



# Ai-M62-12F-Kit Specification

Version V1.0.0

Copyright ©2023

## Document resume

[illegible]

## Content

|                                                               |    |
|---------------------------------------------------------------|----|
| 1. Product Overview.....                                      | 4  |
| 1.1. Characteristic.....                                      | 5  |
| 2. Main parameters .....                                      | 6  |
| 2.1. Power selection .....                                    | 6  |
| 2.2. Static electricity requirement .....                     | 6  |
| 2.3. Electrical characteristic .....                          | 7  |
| 2.4. Wi-Fi RF Performance .....                               | 7  |
| 2.5. BLE RF Performance .....                                 | 8  |
| 2.6. Power consumption .....                                  | 8  |
| 3. Appearance Dimensions .....                                | 9  |
| 4. Description of the indicator light and the key button..... | 10 |
| 5. Pin definition.....                                        | 11 |
| 6. Schematic diagram .....                                    | 14 |
| 7. Product packing information.....                           | 15 |
| 8. Contact us .....                                           | 15 |
| Disclaimer and copyright notice .....                         | 16 |
| Notice .....                                                  | 16 |

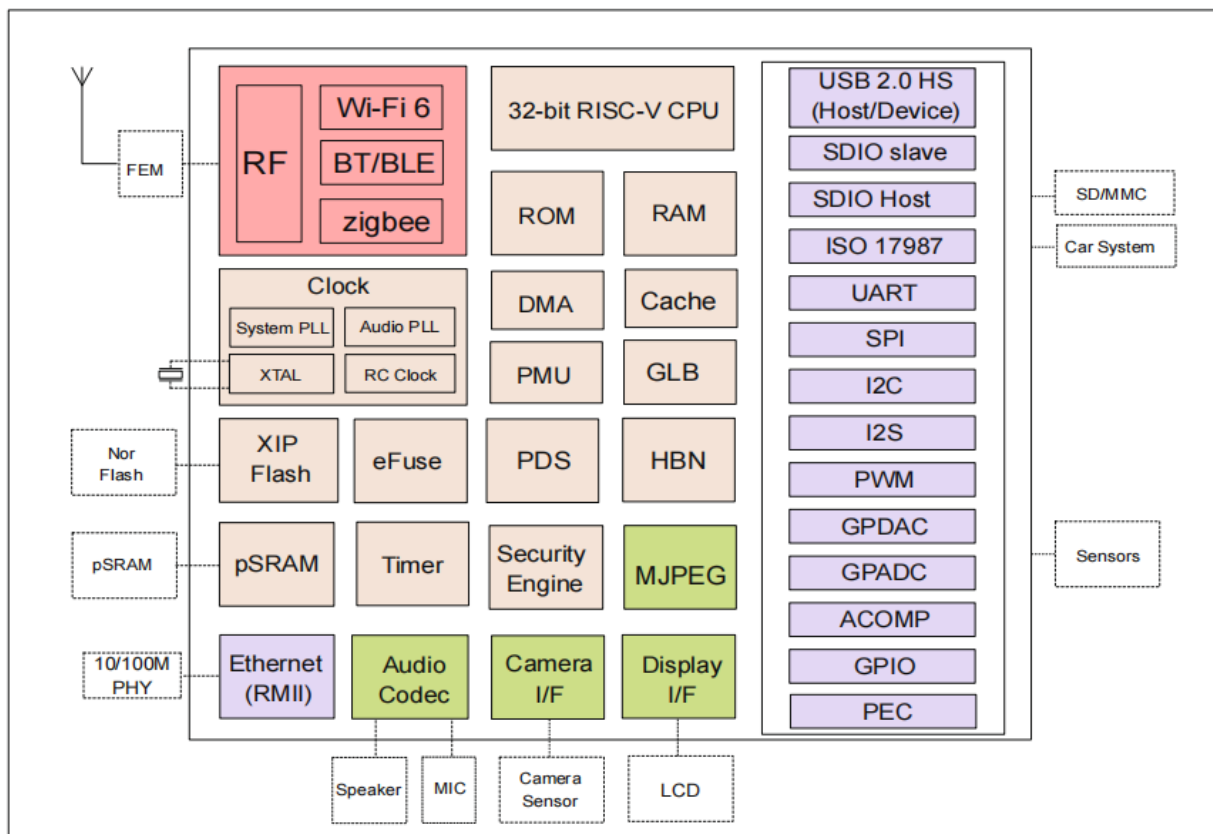
## 1. Product Overview

The Ai-M62-12F-Kit is a development board designed for the Ai-M62-12F module.

