OLink AL-7663B-WG-A USB Combo Module User Guide

Contents

OLink

OLink AL-7663B-WG-A USB Combo Module

Specifications

- Model: AL-7663B-WG-A
- Wireless Standards: IEEE 802.11 a/b/g/n/ac, Bluetooth V2.1/4.2/5.1
- Chipset: MT7663BUN
- Product Size: 40.0mm x 46.5mm x 6.0mm
- Product Weight: 6.9g
- Operating Frequency: 2.4GHz (2.412-2.462 GHz), 5 GHz (5.180-5.825GHz)
- Antenna: External Antennas Design
- Operating Voltage: 5V +/-10% input
- PCB Information: 4-layers design (1+/-0.15mm)
- Peripheral Interface: USB2.0
- Operating Temperature: -10°C to +70°C
- Storage Temperature: -40°C to +85°C

Product Usage Instructions

System Overview
The AL-7663B-WG-A WLAN Module is based on Mediatek MT7663BUN chipset, offering a highly integrated MIMO Wireless LAN network interface controller that complies with the IEEE 802.11 specification and Bluetooth over USB interface.

System Functions
The module combines a MAC, a 2T2R capable baseband, and RF in a single chip. It features an intelligent Wi-Fi/Bluetooth coexistence algorithm to provide optimized Wi-Fi and Bluetooth radio performance.

System Characteristics

- **Dimension:** Typically 40.0mm x 46.5mm x 6.0mm
- **Chipset:** MT7663BUN
- **Operating Frequency:** 2.4GHz (2.412-2.462 GHz), 5 GHz (5.180-5.825GHz)
- **Antenna:** External Antennas Design
- **Operating Voltage:** 5V +/-10% input
- **PCB Information:** 4-layers design (1+/-0.15mm)
- **Peripheral Interface:** USB2.0
- **Operating Temperature:** -10°C to +70°C
- **Storage Temperature:** -40°C to +85°C

Frequently Asked Questions (FAQ)

- **Q: What are the compatible WLAN standards for the AL-7663B-WG-A module?**
  - A: The module supports IEEE Std. 802.11 a/b/g/n/ac and Bluetooth V2.1/4.2/5.1 standards.
- **Q: What is the chipset used in the module?**
  - A: The chipset used is MT7663BUN from Mediate.

Model AL-7663B-WG-A Datasheet

IEEE 802.11 2×2 WiFi 5 Wireless LAN and Bluetooth 5.1

USB Combo Module

[SoC MT7663BUN] for 802.11a/b/g/n/ac + Bluetooth 5.1

Version: 1.2

<Specification may be changed without prior notice>

Sichuan AI-Link Technology Co., Ltd

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Below Space Intentionally Left Blank for Customer Confirmation or Comments		
Typed Name	Signature	Date
Please sign and return this page and the front page to our company by email or fax, or by courier to the followin g address: **Address** Anzhou Industrial Park, Mianyang, Sichuan, P.R.C **Company** Sichuan AI-Link Technology Co., Ltd.		

Module Name		**AL-7663B-WG-A**	
	Designed by	Reviewed by	Approved by
Signature	LIU, Jingshuang	HUANG, Wei	FAN, Xijun
Date	4/1/2023	4/1/2023	4/1/2023

Model AL-7663B-WG-A

Compatible WLAN Standards

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

SoC
MT7663BUN

Product Size
40.0mmx 46.5mmx 6.0mm

Product Weight
6.9g

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- ai-link@ailinkiot.com

Revision Record

Revision	Date	Description	Edited by
V1.0	3/1/2022	Premier Release	LIU, Jingshuang
V1.1	4/1/2023	design optimization Update the format of the specification: add product weight, add RF Connector Dimension, Optimize Mechanical Dimensions	LIU, Jingshuang
V1.2	4/2/2023	Update packaging diagram	LIU, Jingshuang
**Private Preview Only*			

General Description

System Overview

AL-7663B-WG-A module design is based on Mediatek MT7663BUN solution, The MT7663BUN is a highly integrated single chip which has built in a 2×2 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.

