1.MAX7219顯示驅動器,可實現8位元數位的7段數位LED顯示，也可支援條線圖顯示器或者64個獨立的LED。晶片集成了B型BCD編碼器、多路掃描回路，段字驅動器，而且還有一個8*8的靜態RAM用來存儲每一個資料。使用非常方便！

2.本模組位元8位元0.36寸4位元一體**共陰極**數碼管

3.支持多模組級聯(串接), 只需要3個IO口即可驅動多組8位數碼管，顯示時無閃爍

4.模組相容5V/3.3V各式單片機(Arduino/51/AVR/STM32等.)

5.模組尺寸：71MM*22MM*12MM

6.PCB板四個角可採用銅螺柱固定，可有效防止短路等意外情況發生

接線說明：

VCC → **5V**

GND → GND`

DIN → P0

CS → P1

CLK → P2

注意事項：

1.VCC與GND千萬不要接反，以免燒壞晶片

2.用老的51單片機I/O口需要接**上拉電阻**

Logic High Input Voltage$(V_{IH})_{MIN}$=**3.5V**

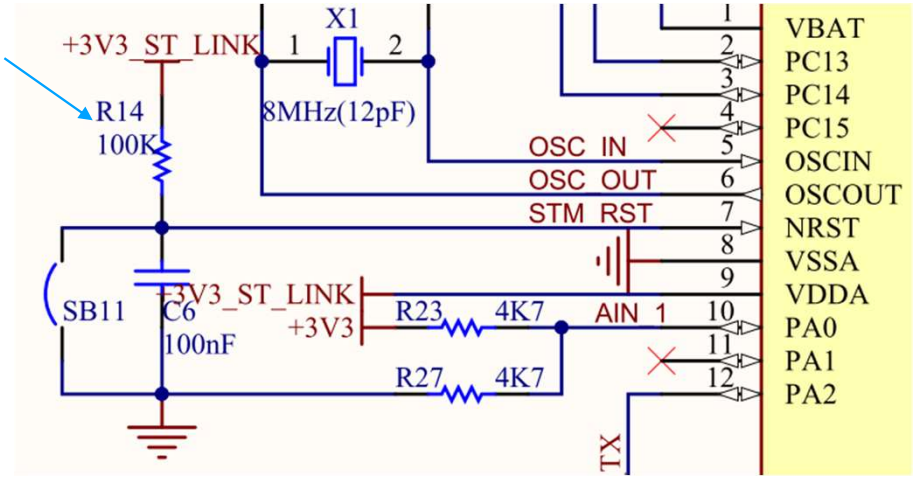
Electrical Characteristics (continued)

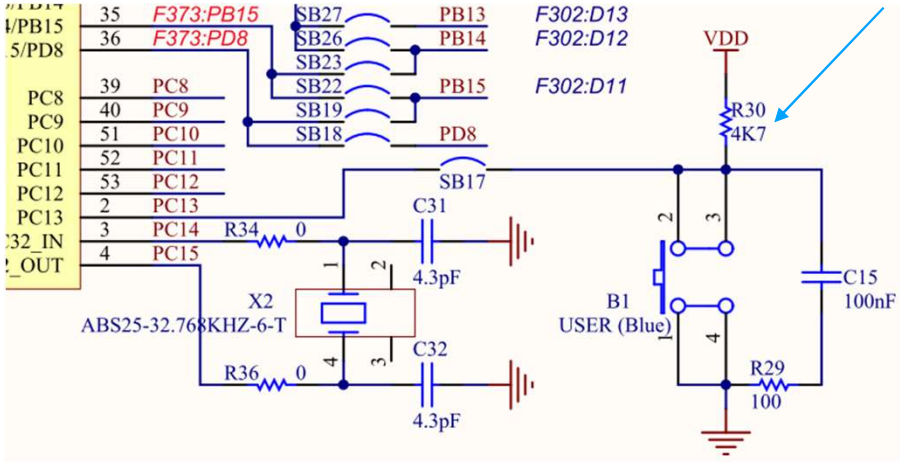
(V+ = 5V ±10%, R_{SET} = 9.53kΩ ±1%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
LOGIC INPUTS						
Input Current DIN, CLK, LOAD, $\overline{CS}$	I_{IH}, I_{IL}	V_{IN} = 0V or V+	-1		1	µA
Logic High Input Voltage	V_{IH}		3.5			V
Logic Low Input Voltage	V_{IL}				0.8	V
Output High Voltage	V_{OH}	DOUT, I_{SOURCE} = -1mA	V+ - 1			V
Output Low Voltage	V_{OL}	DOUT, I_{SINK} = 1.6mA			0.4	V
Hysteresis Voltage	ΔV_I	DIN, CLK, LOAD, $\overline{CS}$		1		V
TIMING CHARACTERISTICS						
CLK Clock Period	t_{CP}		100			ns
CLK Pulse Width High	t_{CH}		50			ns
CLK Pulse Width Low	t_{CL}		50			ns

