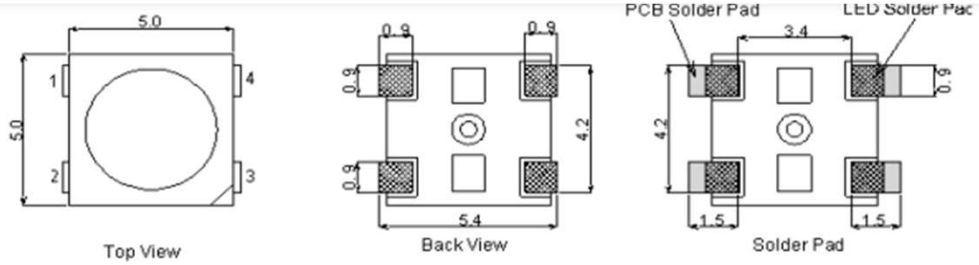
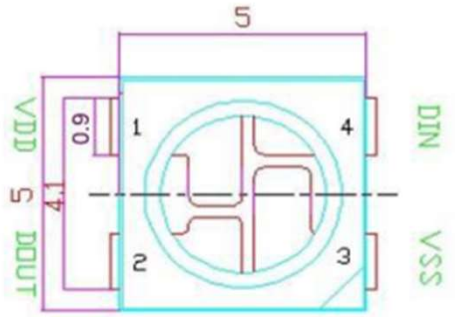
W2812B



PIN configuration



PIN function

NO.	Symbol	Function description
1	VDD	Power supply LED
2	DOUT	Control data signal output
3	VSS	Ground
4	DIN	Control data signal input

Problem 1
Voltage range

Absolute Maximum Ratings

Prameter	Symbol	Ratings	Unit
Power supply voltage	V_{DD}	+3.5~+5.3	V
Input voltage	V_I	-0.5~VDD+0.5	V
Operation junction temperature	Topt	-25~+80	℃
Storage temperature range	Tstg	-40~+105	℃

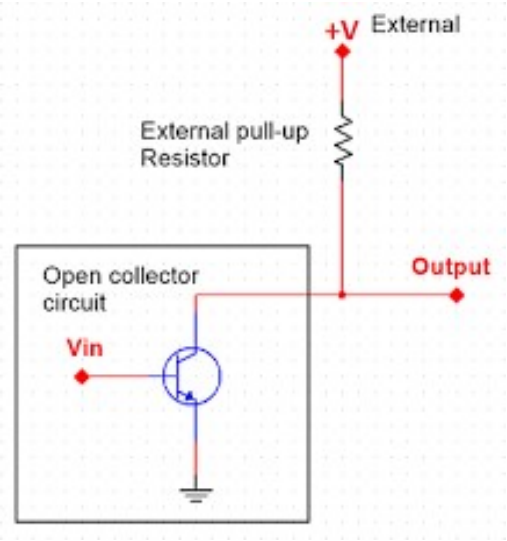
Electrical Characteristics（T_A=-20~+70℃, V_{DD}=4.5~5.5V,V_{SS}=0V,unless otherwise specified）

Prameter	Smybol	conditions	Min	Tpy	Max	Unit
Input current	I_I	V_I=V_{DD}/V_{SS}	——	——	±1	μA
Input voltage level	V_{IH}	D_{IN}, SET	0.7V_{DD}	——	——	V
	V_{IL}	D_{IN}, SET	——	——	0.3 V_{DD}	V
Hysteresis voltage	V_H	D_{IN}, SET	——	0.35	——	V

