

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( $V_{IH}$ )<sub>MIN</sub>=3.5V

## Electrical Characteristics (continued)

(V+ = 5V ±10%, R<sub>SET</sub> = 9.53kΩ ±1%, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, unless otherwise noted.)

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

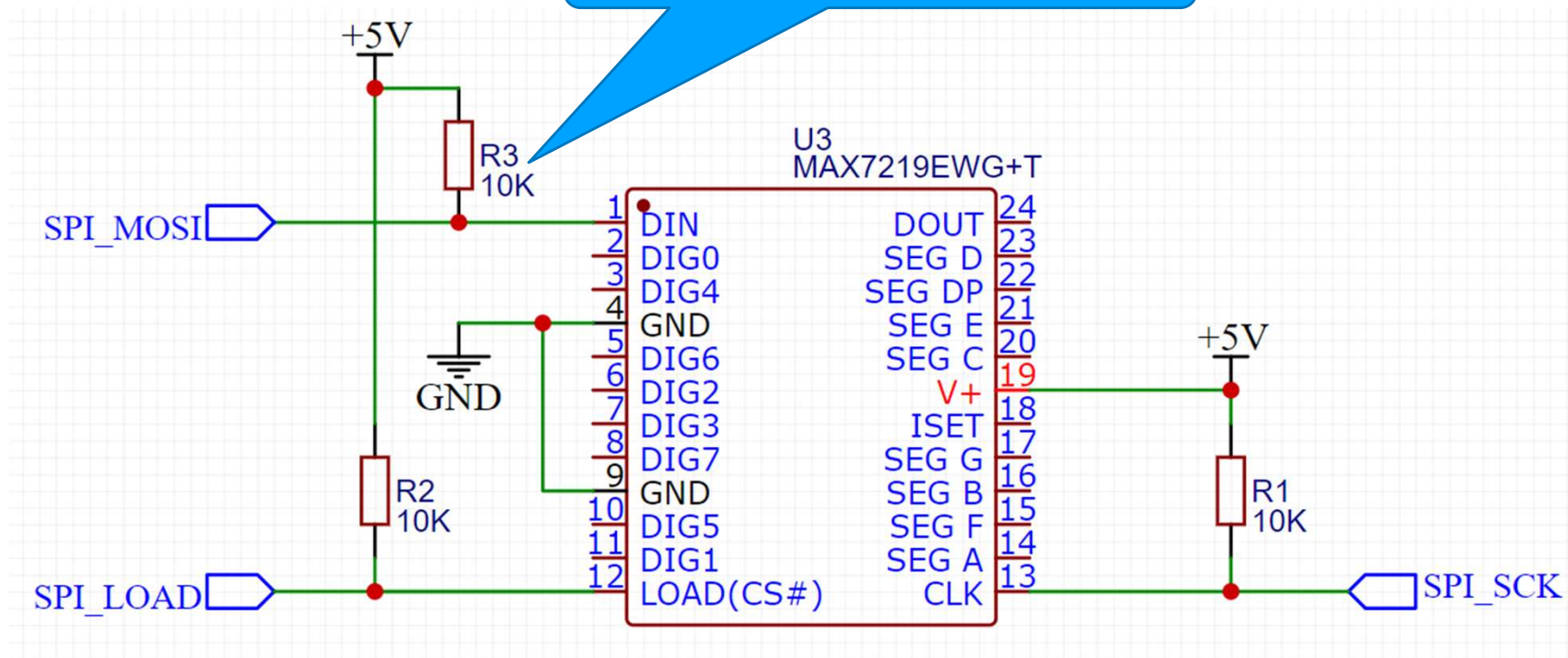
< 10 MHz

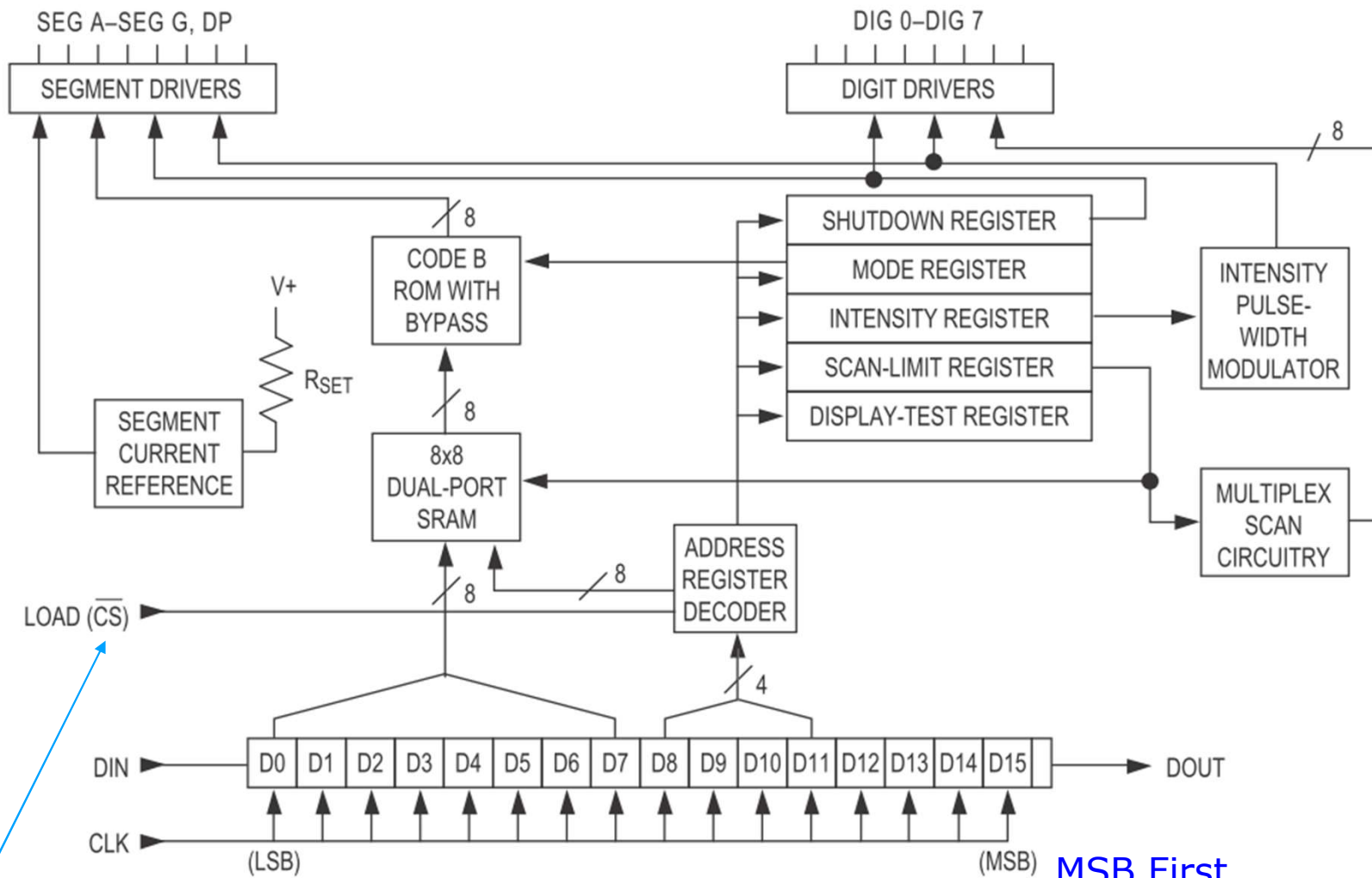


Current < 1 mA

# Pull-up for MAX7219

$5\text{K}\Omega \sim 10\text{K}\Omega \rightarrow 1\text{ mA} \sim 0.5\text{ mA}$

