秘密级别： 公开
生效时间：2022 年 7 月 7 日
保密期限： 长期

Model WF-M63B-USJ1 Datasheet

IEEE 802.11 2x2 WiFi 5 Wireless LAN

and

Bluetooth 5.1

USB Combo Module

[SoC MT7663BUN]

for 802.11a/b/g/n/ac + Bluetooth 5.1

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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Address: Anzhou Industrial Park, Mianyang, Sichuan, P.R.C
Company: Sichuan AI-Link Technology Co., Ltd.

Module Name	**WF-M63B-USJ1**		
	Designed by	Reviewed by	Approved by
Signature	LIU, Jingshuang	HUANG, Wei	FAN, Xijun
Date	7/7/2022	7/7/2022	7/7/2022

Model WF-M63B-USJ1

- **Compatible WLAN Standards**

  IEEE Std. 802.11 a/b/g/n/ac
  Bluetooth V2.1/4.2/5.1

- **SoC**

  MT7663BUN

- **Product Size**

  18mm×27mm×2.4mm

- **Product Weight**

  3.06g

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RoHS

Revision Record

Revision	Date	Description	Edited by
V1.0	7/7/2022	Premier Release	LIU, Jingshuang
** Private Preview Only*			

1 General Description

1.1 System Overview

WF-M63B-USJ1 module design is based on Mediatek MT7663BUN solution, The MT7663BUN is a highly integrated single chip which has built in a 2x2 dual-band wireless LAN radio and Bluetooth radio.

It includes Bluetooth EDR and LE radio which complies with Bluetooth v2.1+EDR, v4.2, and v5.1. The Module is a highly integrated MAC/BBP and 2.4/5GHz PA/LNA single chip which supports a 866.7Mbps PHY rate. The Module is designed to support standard-based features in the areas of security, quality of service, and international regulations, giving end users the greatest performance anytime and in any circumstance. This documentation describes the engineering requirements specification.

1.2 System Properties

Dimension	Typically, 18.0mm x27.0mm x 2.4mm
Chipset	MT7663BUN
Operating Frequency	2.4GHz：2.412~2.484 GHz 5 GHz：5.180~5.825GHz
Antenna	IPEX Connector
Operating Voltage	3.3V±10%
PCB Information	4-layers design (1+/-0.15mm)
Peripheral Interface	USB2.0
Operating Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +85℃
ESD Protection	HBM：2000V IEC(Contact discharge)：±4000V IEC(Air discharge)：±8000V

1.3 Diagram

The general HW architecture for the module is shown in Figure 1. This WLAN Module design is based on Mediatek MT7663BUN. It is a highly integrated single-chip MIMO(Multiple In Multiple Out) Wireless LAN (WLAN) network interface controller complying with the 802.11 specification and Bluetooth over USB interface. It combines a MAC, a 2T2R capable baseband, and RF in a single chip. An intelligent Wi-Fi/Bluetooth coexistence algorithm is implemented to provide the best harmonized Wi-Fi and Bluetooth radio performance.

