



Model WF-R31B-UWD1 Manual

IEEE 802.11 1x1 WiFi 4 Wireless LAN

WIFI Module

[SoC RTL8731BU]

for 802.11a/b/g/n

Version: 1.0

<Specification may be changed without prior notice>

Sichuan AI-Link Technology Co., Ltd

四川爱联科技股份有限公司

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<p>Address: Anzhou Industrial Park, Mianyang, Sichuan, P.R.C Company: Sichuan AI-Link Technology Co., Ltd.</p>		
Module Name		WF-R31B-UWD1
	Designed by	Reviewed by
Signature	Qin, Dakai	Fan, Xijun
Date	28/8/2023	28/8/2023

Model WF-R31B-UWD1

➤ **Compatible WLAN Standards**

IEEE Std. 802.11 a/b/g/n

➤ **SoC**

RTL8731BU

➤ **Product Size**

47.0mm×30.0mm×6.0mm

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RoHS

Features

WLAN

- IEEE 802.11 a/b/g/n compliant
- Support 20MHz, 40MHz bandwidth in 2.4GHz, 5GHz band
- Dual bands 1T1R mode
- data rate up to 150Mbps with USB2.0
- two ant design

Revision Record

Revision	Date	Description	Edited by
V1.0	28/8/2023	Premier Release	Qin, Dakai

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1 General Description

1.1 System Overview

Model WF-R31B-UWD1 is a highly integrated WiFi module by AI-Link, based on the Realtek SoC RTL8731BU, featuring a 1x1 a/b/g/n dual-band Wi-Fi.

The finely tuned hardware architecture and baseband algorithms provide superlative RF performance, as well as low power consumption. Intelligent MAC design powers a highly efficient offload engine; the hardware supports standard features of higher level of security, performance, and conforms most international regulations, offering the great performance at any time, in any circumstance.

1.2 System Properties

Dimension	Typically, 47.0mm×30.0mm×6.0mm
Chipset	RTL8731BU-VR
Operating Frequency	2.4GHz:2.400~2.4835 GHz 5 GHz: 5.150~5.850GHz
Antenna	IPEX Connector and Internal Antenna
Operating Voltage	3.3V±10%
PCB Information	2-layers design (1.0+/-0.10mm)
Peripheral Interface	USB 2.0
Rate	11b: 1, 2, 5.5 and 11Mbps 11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~7, up to 150Mbps
Operating Temperature	-0°C to +70°C
Storage Temperature	-40°C to +80°C
ESD Protection	IEC(Contact discharge): ±2000V

1.3 Diagram

The hardware architecture for the module is shown in Figure 1. The AI-Link' s WF-R31B-UWD1 module Complies with IEEE standards 802.11a/b/g/n; it also supports 1T1R and could reach up to data rate of 150 Mbps.