System functions

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.

System characteristics

Dimension	Typically, 40.0mmx 46.5mmx 6.0mm
Chipset	MT7663BUN
Operating Frequency	• **2.4GHz** 2.412~2.462 GHz • **5 GHz** 5.180~5.825GHz
Antenna	External Antennas Design
Operating Voltage	5V +/-10% input
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

Diagram

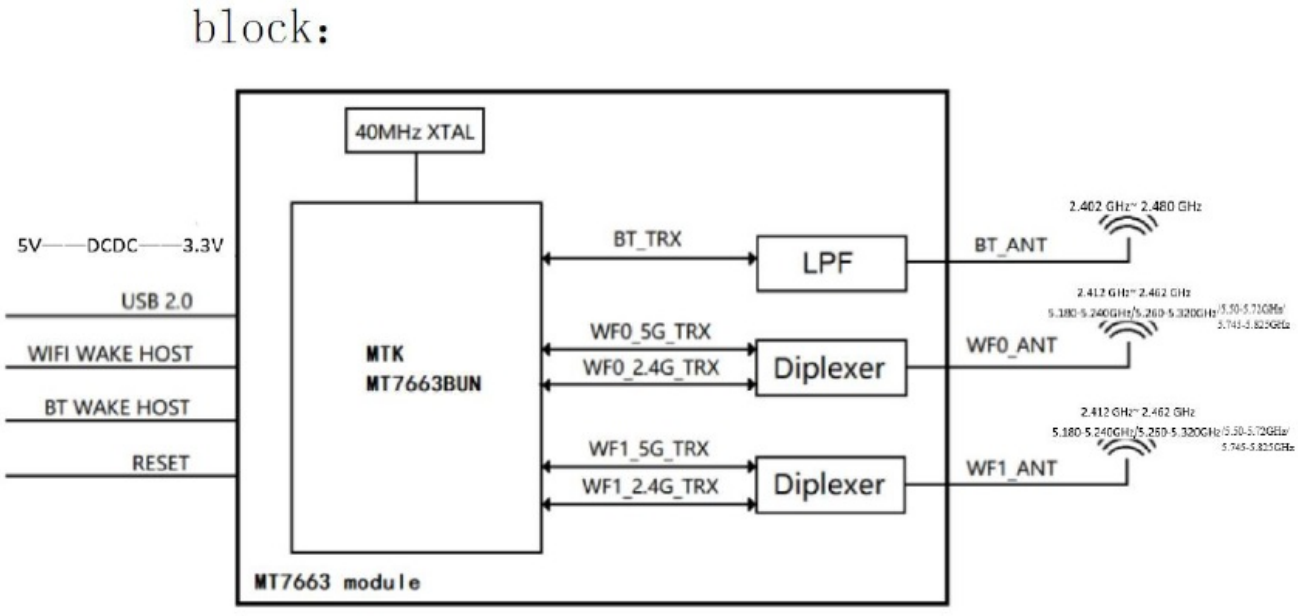
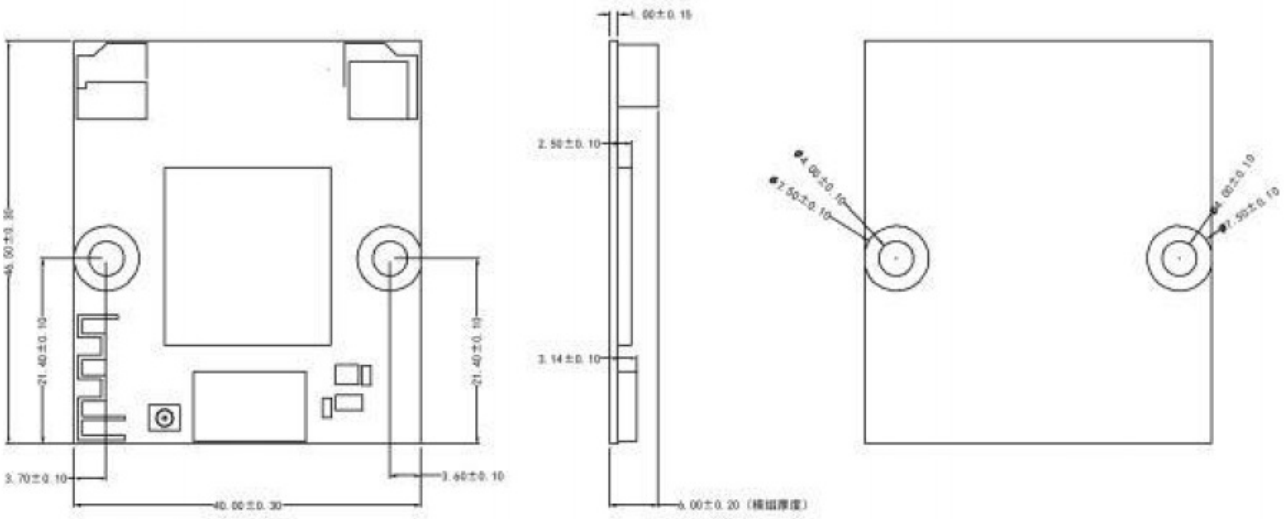