< 10 MHz

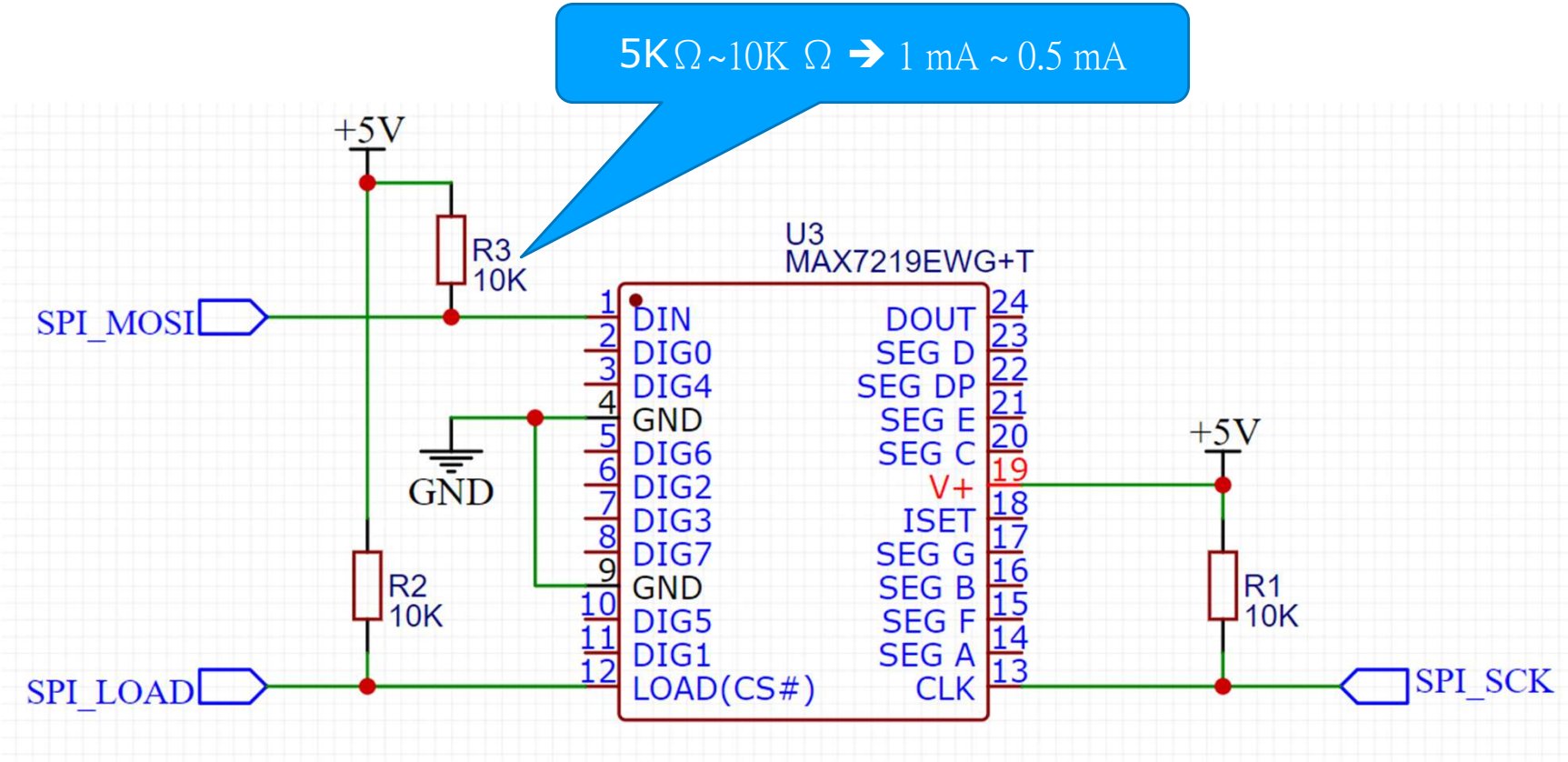
External Pull-up at Nucleo Board

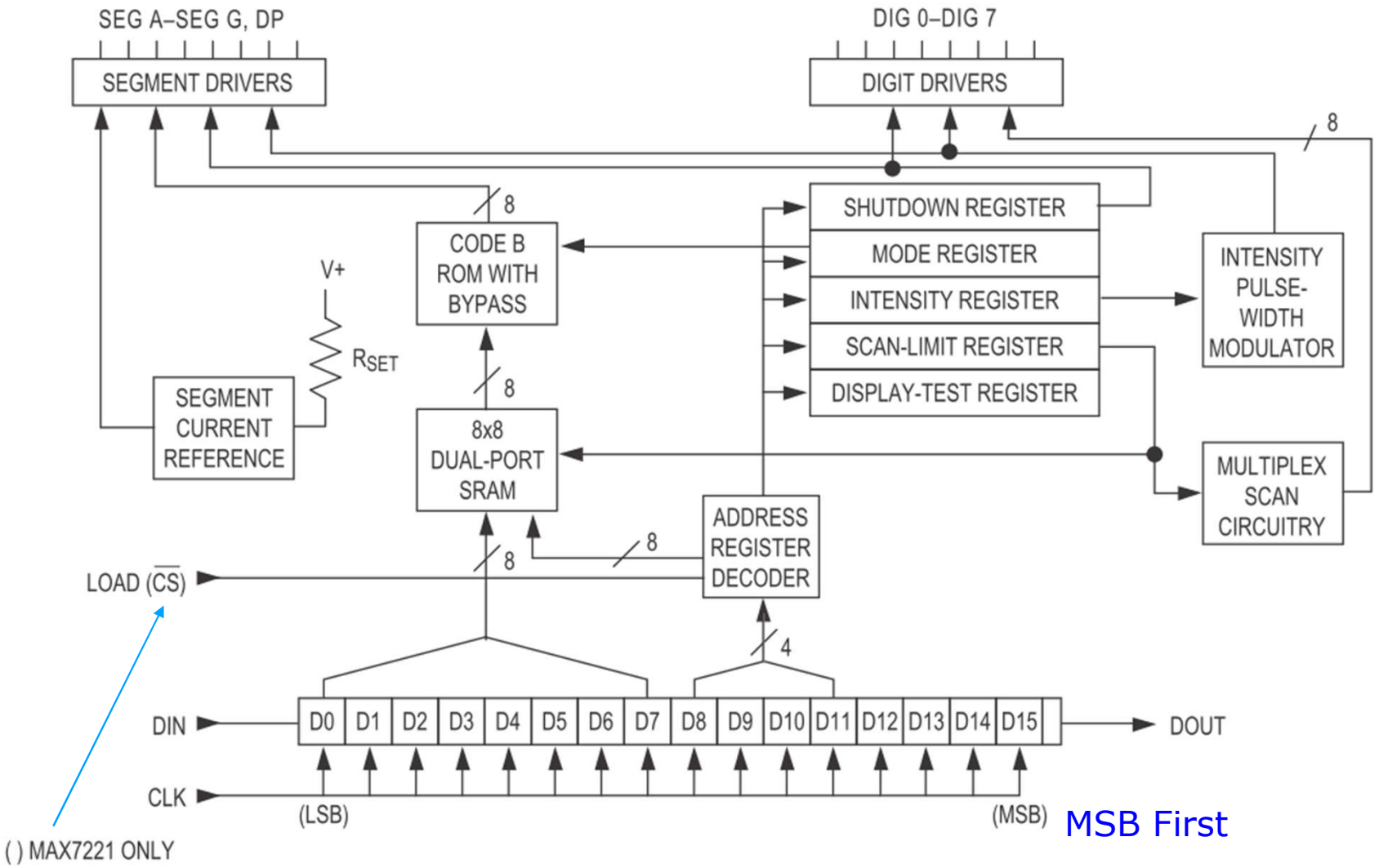




Current < 1 mA

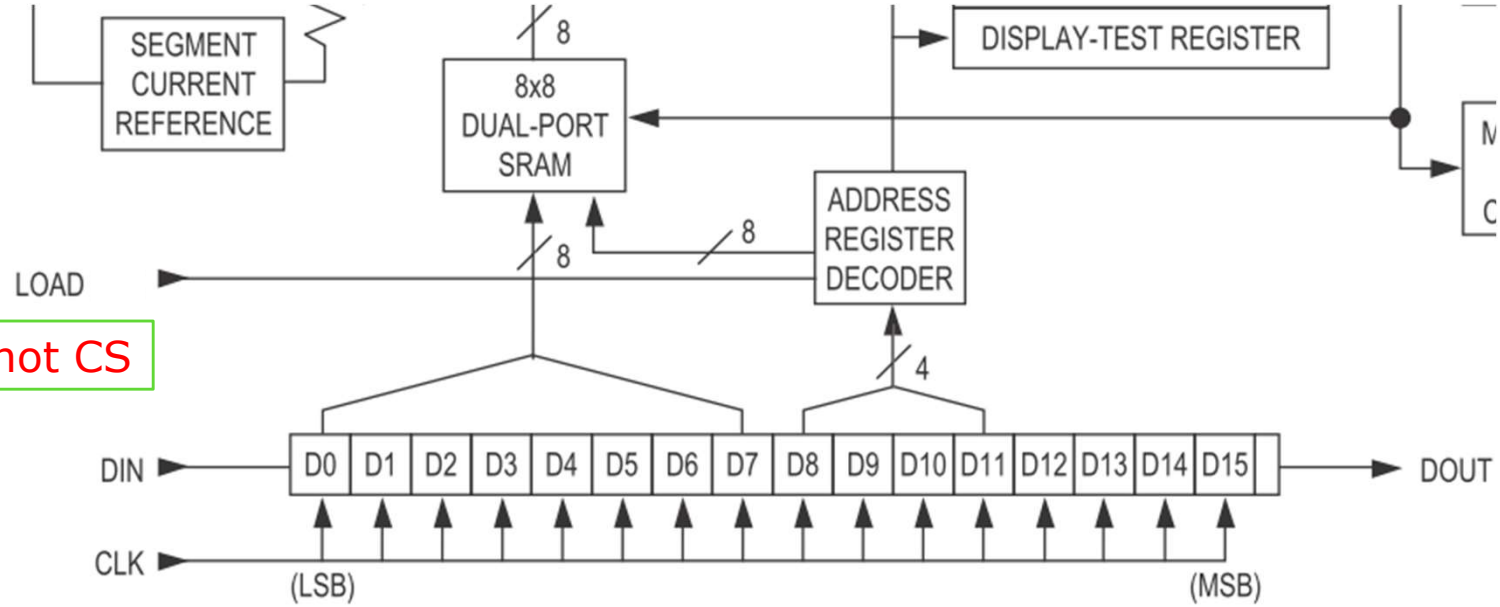
Pull-up for MAX7219




SEG A–SEG G, DP
SEGMENT DRIVERS
DIG 0–DIG 7
DIGIT DRIVERS
8
CODE B ROM WITH BYPASS
SHUTDOWN REGISTER
MODE REGISTER
INTENSITY REGISTER
SCAN-LIMIT REGISTER
DISPLAY-TEST REGISTER
