



Ai-WB2-13-Kit Specification

Version V1.0.0

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1. Product Overview

Ai-WB2-13-Kit is a development board designed for Ai-WB2-13 modules. Ai-WB2-13 is a Wi-Fi & Bluetooth module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The module is equipped with BL602 chip as the core processor and supports Wi-Fi 802.11b/g/n protocol and BLE 5.0 protocol. The BL602 chip has a built-in 32-bit RISC CPU with low power consumption, 276KB RAM, and a wide range of peripheral interfaces, including SDIO, SPI, UART, VDC, IR remote, PWM, ADC, DAC, PIR, and GPIO. It can be widely used in Internet of Things (IoT), mobile devices, wearable electronic devices, smart home and other fields.

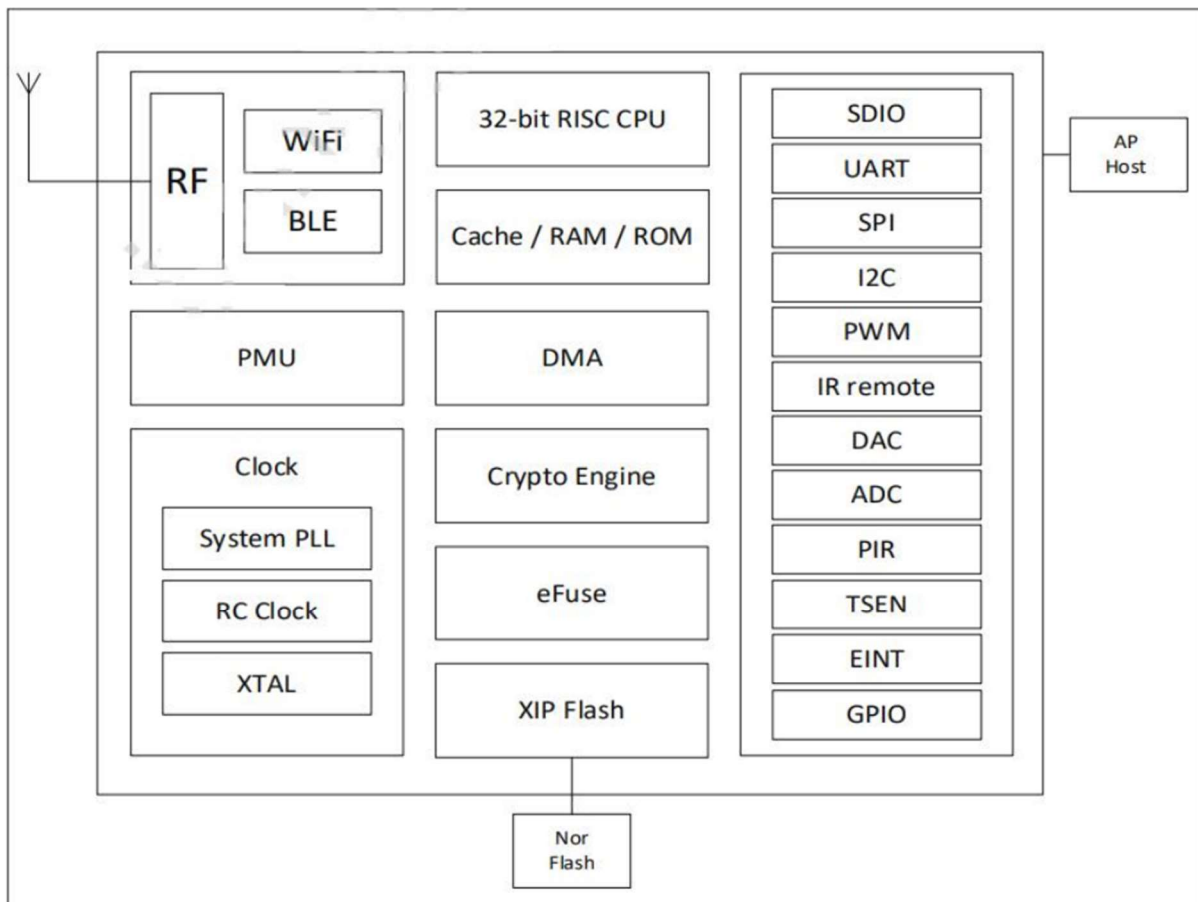


Figure 1 Main chip architecture diagram

1.1. Characteristic

- DIP-30 package
- Supports IEEE 802.11 B/g/n protocol
- Wi-Fi security supports WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3
- Supports 20MHz bandwidth with a maximum speed of 72.2 Mbps
- Bluetooth BLE 5.0, Bluetooth Mesh
- Supports Station + BLE mode, Station + SoftAP + BLE mode
- Supports 32-bit RISC CPU and 276KB RAM.
- Secure Startup. Images with ECC-256 signatures are supported.
- Supports real-time AES decryption (OTFAD) in QSPI and SPI Flash, and supports AES 128 CTR mode
- Supports AES 128, 192, and 256-bit encryption engines
- Supports SHA-1/224/256
- Real random number generator (TRNG)
- The public key accelerator (PKA) supports large numbers of basic operations. The software provides application interfaces such as signature and verification
- Supports SDIO, SPI, UART, VDC, IR remote, PWM, ADC, DAC, PIR, and GPIO
- Integrated Wi-Fi MAC/BB/RF/PA/LNA/Bluetooth
- Supports multiple sleep modes with a deep sleep current of 12 μ A
- Quick Start of universal AT commands
- Supports secondary development and integrates Windows and Linux development environments

2. Main parameters

Table 1 main parameters

| | |
|------------------------------|--|
| Model | Ai-WB2-13-Kit |
| Package | DIP-30 |
| Size | 49.66*25.40(±0.2)mm |