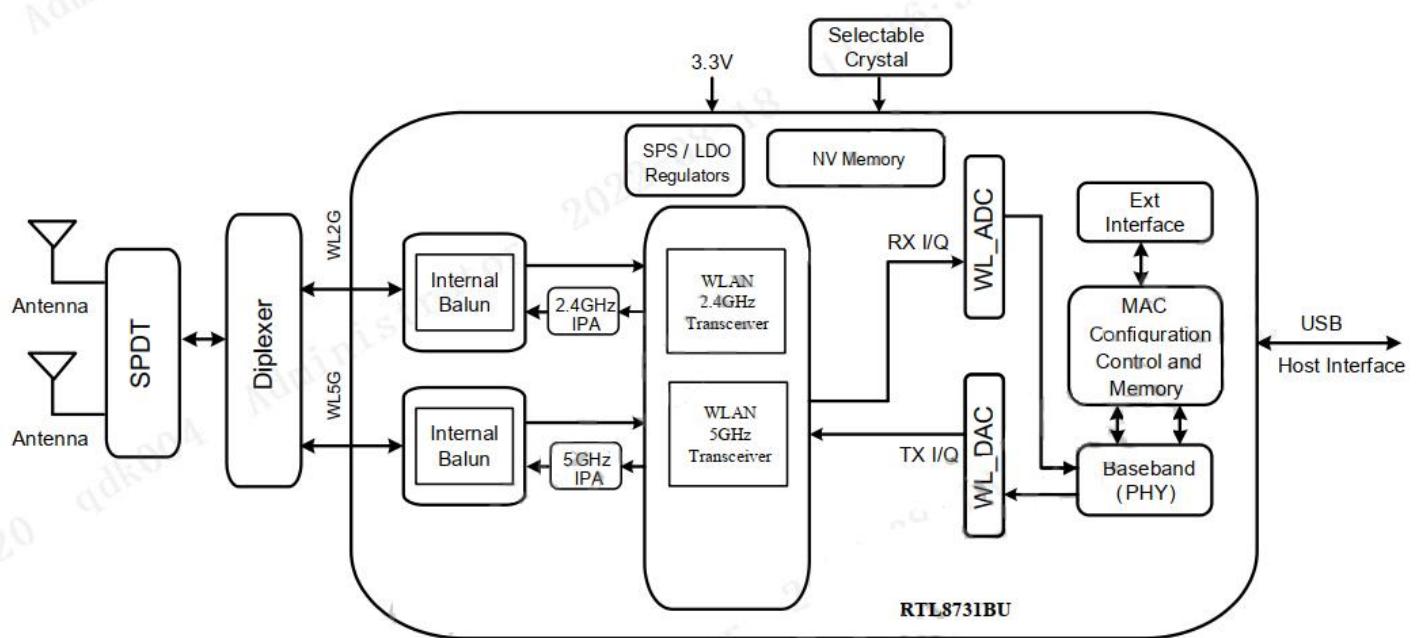
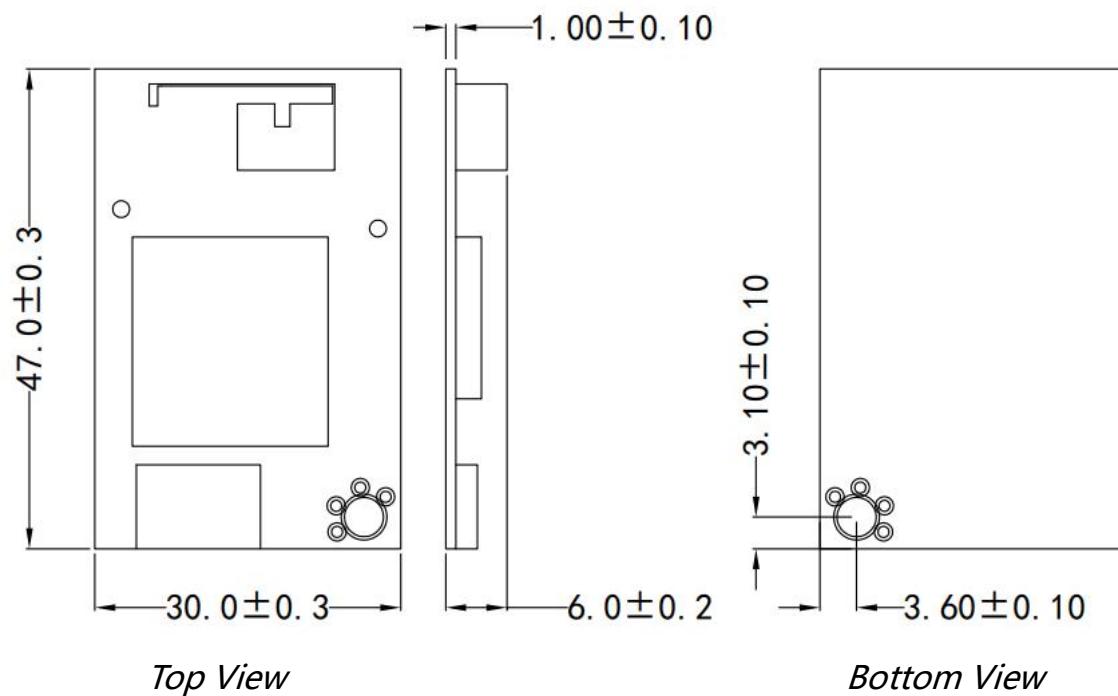