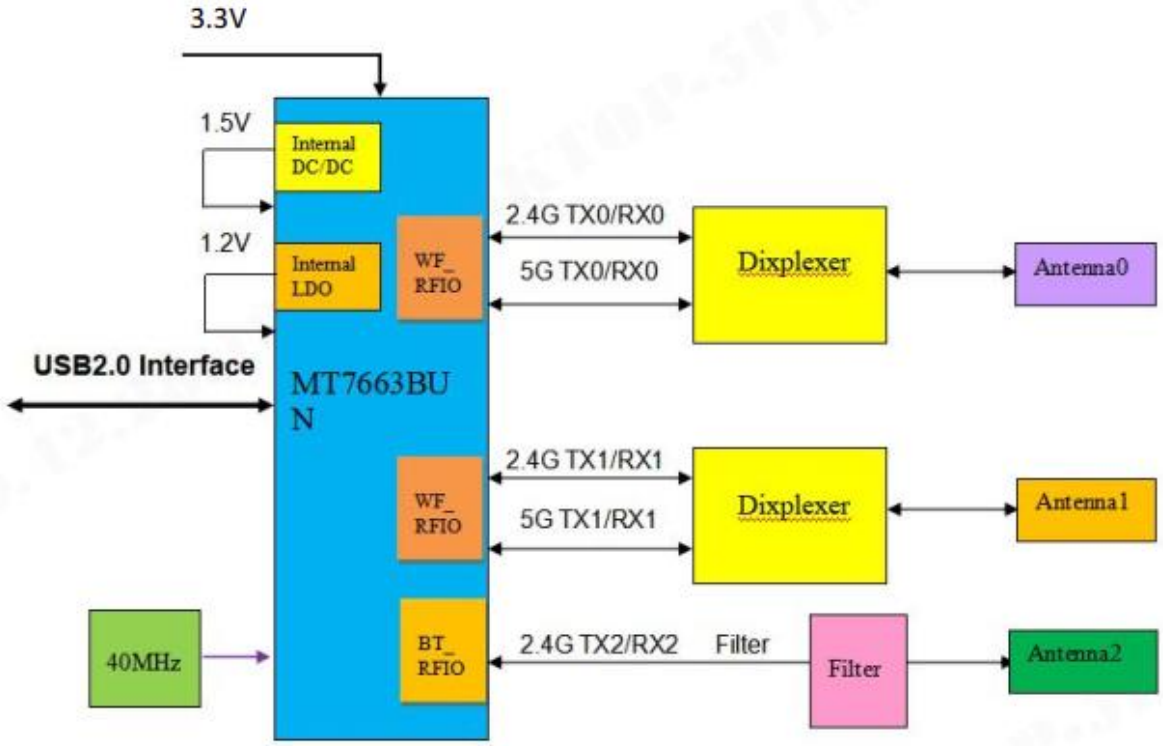
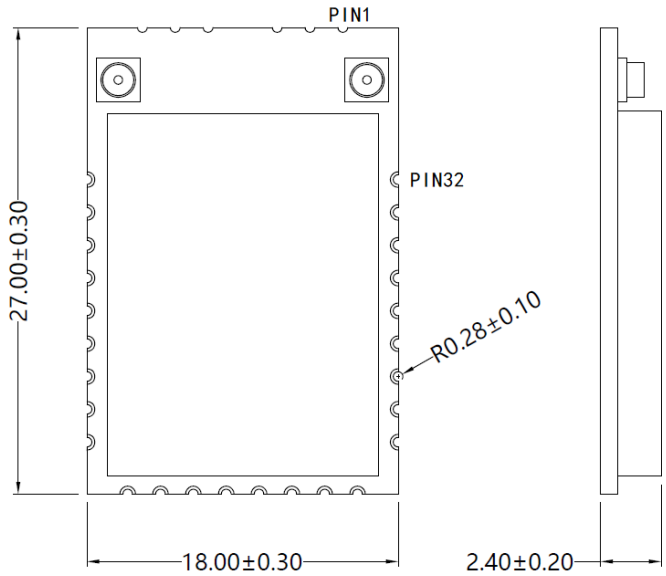


Figure 1 WF-M63B-USJ1 Block Diagram

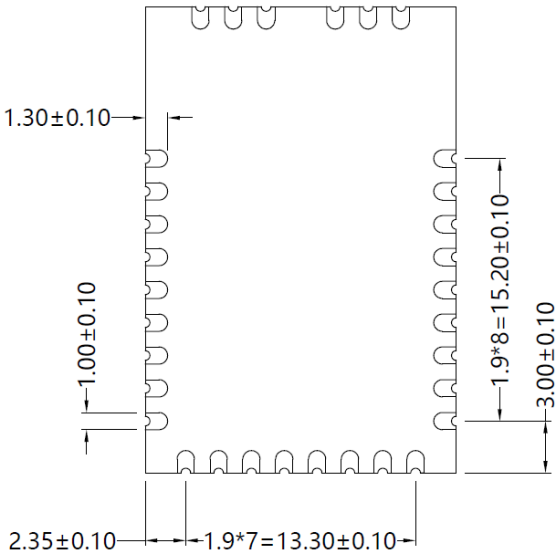
2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

- Typical Dimension (W x L x T): 27.0mmx18.00mm x 2.4mm
- General tolerance: ±0.3mm
- PCB Thickness: 1mm (+/-0.15mm)

