Ai-WB2-05W Specification

Version V1.1.2

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.0.0	2022.9.1	First Edition	Jingran Xiao	NingGuan
V1.1.1	2022.9.14	Optimized on-board antenna	Jingran Xiao	NingGuan
V1.1.2	2022.10.31	Add RF OTA parameters	Jingran Xiao	NingGuan

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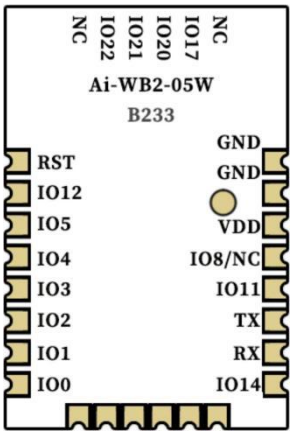
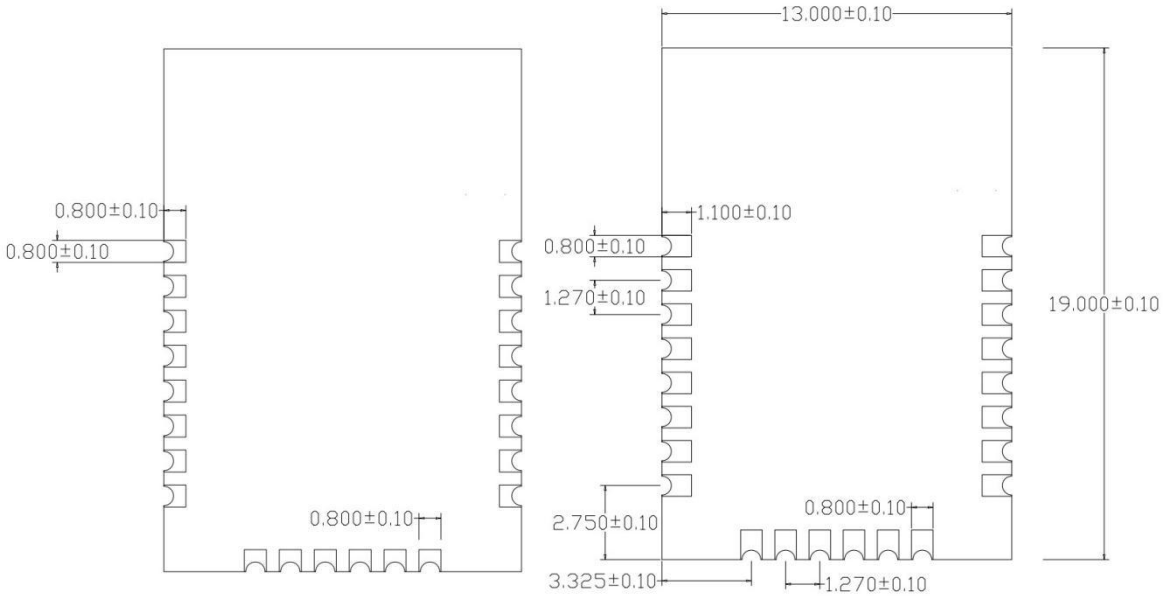
3. Appearance size



Front Back

Figure 3 External view (for reference only)



Front Back

Figure 4 Dimension diagram（unit: mm）

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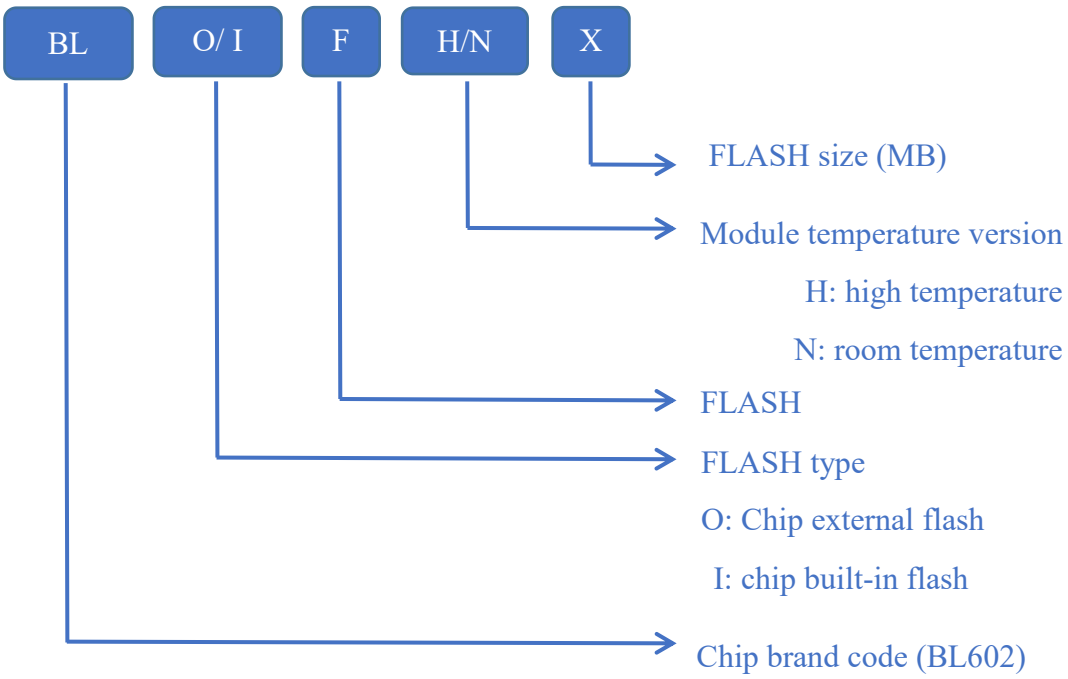