Figure 1: WF-R31B-UWD1 Block Diagram

2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

- Typical Dimension (W x L x T): 47.0mm x 30.0mm x 6.0mm
- General tolerance: $\pm 0.2\text{mm}$
- PCB Thickness: 1.0mm (+/-0.10mm)

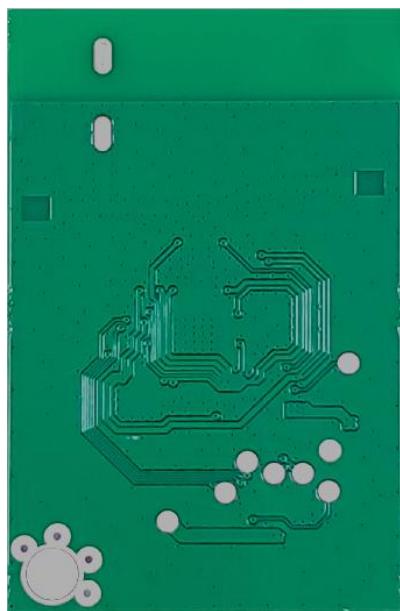


2.2 Pin definitions



Pin	Define	Description
1	GND	GND
2	HSDP	HSDP
3	HSDM	HSDM
4	VIN	+3.3V
5	VIN	+3.3V
6	VIN	+3.3V
7	WL_WAKE_HOST	Wlan WAKE Host
8	HOST_WAKE_WL	Host WAKE Wlan
9	RESET	RESET
10	GND	GND

2.3 Product Photos

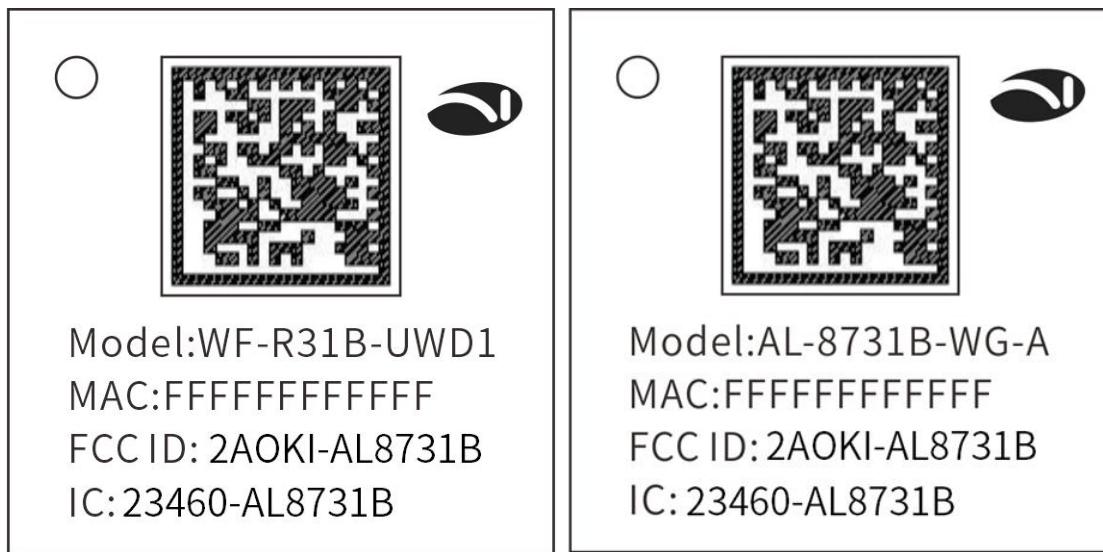


Bottom View



Top View

2.5 Label Information



- WIFI MAC information code
- AI-LINK logo
- Model: WF-R31B-UWD1/AL-8731B-WG-A
- WIFI Mac:FFFFFFFFFFFF (Example)
- FCC ID: 2AOKI-AL8731B
- IC ID: 23460-AL8731B