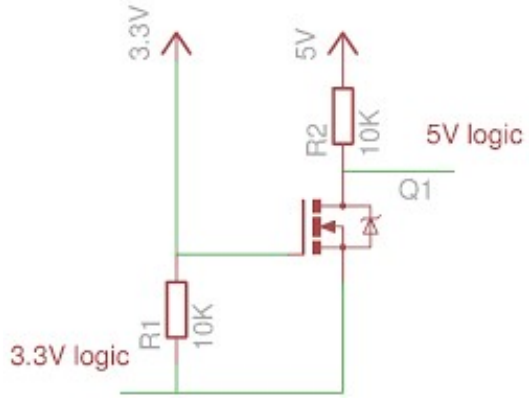
3.5 V = H
1.5 V = L

solution 1: use Buffer IC

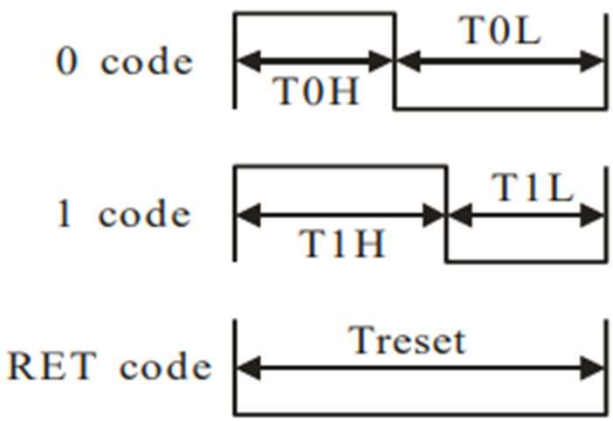
solution 2: pull up 5V open-drain



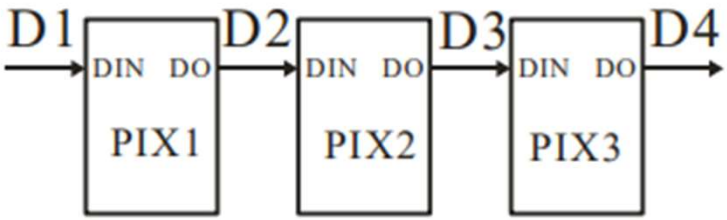
solution 3:use level shifter circuit



Problem 1
Protocol



Cascade method:



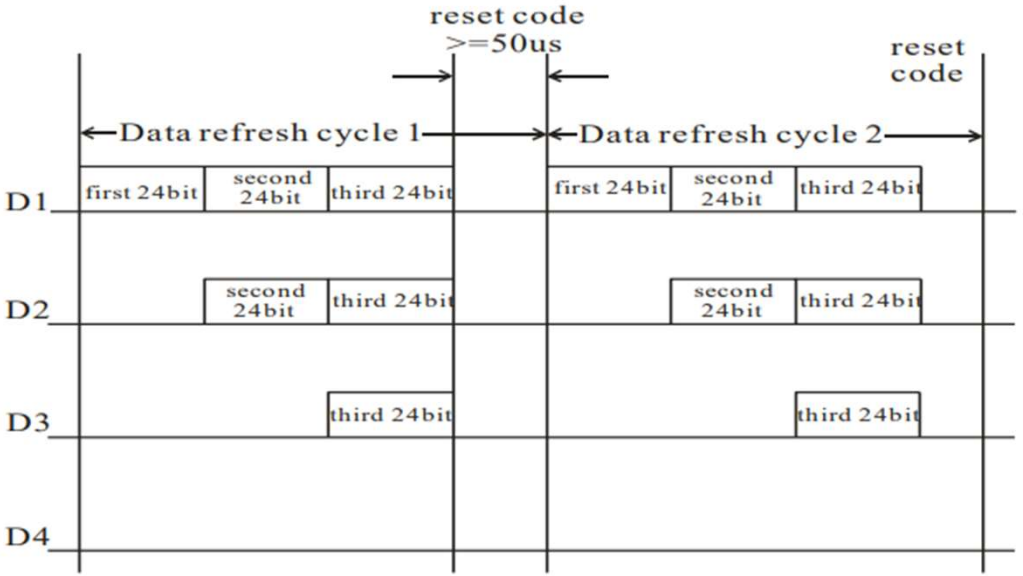
Data transfer time(TH+TL=1.25μs±600ns)

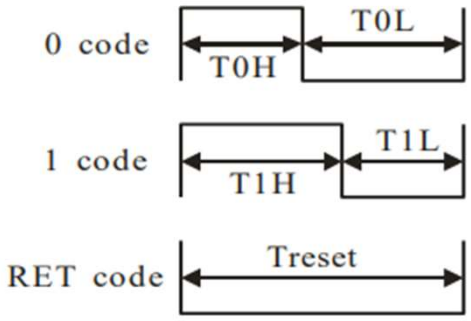
T0H	0 code ,high voltage time	0.4us	±150ns
T1H	1 code ,high voltage time	0.8us	±150ns
T0L	0 code , low voltage time	0.85us	±150ns
T1L	1 code ,low voltage time	0.45us	±150ns
RES	low voltage time	Above 50μs	

Composition of 24bit data:

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0

Note: Follow the order of GRB to sent data and the high bit sent at first.