Figure 1 AL-7663B-WG-A Block Diagram

Mechanical Dimensions

Mechanical Outline Drawing

- **Typical Dimension (W x L x T)**: 40.0mmx 46.5mmx 6.0mm
- **General tolerance:** ±0.3mm
- **PCB Thickness:** 1mm (+/-0.15mm)

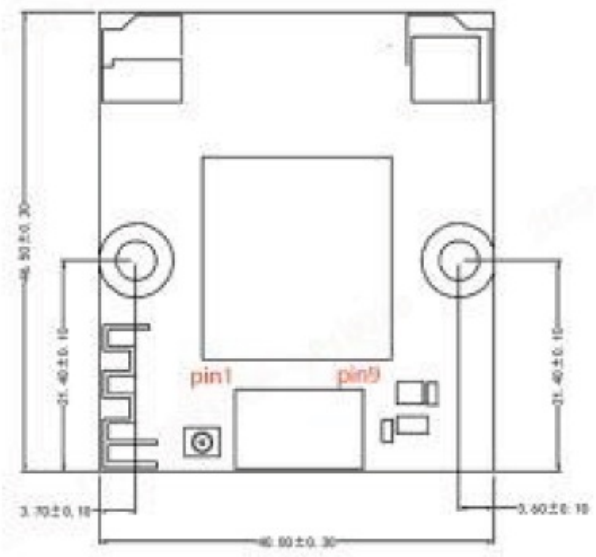


Top View SIDE View BOT View

Product Photos

Bottom View Top View

Pin Definitions



1	RST	Module reset pin, effective at low level, internal 10K pull-up to 3.3V
2	WIFI_WAKE	WIFI wakes up the host, effective at low level, and internal 10k is pulled up to 3.3V
3	GND	ground
4	DP	USB D+
5	DM	USB D-
6	GND	ground
7	BT_WAKE	Bluetooth wake-up, effective at low level, internal 10K pull-up to 3.3V
8	+5V	Module power supply pin, 5V input, requires a load capacity of more than 1.5A
9	+5V	Module power supply pin, 5V input, requires a load capacity of more than 1.5A