Figure 5 the representative information of screen printing of Shield

4. Pin definition

Ai-WB2-05W module is connected with a total of 22 pins, as shown in the pin schematic diagram, pin function definition table is the interface definition.

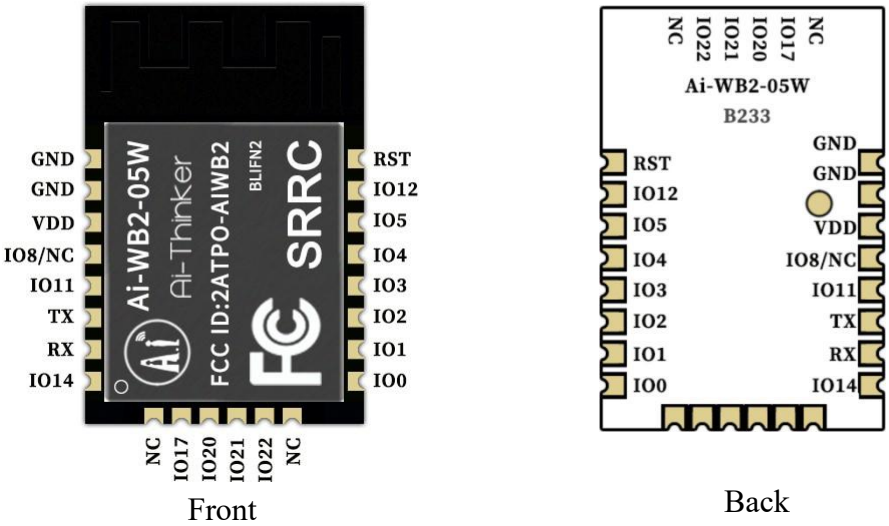

Figure 6 pin diagram

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Table 6 Definition table of pin functions

No.	Name	Description
1	GND	Ground
2	GND	Ground
3	VDD	3.3V power supply. It is recommended that the output current of the external power supply be higher than 500mA
4	IO8/NC	NC, unavailable. If you need to use it, please contact Ai-Thinker. Bootstrap/GPIO8/SPI_MOSI/MISO/IIC_SCL/PWM_CH3
5	IO11	GPIO11/SPI_SCLK/IIC_SDA/ADC_CH10
6	TX	TXD/GPIO16/SPI_MOSI/MISO/IIC_SCL/PWM_CH1
7	RX	RXD/GPIO7/SPI_SCLK/IIC_SDA/PWM_CH2
8	IO14	GPIO14/SPI_SS/IIC_SCL/PWM_CH4/ADC_CH2
9	NC	NC, not available
10	IO17	GPIO17/SPI_MOSI/MISO/IIC_SDA/PWM_CH2
11	IO20	GPIO20/SPI_MOSI/MISO/IIC_SCL/PWM_CH0
12	IO21	GPIO21/SPI_MOSI/MISO/IIC_SDA/PWM_CH1
13	IO22	GPIO22/SPI_SS/IIC_SCL/PWM_CH2
14	NC	NC, not available
15	IO0	GPIO0/SPI_MOSI/MISO/IIC_SCL/PWM_CH0
16	IO1	GPIO1/SPI_MOSI/MISO/IIC_SDA/PWM_CH1
17	IO2	GPIO2/SPI_SS/IIC_SCL/PWM_CH2
18	IO3	GPIO3/SPI_SCLK/IIC_SDA/PWM_CH3
19	IO4	GPIO4/SPI_MOSI/MISO/IIC_SCL/PWM_CH4/ADC_CH1
20	IO5	GPIO5/SPI_MOSI/MISO/IIC_SDA/PWM_CH0/ADC_CH4
21	IO12	GPIO12/SPI_MOSI/MISO/IIC_SCL/PWM_CH2/ADC_CH0
22	RST	By default, the chip is reset and triggered at a low level
Note: 1.At the moment of power-on,if Bootstrap GPIO8 is high, the module enters the programming mode;if Bootstrap GPIO8 is low, the module starts normally.		

