Ai-M62-12F Specification

Version V1.0.0

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.0.0	2023.03.23	First Edition	NanNan Yuan	NingGuan

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2.4. BLE RF performance

Table 4 BLE RF Performance Table

Description	Typical value			Unit
Spectrum range	2400~2483.5MHz			MHz
Output power				
Mode	**Min.**	**Typical value**	**Max.**	**Unit**
1Mbps	-	10	15	dBm
2Mbps	-	10	15	dBm
Receiving sensitivity				
Mode	**Min.**	**Typical value**	**Max.**	**Unit**
1Mbps sensitivity @ 30.8%PER	-	-99	-	dBm
2Mbps sensitivity @ 30.8%PER	-	-97	-	dBm

2.5. Power consumption

The following power consumption data is based on a 3.3V power supply and measured at an ambient temperature of 25°C.

- The POUT power for all transmit modes is the measured value at the antenna interface.
- All transmission data are measured in the continuous transmission mode based on a duty cycle of 100%.

Table 5 Power consumption table

Mode	Min.	Average	Max.	Unit
Transmit 802.11B, 11Mbps,POUT = + 22dBm	-	442	-	mA
Transmit 802.11g, 54Mbps, POUT = + 19dBm	-	296	-	mA
Emission 802.11n, MCS7, POUT = + 19dBm	-	301	-	mA
Launch 802.11ax, MCS9, POUT = + 17dBm	-	269	-	mA
Receive 802.11B, packet length 1024 bytes	-	59	-	mA
Receive 802.11g, packet length 1024 bytes	-	59	-	mA
Receive 802.11n, packet length 1024 bytes	-	59	-	mA
Receive 802.11ax, packet length 1024 bytes	-	59	-	mA

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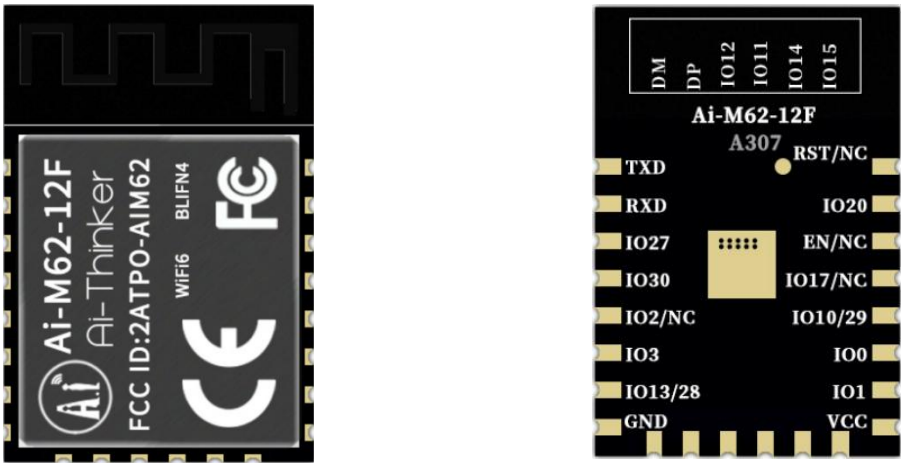
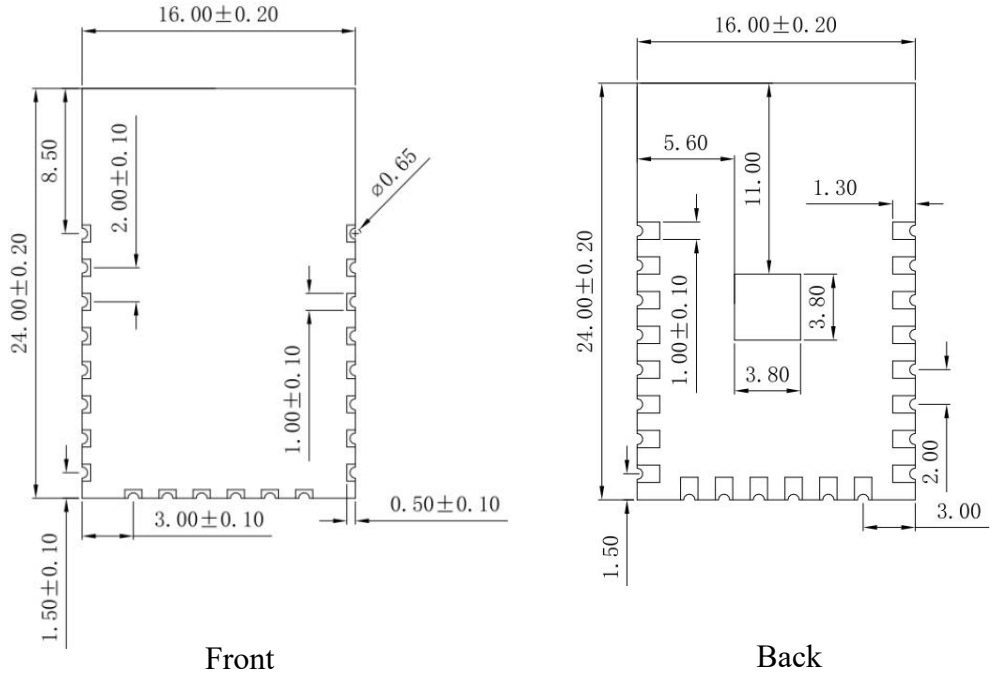
3. Appearance size