DC characteristics
Input voltage requirements

DC	Min	Typ	Max	unit
VCC	4.5	5	5.5	V

Input current requirements

DC	Max (GSM)	Typ (WCDMA)	Typ (LTE)
VCC	700mA	-mA	-mA

RF Characteristics

Wi-Fi Subsystem

Items	Contents
WLAN Standard	IEEE 802.11a/b/g/n/ac
Frequency Range	5.1 GHz~5.9 GHz (5 GHz)
	2.400 GHz ~ 2.497 GHz (2.4 GHz)
Channels	CH1 to CH11 @ 2.4G
	CH36 to CH165 @ 5G
Modulation Mode	• 11b: DBPSK, DQPSK and CCK and DSSS • 11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM • 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM • 11ac: BPSK, QPSK, 16QAM, 64QAM,256QAM and OFDM
Output Power	802.11b /1Mbps-11Mbps: 13dBm ± 3dBm
	• 802.11g /6Mbps-48 Mbps 13dBm ± 2dBm 802.11g /54Mbps: 13dBm ± 2dBm 802.11a /6Mbps-48 Mbps 15dBm ± 3dBm • 802.11a /54Mbps: 15dBm ± 3dBm
	• 2.4G 802.11n HT20 / MCS0-MCS6: 17dBm ± 2dBm • 2.4G 802.11n HT20 /MCS7: 17dBm ± 2dBm • 5G 802.11n HT20 / MCS0-MCS6: 16dBm ± 3dBm • 5G 802.11n HT20 /MCS7: 16dBm ± 3dBm
	• 2.4G 802.11n HT40 / MCS0-MCS6: 17dBm ± 2dBm • 2.4G 802.11n HT40 /MCS7: 17dBm ± 2dBm • 5G 802.11n HT40 / MCS0-MCS6: 16dBm ± 2dBm • 5G 802.11n HT40 /MCS7: 16dBm ± 2dBm
	• 5G 802.11ac VHT20/VHT40/VHT80 MCS0-MCS6: 17dBm ± 2dBm • 5G 802.11ac VHT20/VHT40/VHT80 MCS7: 17dBm ± 2dBm • 5G 802.11ac VHT20/VHT40/VHT80 MCS8-MCS9: 17dBm ± 2dBm
EVM	802.11b /11Mbps : ≤ -10dBm
	802.11g /54Mbps : ≤ -26dBm
	802.11n HT20 /MCS7: ≤ -26dBm
	802.11n HT40 /MCS7 : ≤ -28dBm
Receive Sensitivity 11b,20	1Mbps ≤-76dBm

MHz ≤10%	11Mbps ≤-76dBm
Receive Sensitivity 11g,20 MHz ≤10%	6Mbps ≤-82dBm
	54Mbps ≤-65dBm
Receive Sensitivity 11n,20 MHz ≤10%	MCS0 ≤-82dBm
	MCS7 ≤-64dBm
Receive Sensitivity 11n,40 MHz ≤10%	MCS0 ≤-79dBm
	MCS7 ≤-61dBm
Receive Sensitivity 11ac,20 MHz ≤10%	MCS0 ≤-82dBm MCS7 ≤-64dBm
Receive Sensitivity 11ac,40 MHz ≤10%	MCS7 ≤-79dBm MCS7 ≤-56dBm

Receive Sensitivity 11ac,80 MHz ≤10%	MCS7 ≤-76dBm MCS7 ≤-51dBm

Bluetooth Subsystem

Items	Contents
Channel	BR,EDR:CH0 toCH78
	LE:CH0 to CH39
Modulation	GFSK π/4-DQPSK 8PSK
TX Power	**BR:** 13dBm± 3dBm
	EDR: 13dBm± 3dBm
	LE: -2dBm± 3dBm
RX Characteristics	/
1. Receiver Sensitivity (BER<0.1%)	**BR:** -92dBm
	EDR: -91dBm
	LE: -95dBm
2. Maximum usable signal (BER<0.1%)	**BR:** -5dBm
	EDR: -5dBm
	LE: -5dBm

Note: [1]Typical RFOutput Poweraretestedatroomtemp.25℃

Interface

USB Interface

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

Software Information

RF Driver

Driver software supports operating systems: Linux, Microsoft Win7x64, Win10x64. Test software tool version: WIFI:customer_package_UIv2.06_DLLv4.09_E220200304_WinDriverV.0.0.2.5_FWv.10c 0f240

- **BT:** [2.1749.00]WCN Combo Tool for customer
- Test driver version
- **WiFi** MTKUQA3
- **BT:** MtkUsb_3.0.0.3