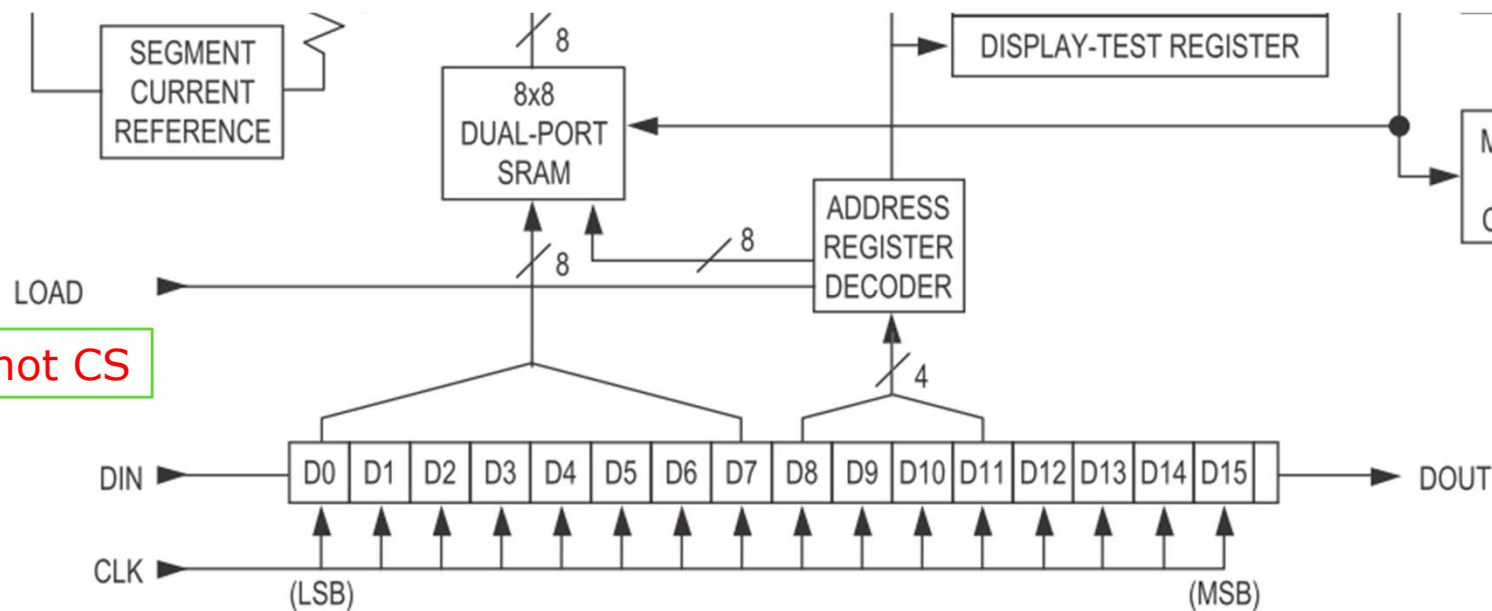




( ) MAX7221 ONLY

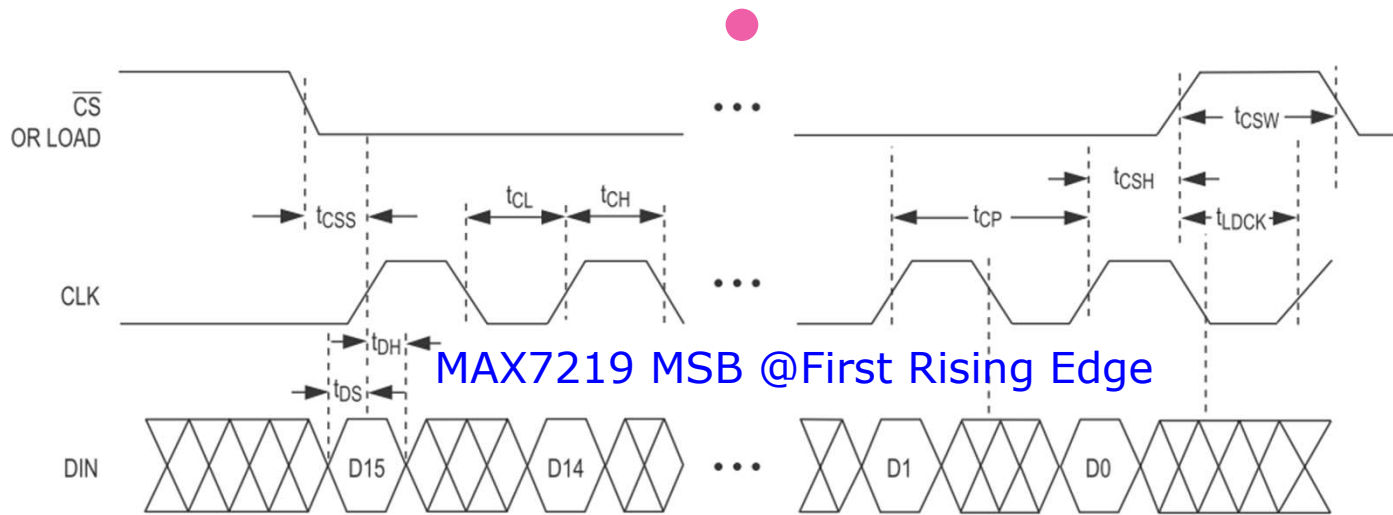
MSB First

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

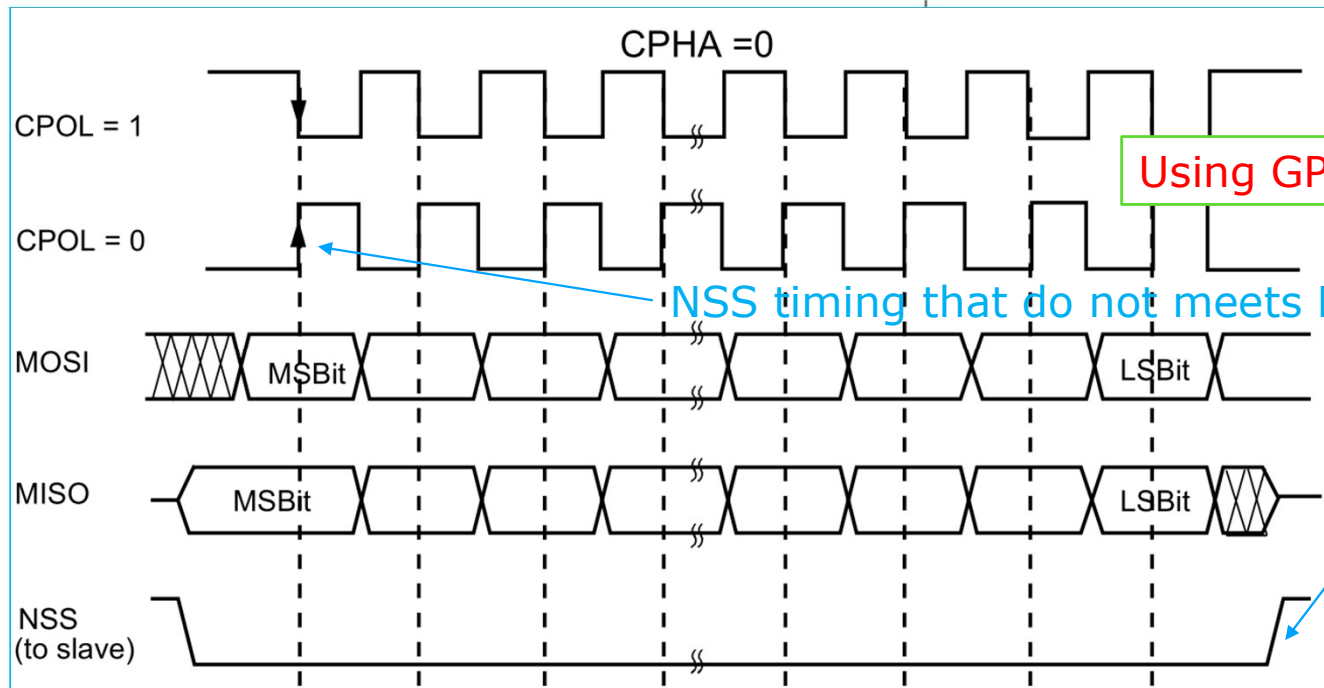