Ai-M62-12F is a Wi-Fi 6 + BLE 5.3 module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The module is equipped with BL616 chip as the core processor, supports Wi-Fi 802.11b/g/n/ax protocol and BLE protocol, and supports Thread protocol. The BL616 system contains a low-power 32-bit RISC-V CPU with floating point cells, DSP units, cache, and memory, up to 320M.

Ai-M62-12F module has rich peripheral interfaces, including Audio Codec, USB2.0, SDU, SD / MMC (SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPADC, ACOMP and GPIO. It can be widely used in audio and video multimedia, Internet of Things (IoT), mobile devices, wearable electronic devices, smart home and other fields.

Ai-M62-12F module Sec Eng module supports AES / SHA / PKA / TRNG and other functions, supports mirror encryption and signature startup, to meet the needs of various security applications in the field of the Internet of Things.



**Figure 1 Main chip block diagram**

## 1.1. Characteristic

- The package is DIP-30
- Support 2.4GHz frequency
- Support IEEE 802.11 b/g/n/ax
- Support BLE5.3
- Support Thread
- Support Wi-Fi/BLE/Thread coexistence
- Wi-Fi security support WPS/WEP/WPA/WPA2/WPA3
- Support 20/40MHz bandwidth , 1T1R, speed up to 229.4 Mbps
- Support STA、SoftAP、STA+SoftAP and sniffer mode
- A 32-bit RISC-V CPU with FPU and DSP, with a maximum main frequency of up to 320M
- 512KB SRAM, 128KB ROM, 4Kb eFuse
- Support Audio Codec、USB2.0、SDU、SD/MMC(SDH)、SPI、UART、I2C、I2S、PWM、GPDAC、GPADC、ACOMP and GPIO,etc.
- Integrated RF Balun、PA/LNA
- Support safe startup; safe debugging
- Support XIP QSPI On-The-Fly AES deciphering (OTFAD)
- Support TrustZone
- Support AES-CBC/CCM/GCM/XTS mode
- Support MD5、SHA-1/224/256/384/512
- Support TRNG (True random number generator)
- Support PKA for RSA / ECC (Public key accelerator)
- Support the Wi-Fi fast connection for BLE
- General AT instructions can be quickly used
- Support for secondary development, with integrated Windows, Linux development environments

## 2. Main parameters

**Table 1 Description of the main parameters**

|                                  |                                                                                         |
|----------------------------------|-----------------------------------------------------------------------------------------|
| <b>Development board model</b>   | Ai-M62-12F-Kit                                                                          |
| <b>Development board package</b> | DIP-30                                                                                  |
| <b>Size</b>                      | 49.66*25.40(±0.2)mm                                                                     |
| <b>Antenna</b>                   | on-board PCB antenna                                                                    |
| <b>Frequency</b>                 | 2400 ~ 2483.5MHz                                                                        |
| <b>Operating temperature</b>     | -40°C ~ 85°C                                                                            |
| <b>Storage temperature</b>       | -40°C ~ 125°C , < 90%RH                                                                 |
| <b>Power supply</b>              | Support voltage 3.3V or 5V, supply current ≥500mA                                       |
| <b>Interface</b>                 | Audio Codec、USB2.0、SDU、SD/MMC(SDH)、SPI、UART、I2C、I2S、PWM、GPDAC、GPADC、ACOMP and GPIO etc. |
| <b>IO</b>                        | 15                                                                                      |
| <b>UART rate</b>                 | Default 115200 bps                                                                      |
| <b>Security</b>                  | WPS/WEP/WPA/WPA2/WPA3                                                                   |
| <b>Flash</b>                     | 4MByte                                                                                  |

### 2.1. Power selection

Ai-M62-12F-Kit three power supply modes are supported:

- Type-C interface power supply (recommend)
- 5V and GND pin header power supply
- 3V3 and GND pin header power supply

### 2.2. Static electricity requirement

Ai-M62-12F-Kit is an electrostatic sensitive device. Therefore, you need to take special precautions when carrying it.