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5. Schematic

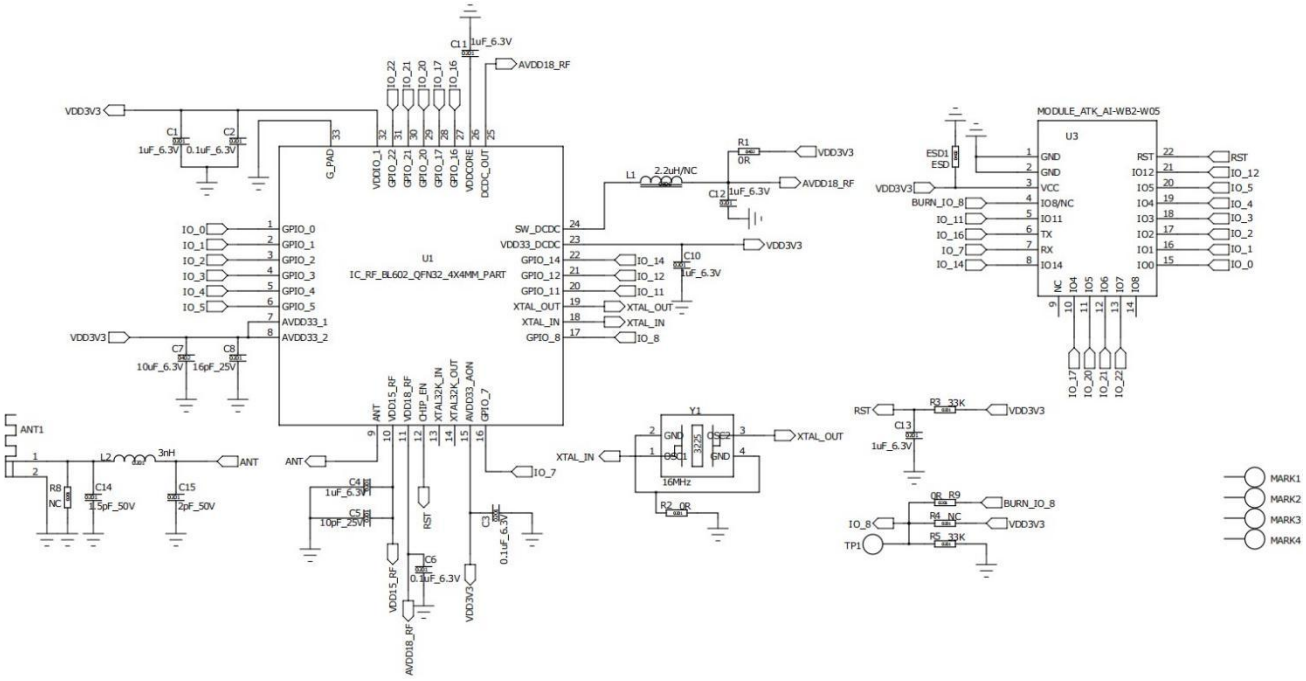

Figure 7 schematic diagram

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6. Antenna parameters

6.1. Antenna Test prototype

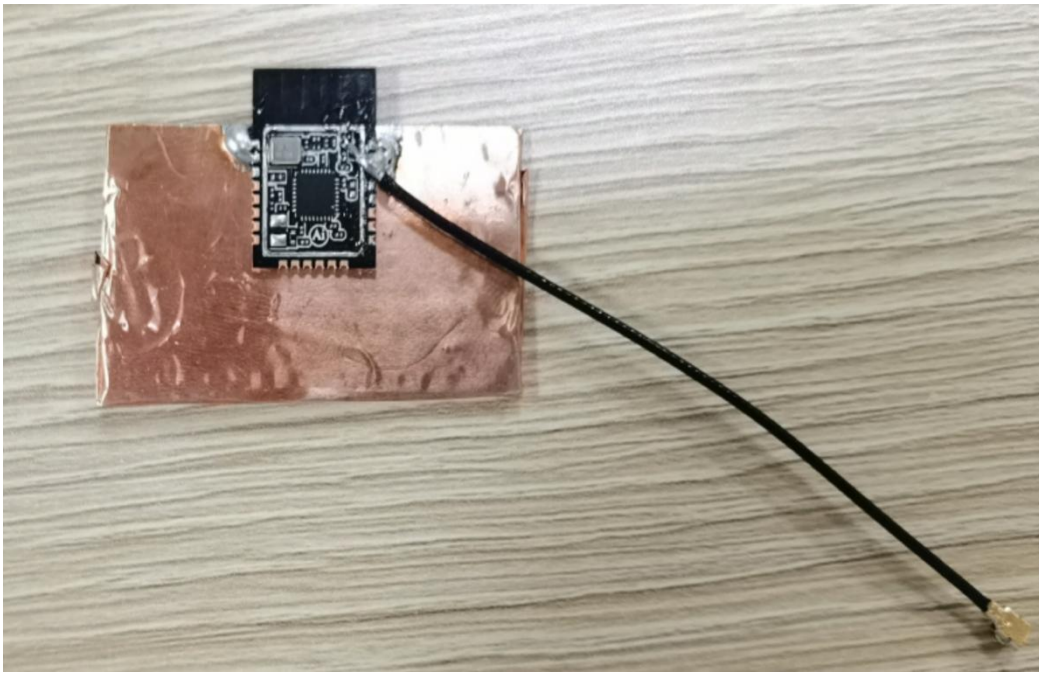

Figure 8 antenna Test prototype sketch Map

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6.2. Antenna S parameters