**Table 1. Serial-Data Format (16 Bits)**

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





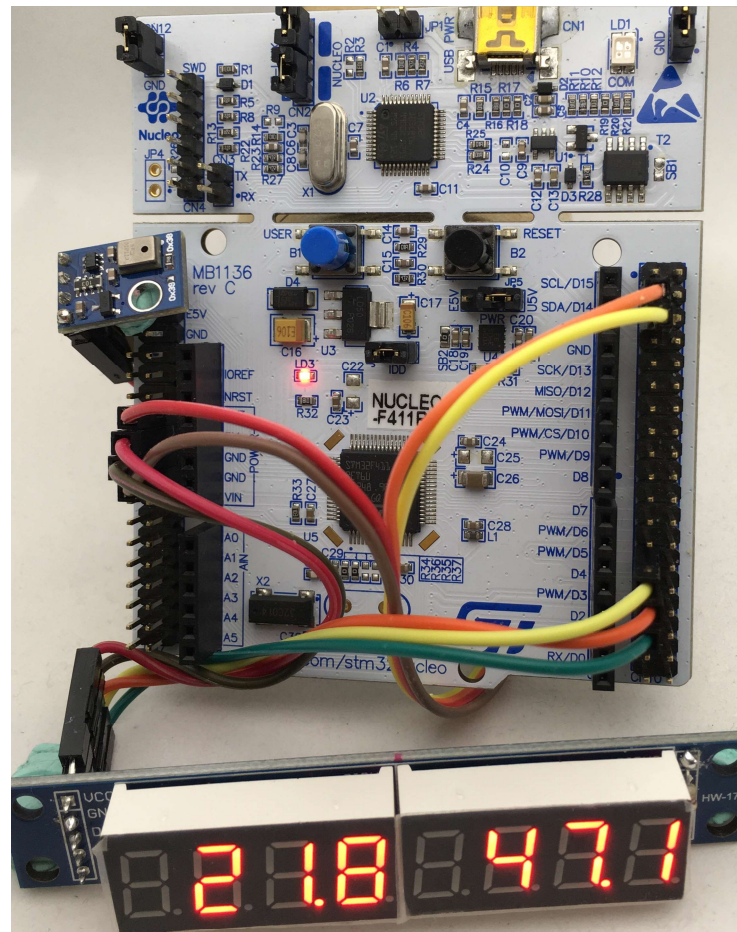
# 接線實體照片



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