**Figure 2 ESD preventive measures**

## 2.3. Electrical characteristic

**Table 2 Electrical characteristics table**

| Parameters             |      | Co | Min.      | Typical value | Max.      | Unit |
|------------------------|------|----|-----------|---------------|-----------|------|
| Voltage Supply(Type-C) |      | VD | 4.5       | 5             | 5.3       | V    |
| Voltage Supply         |      | VD | 2.97      | 3.3           | 3.6       | V    |
| I/O                    | VIL  | -  | -         | -             | 0.3*VDDIO | V    |
|                        | VIH  | -  | 0.7*VDDIO | -             | -         | V    |
|                        | VOL  | -  | -         | 0.1*VDDIO     | -         | V    |
|                        | VOH  | -  | -         | 0.9*VDDIO     | -         | V    |
|                        | IMAX | -  | -         | -             | 15        | mA   |

## 2.4. Wi-Fi RF Performance

**Table 3 Wi-Fi RF performance table**

| Description                     | DesOutput PowerOutput |               |      |      |
|---------------------------------|-----------------------|---------------|------|------|
| Frequency range                 | 2400 ~ 2483.5MHz      |               |      | MHz  |
| Output power                    |                       |               |      |      |
| Mode                            | Min.                  | Typical       | Max. | Unit |
| 11ax Mode HE40, PA output power | -                     | 16            | -    | dBm  |
| 11ax Mode HE20, PA output power | -                     | 17            | -    | dBm  |
| 11n Mode HT40, PA output power  | -                     | 19            | -    | dBm  |
| 11n Mode HT20, PA output power  | -                     | 19            | -    | dBm  |
| 11g Mode, PA output power       | -                     | 19            | -    | dBm  |
| 11b Mode, PA output power       | -                     | 22            | -    | dBm  |
| Receive Sensitivity             |                       |               |      |      |
| Mode                            | Min.                  | Typical value | Max. | Unit |
| 11b, 1 Mbps                     | -                     | -98           | -    | dBm  |
| 11b, 11 Mbps                    | -                     | -90           | -    | dBm  |
| 11g, 6 Mbps                     | -                     | -93           | -    | dBm  |
| 11g, 54 Mbps                    | -                     | -76           | -    | dBm  |
| 11n, HT20 (MCS7)                | -                     | -73           | -    | dBm  |
| 11ax, HE20 (MCS9)               | -                     | -70           | -    | dBm  |
| 11ax, HE40 (MCS9)               | -                     | -67           | -    | dBm  |

## 2.5. BLE RF Performance

**Table 4 BLE RF performance table**

| Description                | Typical value |               |      | Unit |
|----------------------------|---------------|---------------|------|------|
| Frequency range            | 2400 - 2483.5 |               |      | MHz  |
| Output Power               |               |               |      |      |
| Rate Mode                  | Min.          | Typical value | Max. | Unit |
| 1Mbps                      | -             | 10            | 15   | dBm  |
| 2Mbps                      | -             | 10            | 15   | dBm  |
| Receive Sensitivity        |               |               |      |      |
| Rate Mode                  | Min.          | Typical value | Max. | Unit |
| 1Mbps sensitivity@30.8%PER | -             | -99           | -    | dBm  |
| 2Mbps sensitivity@30.8%PER | -             | -97           | -    | dBm  |

## 2.6. Power consumption

The following power consumption data are based on a 3.3V power supply, 25°C ambient temperature, and measured using an internal voltage regulator.

- All measurements are made at the antenna interface with a filter.
- All transmission data are based on 100% duty cycle in continuous transmission mode.