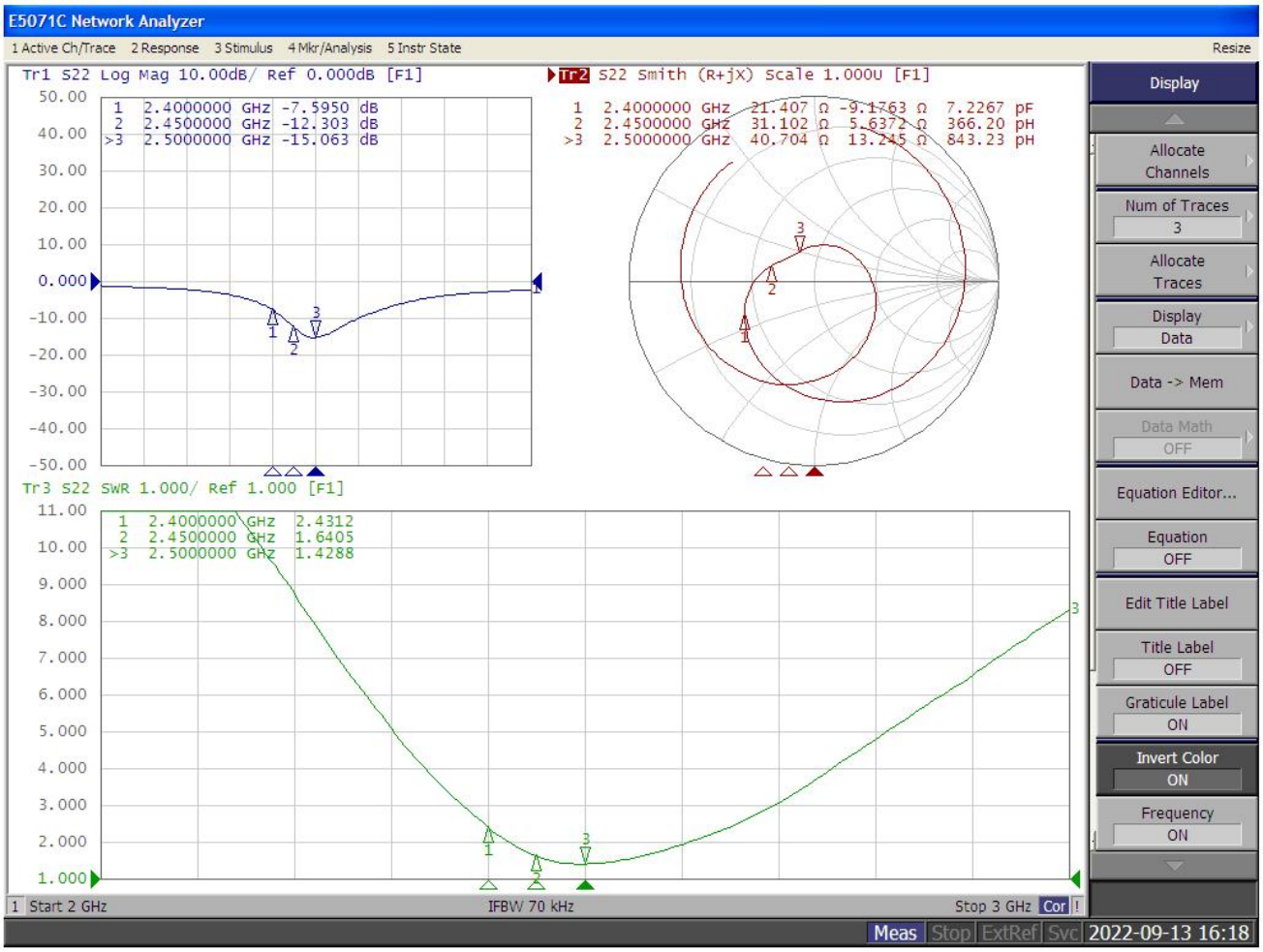

Figure 9 antenna S parameters

6.3. Antenna gain and efficiency

Table 7 antenna gain and efficiency

Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency(MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Gain (dBi)	-0.60	-0.41	-0.32	-0.44	-0.73	-0.73	-0.67	-0.54	-0.34	-0.26	-0.32
Efficiency (%)	42.68	43.47	44.50	44.75	42.81	43.16	42.06	41.34	40.37	40.25	40.05