Front Back

Figure 3 appearance diagram (Rendering diagram is for reference only, subject to actual objects)



Front Back

Figure 4 dimension diagram

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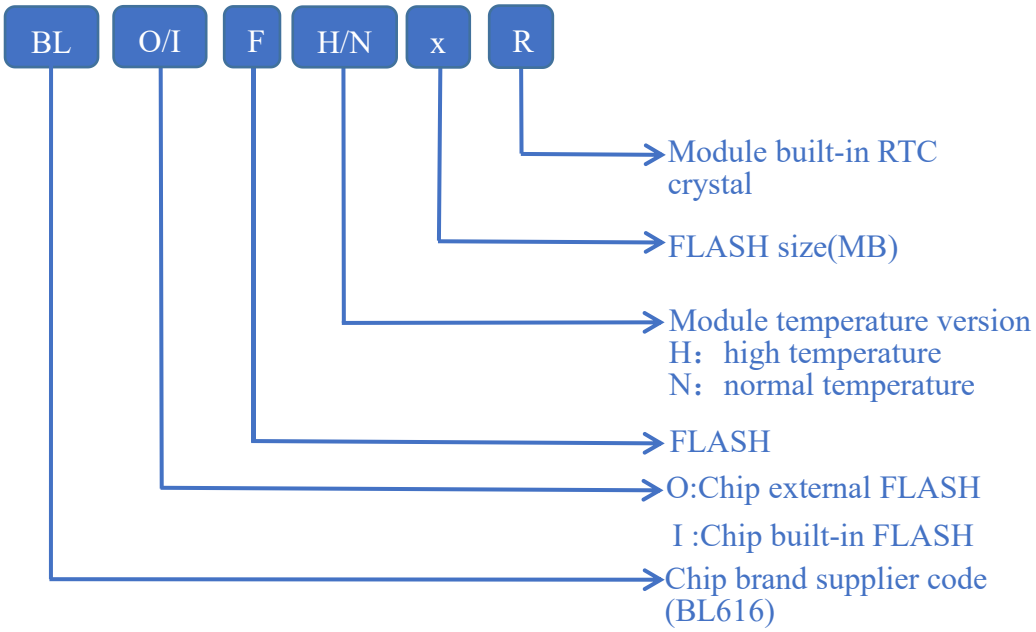

Figure 5 Screen Screen Representative Information of Shields

4. Pin definition

A total of 22 pins are connected to the Ai-M62-12F module, as shown in the pin diagram, the pin function definition table is an interface definition.

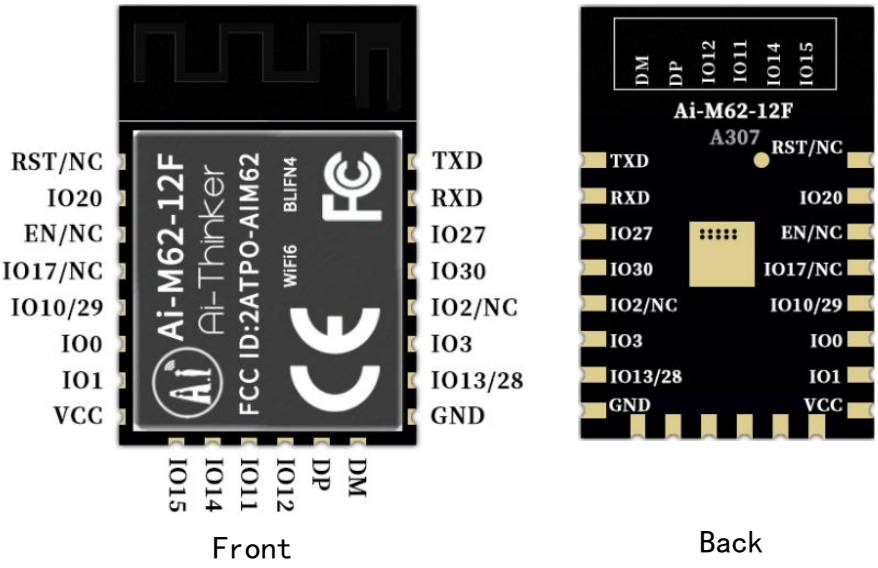

Figure 6 pin diagram

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Table 6 Pin Function Definition Table