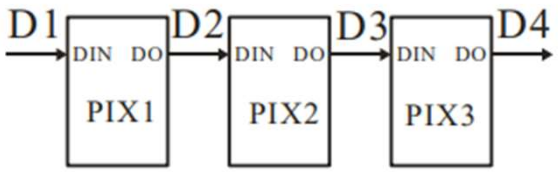


Solution 1: Delay and IO

Solution 2: Use Timer With DMA

Solution 3: Use Serial Peripheral Interface With DMA

Cascade method:



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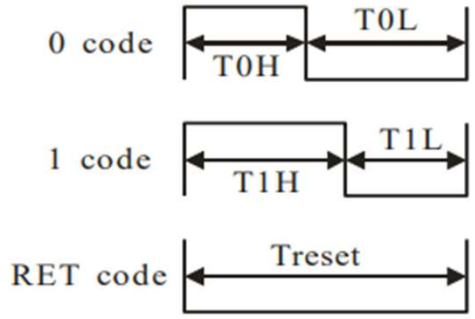
Note: Follow the order of GRB to sent data and the high bit sent at first.



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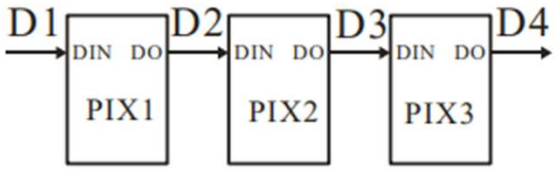
T1L	1 code ,low voltage time	0.45us	±150ns
RES	low voltage time	Above 50μs	

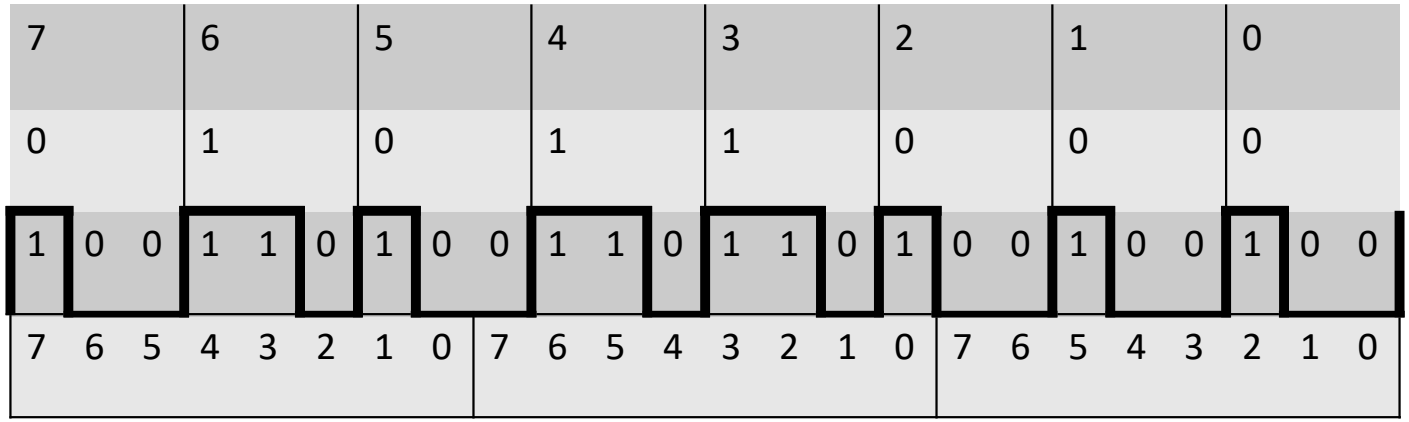
Cascade method:



W2812B Data #

W2812B Data

SPI MOSI



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T1H	1 code ,high voltage time	0.8us	±150ns
T0L	0 code , low voltage time	0.85us	±150ns
T1L	1 code ,low voltage time	0.45us	±150ns
RES	low voltage time	Above 50μs	

0.250 -0.550 us = 4Mhz – 1.8Mhz

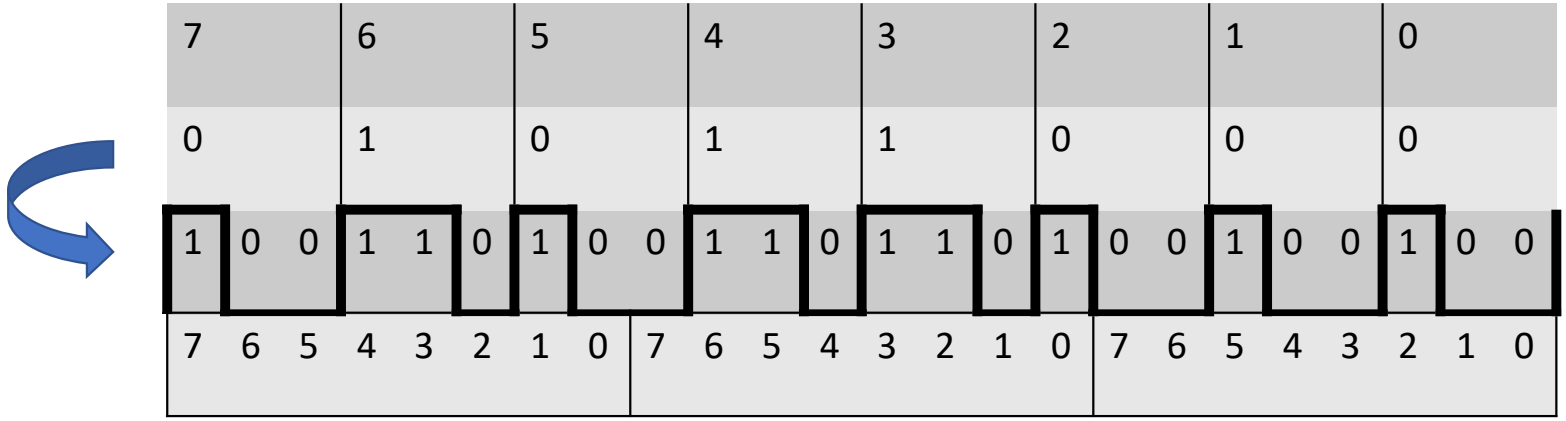
0.650 -0.950 us = 0.325- 0.575 us = 3MHz – 1.7MHz