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6.4. Antenna pattern

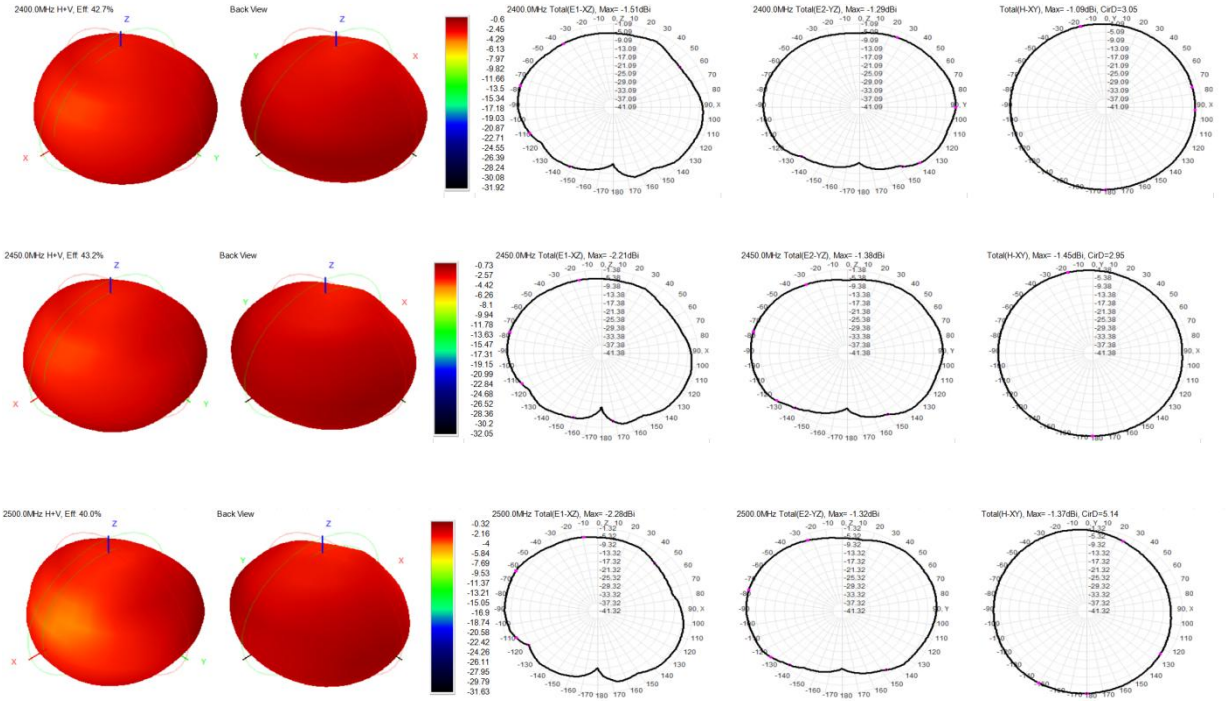

Figure 10 Antenna pattern

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6.5. RF OTA parameters

Table 8 RF OTA parameters

Item	Mode	Rate(Mbps)	Channel	Fre.(MHz)	Data(dBm)
TRP	11b	11	1	2412	17.89
			6	2437	17.76
			13	2472	16.35
	11g	54	1	2412	15.47
			6	2437	15.43
			13	2472	14.01
	HT20	MCS7	1	2412	15.78
			6	2437	15.49
			13	2472	13.97
TIS	11b	11	1	2412	-86.02
			6	2437	-84.76
			13	2472	-85.68
	11g	54	1	2412	-71.74
			6	2437	-72.4
			13	2472	-71.14
	HT20	MCS7	1	2412	-67.05
			6	2437	-66.72
			13	2472	-65.37