Foot	Name	Functional description
1	RST/NC	The default is floating, and it can be customized as a reset pin, which is active at low level. If you need to use it, please contact Ai-Thinker
2	IO20	GPIO20/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH0/PWM0
3	EN/NC	By default, it is enabled as a chip, active at high level, and cannot be used at the same time as RST
4	IO17/NC	Available by default, the IO port is shared with the 32.768KHz crystal output PIN pin inside the module. If the module of the internal patch 32.768KHz crystal oscillator is customized, the IO is in NC state. GPIO17/SPI_SCLK/I2S_FS/I2C_SDA/XTAL_32K_OUT/PWM0
5	IO10/29	The default is IO29,GPIO29/SPI_SCLK/I2S_FS/I2C_SDA/PWM0
6	IO0	GPIO0/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH9/PWM0
7	IO1	GPIO1/SPI_SCLK/I2S_FS/I2C_SDA/ADC_CH8/PWM0
8	VCC	3.3V power supply; The output current of external power supply is recommended to be above 500mA.
9	IO15	Available by default, this IO port is shared with Flash in the module. If a module with external Flash is customized, the IO is not available. For use, please contact Ai-Thinker. GPIO15/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0
10	IO14	Available by default, this IO port is shared with Flash in the module. If a module with external Flash is customized, the IO is not available. For use, please contact Ai-Thinker. GPIO14/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/ADC_CH4/PWM0
11	IO11	Available by default, this IO port is shared with Flash in the module. If a module with external Flash is customized, the IO is not available. For use, please contact Ai-Thinker. GPIO11/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0
12	IO12	Available by default, this IO port is shared with Flash in the module. If a module with external Flash is customized, the IO is not available. For use, please contact Ai-Thinker. GPIO12/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH6/PWM0
13	DP	USB_DP
14	DM	USB_DM
15	GND	Grounding
16	IO13/28	The default is IO28,GPIO28/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH11/PWM0

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17	IO3	GPIO3/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/ADC_CH3/PWM0
18	IO2/NC	The default NC is not available. If you need to use it, please contact Ai-Thinker. If elicited, support Bootstrap/GPIO2/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/ADC_CH2/PWM0
19	IO30	GPIO30/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
20	IO27	GPIO27/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/ADC_CH10/PWM0
21	RXD	RXD/GPIO22/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
22	TXD	TXD/GPIO21/SPI_SCLK/I2S_FS/I2C_SDA/ADC_RCAL_VOUT/PWM0
Note: 1. GPIO2 is used as a Bootstrap. When the power-on moment is high, the module enters the burning mode. When the power-on moment is low, the module starts normally.		