**Table 5 Power consumption table**

| Mode                                 | Min. | AVG | Max. | Unit |
|--------------------------------------|------|-----|------|------|
| Tx 802.11b, 11Mbps, POUT=+22dBm      | -    | 442 | -    | mA   |
| Tx 802.11g, 54Mbps, POUT=+19dBm      | -    | 296 | -    | mA   |
| Tx 802.11n, MCS7, POUT=+19dBm        | -    | 301 | -    | mA   |
| Tx 802.11ax, MCS9, POUT=+17dBm       | -    | 269 | -    | mA   |
| Rx 802.11b, packet length 1024 byte  | -    | 59  | -    | mA   |
| Rx 802.11g, packet length 1024 byte  | -    | 59  | -    | mA   |
| Rx 802.11n, packet length 1024 byte  | -    | 59  | -    | mA   |
| Rx 802.11ax, packet length 1024 byte | -    | 59  | -    | mA   |



### 3. Appearance Dimensions

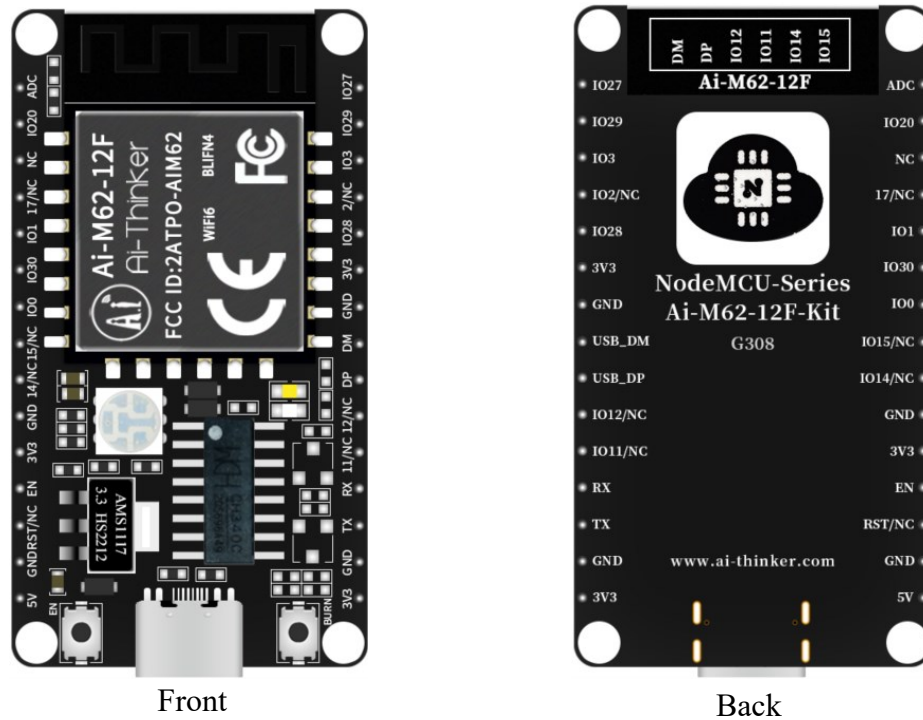


Figure 3 Appearance diagram (Rendering figure is for reference only,subject to physical objects)