| Antenna | On-Board PCB antenna |
| Frequency | 2400 ~ 2483.5MHz |
| Operation temperature | -40°C ~ 85°C |
| Storage environment | -40°C ~ 125°C, < 90%RH |
| Power supply | Support voltage 3.3V or 5V, power supply current≥500mA |
| Interfaces | UART/GPIO/ADC/PWM/I2C/SPI |
| I/O | 11 |
| UART rate | Default value: 115200 bps |
| Security | WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3 |
| Flash | Default: 4MByte |

2.1. Power supply selection

Ai-WB2-13-Kit supports three power supply modes:

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

2.2. Static electricity requirements

Ai-WB2-13-Kit are electrostatic sensitive equipment, special precautions should be taken during handling.



Figure 2 ESD anti-static diagram

2.3. Electrical characteristics

Table 2 Electrical Characteristics Table

| Parameter | | Condition | Min. | Typical value | Max. | Unit |
|---------------------------------|------|-----------|-----------|---------------|-----------|------|
| Interface Power supply (Type-C) | | VDD | 4.5 | 5 | 5.3 | V |
| Power supply voltage (pin) | | VDD | 2.7 | 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 | Typical value | | | Unit |
|--------------------------------|---------------|---------------|------|------|
| Spectrum Range | 2400 - 2483.5 | | | MHz |
| Output power | | | | |
| Model | Min. | Typical value | Max. | Unit |
| 11n mode HT20, PA output power | - | 16 | - | dBm |
| In 11g mode, PA output power | - | 17 | - | dBm |
| In 11b mode, PA output power | - | 19 | - | dBm |
| Receiving sensitivity | | | | |
| Model | 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 |

2.5. BLE RF performance

Table 4 BLE RF performance table

| Description | Typical value | | | Unit |
|-------------------------------|---------------|---------------|------|------|
| Spectrum Range | 2400 - 2483.5 | | | MHz |
| Output power | | | | |
| Rate Mode | Min. | Typical value | Max. | Unit |
| 1Mbps | - | 9 | 15 | dBm |
| Receiving sensitivity | | | | |
| Rate Mode | Min. | Typical value | Max. | Unit |
| 1Mbps sensitivity @ 30.8% PER | - | -96 | - | dBm |