INTENSITY PULSE-WIDTH MODULATOR
V+
RSET
SEGMENT CURRENT REFERENCE
8x8 DUAL-PORT SRAM
MULTIPLEX SCAN CIRCUITRY
ADDRESS REGISTER DECODER
LOAD (CS)
4
DIN
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15
DOUT
CLK
(LSB)
(MSB)
( ) MAX7221 ONLY

MSB First

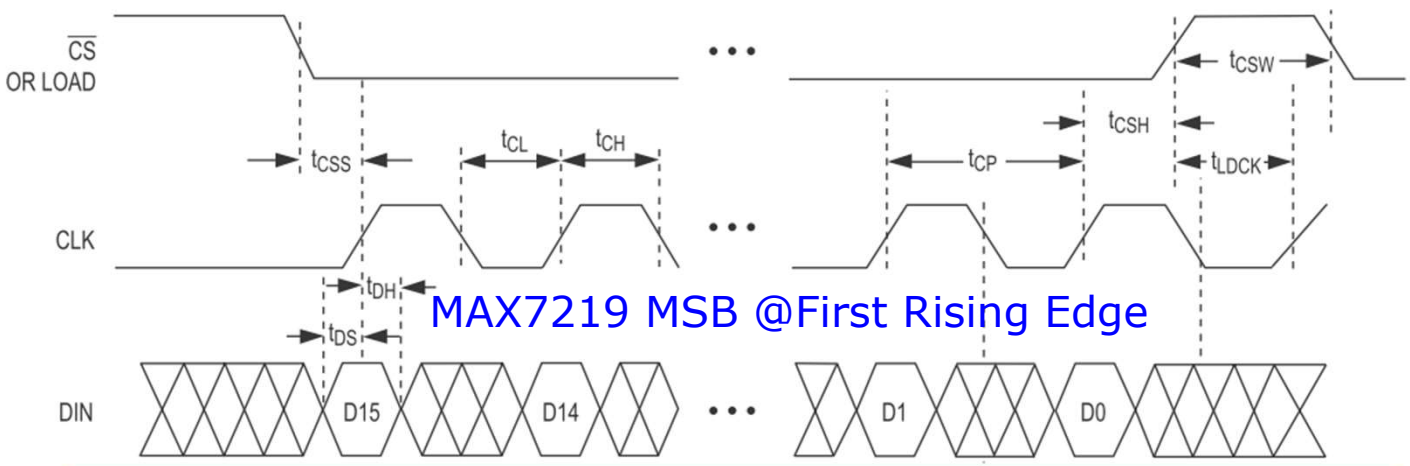
The last 16 bits of serial data are latched on LOAD's rising edge.



