



Ai-WB1-12F-Kit Specification

Version V1.1.0

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1. Product Overview

Ai-WB1-12F-Kit is a development board for AI-WB1-12F module developed by ShenZhen Ai-Thinker Technology Co., LTD. Ai-wb1-12f-kit adopts Type-C socket, integrated WITH CH340C USB to TTL chip, and supports 2Mbps burning firmware.

Ai-WB1-12F is a Wi-Fi& Bluetooth module developed by Shenzhen Ai-Thinker Technology Co., LTD. The module is equipped with W800 chip as the core processor and supports Wi-Fi 802.11b/ G/N protocol and BLE 4.2 protocol. The W800 chip has a low-power 32-bit XT804 CPU, Operating frequency 240MHz, built-in 2MB Flash, 288KB RAM and rich peripheral interface, including SDIO, PSRAM, SPI, UART, I2C, PWM, ADC, Touch Sensor, Duplex I2S and GPIO, etc. It can be widely used in Internet of Things (IoT), mobile devices, wearable electronic devices, smart home and other fields.

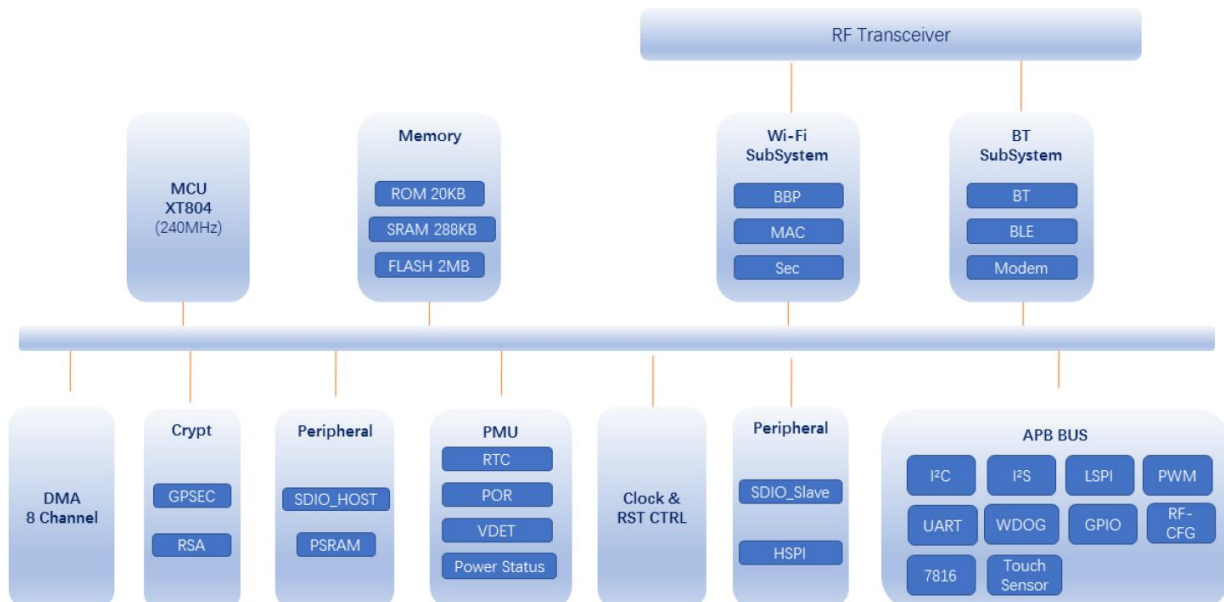


Figure 1 W800 chip architecture diagram

1.1. Characteristic

- Suitable for Ai-WB1-12F module
- Type-C Interface
- Support IEEE 802.11 b/g/n protocol
- Wi-Fi security supports Wi-Fi WMM/WMM-PS/WPA/WPA2 /WPS
- Supports 20/40MHz bandwidth with a maximum speed of 150 Mbps
- Bluetooth BLE 4.2
- Supports Station 、 Station + SoftAP 、 SoftAP mode
- Supports 32-bit XT804 CPU, 288KB RAM
- Tee security engine is built into MCU, and the code can distinguish security events from non-security events
- Integrated SASC/TIPC, memory and internal modules/interfaces can be configured with security attributes to prevent unsafe code access
- Modifying The firmware signature mechanism is enabled to implement secure Boot/upgrade
- With firmware encryption function, enhance code security
- Firmware encryption keys are distributed using asymmetric algorithms to enhance key security
- Hardware encryption module: RC4256, AES128, DES/3DES, SHA1/MD5, CRC32, 2048RSA, true random number generator
- Supports SDIO, PSRAM, SPI, UART, I2C, PWM, ADC, Touch Sensor, Duplex I2S and GPIO