2.6. Power

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

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

Table 5 Power Consumption Table

| Model | Min. | AVG | Max. | Unit |
|------------------------------------|------|-----|------|------|
| Tx 802.11b, 11Mbps, POUT = + 21dBm | - | 260 | - | mA |
| Tx 802.11g, 54Mbps, POUT = + 18dBm | - | 245 | - | mA |
| Tx 802.11n, MCS7, POUT = + 17dBm | - | 230 | - | mA |
| Rx 802.11b, 1024 bytes long | - | 65 | - | mA |
| Rx 802.11g, 1024 bytes long | - | 65 | - | mA |
| Rx 802.11n, 1024 bytes long | - | 65 | - | mA |
| Deep-Sleep | - | 12 | - | μA |

3. Appearance size

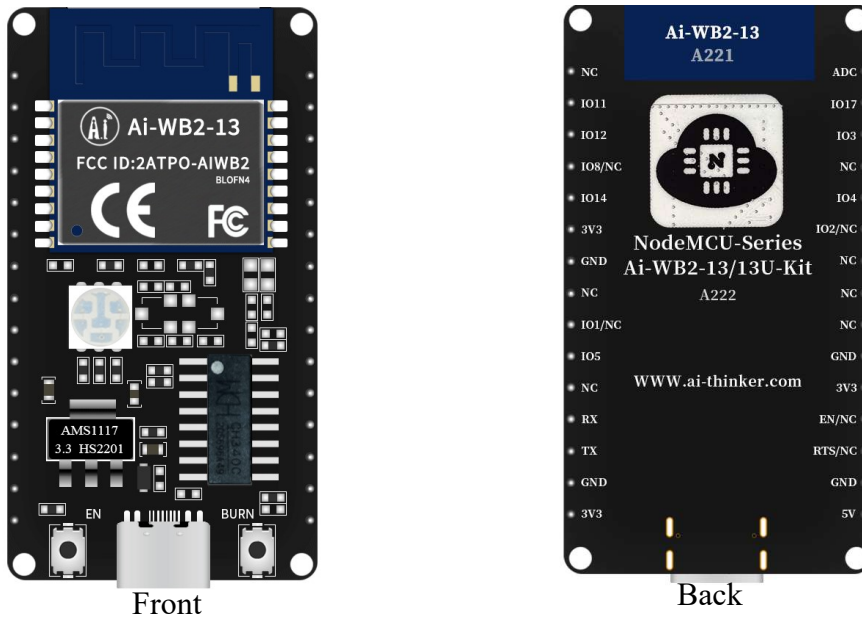


Figure 3 External view (For reference only)