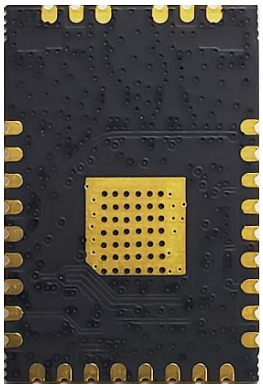


Top View *SIDE View*



BOT View

2.2 Product Photos



Bottom View

Top View

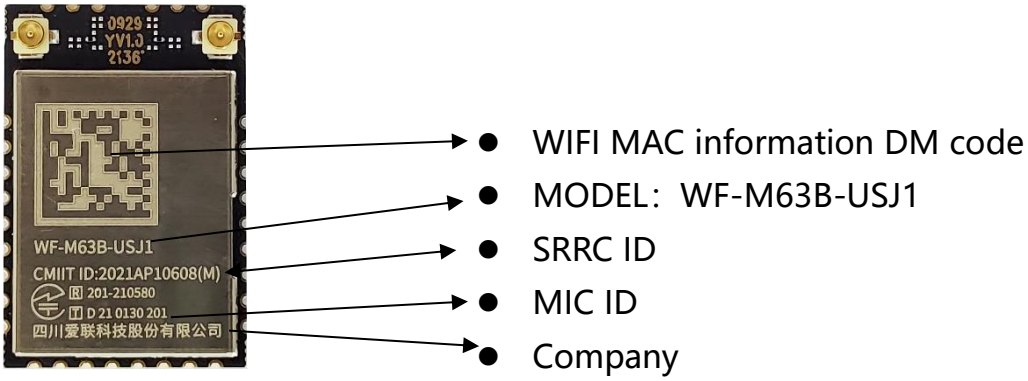
2.3 Pin Definitions

NO	Definition	Descriptions	Remarks
1	GND	Ground	GND
2	NC	NC	NC
3	GND	Ground	GND
4	GND	Ground	GND
5	NC	NC	NC
6	GND	Ground	GND
7	GND	Ground	GND
8	GND	Ground	GND
9	WOW	Wi-Fi device wake up host	The wake-up pin can wake up the GPIO port of the TV, and the module end is pulled up by 4.7K, Active low
10	RST	Internal regulator on/off	Connect the module chip reset pin, pull up the module end, Active low
11	RST	Internal regulator on/off	Connect the module chip reset pin, pull up the module end, and the low level is effective
12	GND	Ground	GND
13	3.3V	+3.3V Voltage power	External power supply with load capacity of more than 1.5A and ripple of less than 5%
14	NC	NC	NC
15	GND	Ground	GND
16	NC	NC	NC
17	NC	NC	NC
18	NC	NC	NC
19	NC	NC	NC
20	GND	Ground	GND
21	DP+	USB interface	USB DP
22	DM-	USB interface	USB DM
23	GND	Ground	GND
24	NC	NC	悬空
25	GPIO3	Debug UART TXD	Debug UART TXD
26	GND	Ground	GND
27	BT RF	BT RF PIN	BT RF PIN
28	GND	Ground	GND

29	BT_Wake_host	BT device wake up host	The wake-up pin can wake up the GPIO port of the TV, and the module end is pulled up by 4.7K, Active low
30 、31、32	NC	NC	NC

2.4 Label Information

- Top Label



3 RF Characteristics

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11a/b/g/n/ac	
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz)	
	5.1 GHz~5.9 GHz (5 GHz)	
Channels	CH1 to CH13 @ 2.4G	
	CH36 to CH165 @ 5G	
Modulation Mode	802.11b: DBPSK, DQPSK ,CCK	
	802.11 a/g/n: BPSK, QPSK, 16QAM, 64QAM	
	802.11 ac: BPSK, QPSK, 16QAM, 64QAM,256QAM	
Output Power & EVM	Power Value	EVM
	802.11b /1-11Mbps: 17dBm ± 2dBm	≤ -10dB
	802.11g/6~48Mbps: 17dBm ± 2dBm	≤ -25dB
	802.11g/54Mbps: 16dBm ± 2dBm	≤ -25dB
	802.11a/6~48Mbps: 17dBm ± 2dBm	≤ -25dB
	802.11a/54Mbps: 15dBm ± 2dBm	≤ -25dB
	802.11n HT20/MCS0~6: @2.4G 17 dBm ± 2dBm	≤ -28dB
	802.11n HT20/MCS7: @2.4G 16 dBm ± 2dBm	≤ -28dB
	802.11n HT20/MCS0~6: @5G 17 dBm ± 2dBm	≤ -28dB
	802.11n HT20/MCS7: @5G 15 dBm ± 2dBm	≤ -28dB