- Integration Wi-Fi MAC/BB/RF/PA/LNA/Bluetooth
- Supports multiple sleep modes, Standby power consumption is less than 20 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-WB1-12F-Kit
Suitable Module	Ai-WB1-12F
Package	DIP-30 (2.54 Spacing standard row of needles)
Size	25.4*55.19(±0.2)mm
Antenna	On-Board antenna
Operation temperature	-40 °C ~ 85 °C
Storage environment	-40 °C ~ 125 °C , < 90%RH
Power supply	Support voltage 5V,power supply current≥500mA
Interfaces	UART/GPIO/ADC/PWM/I2C/SPI/Duplex I2S/SDIO
I/O	18
UART rate	Support 110~2000000bps ,default115200 bps
Bluetooth	BLE 4.2
Security	Wi-Fi WMM/WMM-PS/WPA/WPA2 /WPS
Flash	Default:2MByte

2.1. Power supply selection

Ai-WB1-12F-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-WB1-12F-Kit is an 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
Power supply		3V3/VDD	3.0	3.3	3.6	V
		5V	4.75	5.0	5.25	V
I/O	VIL	-	-0.3	-	0.8	V
	VIH	-	2.0	-	VDD+0.3	V
	VOL	-	-	-	0.4	V
	VOH	-	2.4	-	-	V
	IMAX	-	-	-	24	mA

2.4. Wi-Fi RF performance

表 3 WiFi 射频性能表

Description	Typical value			Unit
Spectrum Range	2400 ~ 2483.5MHz			MHz
Output power				
Model	Min.	Typical value	Max.	Unit
11n mode HT20, PA output power	-	12	-	dBm
11g mode, PA output power	-	13	-	dBm
11b mode, PA output power	-	18	-	dBm
Receiving sensitivity				
Model	Min.	Typical value	Max.	Unit
11b, 1 Mbps	-	-95	-	dBm
11b, 11 Mbps	-	-85	-	dBm
11g, 6 Mbps	-	-89	-	dBm
11g, 54 Mbps	-	-72	-	dBm
11n, HT20 (MCS7)	-	-69	-	dBm

2.5. BLE RF performance

Table 4 BLE RF performance table

Description	Typical value			Unit
Spectrum Range	2400 ~ 2483.5MHz			MHz
Output power				
Rate Mode	Min.	Typical value	Max.	Unit
1Mbps	-	4	6	dBm
Receiving sensitivity				
Rate Mode	Min.	Typical value	Max.	Unit
1Mbps sensitivity @30.8%PER	-	-92	-	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=+19dBm	-	348	-	mA
Tx 802.11g, 54Mbps, POUT =+15dBm	-	190	-	mA
Tx 802.11n, MCS7, POUT =+12dBm	-	190	-	mA
Rx 802.11b, 1024 bytes long	-	96	-	mA
Rx 802.11g, 1024 bytes long	-	96	-	mA
Rx 802.11n, 1024 bytes long	-	96	-	mA
Standby current	-	20	-	μA