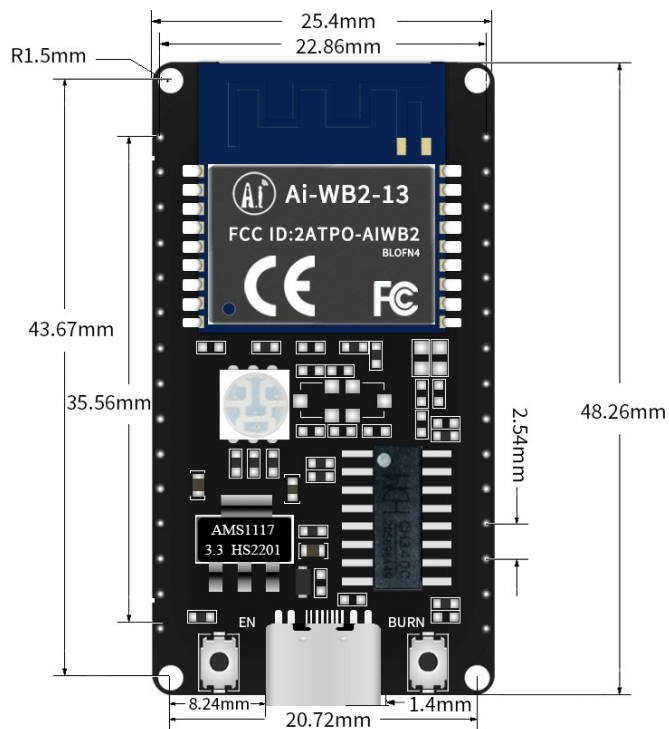


Figure 4 size chart

4. Indicator light and button description

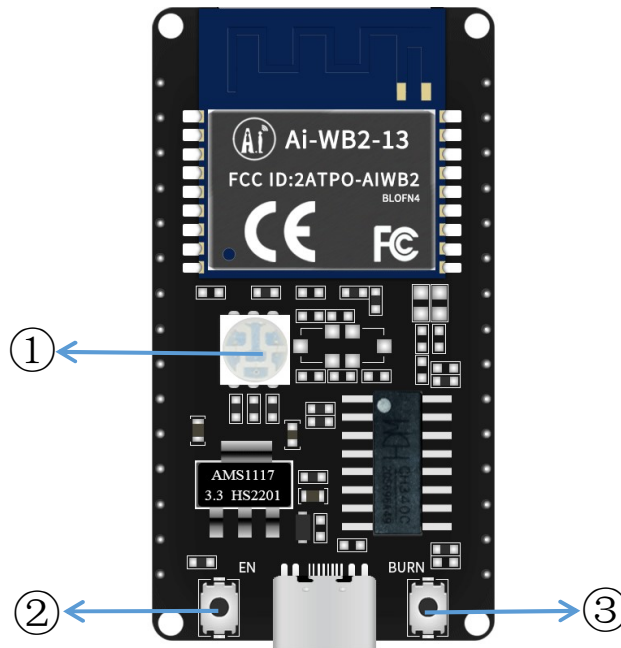


Figure 5 Ai-WB2-13-Kit indicator light and key position

Table 6 Ai-WB2-13-Kit indicator light and key position

| | |
|---|--|
| ① | RGB light (red light is connected to IO14, Green Light is connected to IO17, blue light is connected to IO3, high level effective) |
| ② | Reset button |
| ③ | To burn the button, you need to press the Burn button and then press the reset button. |

5. Pin definition

Ai-WB2-13-Kit, a total of 30 interfaces are connected, for example, the pin function definition table is the interface definition.