Items	Contents	
	802.11n HT40/MCS0~6: @2.4G 17 dBm ± 2dBm	≤ -28dB
	802.11n HT40/MCS7: @2.4G 16 dBm ± 2dBm	≤ -28dB
	802.11n HT40//MCS0~6: @5G 17 dBm ± 2dBm	≤ -28dB
	802.11n HT40/MCS7: @5G 15 dBm ± 2dBm	≤ -28dB
	802.11ac VHT20/40/80-MCS0~6 @5G 17 dBm ± 2dBm	≤ -32dB
	802.11ac VHT20/40/80 MCS7: @5G 15 dBm ± 2dBm	≤ -32dB
	802.11ac VHT40/80 -MCS8~9: @5G 14 dBm ± 2dBm	≤ -32dB
Receiver Sensitivity @2.4G PER≤ 10% @5G PER≤10%	Rate Type	Max
	802.11b /1Mbps @2.4G PER≤8%	-85dBm
	802.11b /11Mbps @2.4G PER≤8%	-79dBm
	802.11g /6Mbps @2.4G	-85 dBm
	802.11g /54Mbps @2.4G	-68dBm
	802.11a /6Mbps @5G	-85 dBm
	802.11a /54Mbps @5G	-68dBm
	802.11n HT20 /MCS0 @2.4G/5G	-85 dBm
	802.11n HT20 /MCS7 @2.4G/5G	-67dBm
	802.11n HT40 /MCS0 @2.4G/5G	-82 dBm
	802.11n HT40 /MCS7 @2.4G/5G	-64dBm
	802.11ac VHT20 /MCS0 @5G	-85dBm
	802.11ac VHT20 /MCS7 @5G	-67dBm
	802.11ac VHT40 /MCS0 @5G	-82 dBm
	802.11ac VHT40 /MCS9 @5G	-57dBm
	802.11ac VHT80 /MCS0 @5G	-79 dBm
	802.11ac VHT80 /MCS9 @5G	-54dBm

3.2 Bluetooth Subsystem

Items	Contents
Host Interface	USB
TX Characteristics	
Channel	BR、EDR:CH0 toCH78
	LE:CH0 to CH39
Modulation	GFSK、π/4-DQPSK 、8PSK

TX Power	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	BR		10	
	EDR		10	
	BLE		10	
RX Characteristics				
RX	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	BR（BER<0.1%）		-92	
	EDR（BER<0.01%）		-91	
	BLE（PER<30.8%）		-95	

** Note: [1] Typical RF Output Power are tested at room temp.25℃*

4 Interface

4.1 USB Interface

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

5 Software Information

5.1 RF Driver

WIFI:customer_package_UIv2.06_DLLv4.09_E220200304_WinDriverV.0.0.2.5_FWv.10c0f240

BT: [2.1749.00]WCN Combo Tool for customer

5.2 Normal Driver

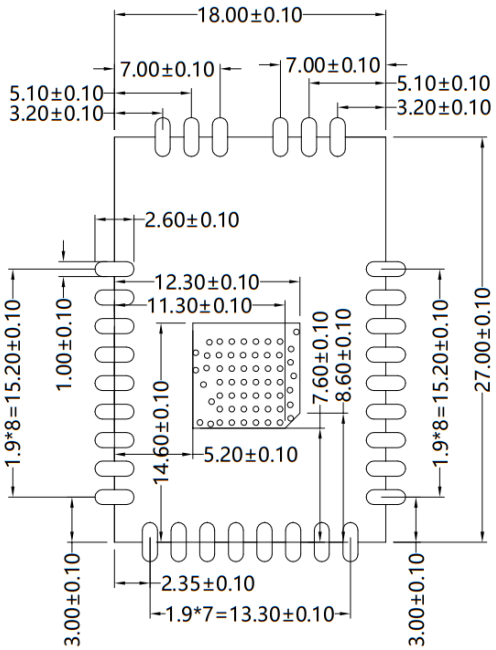
MT76x3_MP1.4.1

**Note:*

The software (driver) package version is subject to change without notice because it may encounter several updates. It is advised to consult with AI-Link for the best right driver package.

