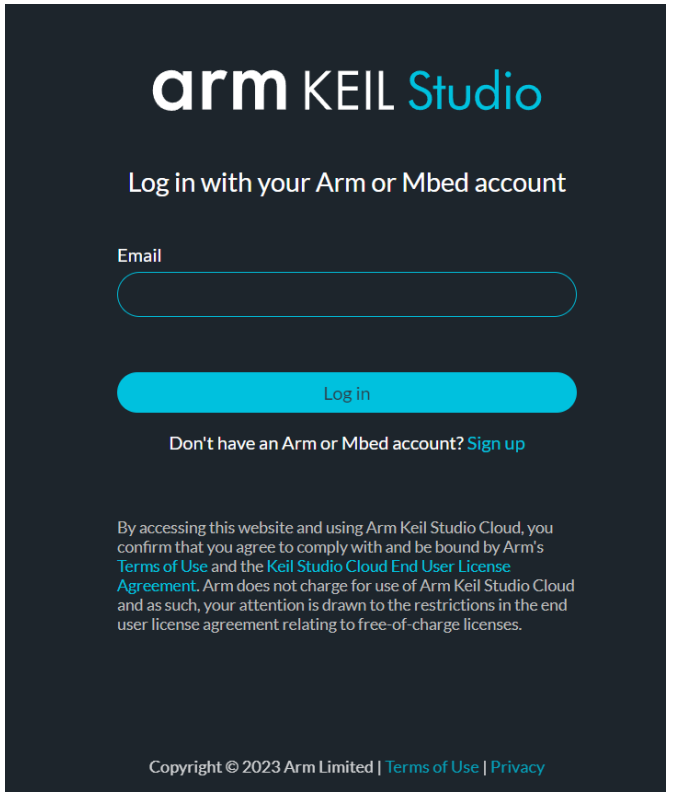
1-2. STM32 F446RE

- 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)