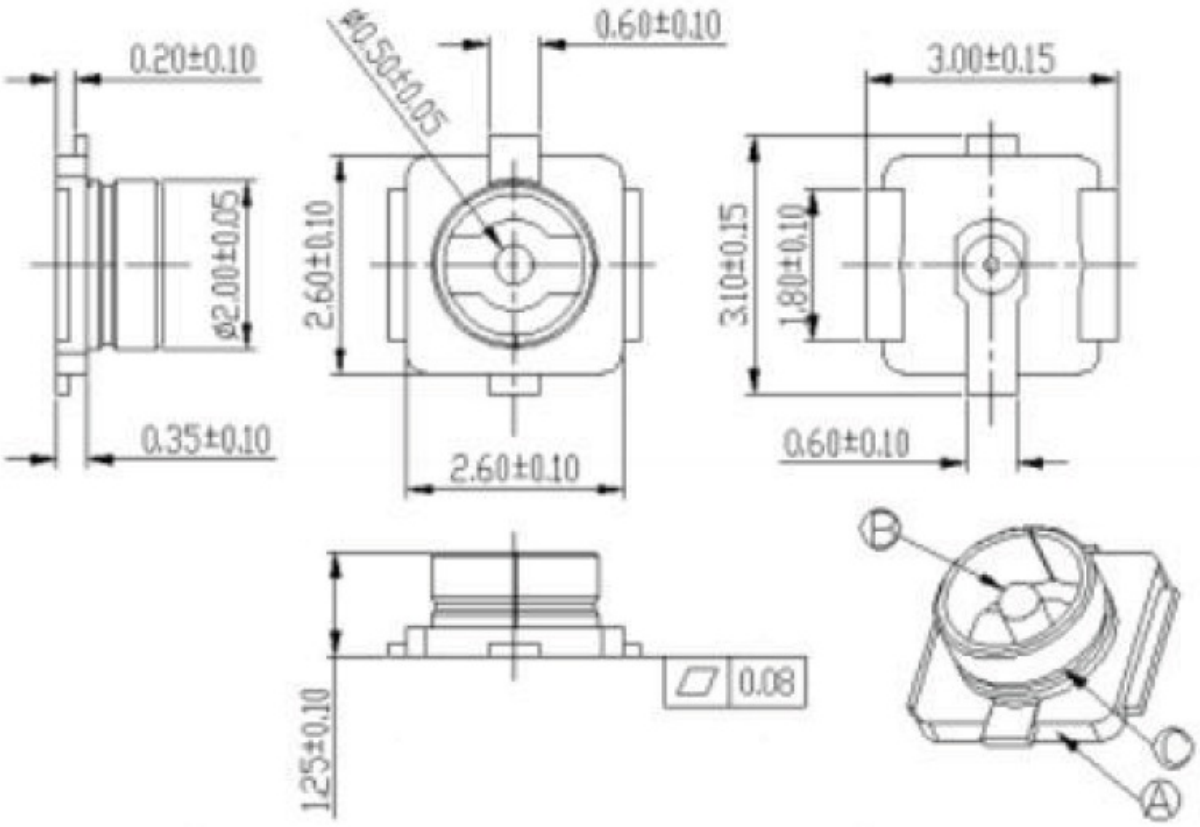
Normal Driver

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.