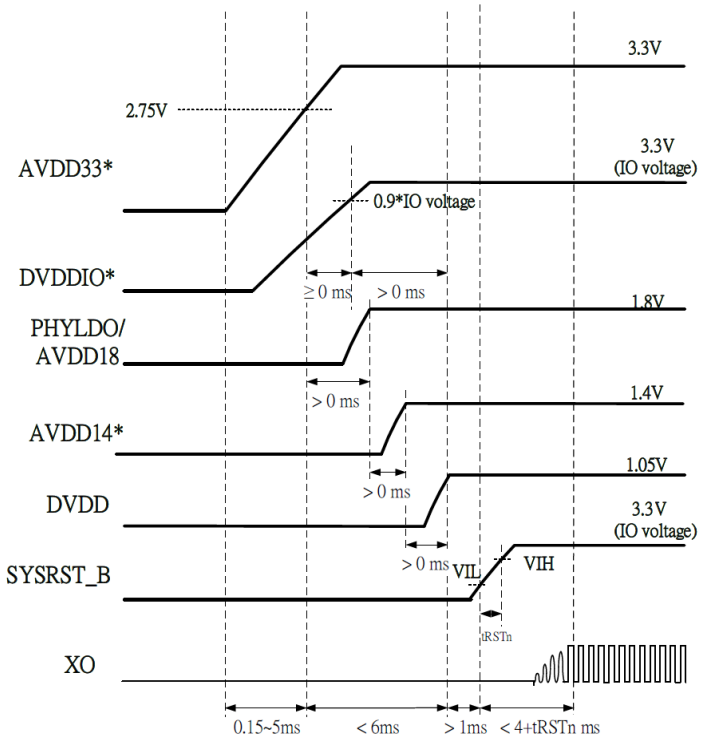
6 Reference Design

6.1 Recommend PCB Layout Decal

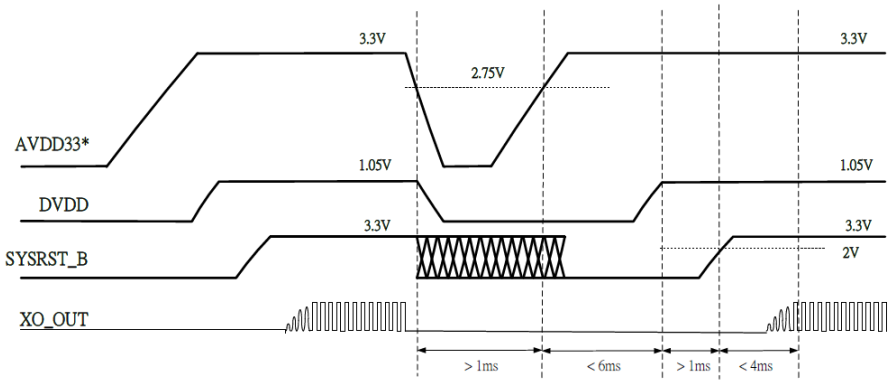


7 Host Interface Timing Diagram

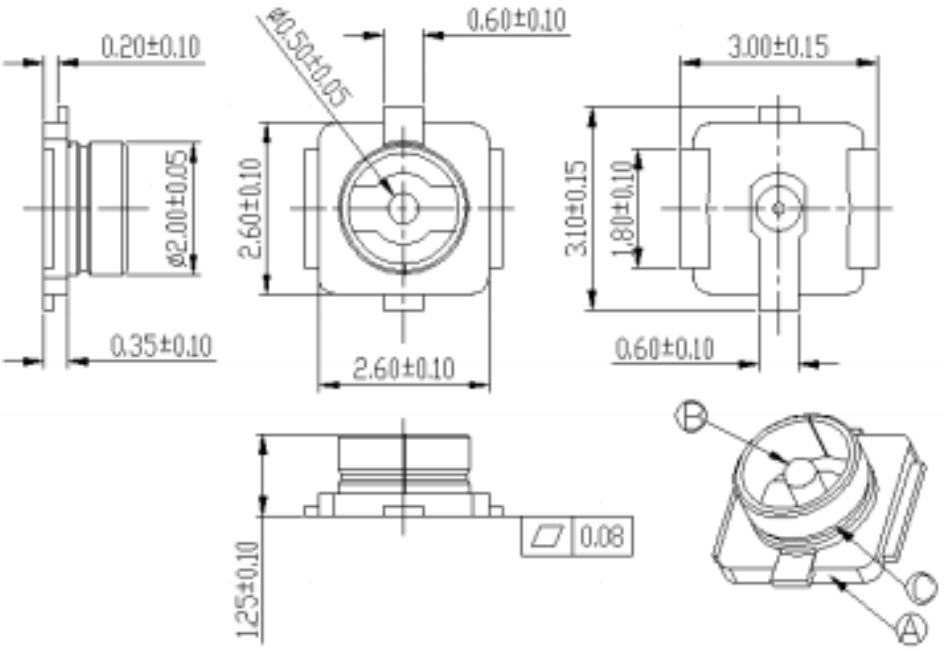
7.1 Chip power on sequence



7.2 reset sequence



8 RF Connector Dimension

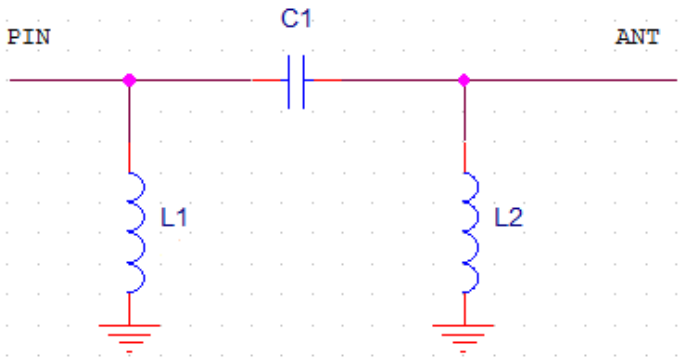


C	SHELL	Copper Alloy/Selectively Au Plated Over Ni
B	CONTACT	Copper Alloy/Selectively Au Plated Over Ni
A	HOUSING	High Temp. Plastic UL94V-0/Natural
ITEM	PART NAME	MATERIAL/FINISH