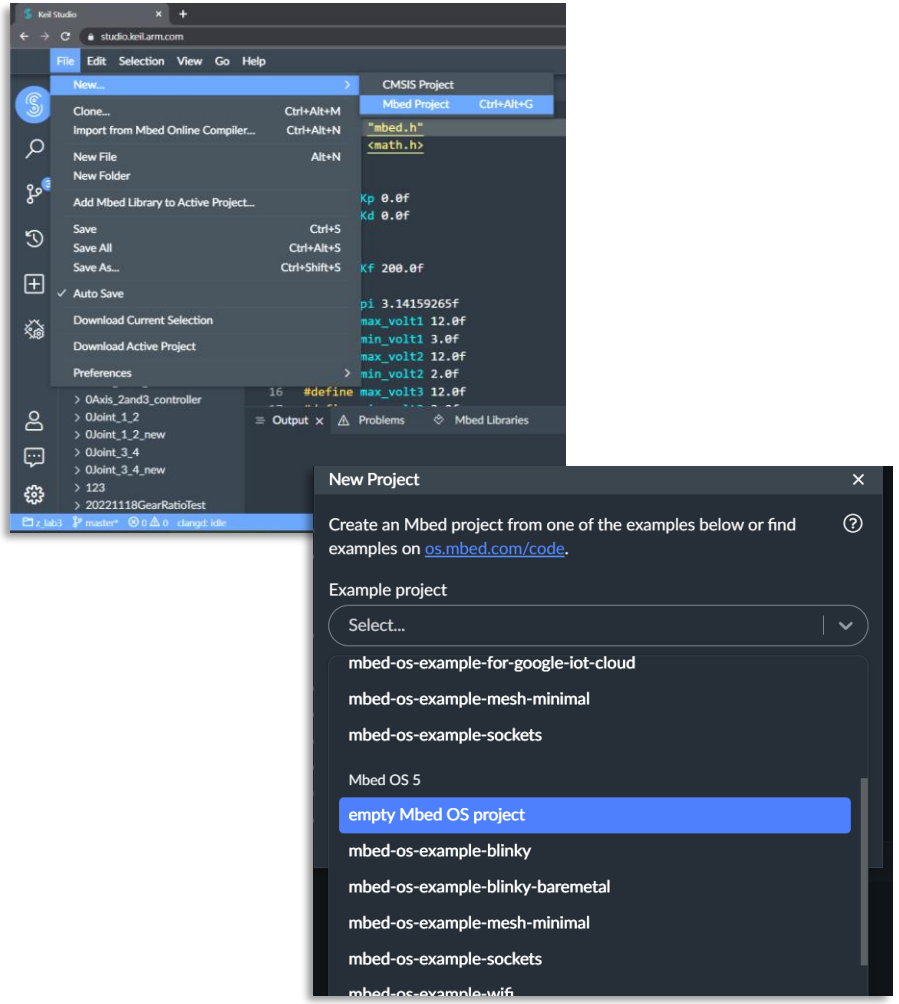
1-4. Instruction

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



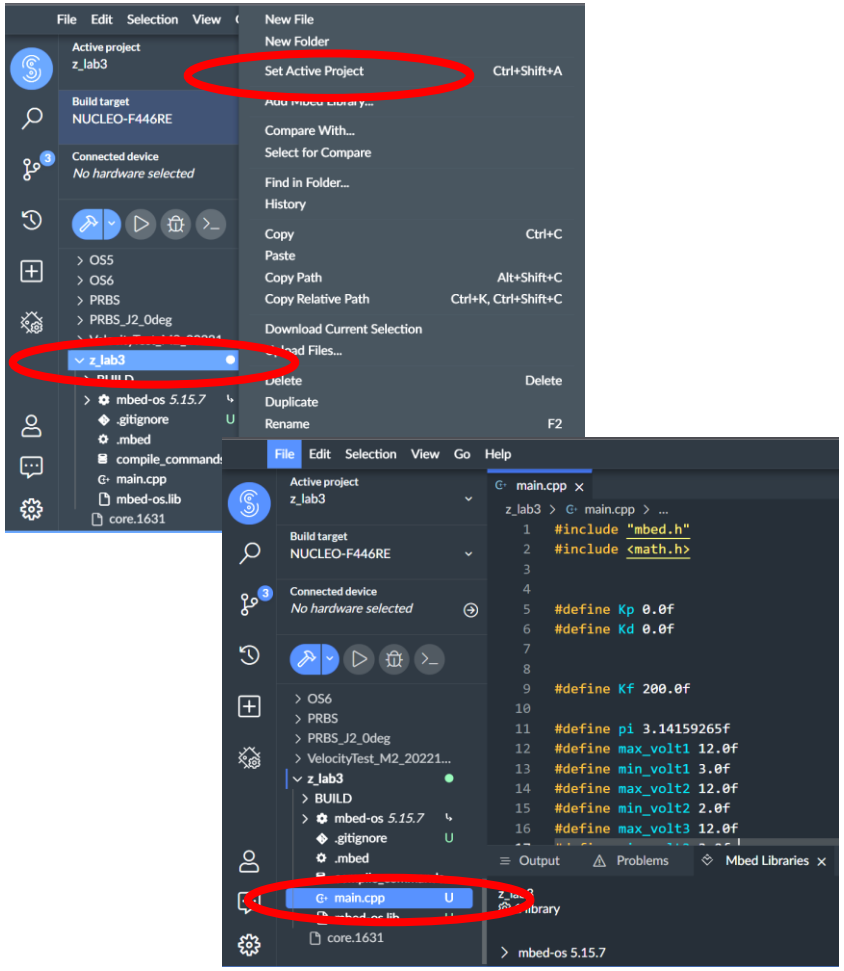
1-4. Instruction