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5. Schematic diagram

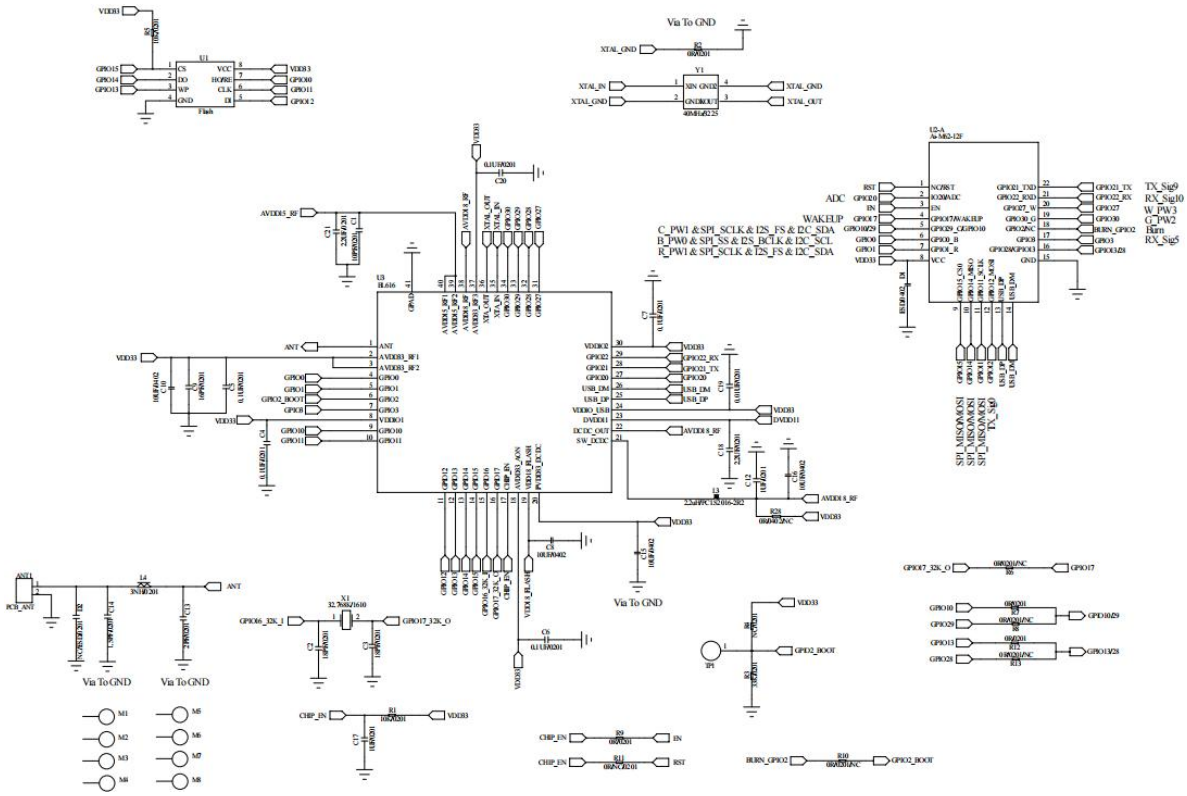

Figure 7 Schematic Diagram

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6. Antenna parameters

6.1. Schematic of Antenna Test Prototype

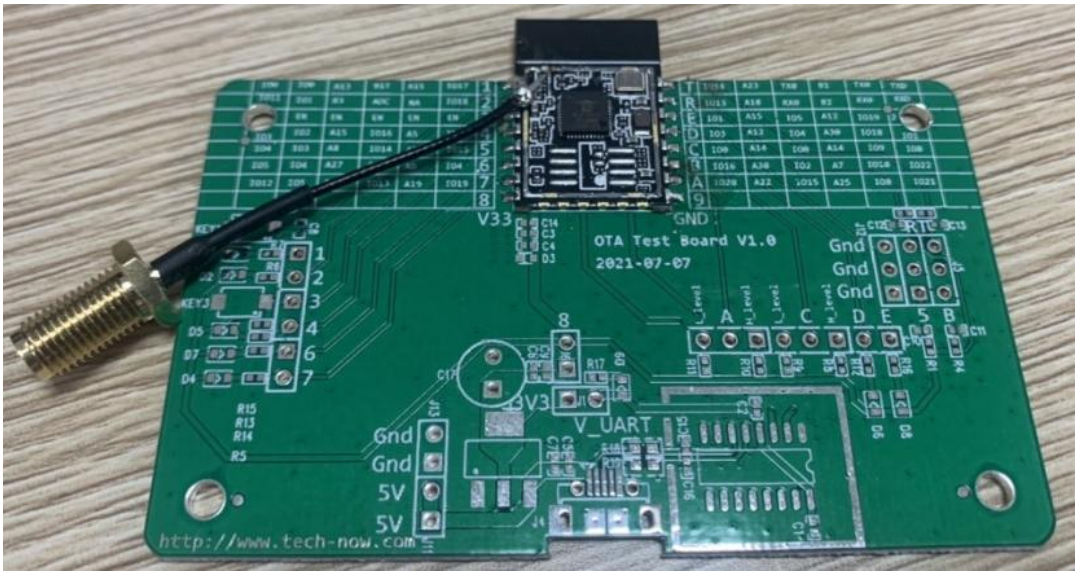

Figure 8 schematic diagram of antenna test prototype

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6.2. Antenna s parameter

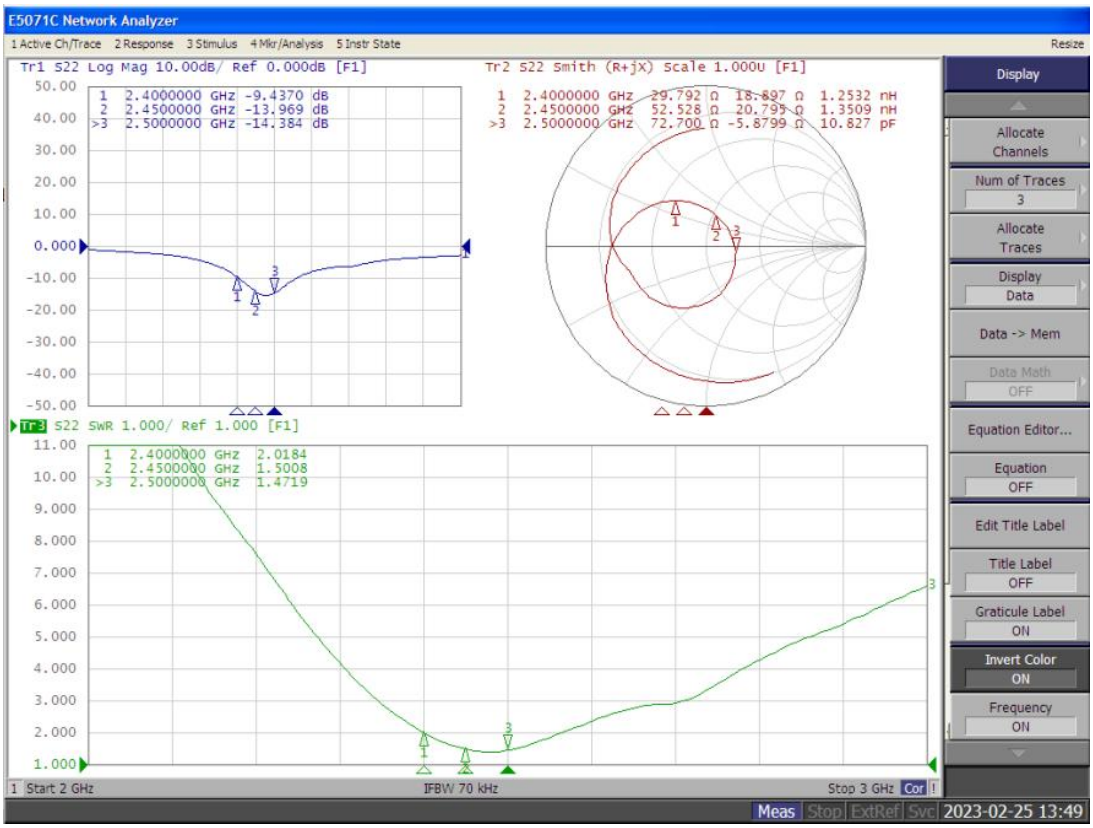

Figure 9 antenna s parameters

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)	0.15	0.35	0.33	0.54	0.93	1.00	1.21	1.32	1.18	1.14	1.23
Efficiency (%)	46.44	48.21	46.87	48.02	51.00	51.53	54.15	55.61	54.13	53.62	54.38