Figure: The dimensions of the connector I-PEX(Unit: mm)

9 Antenna matching

The 27th Pin connect to antenna, please refer to design demand

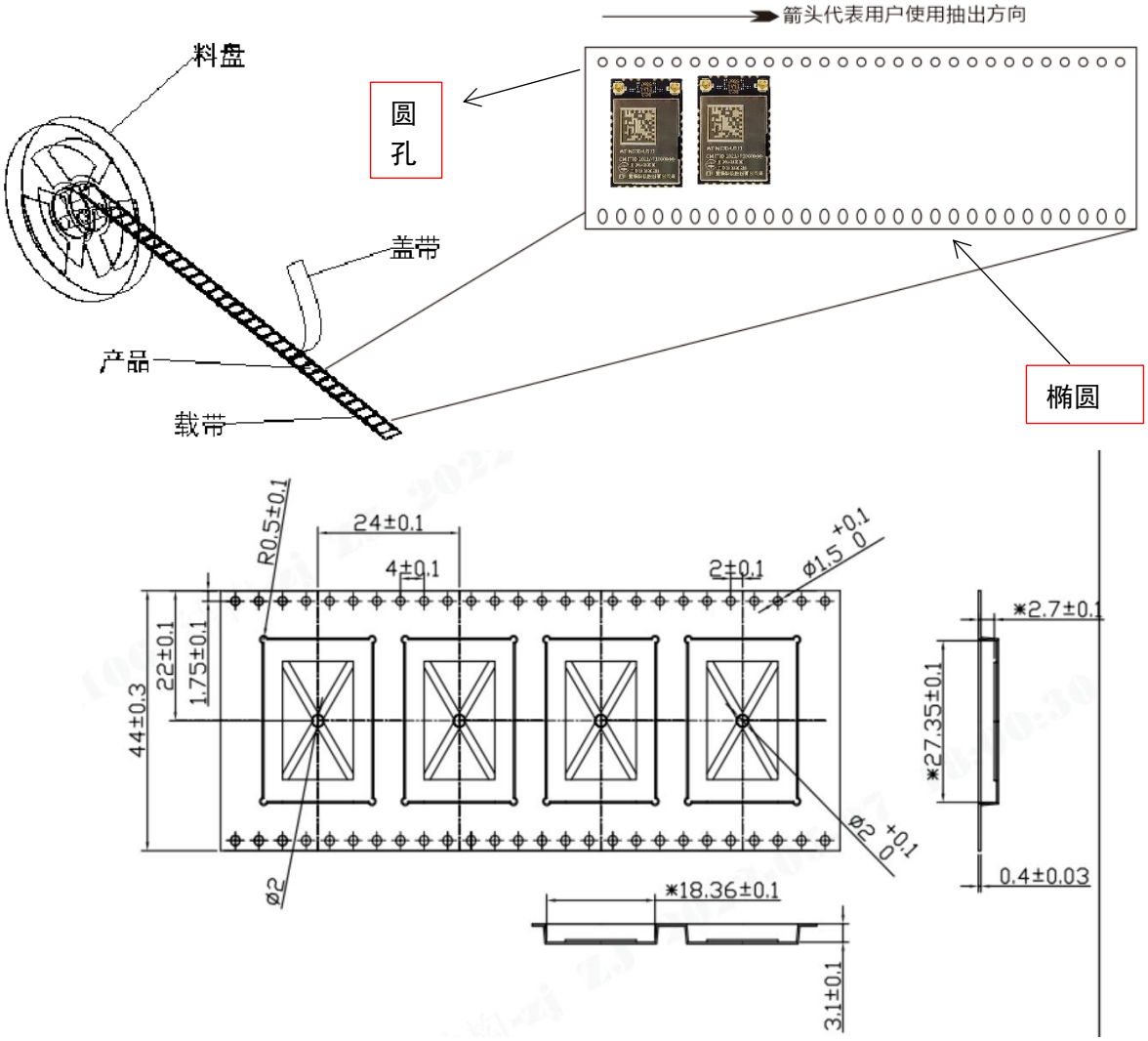


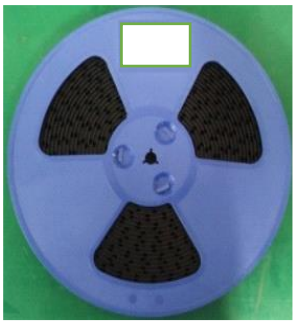
a). The module and antenna shall be far away from the interference source, and the module ground and antenna ground shall be integrated.