3. Appearance size

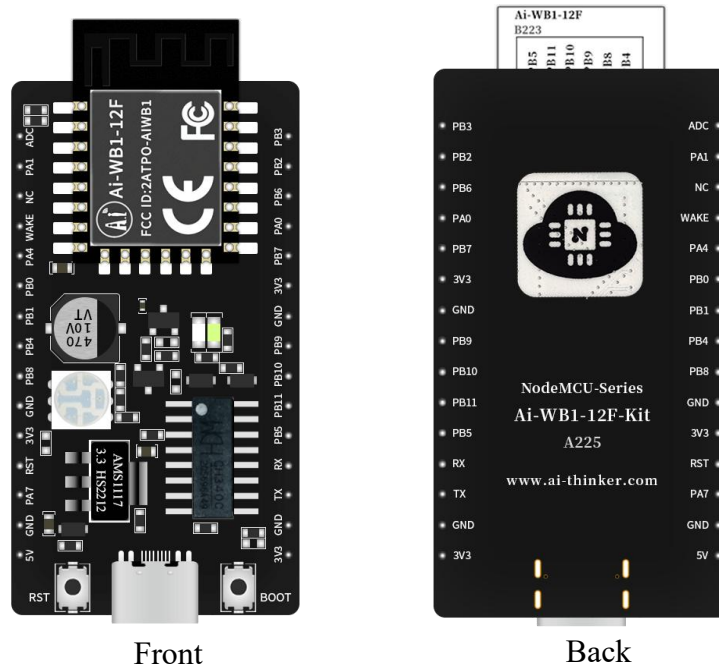


Figure 3 External view (For reference only)

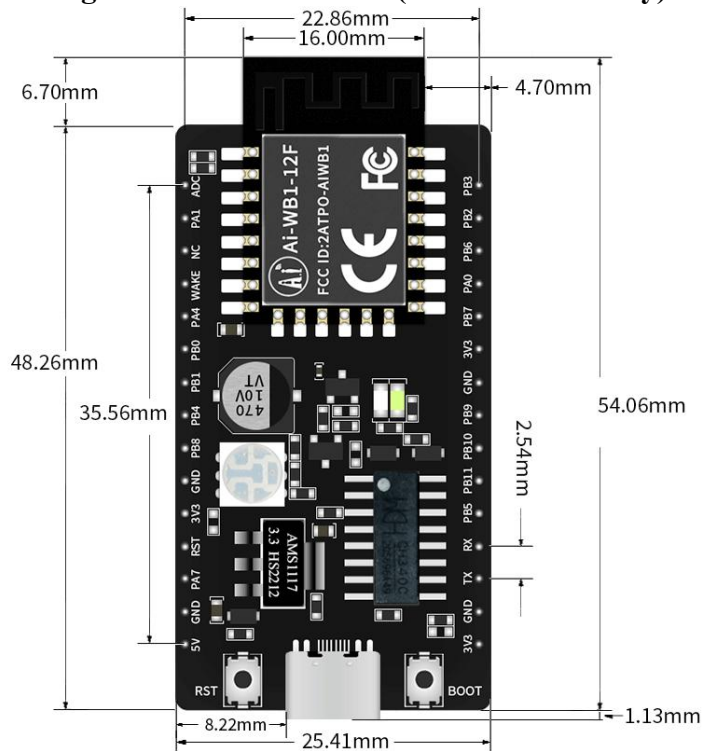


Figure 4 size chart

4. Indicator light and button description

Ai-WB1-12F-Kit is connected with heating and cooling lights and RGB lights, leading to RST (reset button) and BOOT (download button), as shown below:

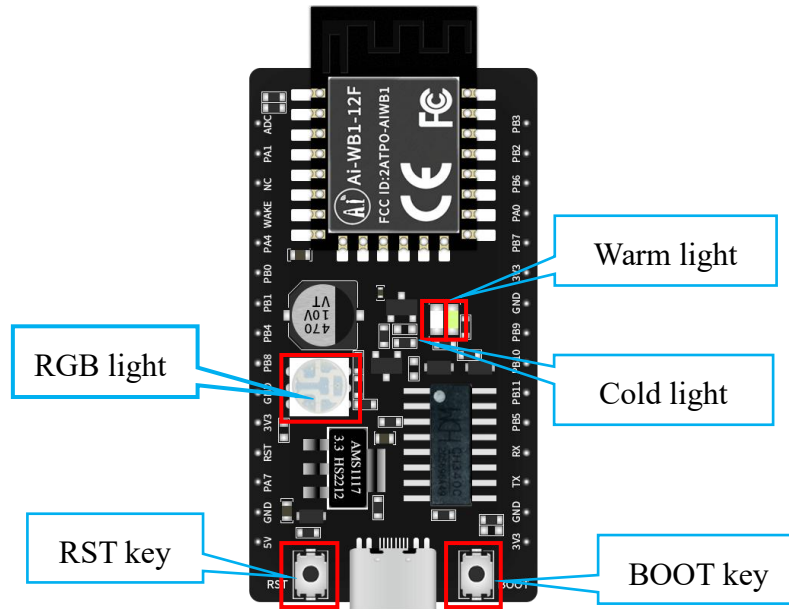


Figure 6 indicator light and key position

Table 7 I/O mapping of indicators and buttons

Device	Function	GPIO
RGB Light	R (red light)	PA4
	G (green light)	PB0
	B (blue light)	PB1
Cold Light	/	PB2
Warm Light	/	PB3
RST Key	Reset button	RST
BOOT Key	Download button	PA0

Table 6 Definition table of pin functions

No.	Name	Function
1	ADC	Reference voltage of ADC0
2	PA1	JTAG_CK/I2C_SCL/PWM3/I2S_LRCK/ADC0
3	NC	Dangling
4	WAKE	WAKEUP wake up capabilities
5	PA4	JTAG_SWO/I2C_SDA/PWM4/I2S_BCK/ADC1/JTAG_SWO
6	PB0	PWM0/LSPI_MISO/UART3_TX/PSRAM_CK/Touch3/GPIO
7	PB1	PWM1/LSPI_CLK/UART3_RX/PSRAM_CS/Touch4/GPIO
8	PB4	LSPI_CS/UART2_RTS/UART4_TX/PSRAM_D2/Touch7/GPIO
9	PB8	I2S_BCK/MMC_D0/PWM_BREAK/SDIO_D0/Touch11/GPIO
10	GND	Ground
11	3V3	3.3V power supply
12	RST	as chip enable, high level enable
13	PA7	PWM4/LSPI_MOSI/I2S_MCK/I2S_DI/Touch0/GPIO
14	GND	Ground
15	5V	5V power supply
16	3V3	3.3V power supply
17	GND	Ground
18	TX	UART0_TX/PWM0/UART1_RTS/I2C_SDA
19	RX	UART0_RX/PWM1/UART1_CTS/I2C_SCL
20	PB5	LSPI_MOSI/UART2_CTS/UART4_RX/PSARM_D3/Touch8/GPIO
21	PB11	I2S_DO/MMC_D3/HSPI_DO/SDIO_D3/GPIO
22	PB10	I2S_DI/MMC_D2/HSPI_DI/SDIO_D2/GPIO
23	PB9	I2S_LRCK/MMC_D1/HSPI_CS/SDIO_D1/Touch12/GPIO
24	GND	Ground
25	3V3	3.3V power supply
26	PB7	UART1_RX/MMC_CMD/HSPI_INT/SDIO_CMD/Touch10/GPIO

27	PA0	I2S_MCLK/LSPI_CS/PWM2/I2S_DO/BOOTMODE
28	PB6	UART1_TX/MMC_CLK/HSPI_CK/SDIO_CK/Touch9/GPIO
29	PB2	PWM2/LSPI_CK/UART2_TX/PSRAM_D0/Touch5/GPIO
30	PB3	PWM3/LSPI_MISO/UART2_RX/PSRAM_D1/Touch6/GPIO

6. Precautions

Ai-WB1-12F-Kit is used for serial communication, the Type-c interface cannot be connected to the TX and RX interfaces of pin row at the same time; otherwise, the Type-C interface cannot send data.