0.700 -1.000 us = 0.350 – 0.500 us = 2.8MHz – 2MHz

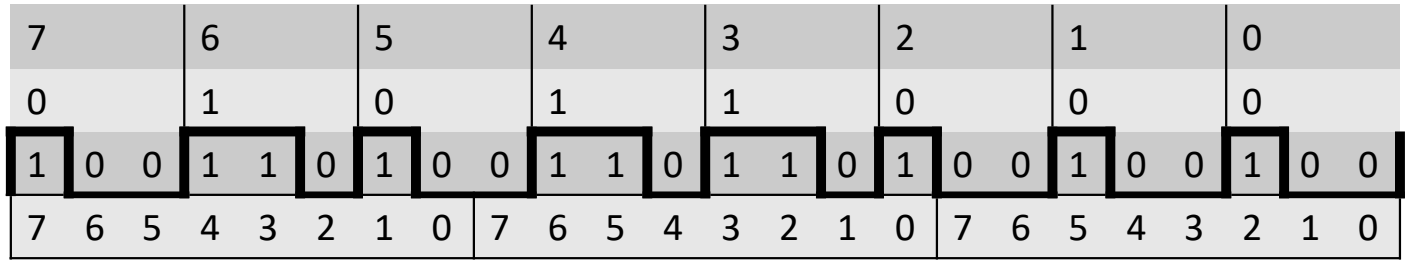
0.300 -0.600 us = 3.3Mhz – 1.6MHz

SPI Clock = 2.8MHz – 2MHz

Data Encoding



Method 1 LUT



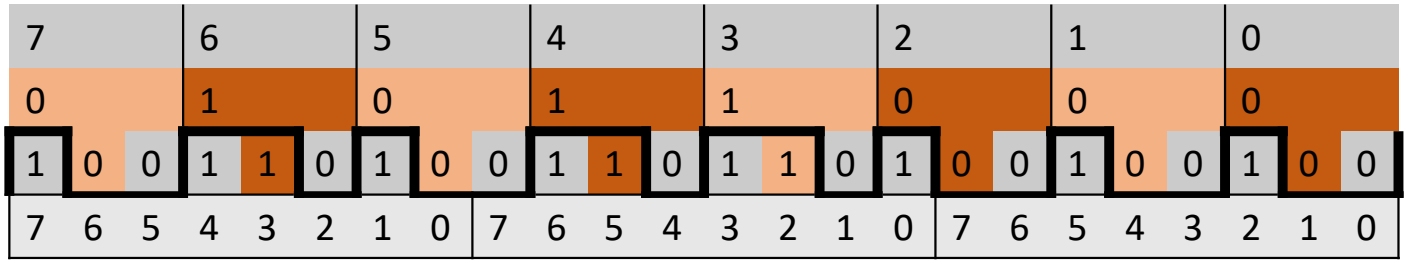

```
const uint8_t W2812LUT[] = { 0b10010010, 0b01001001, 0b00100100, 0b1001
        0b01001001, 0b00100110, 0b10010010, 0b01001001, 0b00110100, 0b1
        0b01001001, 0b00110110, 0b10010010, 0b01001001, 0b10100100, 0b1
        0b01001001, 0b10100110, 0b10010010, 0b01001001, 0b10110100, 0b1
        0b01001001, 0b10110110, 0b10010010, 0b01001101, 0b00100100, 0b1
        0b01001101, 0b00100110, 0b10010010, 0b01001101, 0b00110100, 0b1
        0b01001101, 0b00110110, 0b10010010, 0b01001101, 0b10100100, 0b1
        0b01001101, 0b10100110, 0b10010010, 0b01001101, 0b10110100, 0b1
        0b01001101, 0b10110110, 0b10010010, 0b01101001, 0b00100100, 0b1
        0b01101001, 0b00100110, 0b10010010, 0b01101001, 0b00110100, 0b1
        0b01101001, 0b00110110, 0b10010010, 0b01101001, 0b10100100, 0b1
        0b01101001, 0b10100110, 0b10010010, 0b01101001, 0b10110100, 0b1
        0b01101001, 0b10110110, 0b10010010, 0b01101101, 0b00100100, 0b1
        0b01101101, 0b00100110, 0b10010010, 0b01101101, 0b00110100, 0b1
        0b01101101, 0b00110110, 0b10010010, 0b01101101, 0b10100100, 0b1
```

+Speed

- Space

```
void byteToW2812BEncode1(uint8_t dataIn, uint8_t* Array3Output)
{
    memcpy(Array3Output,&W2812LUT[dataIn*3],3);
}
```

Method 2 Calculate




```
void byteToW2812BEncode2(uint8_t dataIn, uint8_t* Array3Output)
{
    Array3Output[0] = 0b10010010;
    Array3Output[1] = 0b01001001;
    Array3Output[2] = 0b00100100;


    Array3Output[0] |= (((dataIn >> 7) & 0x1) << 6)
            | (((dataIn >> 6) & 0x1) << 3) | (((dataIn >> 5) & 0x1));

    Array3Output[1] |= (((dataIn >> 4) & 0x1) << 5)
                    | (((dataIn >> 3) & 0x1) << 2);

    Array3Output[2] |=(((dataIn >> 2) & 0x1) << 7)
                    | (((dataIn >> 1) & 0x1) << 4) | (((dataIn ) & 0x1)

}
```

TODO

- SET SPI TO 2 – 2.8 Mhz , 8bits ,Ignore CLK ,MISO
- SET IO TO pull up – Opendrain
- Create W2812BEncode Library