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6.4. Antenna field pattern

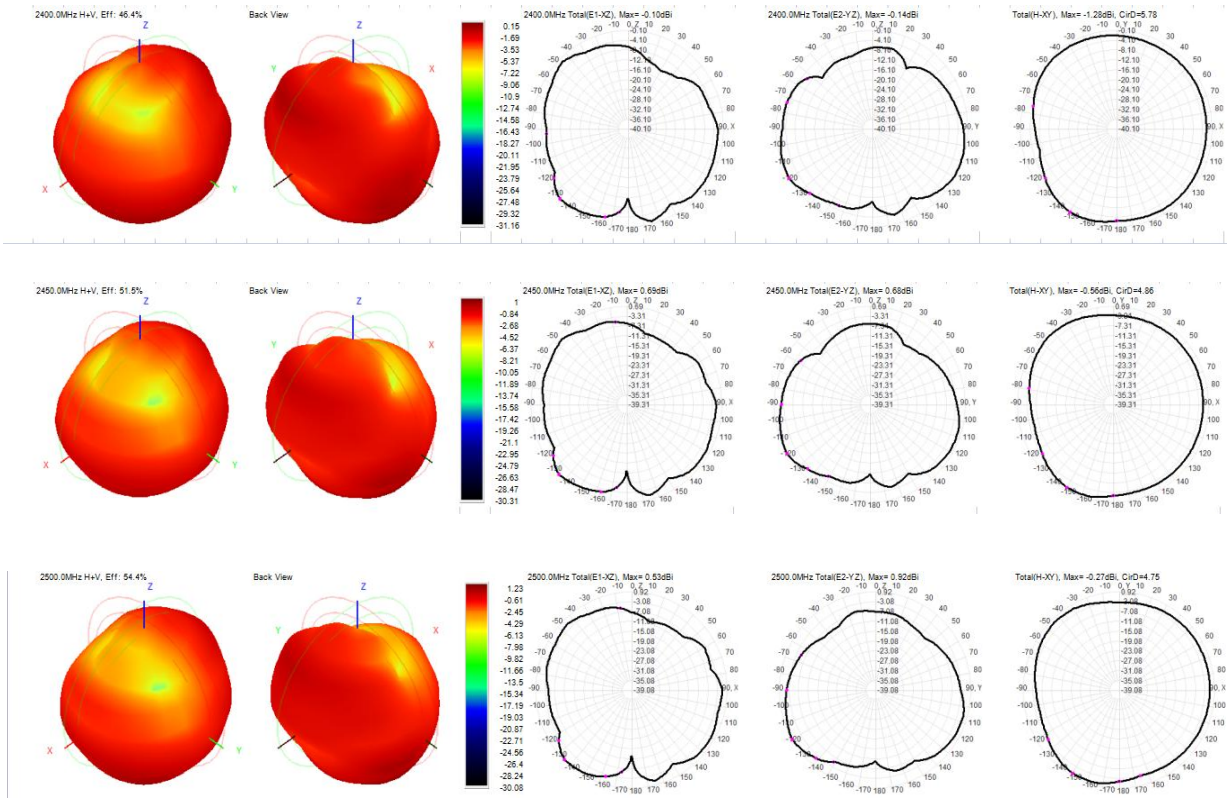

Figure 10 antenna field diagram

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7. Design guidance

7.1. Application guidance circuit

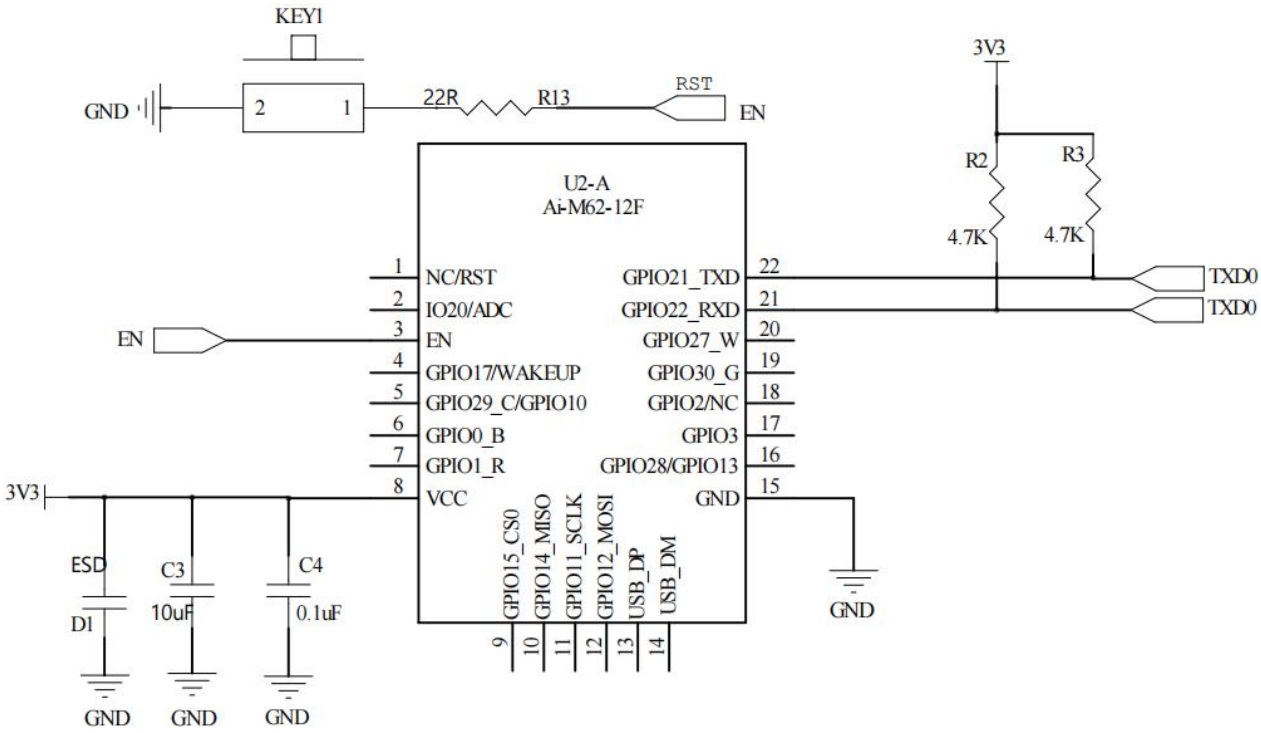

Figure 11 Application Guidance Circuit

- IO2 is the module start control pin, which is in normal working mode at low level and in firmware burning mode at high level. The default low level inside the chip.
- IO2/NC, not available by default
- IO11/IO12/IO14/IO15, available by default. These IO ports are shared with the internal Flash of the module. If the module with external Flash is customized, it cannot be used. For use, please contact Ai-Thinker.