3 RF Characteristics

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11a/b/g/n	
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz) 5.15 GHz~5.85 GHz (5 GHz)	
Channels	CH1 to CH13 for CE@SRRC @ 2.4G CH1 to CH11 for FCC@IC @ 2.4G CH36 to CH165 @ 5G	
Modulation Mode	802.11b: DBPSK, DQPSK ,CCK 802.11 a/g/n: BPSK, QPSK, 16QAM, 64QAM	
Output Power & EVM	Power Value	EVM
	802.11b /11Mbps: 20.0 ± 2.0dBm	≤ -10dB
	802.11g /54Mbps: 19.0 ± 2.0dBm	≤ -25dB
	802.11a /54Mbps: 18.0 ± 2.0dBm	≤ -25dB
	802.11n HT20 /MCS7: @2.4G 18.0 ± 2.0dBm	≤ -28dB
	802.11n HT20 /MCS7: @5G 16.0 ± 2.0dBm	≤ -28dB
	802.11n HT40 /MCS7: @2.4G 18.0 ± 2.0dBm	≤ -28dB
	802.11n HT40 /MCS7: @5G 16.0 ± 2.0dBm	≤ -28dB
Receiver Sensitivity @2.4G PER≤10% @5G PER≤10%	Rate Type	Max
	802.11b /11Mbps @2.4G PER≤8%	-83dBm
	802.11g /54Mbps @2.4G	-71dBm
	802.11a /54Mbps @5G	-71dBm
	802.11n HT20 /MCS7 @2.4G	-69dBm
	802.11n HT20 /MCS7 @5G	-69dBm
	802.11n HT40 /MCS7 @2.4G	-66dBm
	802.11n HT40 /MCS7 @5G	-66dBm

4 Interface

4.1 USB Interface

The module supports the USB (USB v2.0 specification) device port, Use USB as the host interface for Bluetooth.