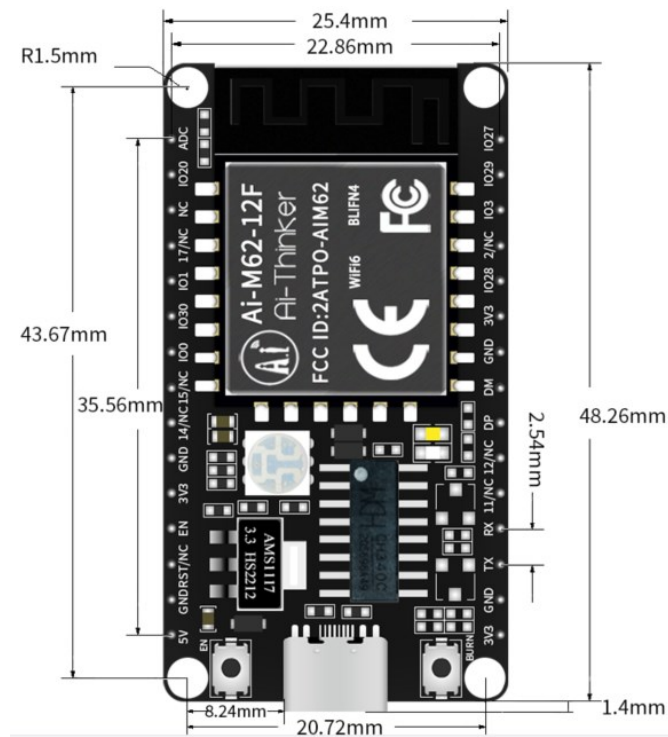
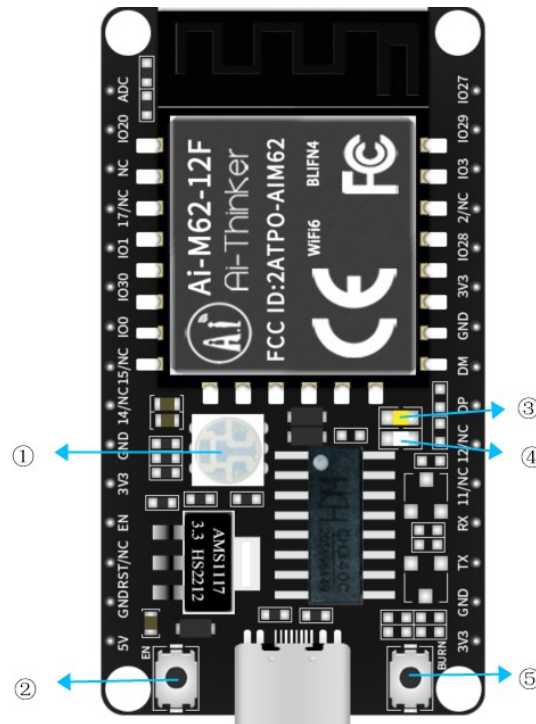


Figure 4 Dimension diagram

## 4. Description of the indicator light and the key button



**Figure 5 Ai-M62-12F-Kit indicator light and key position**

**Table 6 Ai-M62-12F-Kit indicator light and key position**

|   |                                                                                                                                                          |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① | RGB light (red light connect to IO1, green light connect IO30, blue light connect to IO0)                                                                |
| ② | Reset button                                                                                                                                             |
| ③ | White light (IO 29)                                                                                                                                      |
| ④ | Warm light (IO 27)                                                                                                                                       |
| ⑤ | Burning key. When burning, it is necessary to press the burn key and reset key successively, and then release the reset button and burn key successively |

## 5. Pin definition

Ai-M62-12F-Kit connects with 30 interfaces, as shown in the schematic diagram of the pin, and the pin function definition table is the interface definition.