- IO17/NC, available by default. The IO port is shared with the 32.768KHz crystal output PIN pin inside the module. If the module of the internal patch 32.768KHz crystal oscillator is customized, the IO is in NC state.

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7.2. Recommended PCB package size

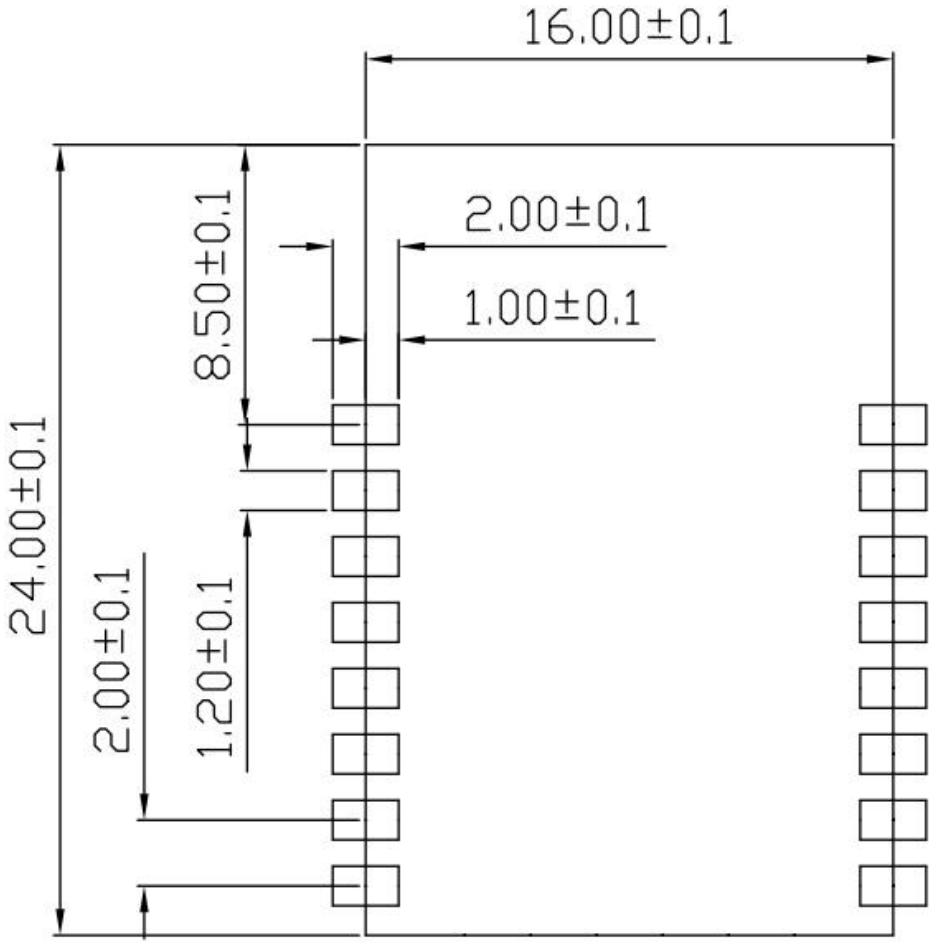

Figure 12 Recommended PCB Package Size

7.3. Antenna layout requirements

- In the installation position on the motherboard, the following 2 methods are recommended:

Scheme 1: Place the module on the edge of the main board, and the antenna area extends out of the edge of the main board.