CN8

Arduin



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

CN9

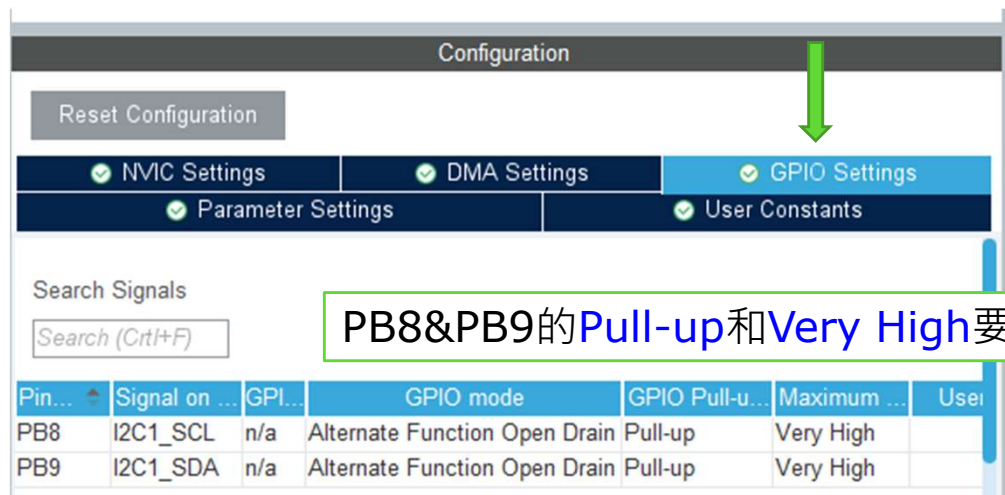
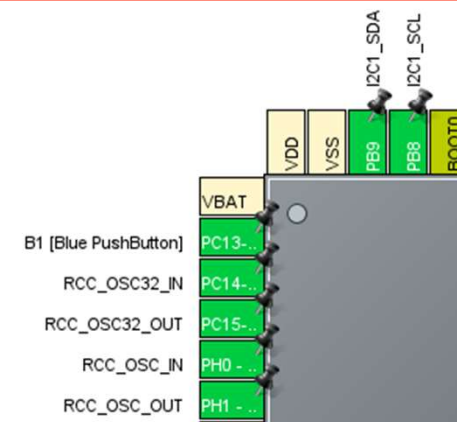
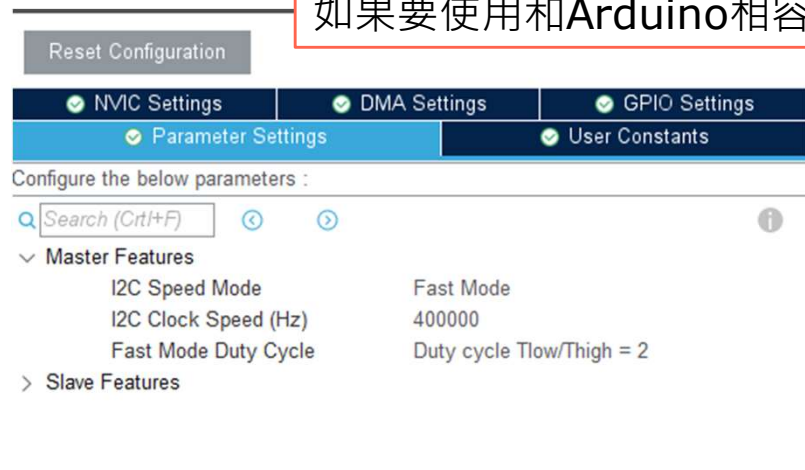
Morpho