RF Connector Dimension

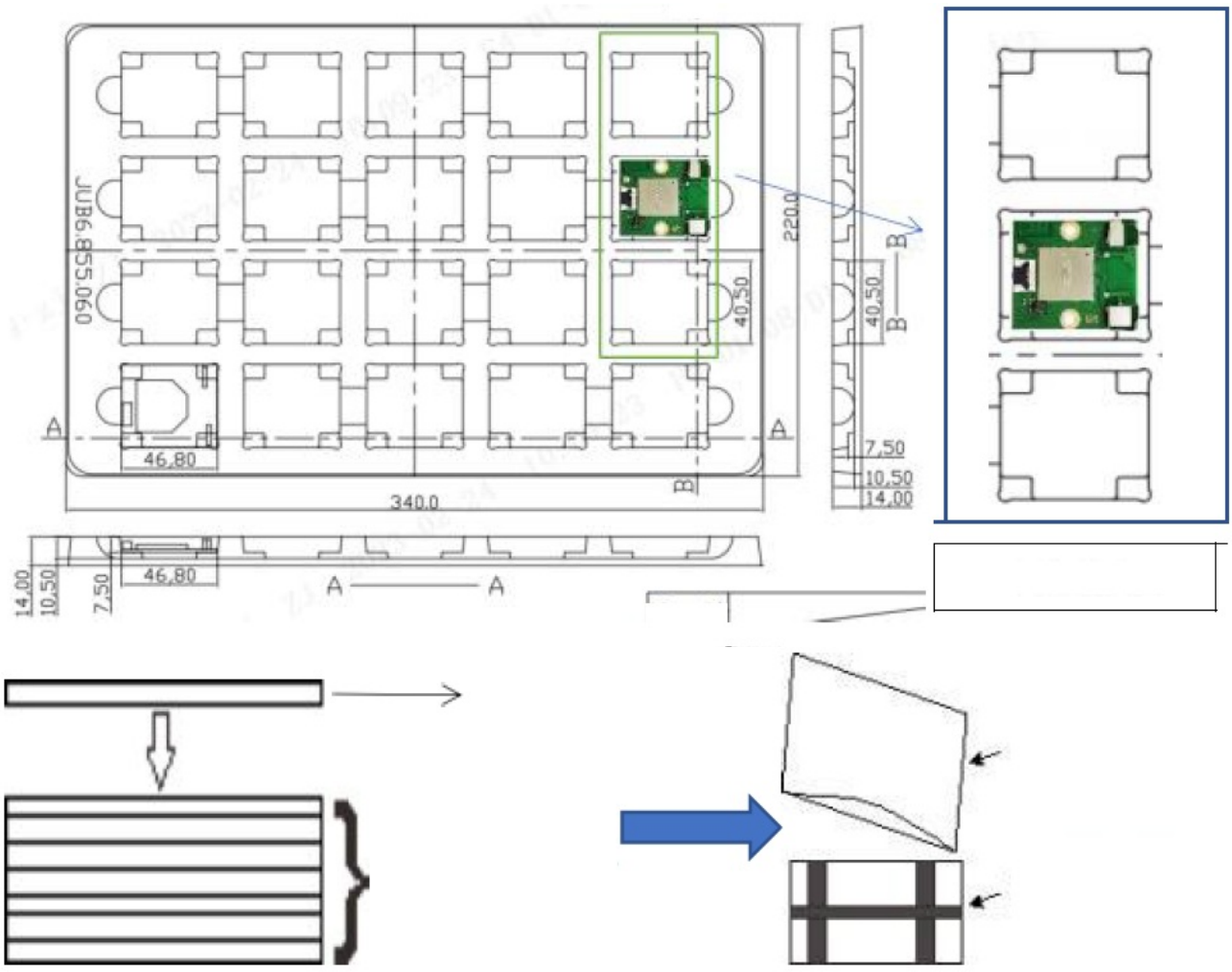


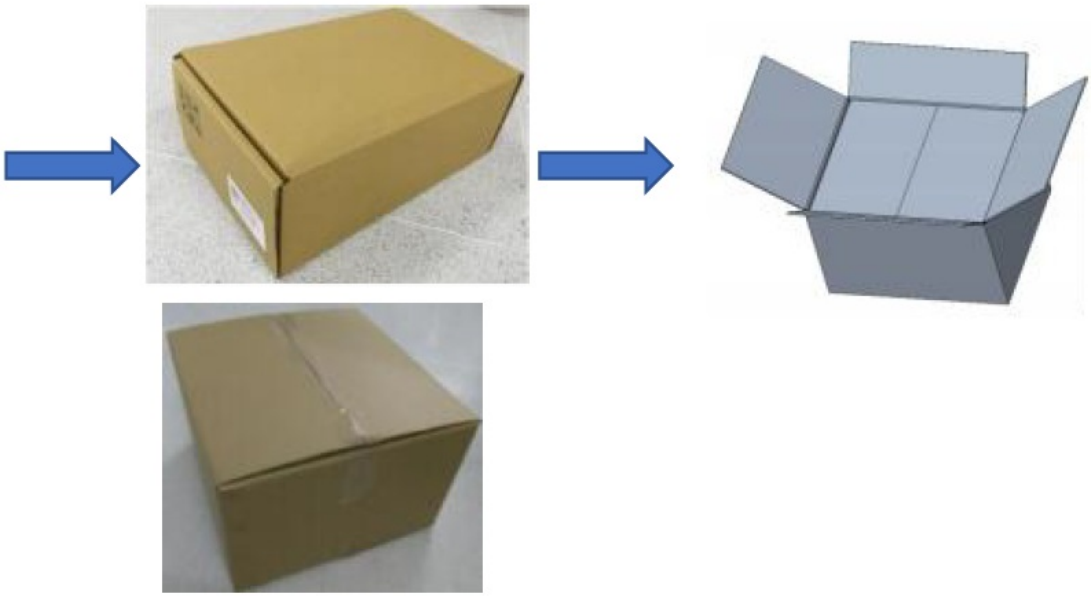
①	SHELL	Copper Alloy/Selectively Au Plated Over Ni
②	CONTACT	Copper Alloy/Selectively Au Plated Over Ni
③	HOUSING	High Temp. Plastic UL94V-0/Natural
ITEM	PART NAME	MATERIAL/FINISH

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

Package, Storage & Dispo

Package





1. The product placement direction, label pasting position, and packaging shall be carried out according to the schematic diagram