5 Software Information

5.1 RF Driver

MP_Kit_RTL11n_8733BU_USB_v0.43r2 or later

6 RF Connector Dimension

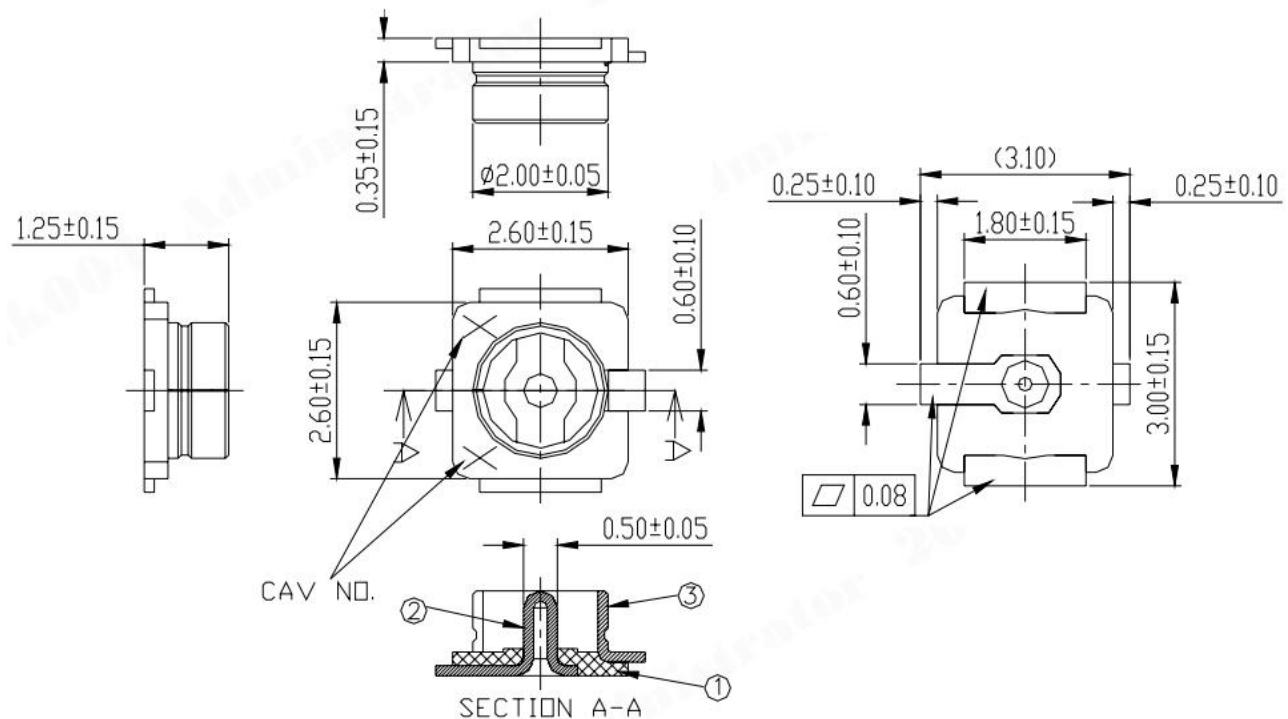
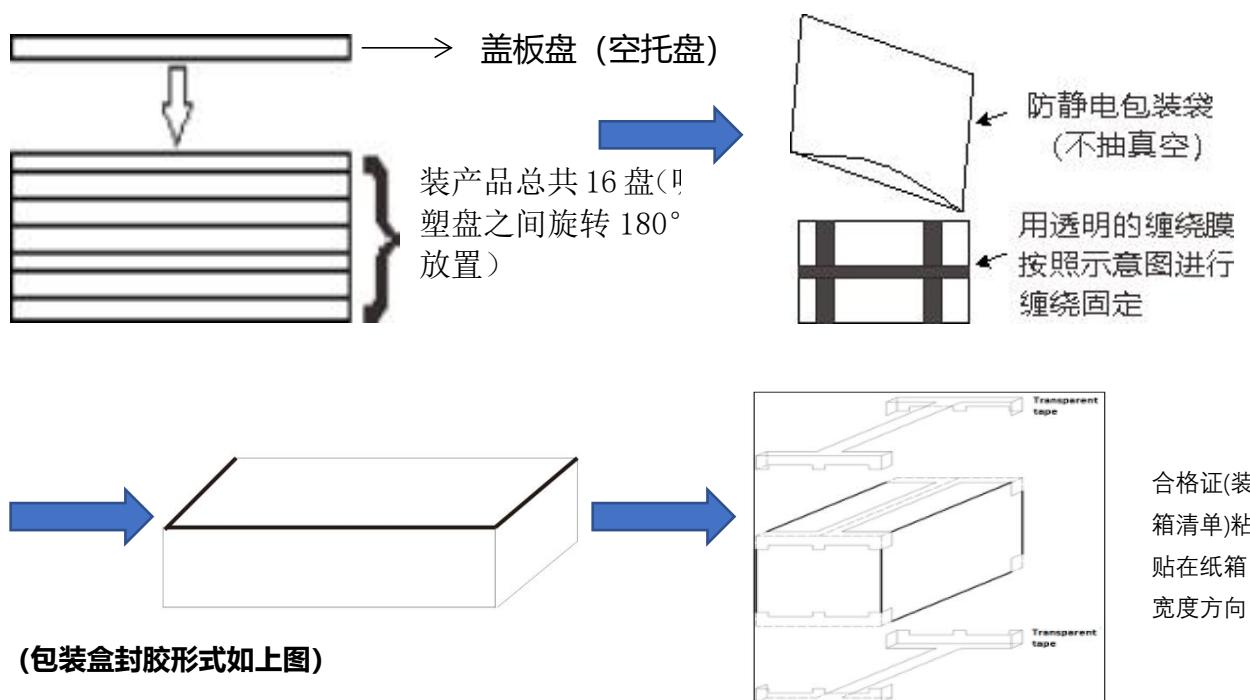
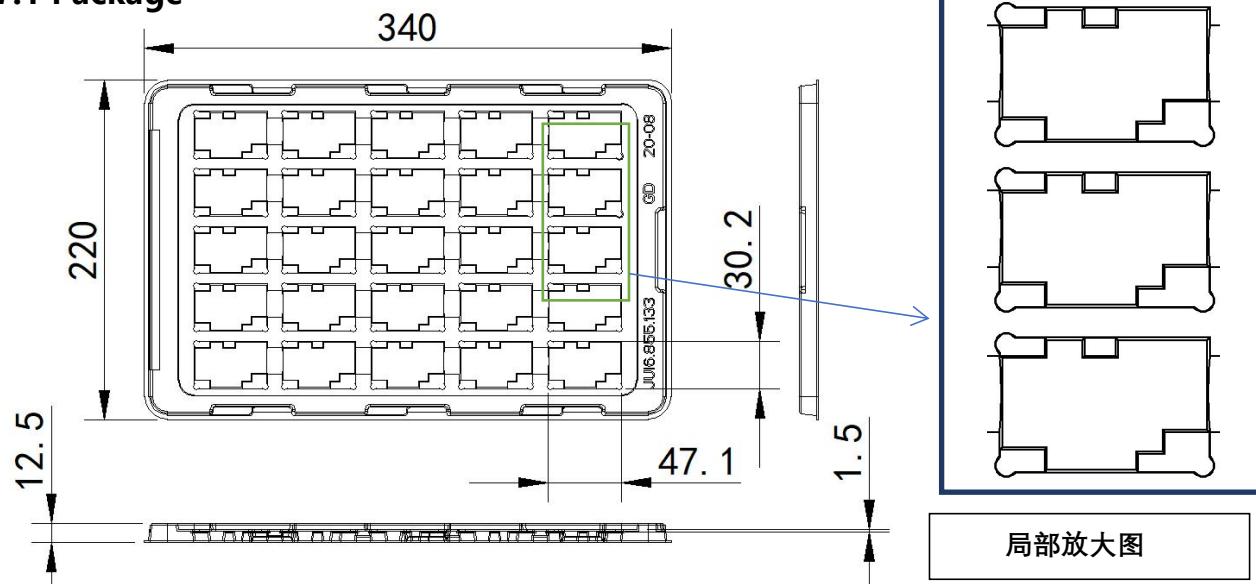