# \*.ioc檔設定，I<sup>2</sup>C容易出錯的地方

如果要使用和Arduino相容的腳位，I<sup>2</sup>C1在PB8 & PB9



PB8&PB9的Pull-up和Very High要設起來

# SPI @ Connectivity Setting

SPI1 Mode and Configuration

Mode

Mode: Half-Duplex Master

Hardware NSS Signal: Disable

Configuration

Reset Configuration

✓ NVIC Settings    ✓ DMA Settings    ✓ GPIO Settings

✓ Parameter Settings    ✓ User Constants

Configure the below parameters :

Search (Ctrl+F)

Basic Parameters

Frame Format: Motorola

Data Size: 8 Bits

First Bit: MSB First

Clock Parameters

Prescaler (for Baud Rate): 16

Baud Rate: 5.25 MBits/s

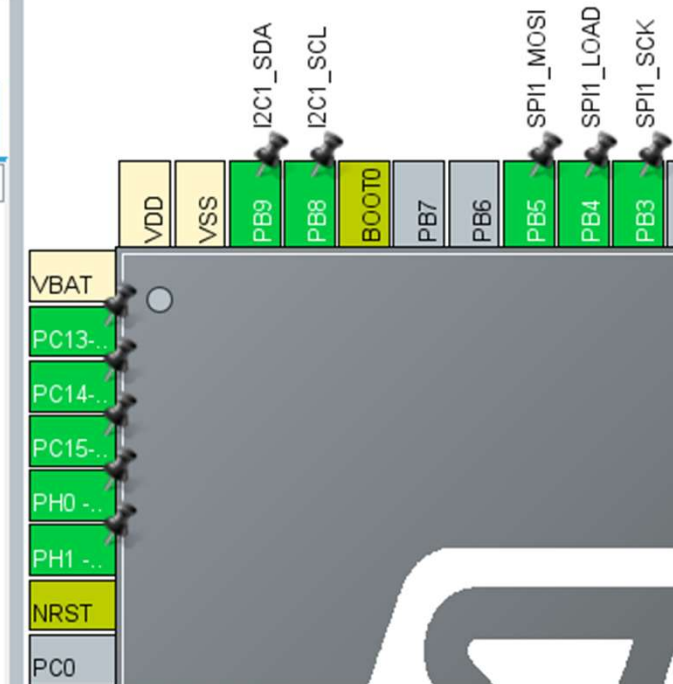
Clock Polarity (CPOL): Low

Clock Phase (CPHA): 1 Edge

Advanced Parameters

CRC Calculation: Disabled

NSS Signal Type: Software



# For MAX7219 SPI GPIO Setting

GPIO I2C RCC SPI SYS USART NVIC

Search Signals  
Search (Ctrl+F) ☐ Show only Modified Pins

Pin N...	Signal on Pin	G...	GPIO mode	GPIO Pull-up/Pull-down	Max...	User...	Mod...
PB3	SPI1_SCK	n/a	Alternate F...	No pull-up and no pull-d...	Ver...		<input type="checkbox"/>
PB5	SPI1_MOSI	n/a	Alternate F...	No pull-up and no pull-d...	Ver...		<input type="checkbox"/>

PB3 Configuration :

GPIO mode: Alternate Function Push Pull

GPIO Pull-up/Pull-down: No pull-up and no pull-down

Maximum output speed: Very High

User Label:

SPI Pins只有  
Push-Pull可選

Pin Diagram Labels: VDD, VSS, I2C1\_SDA, I2C1\_SCL, BOOT0, PB7, PB6, PB5, PB4, PB3, PD2, PC12, PC11, PC10, PA15, PA14, TCK, VBAT, PC13, PC14, PC15, PH0, PH1, NRST, PC0, PC1, PC2, PC3, VSSA, PA13, TMS.