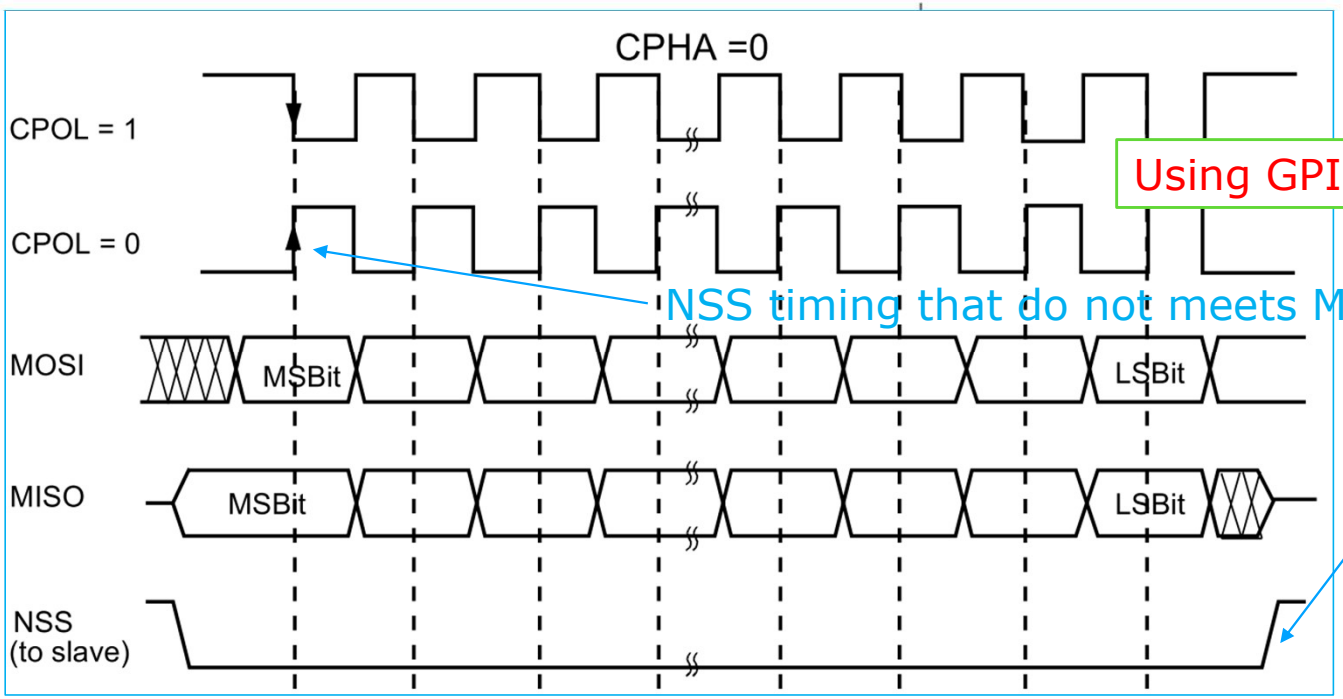
It is LOAD not CS

Table 1. Serial-Data Format (16 Bits)

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
X	X	X	X	ADDRESS				MSB	DATA						LSB