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**

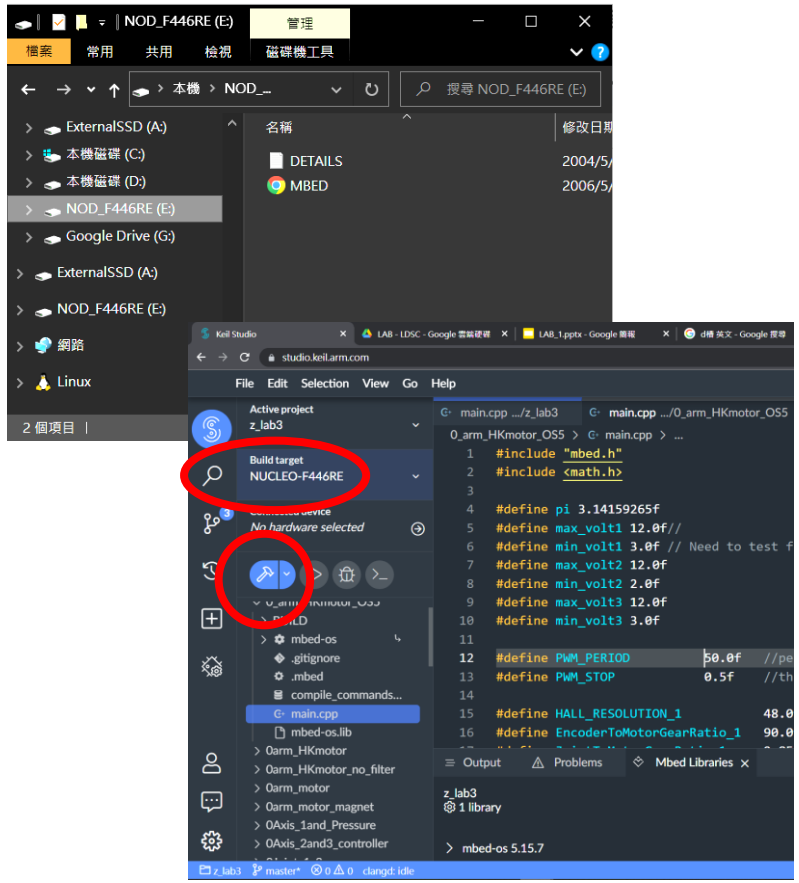
    >>click on the **hammer mark**

    >>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