2. The quantity of products is 12 pieces per layer, with an empty tray on the upper layer, 240 pieces per box, and 960 pieces per box
3. Inner box size: 240mm * 385mm * 140mm, outer box size 495 * 390 * 289mm
4. Other matters not covered shall be executed according to the customer's packaging requirements

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
- Contai**n**er **Requirement:** products shall be placed in a container well-functioning as an electrostatic shielding.

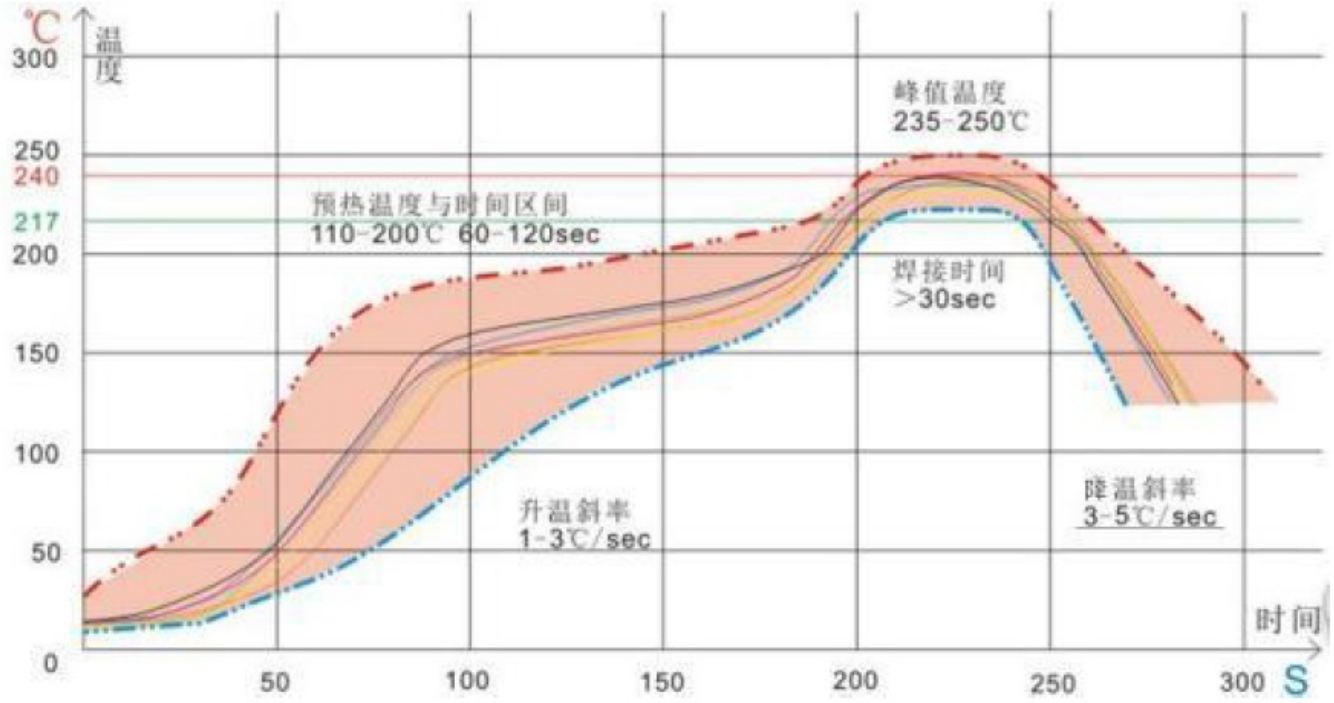
Disposal
The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