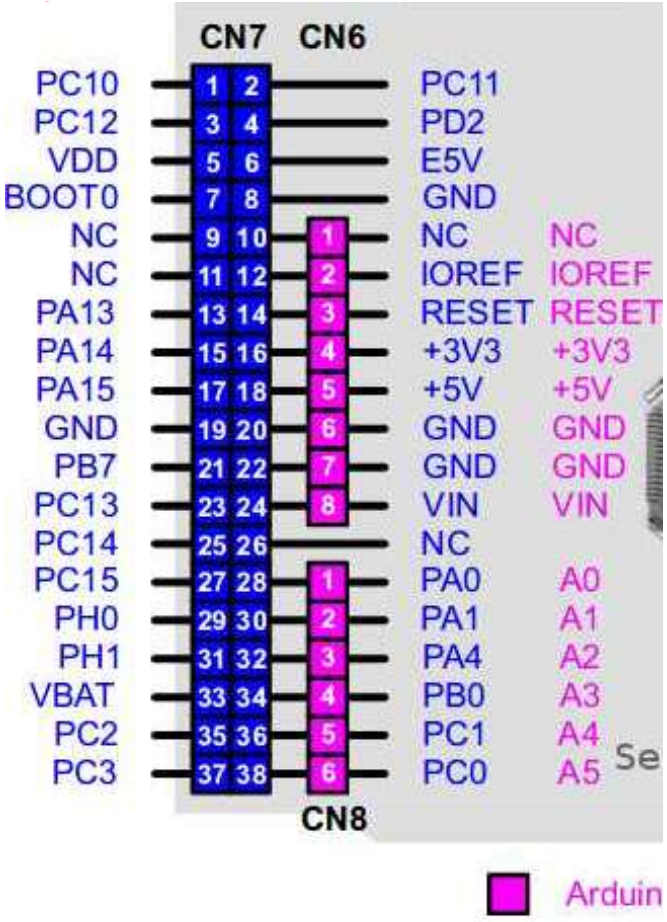
MAX7219 MSB @First Rising Edge

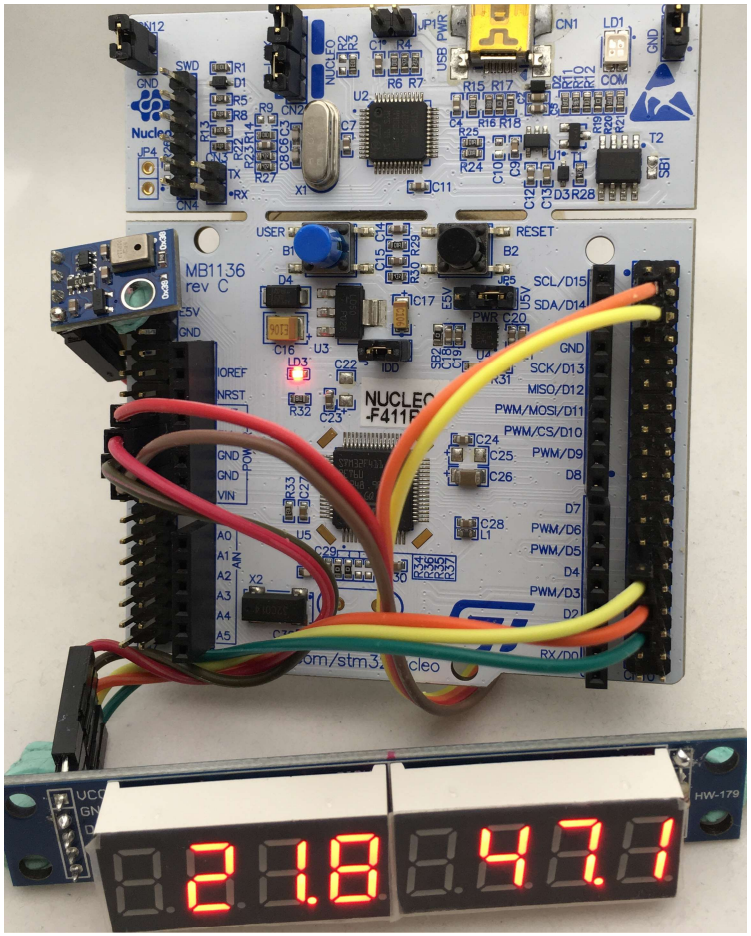


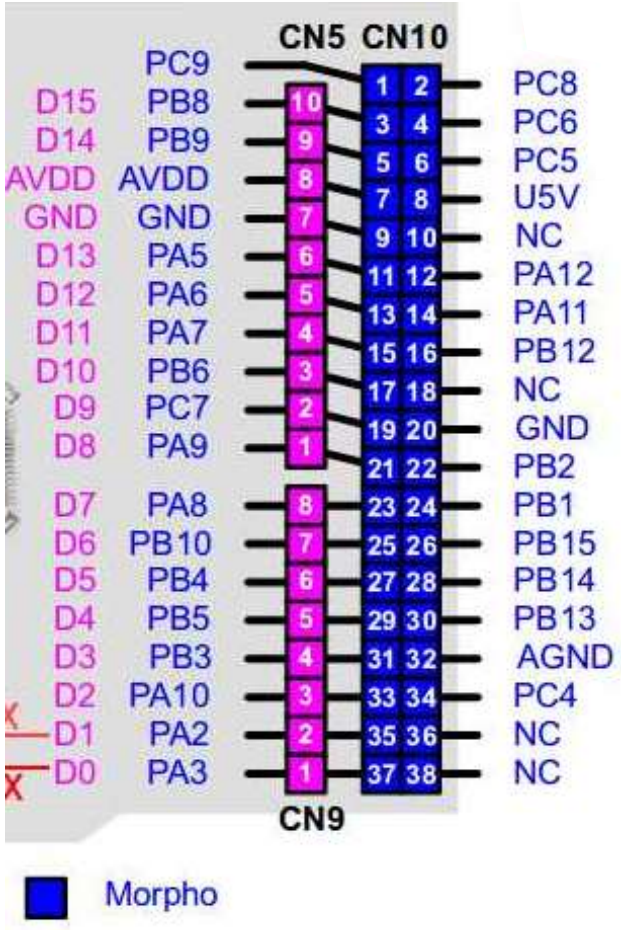
Using GPIO as LOAD control pin

NSS timing that do not meets MAX7219

接線實體照片

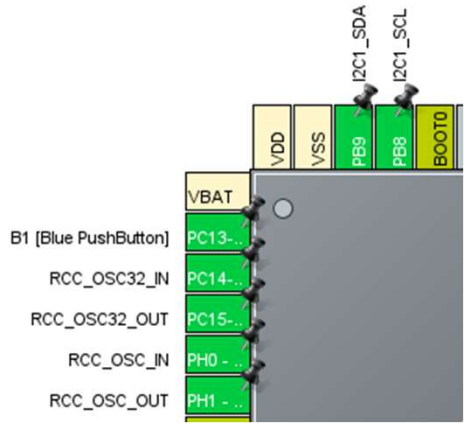

CN7 CN6
PC10 1 2 PC11
PC12 3 4 PD2
VDD 5 6 E5V
BOOT0 7 8 GND
NC 9 10 NC NC
NC 11 12 IOREF IOREF
PA13 13 14 RESET RESET
PA14 15 16 +3V3 +3V3
PA15 17 18 +5V +5V
GND 19 20 GND GND
PB7 21 22 GND GND
PC13 23 24 VIN VIN
PC14 25 26 NC
PC15 27 28 PA0 A0
PH0 29 30 PA1 A1
PH1 31 32 PA4 A2
VBAT 33 34 PB0 A3
PC2 35 36 PC1 A4
PC3 37 38 PC0 A5
CN8
Arduin