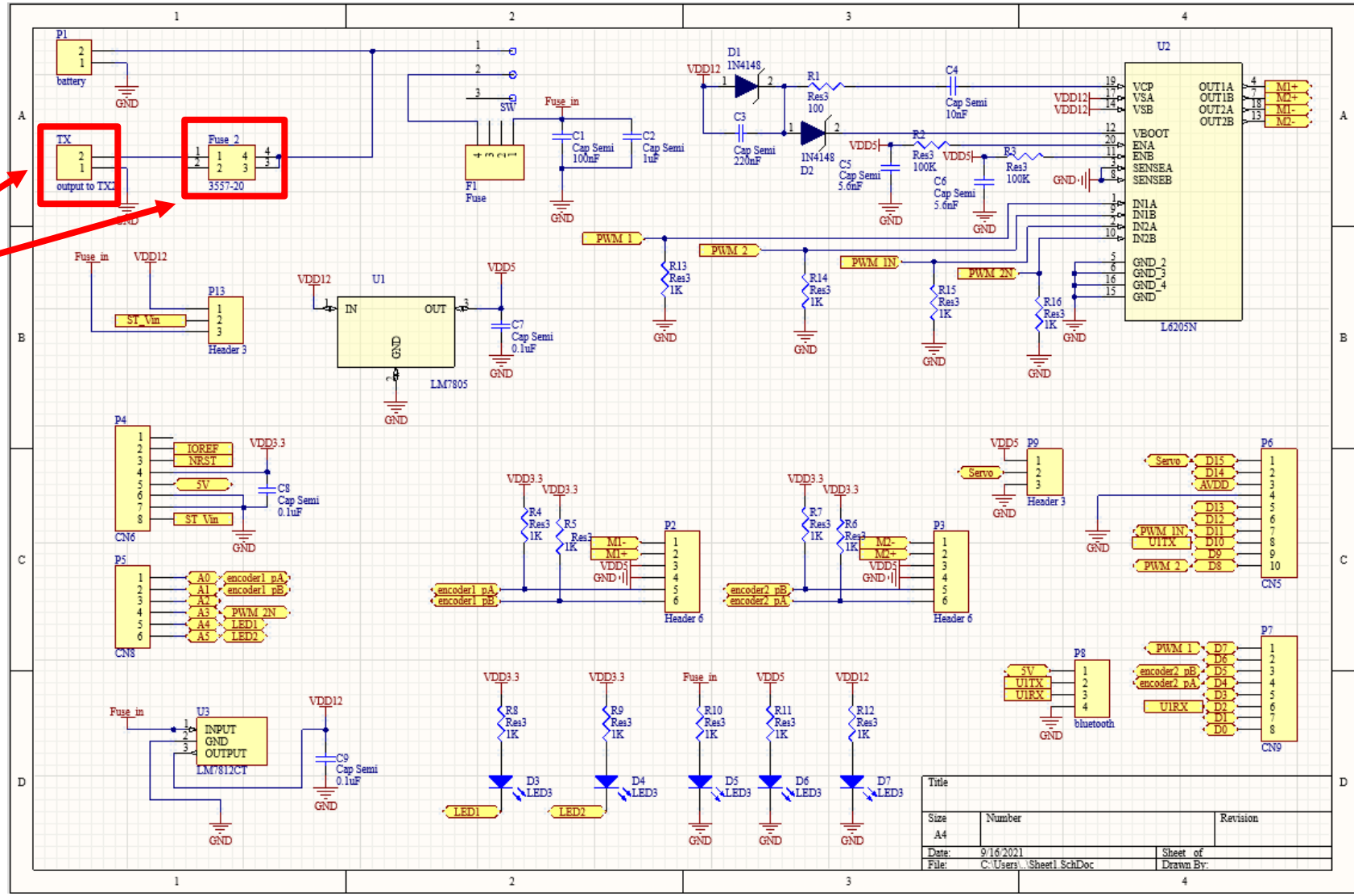
2-1. Material List

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

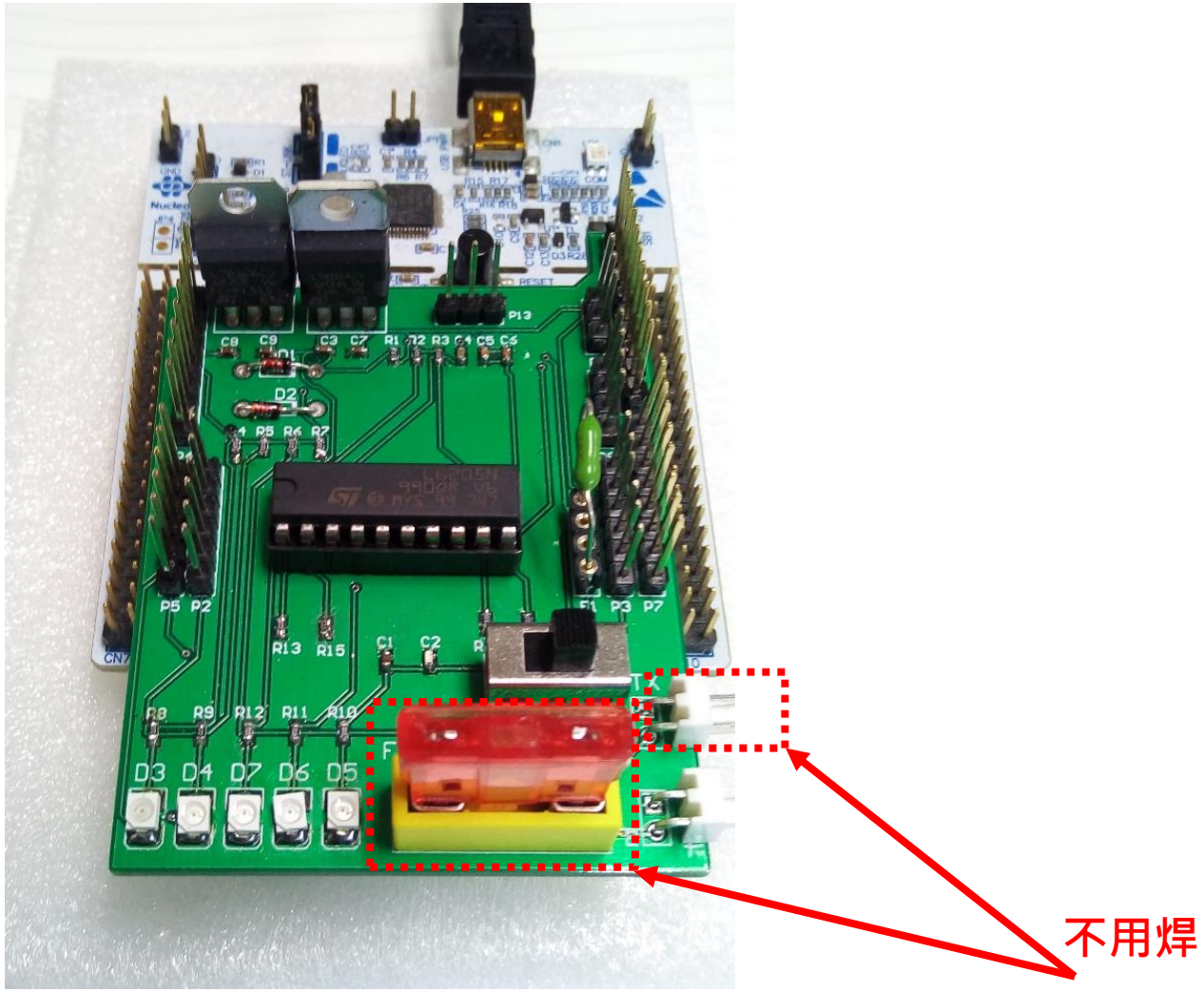
(或L6205N)