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7. Design Guidance

7.1. Application Guide circuit

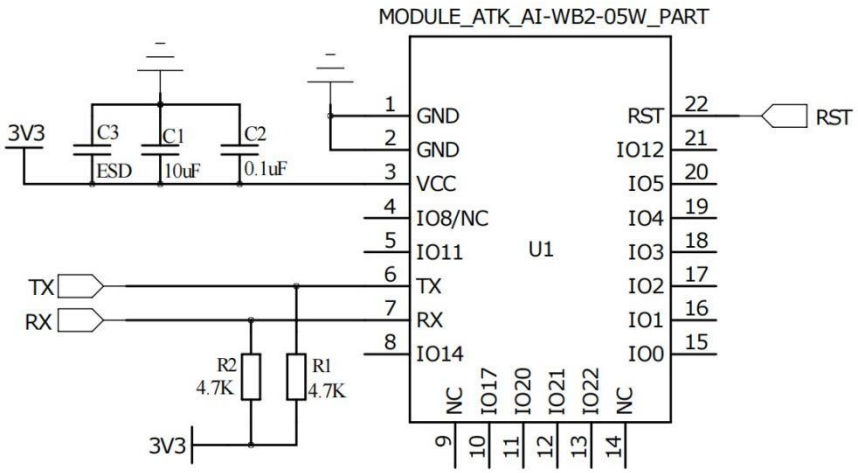

Figure 11 Application circuit diagram

- If the IO port is used as PWM, it is recommended to reserve a 4.7K pull-down resistor around the module. Especially in the application of light control, it can prevent the flashing light phenomenon at the moment of power-on start
- The IO8/NC pin, which are not available by default. If you need to use it, please contact Ai-Thinker

7.2. Recommend PCB package size

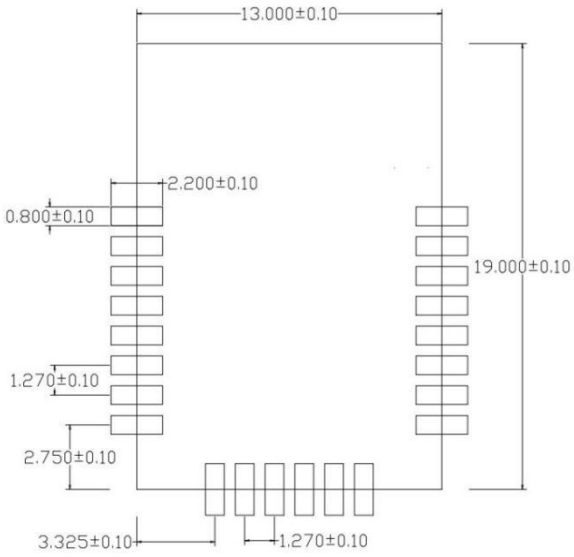

Figure 12 recommended PCB package size

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7.3. Antenna layout requirements

- The following two methods are recommended for the installation position on the mainboard

Option 1: put the module on the edge of the motherboard, and the antenna area extends out of the edge of the motherboard

Option : put the module on the edge of the motherboard, the edge of the motherboard at the antenna position hollowed out an area

- In order to meet the performance of the on-board antenna, it is forbidden to place metal parts around the antenna and keep away from high-frequency devices

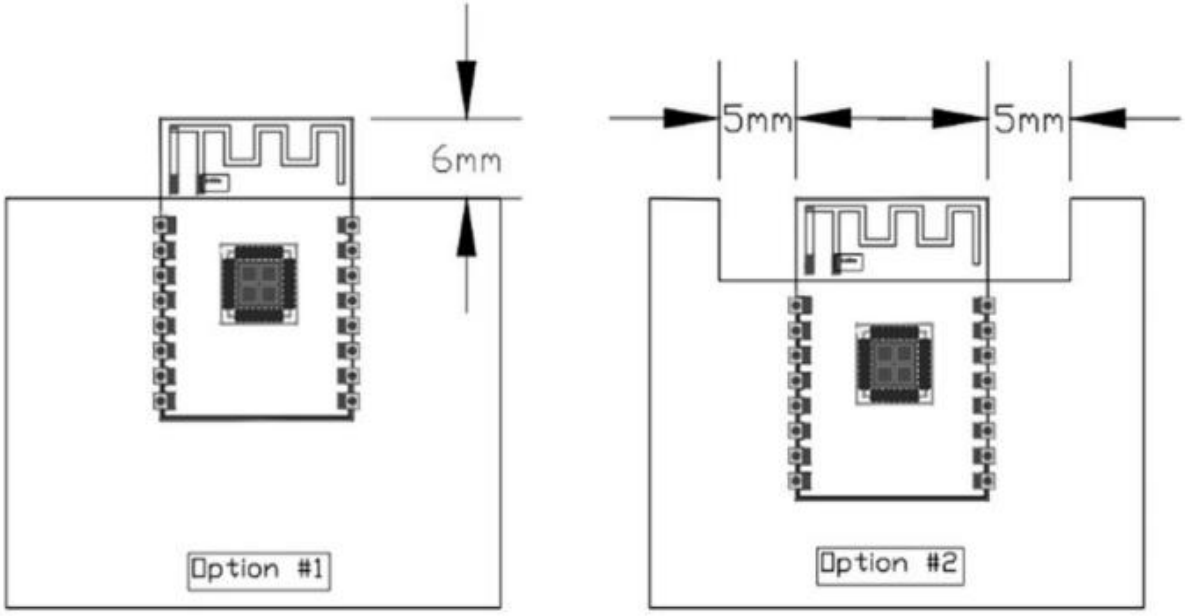

Figure 13 Antenna layout diagram

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7.4. Power supply

- Recommended 3.3V voltage, peak current over 500mA.
- We recommend that you use LDO for power supply. If you use DC-DC, we recommend that you control the ripple within 30mV.
- DC-DC power supply circuit is recommended to reserve the position of dynamic response capacitance, which can optimize the output ripple when the load changes greatly.
- It is recommended to add ESD devices to the 3.3V power interface.