Figure 2: The dimensions of the connector

7 Package, Storage & Disposal

7.1 Package



1. The product placement direction, label pasting position and packaging shall be carried out according to the schematic diagram;
2. Put 2 bags of 2G desiccant and a humidity card in the packing box;
3. The number of products is 25 in each layer, with an empty tray on the upper layer. Each box contains 4 boxes, totaling 1600pcs, and each box contains 400pcs products;

4. Outer box size: 499mm * 394mm * 298mm;
5. Other matters not covered shall be implemented according to the customer's packaging requirements.

7.2 Storage

All electronic components must be stored in a clean, well-ventilated place free of corrosive gas. Unless otherwise specified, the temperature and humidity of the storage place must meet below requirements:

- Temperature: -30~85°C;
- Humidity: 20%~75%;
- Humidity sensitivity grade: MSL 3
- Container Requirement: products shall be placed in a container well-functioning as an electrostatic shielding.

7.3 Disposal

The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

8 Antenna specification

ANT	NO.	Type	Antenna Project Code	Part No. & manufacturer	Gain
Ant1	1	External PIFA Antenna	PIFA Antenna	TX-DM*BD113B63M B&T	2.4G:2.18dBi 5G:4.33dBi
	2			TX-DM*BD113Y63M Yishengbang	2.4G:4.29dBi 5G:4.55dBi
	3			TX-DM*BD113Y63M Jiexuntong	2.4G:3.92dBi 5G:2.66dBi
	4			TX-DM*BD113JH63M JINGHONG	2.4G:2.72dBi 5G:1.51dBi
Ant2	1	Onboard PIFA Antenna	Metal Antenna	RFMTA170900NNLB003 walsin	2.4G:3.68dBi 5G:2.88dBi

*: The length of the antenna cable

9 Authentication

1. FCC Radiation Exposure Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Labelling Instruction for Host Product Integrator

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: **2AOKI-AL8731B**" any similar wording that expresses the same meaning may be used.

Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

Integration instructions for host product manufactures according to KDB 996369 D03 OEM**Manual v01****2.2 List of applicable FCC rules**

FCC Part 15 Subpart C 15.247

FCC Part 15 Subpart C 15.407

2.3 Specific operational use conditions

The module is a WIFI Module with 2.4G&5G function.