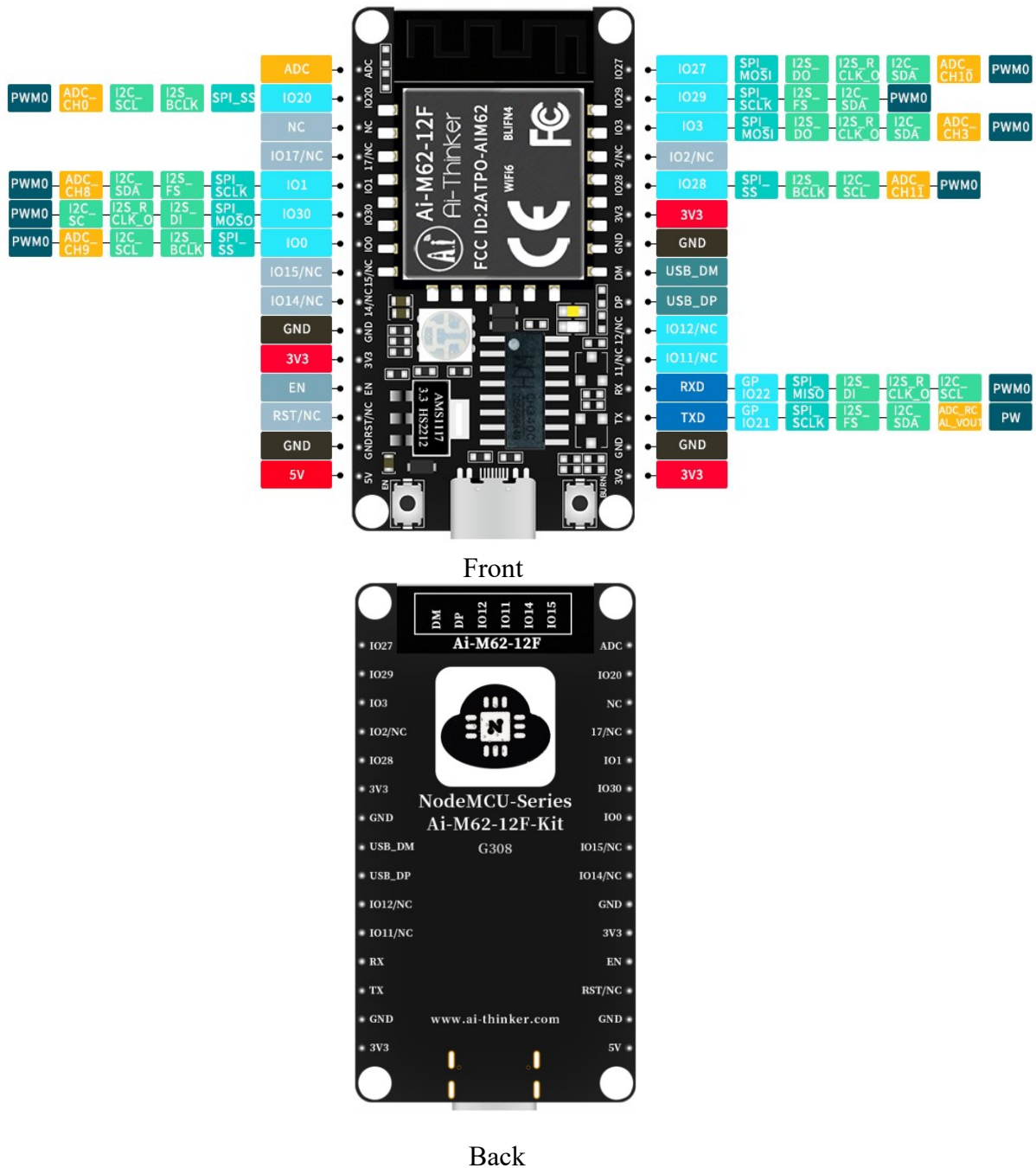


Figure 6 Schematic diagram of module pins

**Table 7 Pin function definition table**

| No. | Name    | Function                                                                                                                                                                                                                                                                   |
|-----|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | ADC     | ADC pin, share voltage with IO 20 pin                                                                                                                                                                                                                                      |
| 2   | IO20    | GPIO20/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH0/PWM0                                                                                                                                                                                                                                |
| 3   | NC      | NC                                                                                                                                                                                                                                                                         |
| 4   | 17/NC   | Default available, the IO port is shared with the 32.768KHz crystal vibration output PIN foot inside the module. If the module of the internal patch 32.768KHz crystal vibration is customized, the IO is in the NC state.GPIO17/SPI_SCLK/I2S_FS/I2C_SDA/XTAL_32K_OUT/PWM0 |
| 5   | IO1     | GPIO1/SPI_SCLK/I2S_FS/I2C_SDA/ADC_CH8/PWM0                                                                                                                                                                                                                                 |
| 6   | IO30    | GPIO30/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0                                                                                                                                                                                                                             |
| 7   | IO0     | GPIO0/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH9/PWM0                                                                                                                                                                                                                                 |
| 8   | IO15/NC | Default available, the IO port is shared with Flash inside the module. If the external Flash module is customized, the IO is not usable. If you need to use it, please contact Ai-Thinker.<br>GPIO15/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0                               |
| 9   | IO14/NC | Default available, the IO port is shared with Flash inside the module. If the external Flash module is customized, the IO is not usable. If you need to use it, please contact Ai-Thinker.<br>GPIO14/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/ADC_CH4/PWM0                       |
| 10  | GND     | Ground                                                                                                                                                                                                                                                                     |
| 11  | 3V3     | 3.3V power supply                                                                                                                                                                                                                                                          |
| 12  | EN      | Chip enabled pin, high level effective                                                                                                                                                                                                                                     |
| 13  | RST/NC  | Default NC, is not usable                                                                                                                                                                                                                                                  |
| 14  | GND     | Ground                                                                                                                                                                                                                                                                     |
| 15  | 5V      | 5V power supply                                                                                                                                                                                                                                                            |
| 16  | 3V3     | 3.3V power supply                                                                                                                                                                                                                                                          |
| 17  | GND     | Ground                                                                                                                                                                                                                                                                     |
| 18  | TX      | TXD/GPIO21/SPI_SCLK/I2S_FS/I2C_SDA/ADC_RCAL_VOUT/PW                                                                                                                                                                                                                        |
| 19  | RX      | RXD/GPIO22/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0                                                                                                                                                                                                                         |
| 20  | IO11/NC | Default available, the IO port is shared with Flash inside the module. If the external Flash module is customized, the IO is not usable. If you need to use it, please contact Ai-Thinker.<br>GPIO11/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0                               |