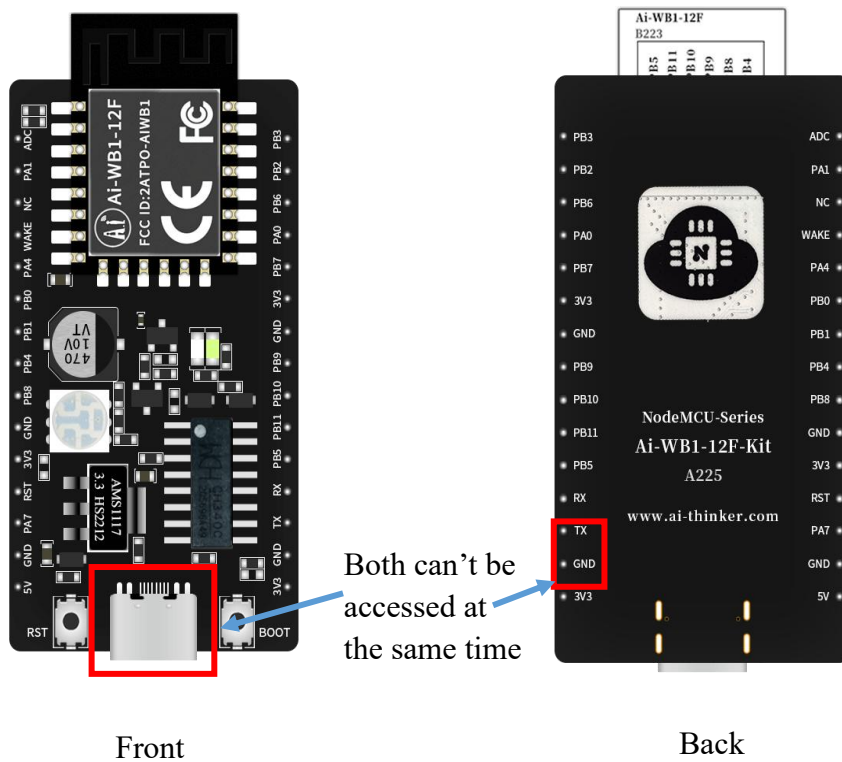


Figure 8 Interface diagram

8. Product Related models

Table 8 product related model table

Model	Power supply	Package	Size	Antenna
Ai-WB1-12F	3.0V ~ 3.6V, $I \geq 500\text{mA}$	SMD-22	24.0*16.0*3.1(± 0.2)mm	On-board PCB antenna
Ai-WB1-32S	3.0V ~ 3.6V, $I \geq 500\text{mA}$	SMD-38	25.5*18.0*3.1(± 0.2)mm	Default onboard PCB antenna/compatibl
Ai-WB1-12F-Kit	3.3V or 5V, $I > 500\text{mA}$	DIP-30	25.41*55.19(± 0.2)mm	On-board PCB antenna
Ai-WB1-32S-Kit	3.3V or 5V, $I > 500\text{mA}$	DIP-38	25.4*55.78(± 0.2)mm	On-board PCB antenna
Product information: https://docs.ai-thinker.com				

9. Product package information

Table 9 packing information table

Packing List	Packaging method	Per package (Electrostatic bag)	Per package (Sealed bag)
Ai-WB2-12F-Kit	Foam+ Electrostatic bag	1pcs	20pcs

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

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

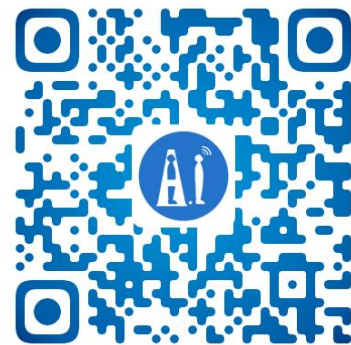
[Overseas business cooperation: overseas@aithinker.com](mailto:overseas@aithinker.com)

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

Tel: 0755-29162996



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