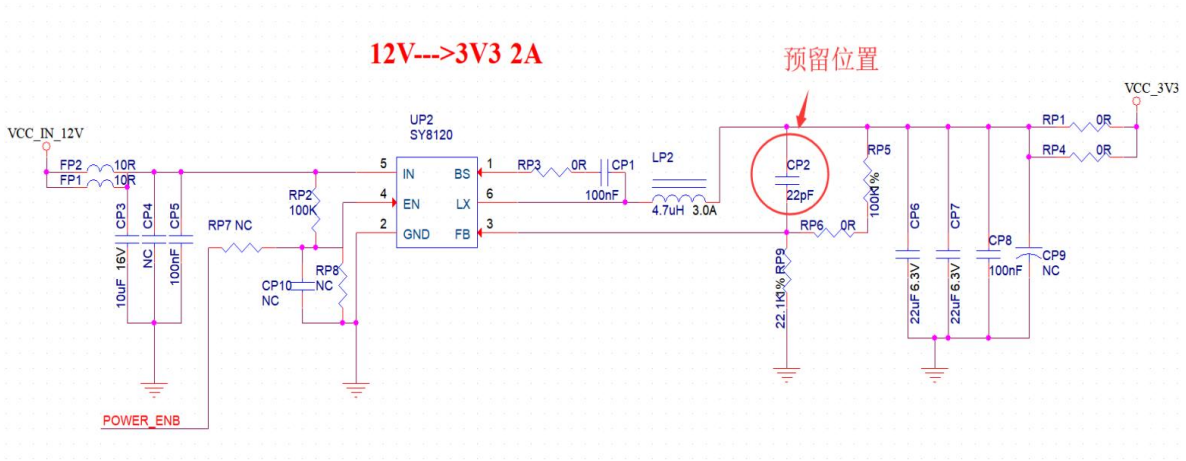

Figure 14 DC-DC step-down circuit diagram

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7.5. GPIO

- There are some IO ports on the periphery of the module. If you need to use it, it is recommended to connect a 10-100 ohm resistor in series with the IO port. This inhibits overshoot and makes both sides level more stable. It is helpful for EMI and ESD.
- For special I/O ports to be pulled up and down, refer to the direction for use in the specifications, which may affect the module start-up configuration.
- The I/O port of the module is 3.3V. If the main control does not match the I/O port level of the module, a level conversion circuit needs to be added.
- If the I/O port is directly connected to the peripheral interface, or the terminal such as the row pin, it is recommended to reserve ESD devices near the terminal of the I/O port.

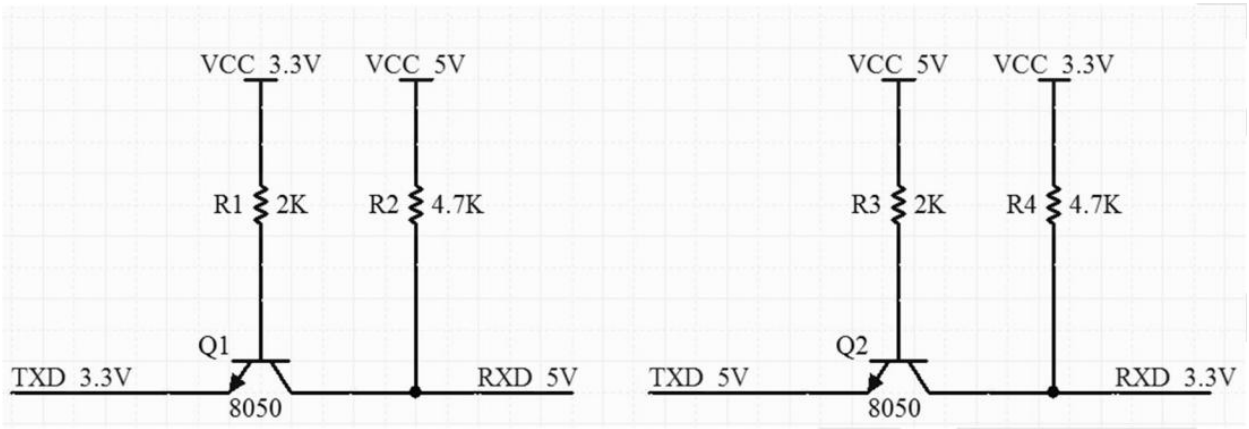

Figure 15 level conversion circuit

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8. Storage Conditions

Products sealed in moisture-proof bags shall be stored in a non-condensing atmospheric environment of <40℃/90% RH.