|    |         |                                                                                                                                                                                                                                           |
|----|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | IO12/NC | Default available, the IO port is shared with Flash inside the module. If the external Flash module is customized, the IO is not usable. If you need to use it, please contact Ai-Thinker.<br>GPIO12/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH6/PWM0 |
| 22 | USB_DP  | USB_DP                                                                                                                                                                                                                                    |
| 23 | USB_DM  | USB_DM                                                                                                                                                                                                                                    |
| 24 | GND     | Ground                                                                                                                                                                                                                                    |
| 25 | 3V3     | 3.3V power supply                                                                                                                                                                                                                         |
| 26 | IO28    | GPIO28/SPI_SS/I2S_BCLK/I2C_SCL/ADC_CH11/PWM0                                                                                                                                                                                              |
| 27 | IO2/NC  | Default NC, is not usable                                                                                                                                                                                                                 |
| 28 | IO3     | GPIO3/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/ADC_CH3/PWM0                                                                                                                                                                                     |
| 29 | IO29    | GPIO29/SPI_SCLK/I2S_FS/I2C_SDA/PWM0                                                                                                                                                                                                       |
| 30 | IO27    | GPIO27/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/ADC_CH10/PWM0                                                                                                                                                                                   |

## 6. Schematic diagram

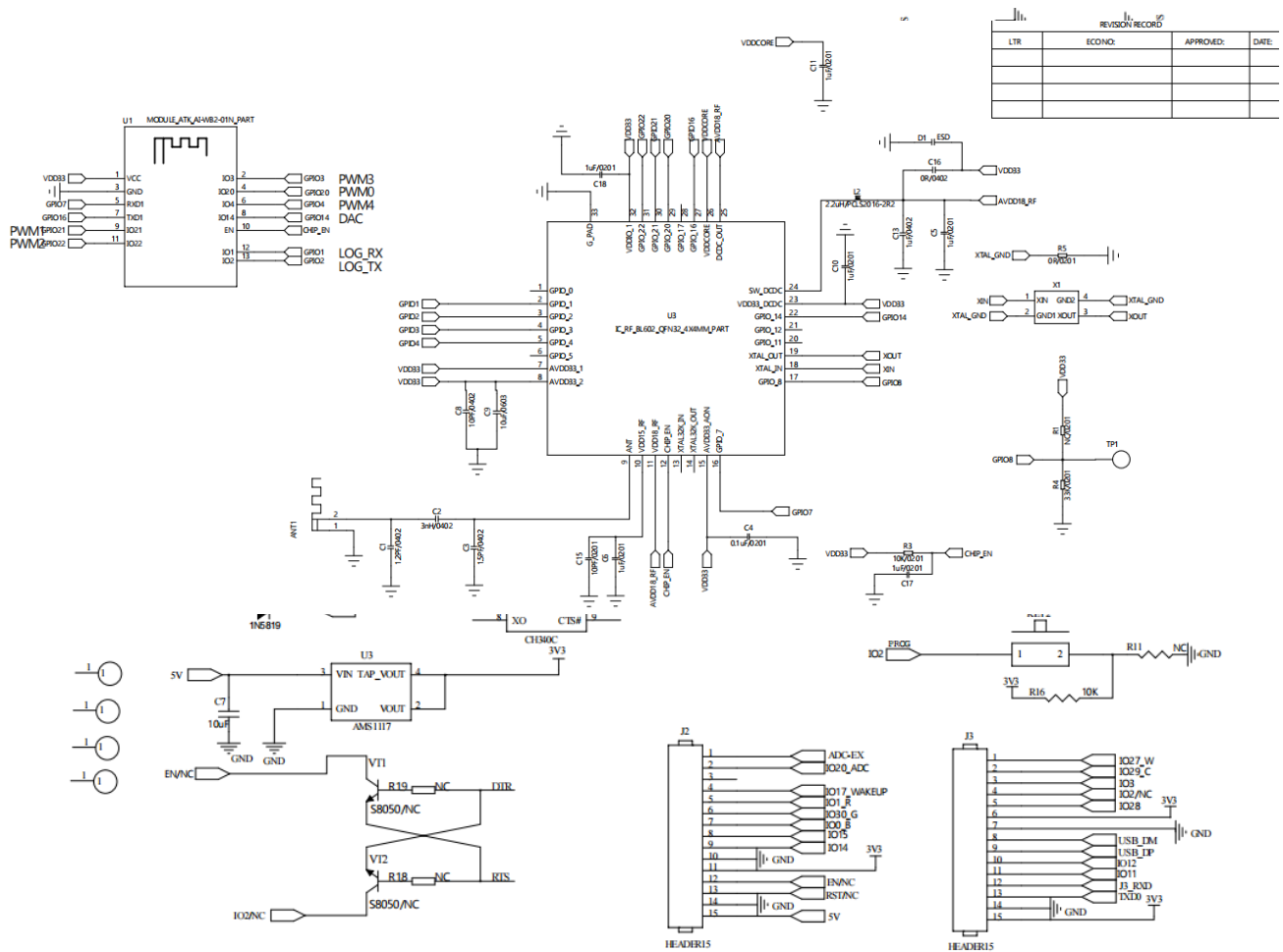


Figure 7 Module schematic

## 7. Product packing information

Table 8. Packing information table

| Packing list   | Manner of packing                    | MOQ<br>(Electrostatic bag) | SPQ (sealing bag) |
|----------------|--------------------------------------|----------------------------|-------------------|
| Ai-M62-12F-Kit | Bubble cotton +<br>electrostatic bag | 1pcs                       | 20pcs             |

## 8. Contact us

[Ai-Thinker official website](#)

[Office forum](#)

[Develop DOCS](#)

[LinkedIn](#)

[Tmall shop](#)

[Taobao shop](#)

[Alibaba shop](#)

Technical support email: [support@aithinker.com](mailto:support@aithinker.com)

Domestic business cooperation: [sales@aithinker.com](mailto:sales@aithinker.com)

Overseas business cooperation: [overseas@aithinker.com](mailto:overseas@aithinker.com)

Company Address: Room 403,408-410, Block C, Huafeng Smart Innovation Port, Gushu 2nd Road, Xixiang, Baoan District, Shenzhen.

Tel: +86-0755-29162996



WeChat mini program



WeChat official account

## Disclaimer and copyright notice

The information in this article,including the URL address for reference,is subject to change without notice.

The document is provided"as is"without any guarantee responsibility,including any guarantee for merchantability,suitability for a specific purpose,or non-infringement,and any guarantee mentioned elsewhere in any proposal,specification or sample.This document does not bear any responsibility,including the responsibility for infringement of any patent rights arising from the use of the information in this document.This document does not grant any license for the use of intellectual property rights in estoppel or other ways,whether express or implied.

The test data obtained in the article are all obtained from Ai-Thinker's laboratory tests,and the actual results may vary slightly.

All brand names,trademarks and registered trademarks mentioned in this article are the property of their respective owners,and it is hereby declared.

The final interpretation right belongs to Shenzhen Ai-Thinker Technology Co.,Ltd.

## Notice

Due to product version upgrades or other reasons,the contents of this manual may be changed.

Shenzhen Ai-Thinker Technology Co.,Ltd.reserves the right to modify the contents of this manual without any notice or prompt.

This manual is only used as a guide.Shenzhen Ai-Thinker Technology Co.,Ltd. makes every effort to provide accurate information in this manual.However, Shenzhen Ai-Thinker Technology Co.,Ltd. does not guarantee that the contents of the manual are completely free of errors.All statements and information in this manual And the suggestion does not constitute any express or implied guarantee.