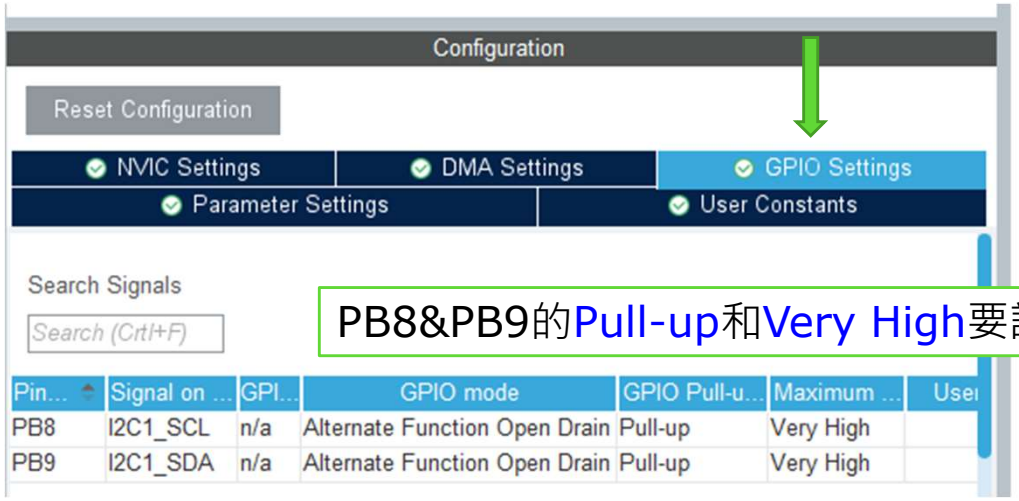

MB1136
rev C
NUCLEO
F411RE
21.8
47.1


CN5 CN10
PC9
D15 PB8
D14 PB9
AVDD AVDD
GND GND
D13 PA5
D12 PA6
D11 PA7
D10 PB6
D9 PC7
D8 PA9
D7 PA8
D6 PB10
D5 PB4
D4 PB5
D3 PB3
D2 PA10
D1 PA2
D0 PA3
1 2 PC8
3 4 PC6
5 6 PC5
7 8 U5V
9 10 NC
11 12 PA12
13 14 PA11
15 16 PB12
17 18 NC
19 20 GND
21 22 PB2
23 24 PB1
25 26 PB15
27 28 PB14
29 30 PB13
31 32 AGND
33 34 PC4
35 36 NC
37 38 NC
CN9
Morpho