b). Pin27 is the RF interface of WiFi module. The coplanar impedance between Pin2 and antenna is required to be 50Ω. It is recommended to use arc and straight line with the length as short as possible.
c). L1, L2 and C1 form a π type matching network and are close to the antenna interface design, which is adjusted according to the actual measurement effect of antenna recommendation and typesetting design.

10 Package, Storage & Dispo

10.1 Package






1, product placement direction, label placement, packaging according to the diagram;
2, each roll put 880 products, each small box put 1 roll, the big box a total of 5 small boxes, the number of products a total of 4400 / box;
3, outer box size :370mm*300mm*370mm, small box size :355mm*355mm*55mm;
4. 2 bags of 2g desiccant and 1 6-color humidity card are placed in the vacuum bag;
5. Other matters not covered shall be carried out according to customer's packaging requirements.

10.2 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：-40~85℃;
- Humidity：20%~75%;
- Humidity sensitivity grade： MSL 3
- Container Requirement: products shall be placed in a container well-functioning as an electrostatic shielding.

10.3 Disposal

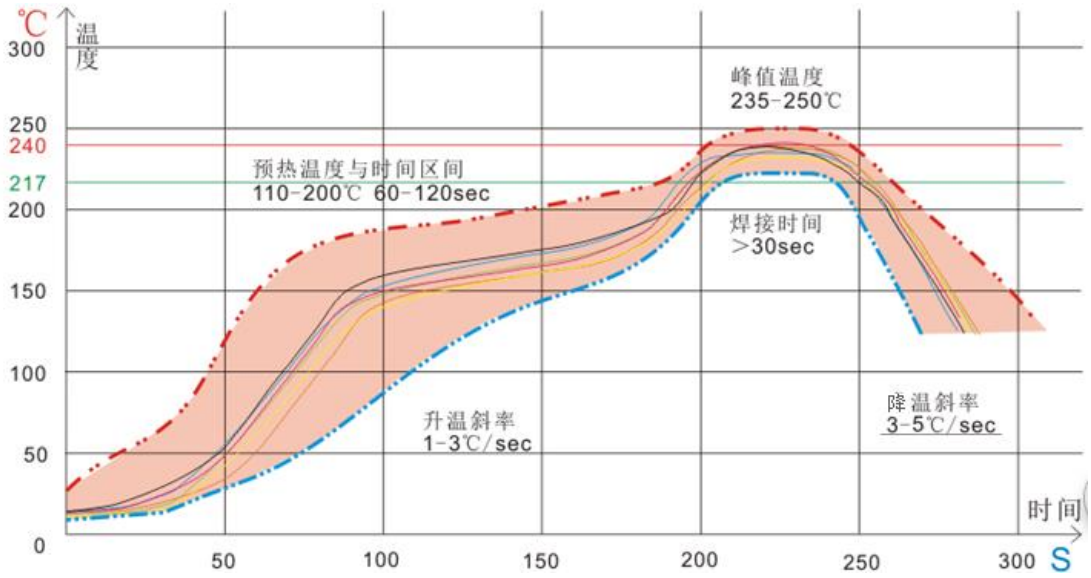
The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

11 Appendix

Key Components List

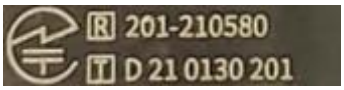
NO.	Name	Model	Specification	Manufacturer
1	IC	MT7663BUN		MediaTek
2	PCB	JUI7.820.0929 series	FR-4, 2-lay，1mm	Brain Power

12 Refelow Standard Condition



Heating zone: temperature: < 150 °C, time: between 60 and 90 seconds, the slope is controlled between 1 ~ 3 °C / S.
Preheating constant temperature zone: temperature: 150 °C ~ 200 °C, time: between 60-120 seconds, slope between 0.3-0.8.
Reflow soldering area: peak temperature 235 °C ~ 250 °C (recommended peak temperature < 245 °C), time 30-70 seconds.
Cold area: temperature: 217 °C ~ 170 °C, slope between 3 ~ 5 °C / S.
The solder is lead-free solder in tin-silver copper alloys/Sn&Ag&Cu Lead-free solder (SAC305).