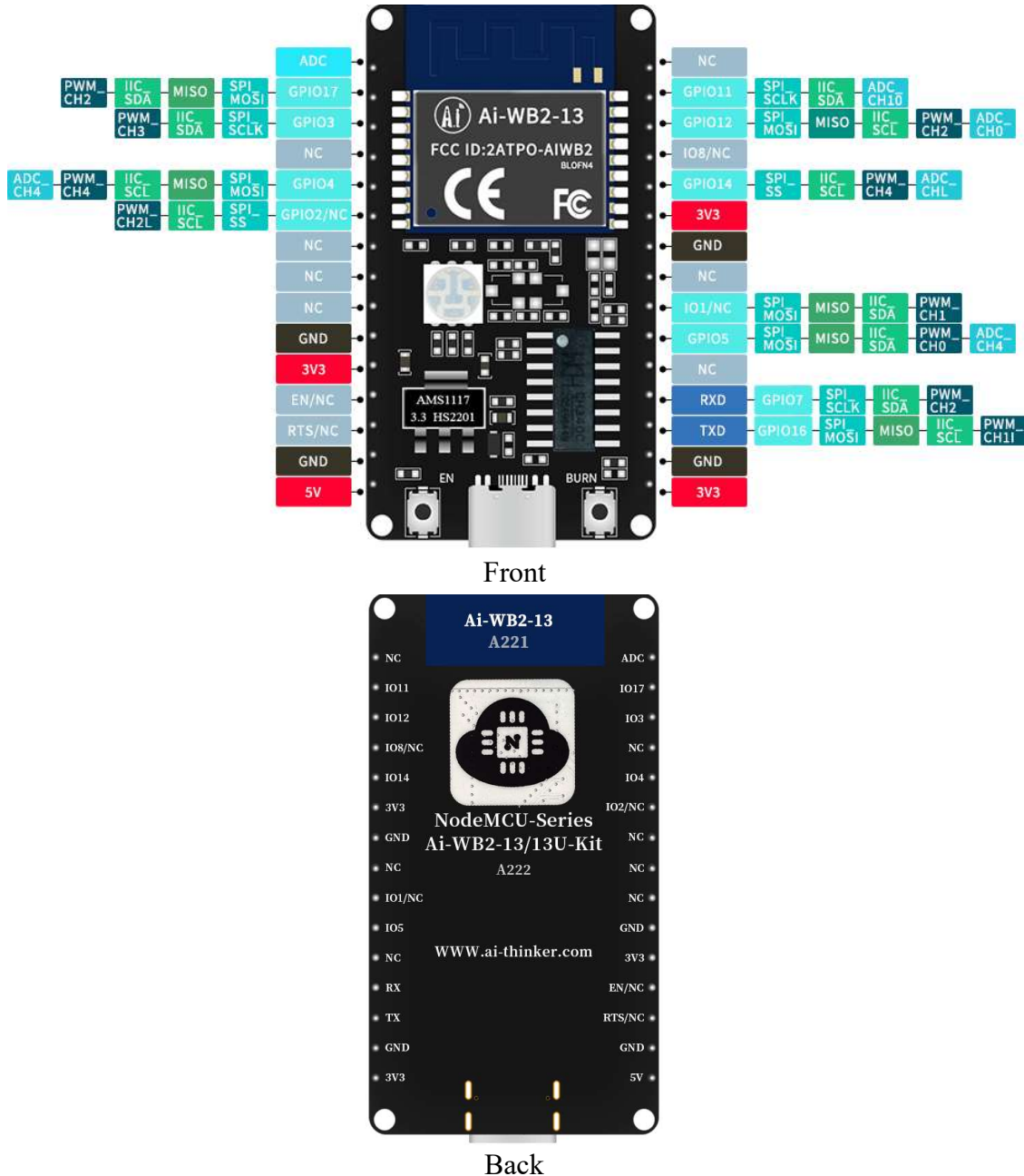


Figure 5 pin diagram

Table 6 Definition table of pin functions

| No. | Name | Function |
|-----|------|--|
| 1 | ADC | ADC pin, divided voltage with IO11 pin |