Scheme 2: Place the module on the edge of the motherboard, and the edge of the motherboard hollowed out an area at the antenna position.

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

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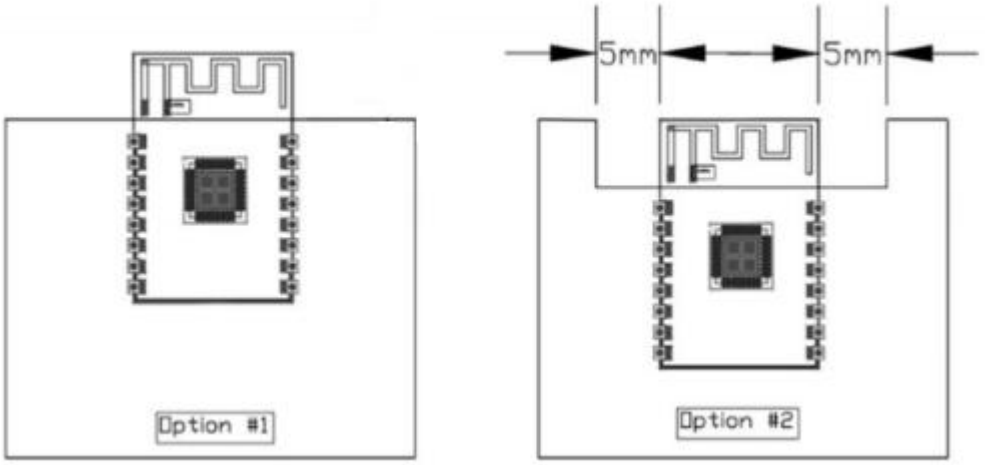

Figure 13 schematic diagram of antenna layout

7.4. Power supply

- Recommended 3.3V voltage, peak current above 500mA.
- LDO is recommended for power supply; If DC-DC is used, it is recommended that the ripple be controlled within 30mV.
- The DC-DC power supply circuit suggests to reserve the position of the dynamic response capacitor, which can optimize the output ripple when the load changes greatly.
- It is recommended to add ESD devices to the 3.3V power interface.

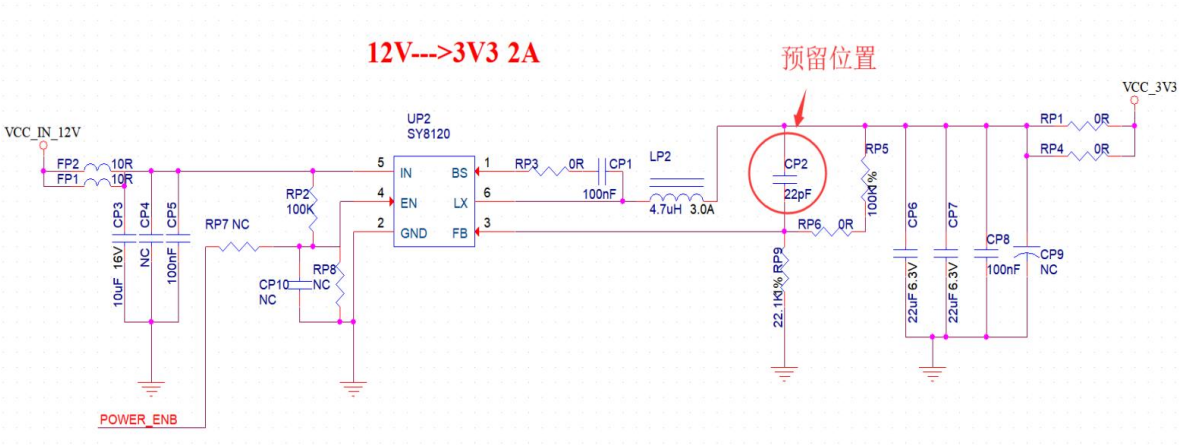

Figure 14 DC-DC step-down circuit diagram

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7.5. GPIO

- Some IO ports are led out from the periphery of the module. If you need to use a resistor of 10-100 ohms in series on the IO port. This can suppress overshoot and make the level on both sides more stable. It is helpful for both EMI and ESD.
- For the up and down of the special IO port, please refer to the instructions in the specification, which will affect the startup configuration of the module.
- The IO port of the module is 3.3V. If the level of the IO port of the main control and the module does not match, a level conversion circuit needs to be added.
- If the IO port is directly connected to the peripheral interface or terminals such as pins, it is recommended to reserve ESD devices at the IO port wiring close to the terminals.