需自備一條USB A to mini B

2-2. Circuit Layout

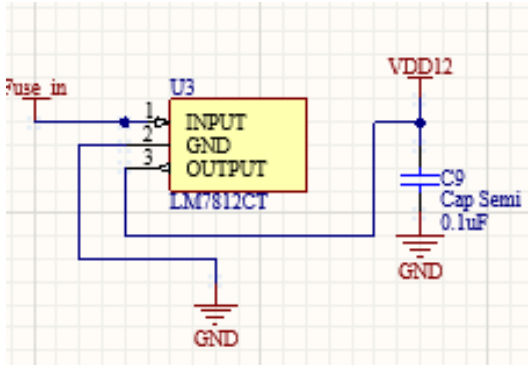


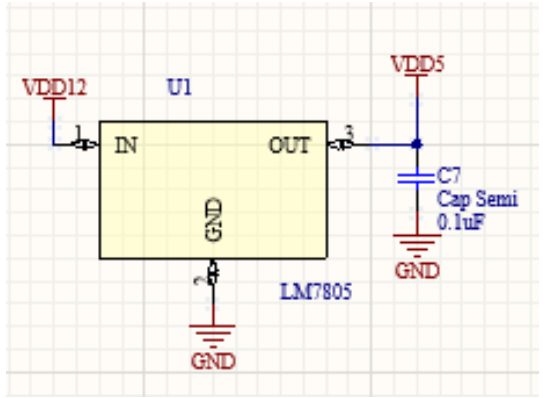
2-2. Circuit Layout



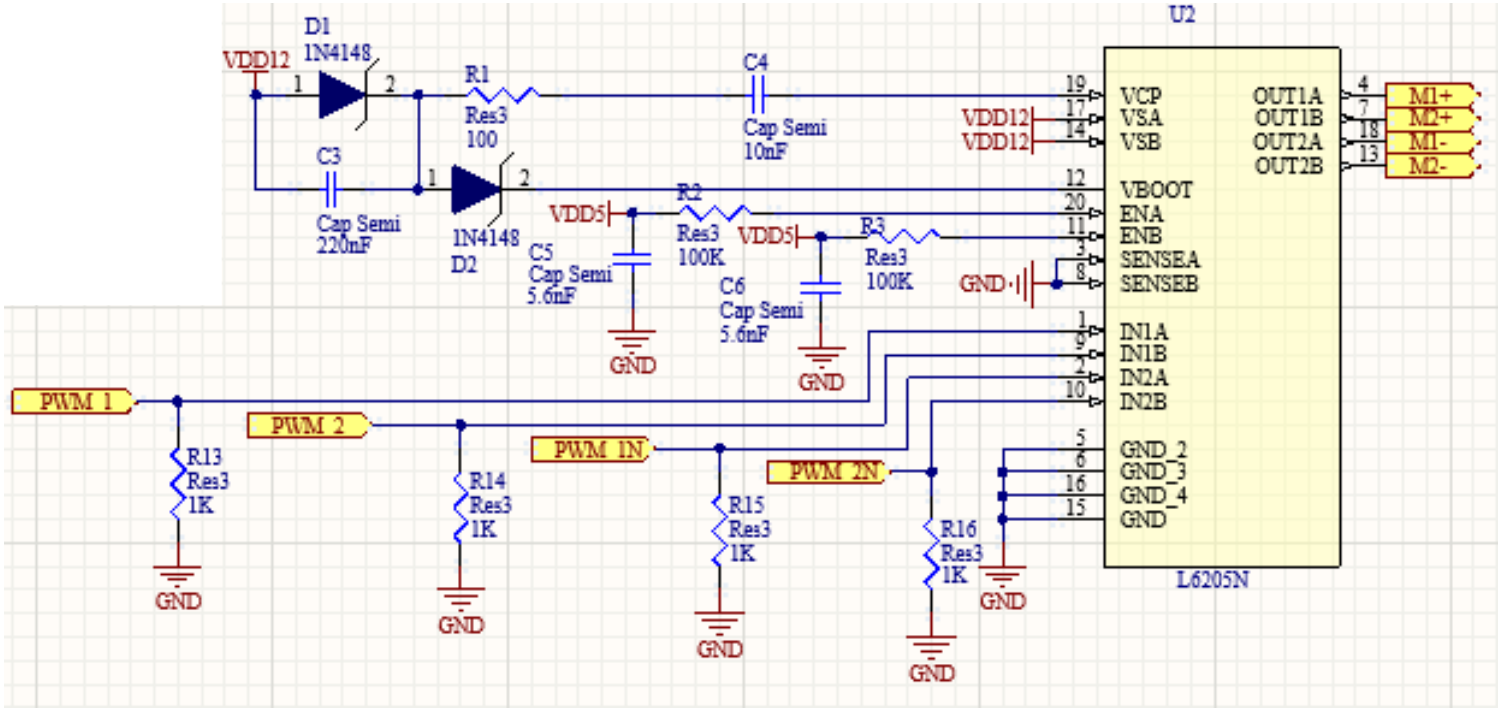
2-3. Description

- 穩壓 / 降壓元件





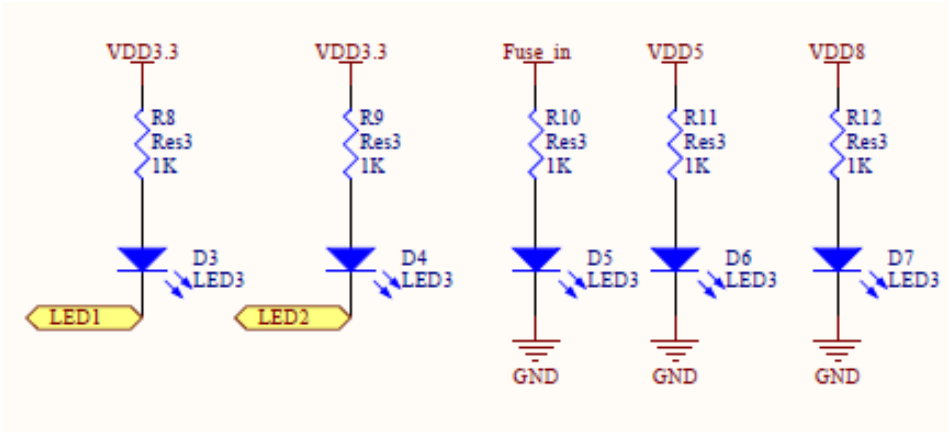