| | | |
|----|--------|---|
| 2 | IO17 | GPIO17/SPI_MOSI/MISO/IIC_SDA/PWM_CH2 |
| 3 | IO3 | GPIO3/SPI_SCLK/IIC_SDA/PWM_CH3 |
| 4 | NC | Empty feet |
| 5 | IO4 | GPIO4/SPI_MOSI/MISO/IIC_SCL/PWM_CH4/ADC_CH4 |
| 6 | IO2/NC | It is not recommended and is shared with the internal Flash of the module. If you need to use it, please contact Ai-Thinker GPIO2/SPI_SS/IIC_SCL/PWM_CH2 |
| 7 | NC | Empty feet |
| 8 | NC | Empty feet |
| 9 | NC | Empty feet |
| 10 | GND | Ground |
| 11 | 3V3 | 3.3V power supply |
| 12 | EN/NC | By default, it is enabled as a chip. The high level is effective and cannot be used together with RST. |
| 13 | RST/NC | By default, it is suspended and can be customized as a reset pin. It is valid at a low level. If you need to use it, please contact Ai-Thinker |
| 14 | GND | Conductive earth |
| 15 | 5V | 5V power supply |
| 16 | 3V3 | 3.3V power supply |
| 17 | GND | Ground |
| 18 | TX | TXD/GPIO16/SPI_MOSI/MISO/IIC_SCL/PWM_CH1 |
| 19 | RX | RXD/GPIO7/SPI_SCLK/IIC_SDA/PWM_CH2 |
| 20 | NC | Empty feet |
| 21 | IO5 | GPIO5/SPI_MOSI/MISO/IIC_SDA/PWM_CH0/ADC_CH4 |
| 22 | IO1/NC | It is not recommended and is shared with the internal Flash of the module. If you need to use it, please contact Ai-Thinker GPIO1/SPI_MOSI/MISO/IIC_SDA/PWM_CH1 |
| 23 | NC | Empty feet |
| 24 | GND | Ground |
| 25 | 3V3 | 3.3V power supply |
| 26 | IO14 | GPIO14/SPI_SS/IIC_SCL/PWM_CH4/ADC_CH2 |
| 27 | IO8/NC | The default NC is unavailable |
| 28 | IO12 | GPIO12/SPI_MOSI/MISO/IIC_SCL/PWM_CH2/ADC_CH0 |
| 29 | IO11 | GPIO11/SPI_SCLK/IIC_SDA/ADC_CH10 |
| 30 | NC | Empty feet |