PB4 Configuration :

GPIO output level: High

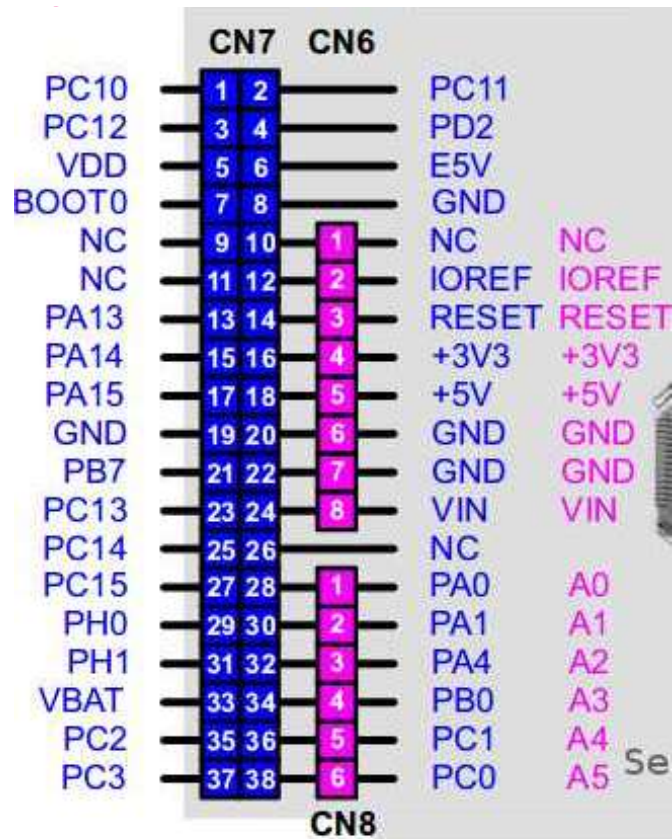
GPIO mode: Output Open Drain

GPIO Pull-up/Pull-down: No pull-up and no pull-down

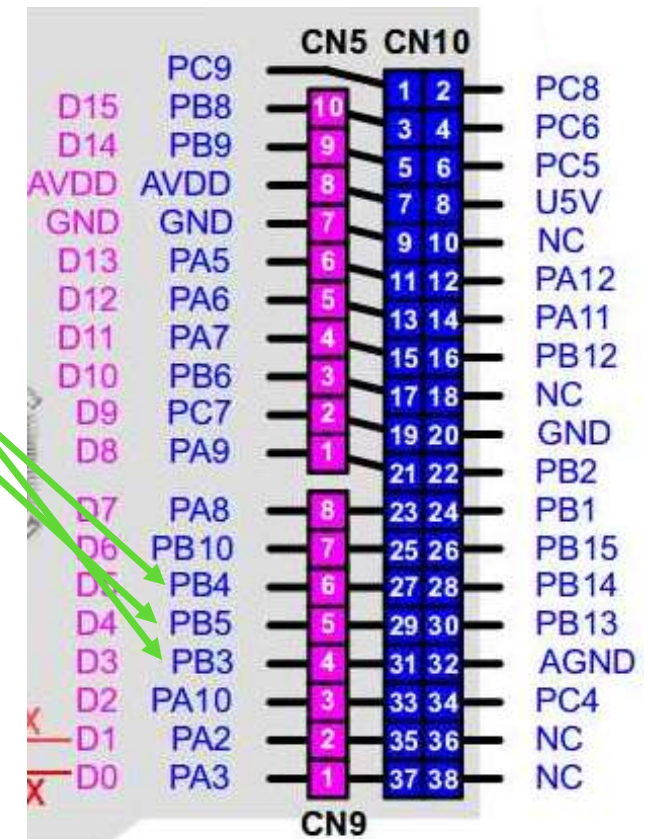
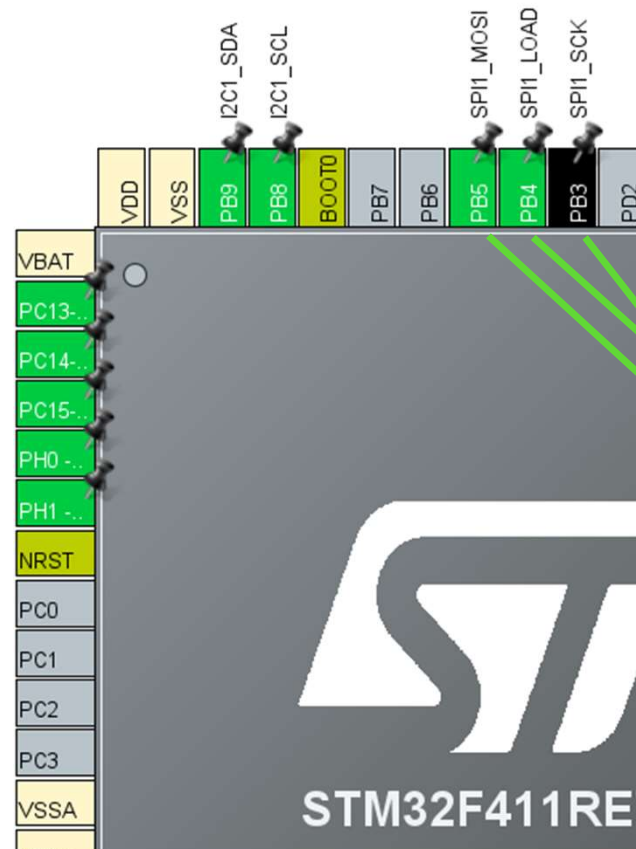
Maximum output speed: Low

User Label: SPI1\_LOAD

# For MAX7219 SPI GPIO Wiring



■ Arduino



■ Morpho



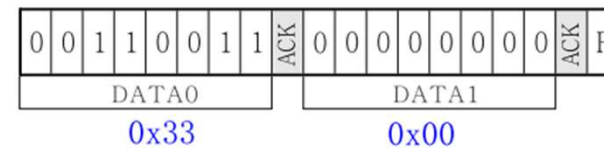
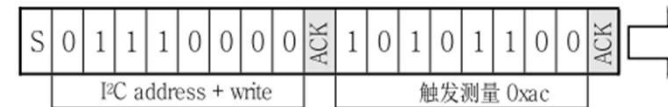
# AHT10Datasheet 遺漏的片段!