- 驅動器



請查看datasheet

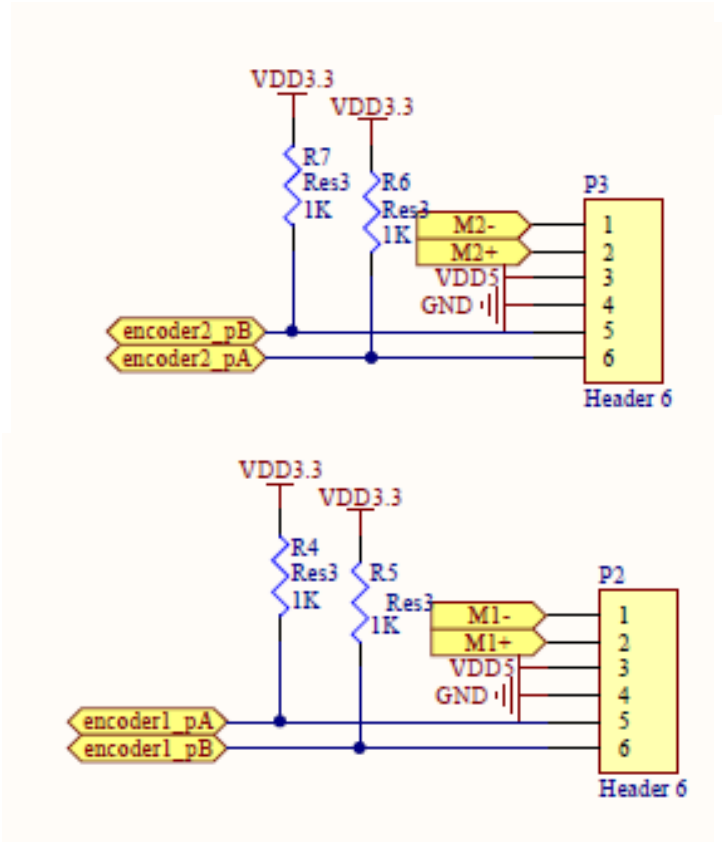
2-3. Description

- LED



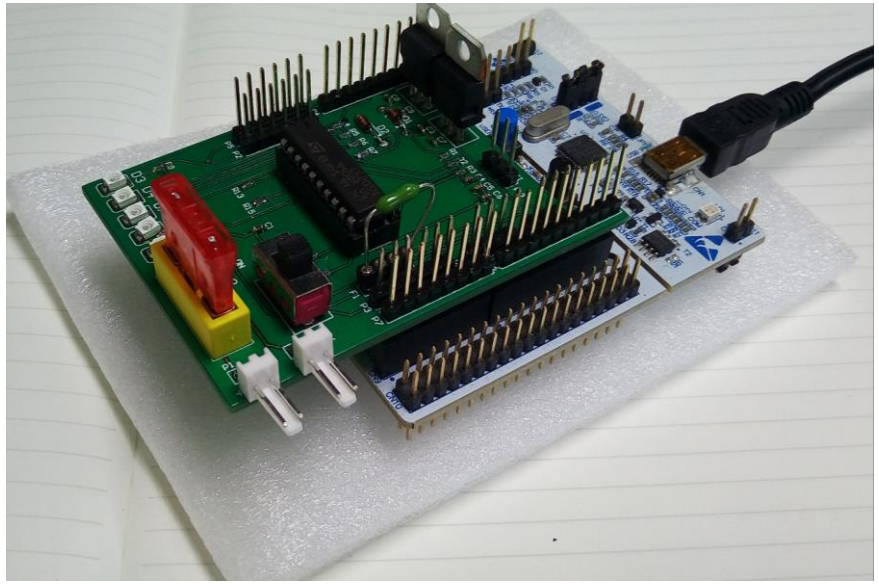
這裡是pull up, 寫程式的時候要注意

- 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

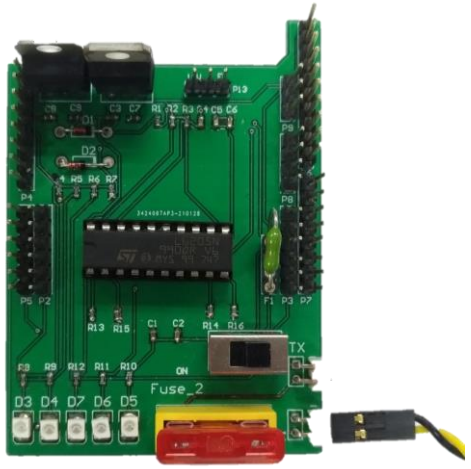