13 Certification Information:

NO.	Name	ID	remark
1	SRRC	2021AP10608(M)	/
2	MIC		/

SRRC:

This product is a radio transmitter module for restricted non-standalone operation. The module bearing CMIIT ID: 2021AP10608(M) approval does not mean that the final equipment in which the module is embedded or used complies with relevant radio management technical regulations or standards. The final equipment of the specific manufacturer is responsible for the technical compliance with the relative local or nationwide radio management technical regulations or standards.

MIC:

Additional marking for 5 GHz indoor products

For products using frequencies within 5.15-5.35 GHz, please additionally print the following warning text “5GHz product for indoor use only” on your product:WF-M63B-USJ1

FCC Warning

15.19 Labeling requirements.

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.

15.21 Information to user.

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

15.105 Information to the user.

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.

FCC RF Radiation Exposure Statement:

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

2.This equipment complies with RF 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.

IC Warning

This device complies with Industry Canada’s licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'Industrie 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, et

(2)l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The information listed above provides the user with information needed to make him or her aware of a RF exposure, and what to do to assure that this radio operates within the FCC exposure limits of this radio.

The device complies with RF specifications when the device used at **20cm** from the body.Third-party belt-clips, holsters, and similar accessories used by this device should not contain any metallic components. Body-worn 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.

The band 5150-5250MHz indoor use only.

Additional Section: Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01
2.1 Conditions on using Sichuan AI-Link Technology Co.,Ltd. regulatory approvals:

A.Customer must ensure that its product (The ”CUSTOMER Product”) is electrically identical to Sichuan AI-Link Technology Co.,Ltd. reference designs.
Customer acknowledges that any modifications to Sichuan AI-Link Technology Co.,Ltd. reference designs may invalidate regulatory approvals in relation to the CUSTOMER Product, or may necessitate notifications to the relevant regulatory authorities.
B.Customer is responsible for ensuring that antennas used with the product are of the same type, with same or lower gains as approved and providing antenna reports to Sichuan AI-Link Technology Co.,Ltd.
C.Customer is responsible for regression testing to accommodate changes to Sichuan AI-Link Technology Co.,Ltd. reference designs, new antennas, and portable RF exposure safety testing/approvals.
D.Appropriate labels must be affixed to the CUSTOMER Product that comply with applicable regulations in all respects.
E.A user’s manual or instruction manual must be included with the customer product that contains the text as required by applicable law. Without limitation of the foregoing, an example (for illustration purposes only) of possible text to include is set forth below:

2.2 List of applicable FCC rules (customers' product must also compliant with these rules)
The module complies with FCC Part 15.247, and Canada RSS-247

2.3 Specific operational use conditions
The module has been certified for Mobile/portable applications. The host product operating conditions must be such that there is a minimum separation distance of 20 cm between the antenna radiating structures and nearby persons. The host manufacturer installing this module into their product must ensure that the final composite 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. If the end product manufacturer use it to a portable product, please provide the SAR compliance.

2.4 Limited module procedures
Not applicable.

2.5 Trace antenna designs
Not applicable.

2.6 RF exposure considerations
The device can be used in mobile exposure condition without restriction 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.

This equipment complies with FCC’s and IC’s RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed and operated to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. Installers must ensure that 20cm separation distance will be maintained between the device and users.

Note: the OEM product manuals must include a statement in order to alert the users of FCC RF exposure compliance.

2.7 Antennas
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 following antennas of the same type with equal or lower gain.
The antenna must be installed such that 20cm can be maintained between the antenna and users.

Antenna Type	Antenna Gain	Frequency Range	Connector Type	Min separation
FPC antenna	5.16	2402- 2480MHz	i-pex	20cm
	5.16	2402- 2480MHz		
	5.16	2412- 2462MHz		
	4.32	5.15-5.25 GHz		
	4.32	5.25-5.35 GHz		
	4.16	5.47-5.725 GHz		
	4.06	5.725-5.85 GHz		

2.8 Label and compliance information

Host product manufacturers must provide a physical or e-label stating
“Contains FCC ID:2AOKI-WFM63BUSJ1 ” & "Contains IC: 23460-WFM63BUSJ1" with their finished product.

2.9 Information on test modes and additional testing requirements

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. If no other module used and no change to this module, the product can only to compliance with FCC part 15 B to meet the sale requirement. 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 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 circuity), 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.