WiFi Specification:

Operation Frequency:

2412~2472MHz; 5180~5240MHz; 5260~5320MHz; 5500~5720MHz; 5745~5825MHz.

Modulation:

BPSK/QPSK/16QAM/64QAM(802.11a)

DBPSK/DQPSK/CCK(802.11b)

BPSK/QPSK/16QAM/64QAM(802.11g)

BPSK/QPSK/16QAM/64QAM(802.11n)

Type: one is PIFA Antenna and another one is Metal Antenna

Maximum PIFA Antenna gain: 4.29dBi@2.4G;4.55dBi@5G

Maximum Metal Antenna gain: 3.68dBi@2.4G;2.88dBi@5G

The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization

2.7 Antennas

Antenna Specification are as follows: Type: one is PIFA Antenna and another one is Metal Antenna

ANT	NO.	Type	Antenna Project Code	Part No. & manufacturer	Gain
Ant1	1	External PIFA Antenna	PIFA Antenna	TX-DM*BD113B63M B&T	2.4G:2.18dBi 5G:4.33dBi
	2			TX-DM*BD113Y63M Yishengbang	2.4G:4.29dBi 5G:4.55dBi
	3			TX-DM*BD113Y63M Jiexuntong	2.4G:3.92dBi 5G:2.66dBi
	4			TX-DM*BD113JH63M JINGHONG	2.4G:2.72dBi 5G:1.51dBi
Ant2	1	Onboard PIFA Antenna	Metal Antenna	RFMTA170900NNLB003 walsin	2.4G:3.68dBi 5G:2.88dBi

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.)

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains Transmitter Module FCC ID: **2AOKI-AL8731B**" with their finished product.

2.9 Information on test modes and additional testing requirements

WIFI

Operation Frequency:

2412~2472MHz; 5180~5240MHz; 5260~5320MHz; 5500~5720MHz; 5745~5825MHz.

Modulation:

BPSK/QPSK/16QAM/64QAM(802.11a)

DBPSK/DQPSK/CCK(802.11b)

BPSK/QPSK/16QAM/64QAM(802.11g)

BPSK/QPSK/16QAM/64QAM(802.11n)

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Manufacturer's Name: Sichuan AI-Link Technology Co., Ltd.

Sample Description: WIFI Module

Trade Mark: Wireless-tag

Model number: WF-R31B-UWD1/AL-8731B-WG-A

This device was tested for operations. To comply with RF exposure requirements, a minimum separation distance of 20cm must be maintained between the user's body and the charger, including the antenna. Accessories that do not meet these requirements may not comply with RF exposure requirements and should be avoided. Use only the supplied or an approved antenna.

This device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. All essential radio test suites have been carried out. This restriction will be applied to all Member States of European Union.

1. The device complies with RF specifications when the device used at 20cm from your body

Declaration of Conformity

Hereby, Sichuan AI-Link Technology Co., Ltd. declares that the product type WF-R31B-UWD1/AL-8731B-WG-A is in compliance with Directives 2014/53/EU

IMPORTANT NOTES

Co-locating warning:

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

OEM integration instructions:

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module **FCC ID: 2AOKI-AL8731B**".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as shown in this manual.

2. ISED Canada RSS-Gen Notice (in English and French):

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) L'appareil ne doit pas produire de brouillage; (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20cm entre le radiateur et votre corps. Please notice that if the IC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: **23460-AL8731B**" any similar wording that expresses the same meaning may be used.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit : Contient IC: **23460-AL8731B** est le numéro d'homologation du module.

- i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- ii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
- iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and

- i. le dispositif utilisé dans la bande 5150-5250 MHz est réservé à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable aux systèmes mobiles par satellite dans le même canal;
- ii. pour les dispositifs à antenne (s) détachable (s), le gain d'antenne maximal autorisé pour les dispositifs dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. limite; pour les dispositifs à antenne (s) détachable (s), le gain d'antenne maximal autorisé pour les dispositifs de la bande 5725-5850 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. les limites, le cas échéant; et

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