*.ioc檔設定，I²C容易出錯的地方

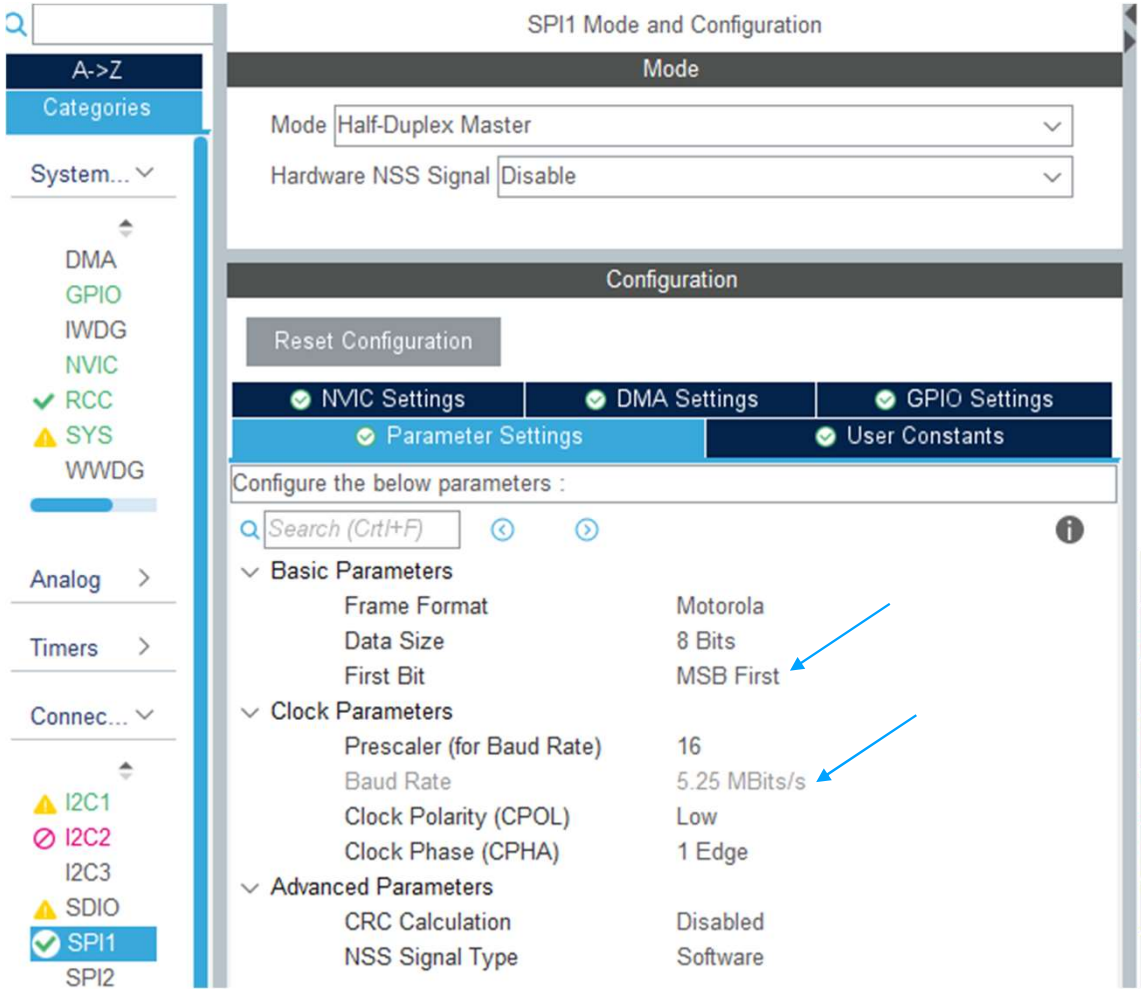
如果要使用和Arduino相容的腳位，I²C1在PB8 & PB9

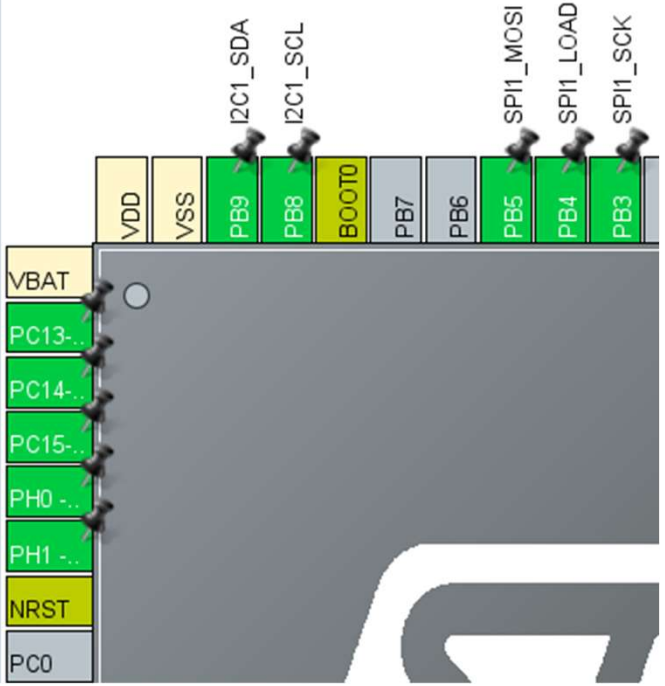




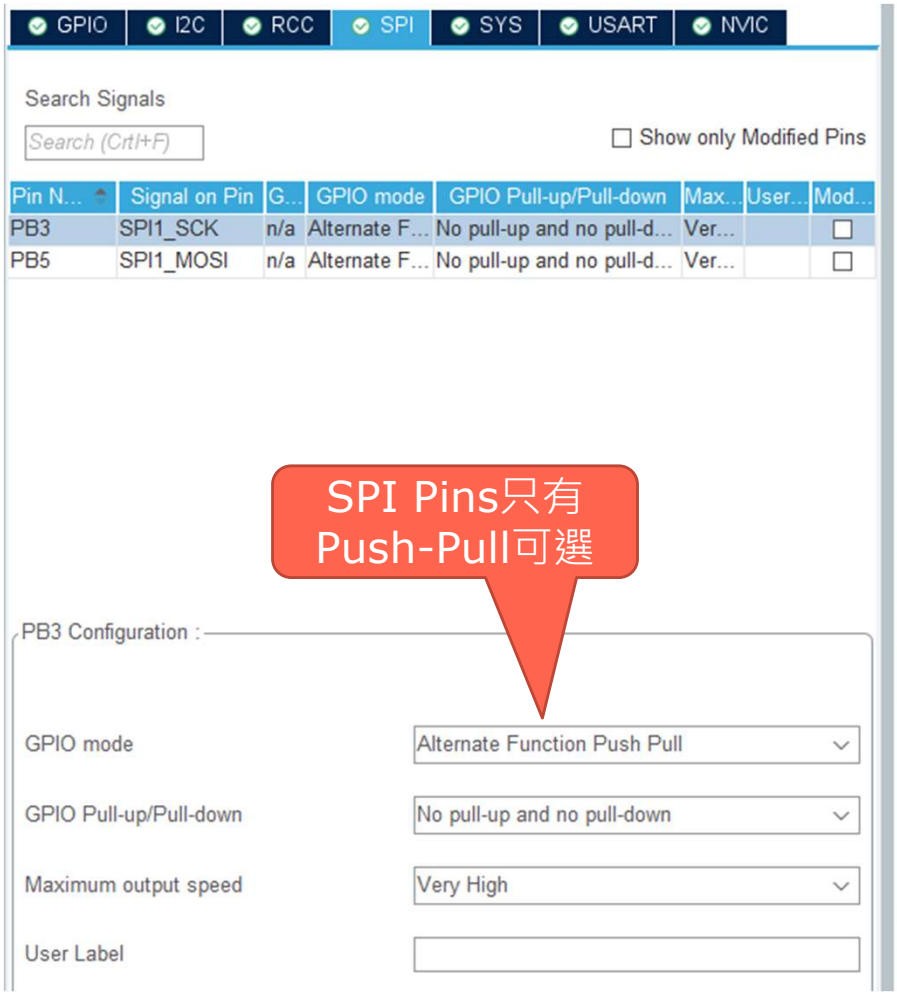
PB8&PB9的Pull-up和Very High要設起來

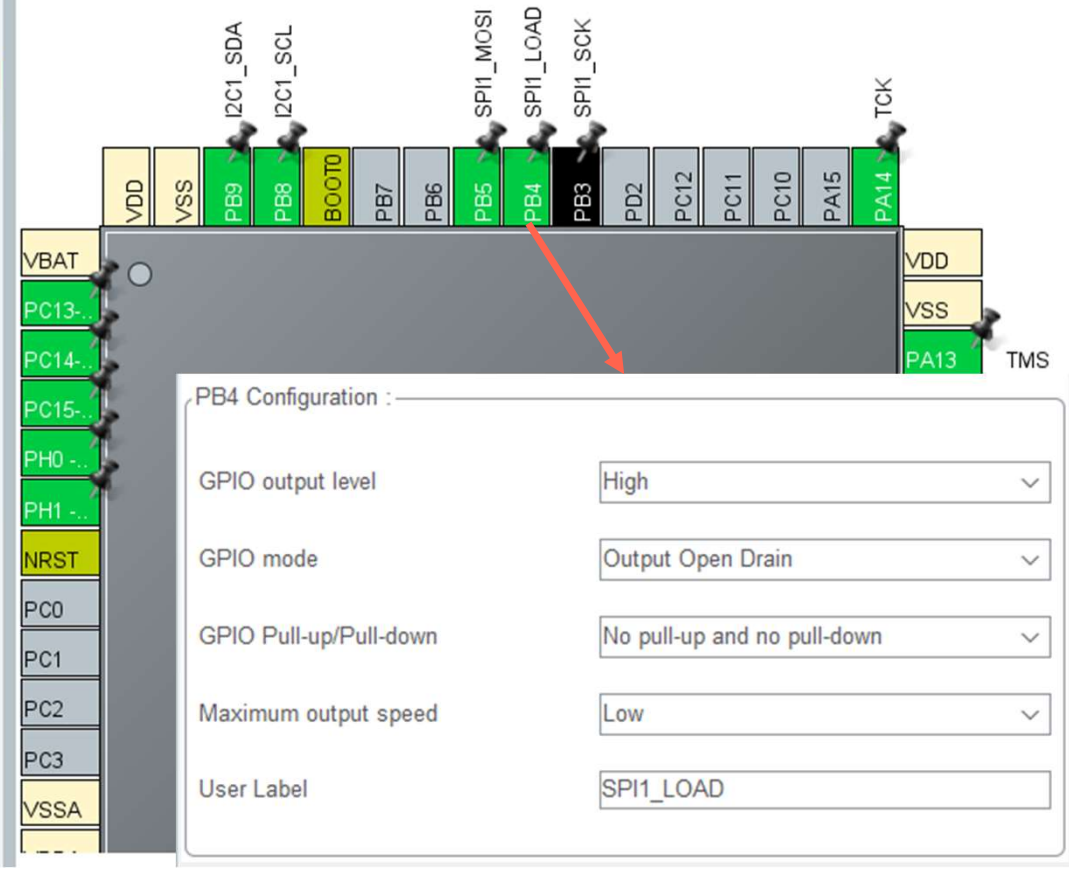
SPI @ Connectivity Setting



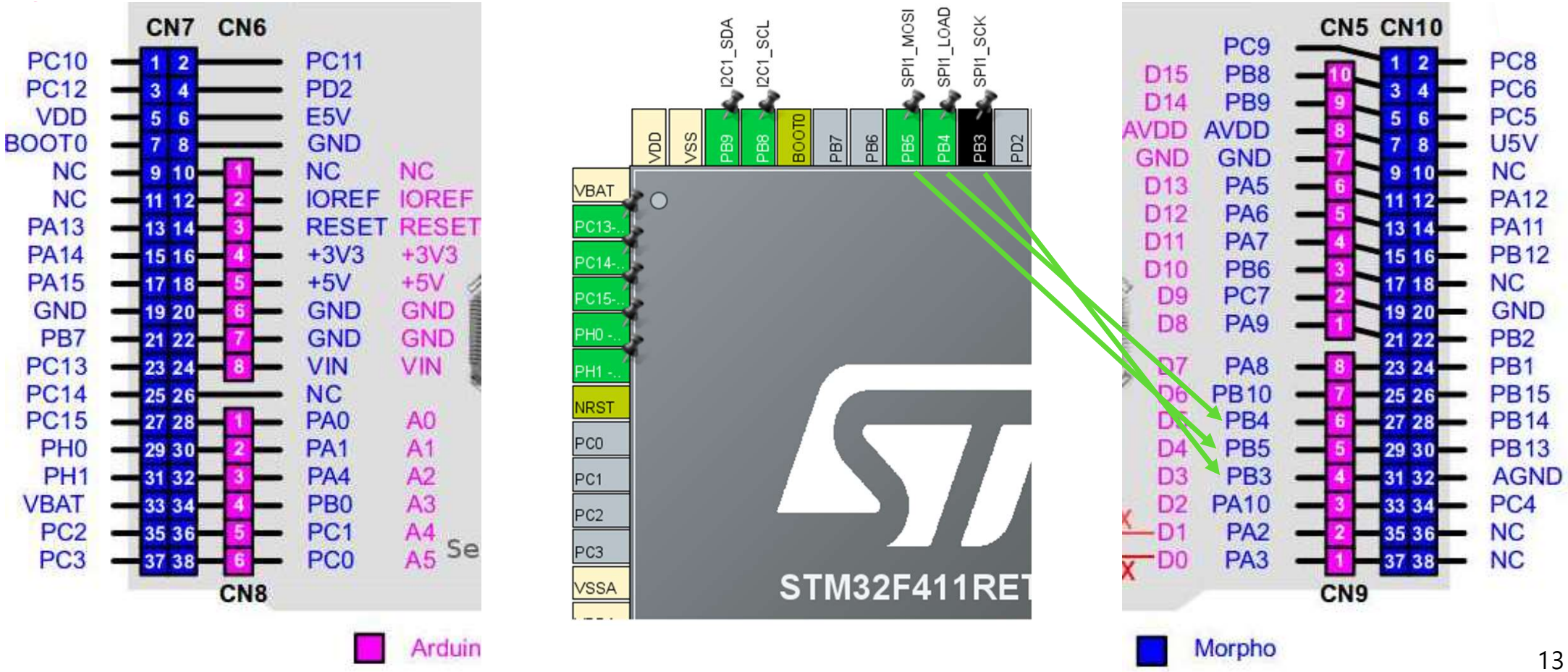


For MAX7219 SPI GPIO Setting





For MAX7219 SPI GPIO Wiring



AHT10Datasheet 遺漏的片段!

https://github.com/MoonFox2006/AHT10_Test/blob/master/src/AHT10.cpp

```
bool AHT10::begin() {
  Wire.beginTransmission(AHT10_ADDR);
  Wire.write(0xE1);
  Wire.write(0x08);
  Wire.write(0x00);
  return Wire.endTransmission() == 0;
}
```