The humidity sensitivity level MSL of the module is Level 3.

After the vacuum bag is unpacked, it must be used up within 168 hours at 25±5℃/60%RH, otherwise it can be put on line again after baking.

9. Reflow welding curve diagram

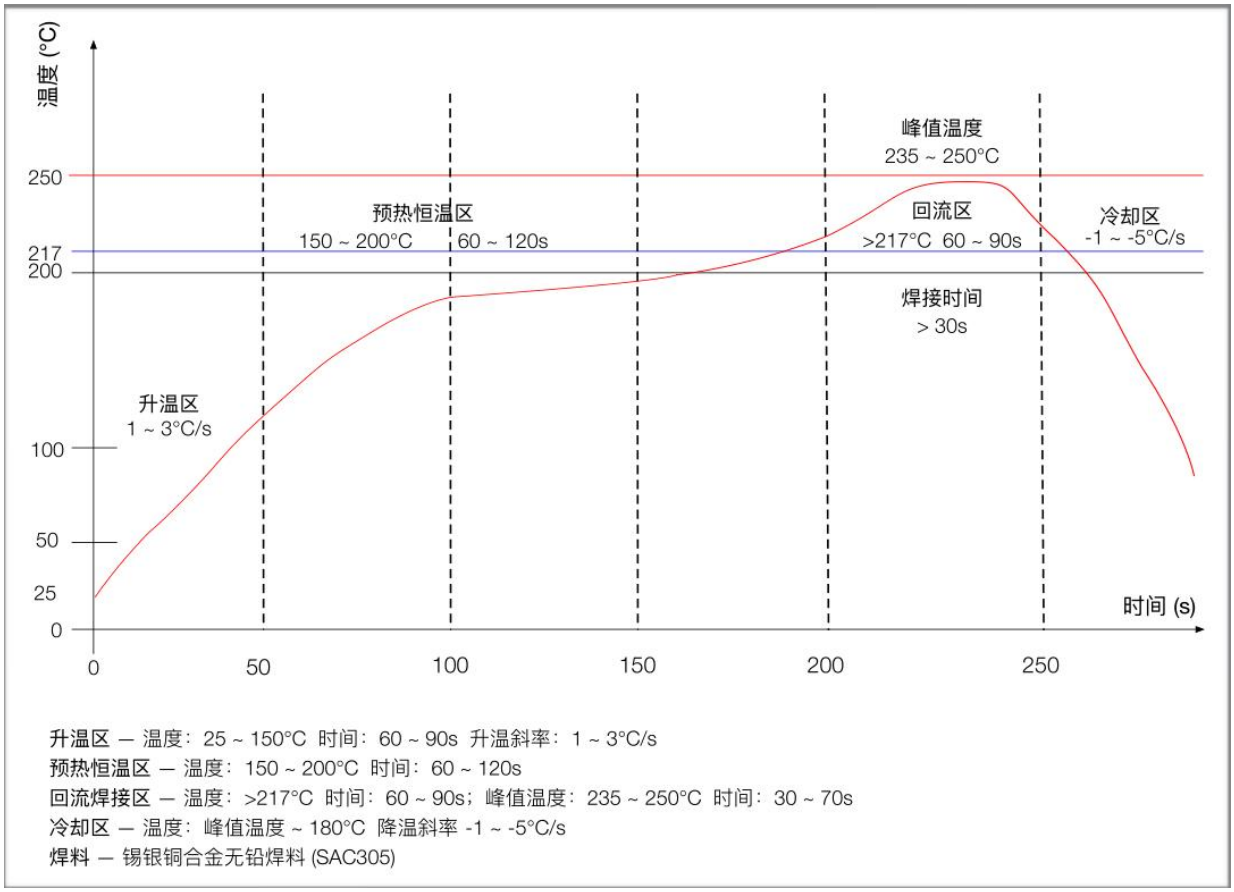

Figure 16 reflow soldering curve

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10.Product packaging information

Ai-WB2-05W module was packaged in a tape, 1 000pcs/reel. As shown in the below image:

Figure 17 Package and packing diagram

11.Contact us

Ai-Thinker official website　　Office forum　　Develop DOCS

LinkedIn　　Tmall shop　　Taobao shop　　Alibaba shop

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Domestic business cooperation：sales@aithinker.com

Overseas business cooperation：overseas@aithinker.com

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Tel：+86-0755-29162996

WeChat mini program

WeChat official account

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