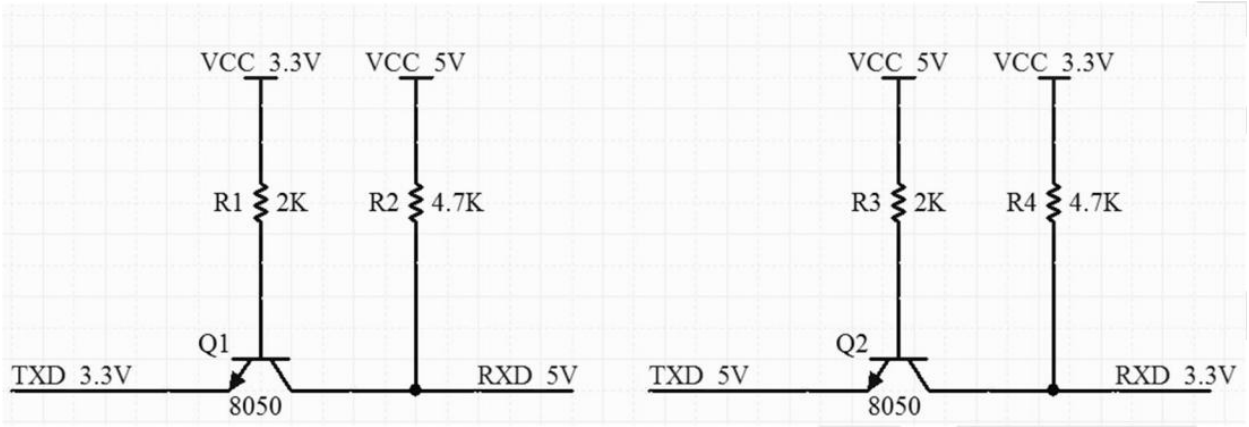

Figure 15 Level Shift Circuit

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8. Storage conditions

The product sealed in the moisture-proof bag should be stored in a non-condensing atmospheric environment of <40° C/90%RH.

The moisture sensitivity level MSL of the module is level 3.

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

9. Reflow Soldering Curve

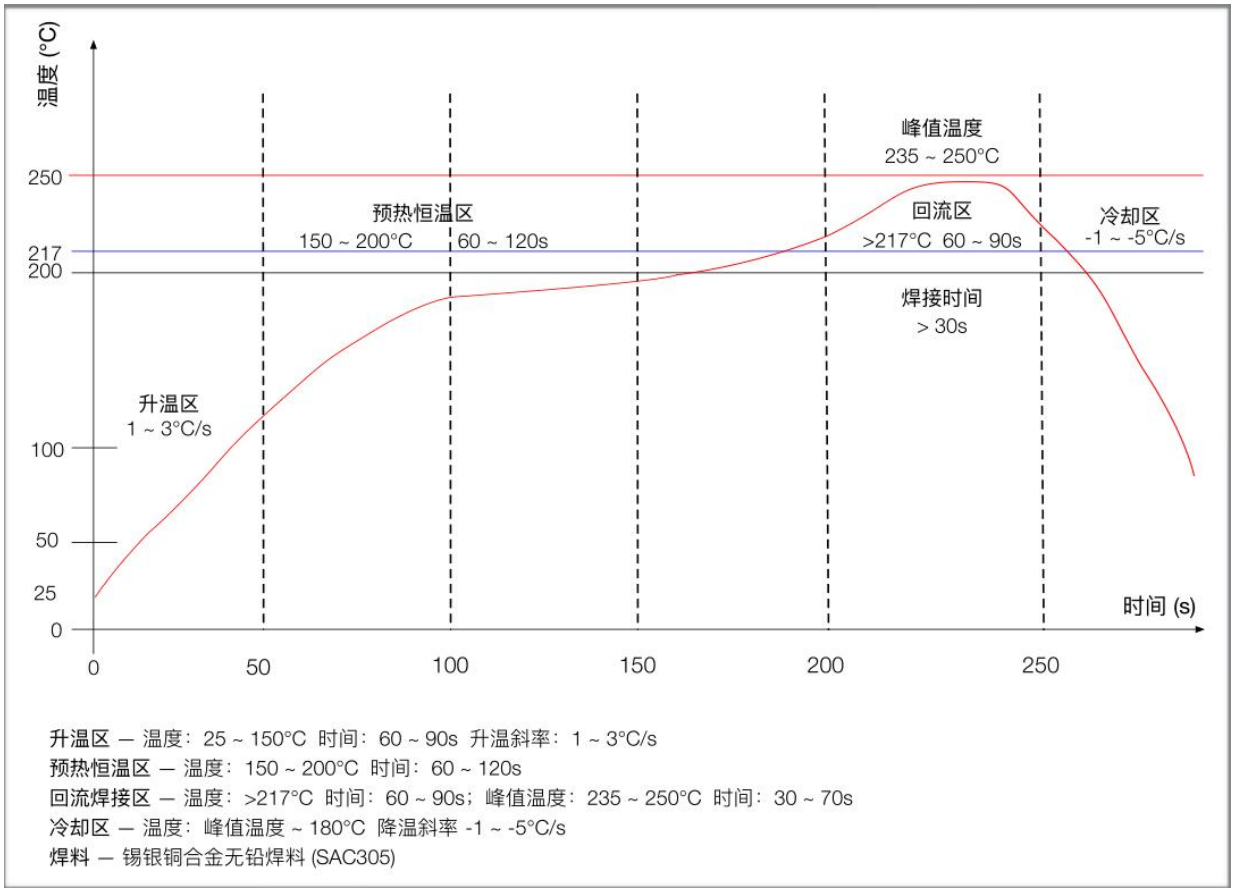

Figure 16 reflow soldering graph

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10.Product packaging information

The Ai-M62-12F module adopts braided packaging, 800 pcs/disk. As shown in the following figure:

Figure 17 packing tape drawing

11.Contact us

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WeChat mini program

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