[https://github.com/MoonFox2006/AHT10\\_Test/blob/master/src/AHT10.cpp](https://github.com/MoonFox2006/AHT10_Test/blob/master/src/AHT10.cpp)

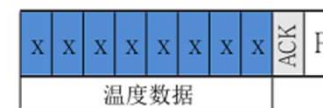
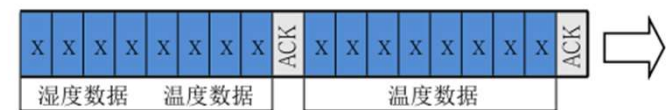
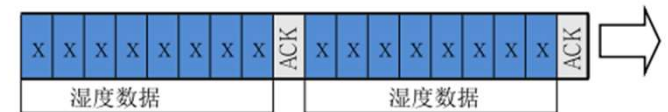
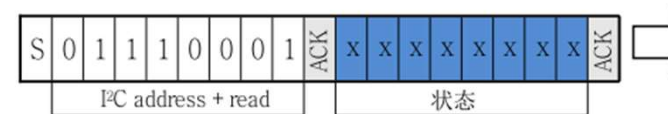
```
bool AHT10::begin() {
    Wire.beginTransmission(AHT10_ADDR);
    Wire.write(0xE1);
    Wire.write(0x08);
    Wire.write(0x00);
    return Wire.endTransmission() == 0;
}
```

触发测量数据

$$0x70 = 0x38 \ll 1$$



读取温湿度数据



□ 主机到从机    ■ 从机到主机    ACK ACK    S Start    P Stop