- Deadline
- Soldering (Req1)
- Serial Communication (Req2)
- LED Control (Req3)

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

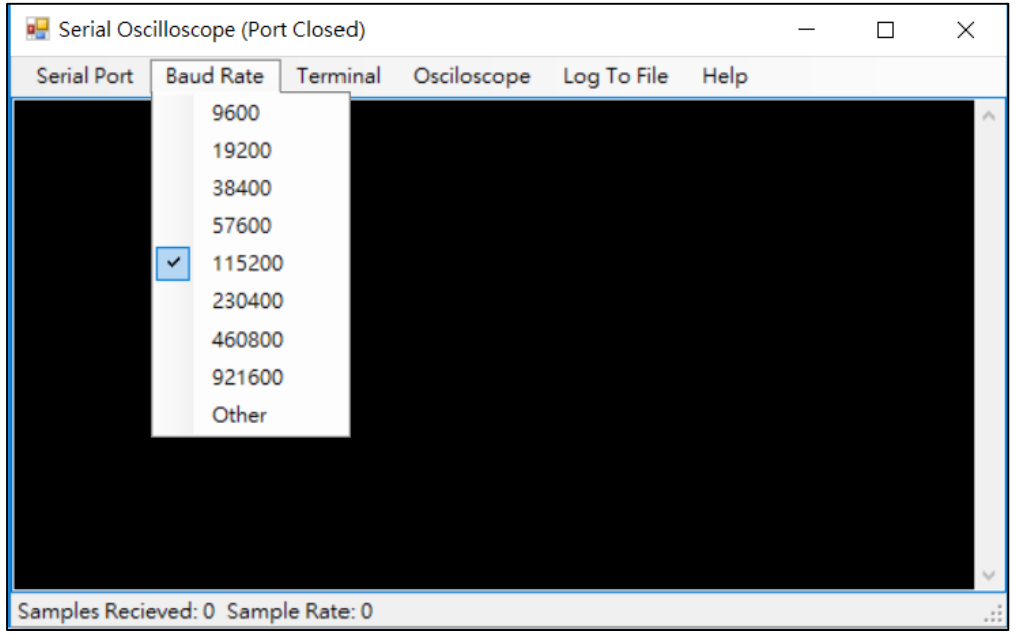
6.7 LM340 / LM7812 Electrical Characteristics, V_O = 12 V, V_I = 19 V