6. Schematic diagram

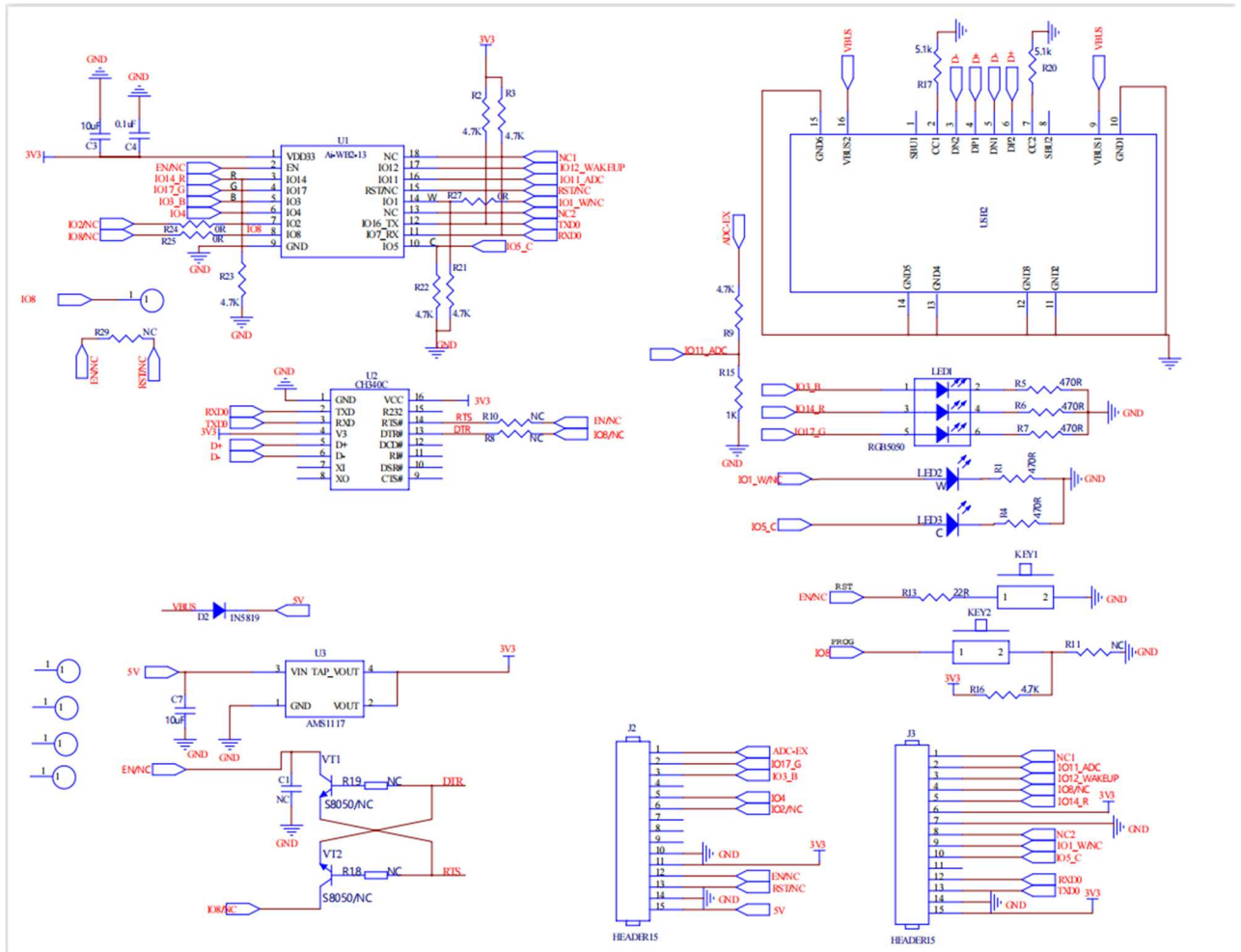


Figure 6 schematic diagram

7. Product Related models

Table 8 product related model table

| Model | Power supply | Package | Size | Antenna |
|--|--|---------|-----------------------|---|
| Ai-WB2-12S | 2.7V ~ 3.6V, I _≥ 500mA | SMD-16 | 24.0*16.0*3.1(±0.2)mm | On-board PCB antenna |
| Ai-WB2-12F | 2.7V ~ 3.6V, I _≥ 500mA | SMD-22 | 24.0*16.0*3.1(±0.2)mm | On-board PCB antenna |
| Ai-WB2-07S | 2.7V ~ 3.6V, I _≥ 500mA | SMD-22 | 17.0*16.0*3.1(±0.2)mm | IPEX |
| Ai-WB2-13 | 2.7V ~ 3.6V, I _≥ 500mA | SMD-18 | 20.0*18.0*3.1(±0.2)mm | On-board PCB antenna |
| Ai-WB2-13U | 2.7V ~ 3.6V, I _≥ 500mA | SMD-18 | 14.0*18.0*3.1(±0.2)mm | IPEX |
| Ai-WB2-32S | 2.7V ~ 3.6V, I _≥ 500mA | SMD-38 | 25.5*18.0*3.1(±0.2)mm | Default On-board PCB antenna/compatible with IPEX |
| Ai-WB2-01M | 2.7V ~ 3.6V, I _≥ 500mA | DIP-18 | 18.0*18.0*2.8(±0.2)mm | On-board PCB antenna |
| Ai-WB2-12F-Kit | 3.3V or 5V, I _{>} 500mA | DIP-30 | 49.66*25.4(±0.2)mm | On-board PCB antenna |
| Ai-WB2-13-Kit | 3.3V or 5V, I _{>} 500mA | DIP-30 | 49.66*25.4(±0.2)mm | On-board PCB antenna |
| Ai-WB2-32S-Kit | 3.3V or 5V, I _{>} 500mA | DIP-38 | 55.05*25.4(±0.2)mm | On-board PCB antenna |
| Product information: https://docs.ai-thinker.com | | | | |

8. Product package information

Table 9 packing information table

| Packing List | Package | Per package (Electrostatic bag) | Per package (Sealed bag) |
|---------------|-------------------------|------------------------------------|-----------------------------|
| Ai-WB2-13-Kit | Foam+ Electrostatic bag | 1pcs | 20pcs |

9. Contact us

[Ai-Thinker official website](#)

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