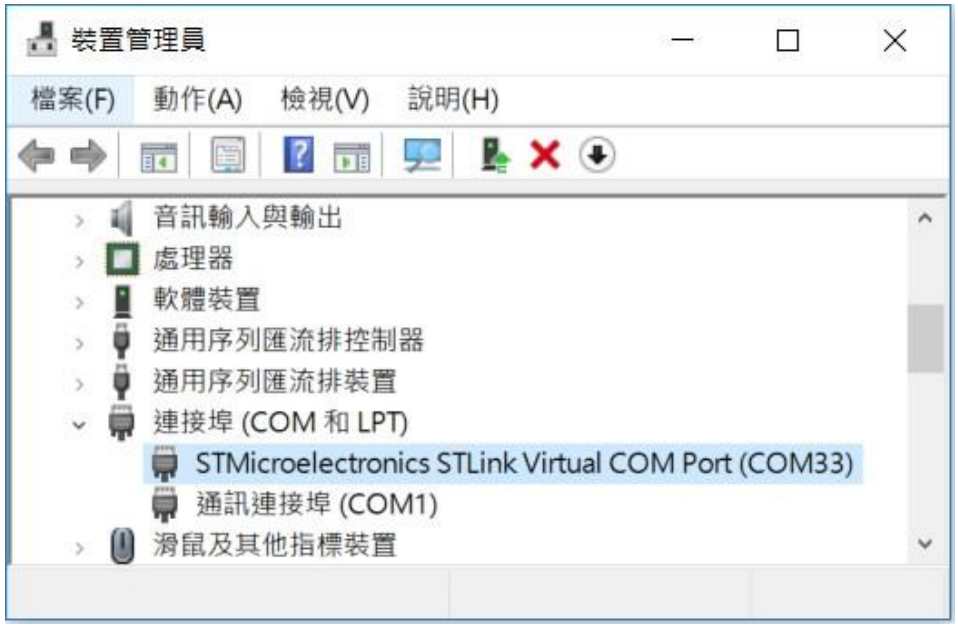
0°C ≤ T_J ≤ 125°C unless otherwise specified(1)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_O	Output voltage	T_J = 25°C, 5 mA ≤ I_O ≤ 1 A	11.5	12	12.5	V
		P_D ≤ 15 W, 5 mA ≤ I_O ≤ 1 A 14.5 V ≤ V_{IN} ≤ 27 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



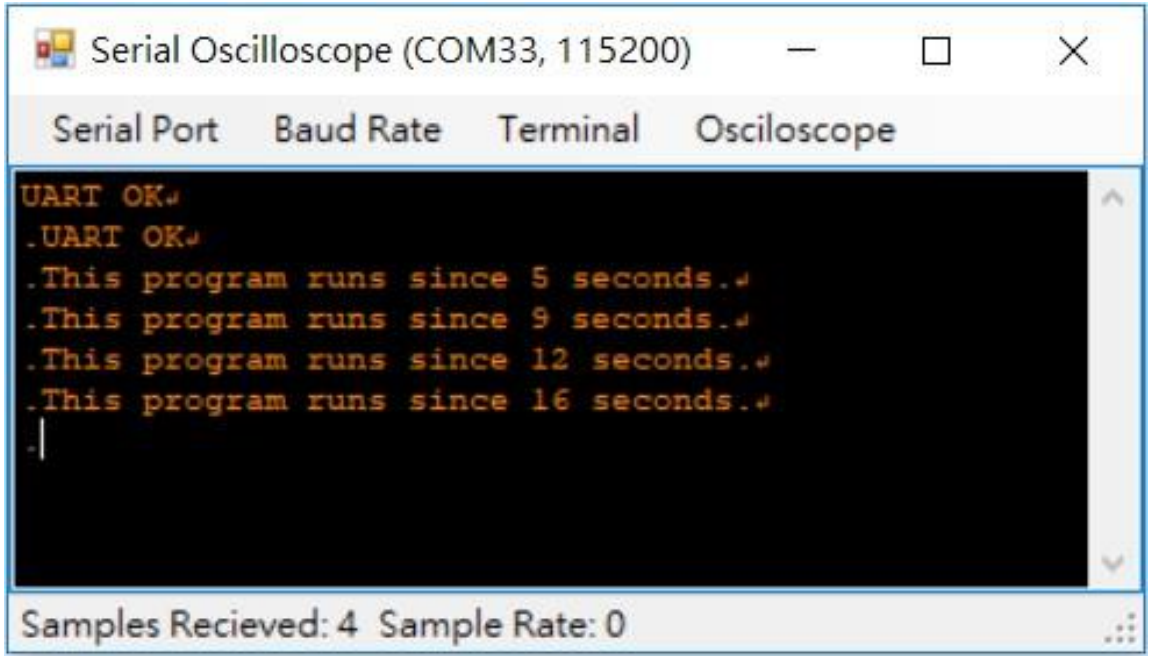


Serial Communication

- (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()



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)