Appendix

Key Components List

NO.	Name	Model	Specification	Manufacturer
1	IC	MT7663BUN	QFN	MediaTek
2	PCB	JUI7.820.0962 series	FR-4, 4-lay 1mm	

Refer low 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).

Antenna specification

ANT	TYPE	Antenna Project Code	Part No. & manufacturer	Gain
ANT1	Onboard PIFA Antenna	Metal Antenna	JUI6.604.003series Sichuan Yide Xinguang Electronics Co., Ltd	2.4G :1.99dBi 5G:1.96dBi
ANT2	Onboard PIFA Antenna	Metal Antenna	JUI6.604.004series Sichuan Yide Xinguang Electronics Co., Ltd	2.4G :1.94dBi 5G:1.96dBi
			TX-	
			DM150BD113B63M	
			ZHONGSHAN B&T	2.4G:1.46dBi
			TECHNOLOGY	
			Co..Ltd	
			TX-	
			DM200BD113B63M	
			ZHONGSHAN B&T	2.4G:1.29dBi
			TECHNOLOGY	
			Co..Ltd	
ANT3	External PIFA Antenna	PIFA Antenna	TX- DM270BD113B63M	
			ZHONGSHAN B&T	2.4G:0.90dBi
			TECHNOLOGY	
			Co..Ltd	
			TX-	
			DM350BD113B63M	
			ZHONGSHAN B&T	2.4G:0.59dBi
			TECHNOLOGY	
			Co..Ltd	
			TX- DM400BD113B63M	2.4G:1.04dBi

			ZHONGSHAN B&T	
			TECHNOLOGY	
			Co..Ltd	
			TX-	
			DM500BD113B63M	
			ZHONGSHAN B&T	2.4G:0.46dBi
			TECHNOLOGY	
			Co..Ltd	
			TX-	
			DM100BD113B63M	
			ZHONGSHAN B&T	2.4G:1.89dBi
			TECHNOLOGY	
			Co..Ltd	
			TX-	
			DM100BD113Y63M	
			Shenzhen Yishengbang	2.4G :3.93dBi
			Technology	
			Company Limited	
			TX-	
			DM150BD113Y63M	
			Shenzhen Yishengbang	2.4G :3.93dBi
			Technology	
			Company Limited	
			TX-	
			DM200BD113Y63M	
			Shenzhen Yishengbang	2.4G :4.29dBi
			Technology	
			Company Limited	
			TX-	
			DM270BD113Y63M	
			Shenzhen	2.4G :4.32dBi
			Yishengbang	
			Technology	

			Company Limited	
			TX-	
			DM350BD113Y63M	
			Shenzhen Yishengbang	2.4G :3.12dBi
			Technology	
			Company Limited	
			TX-	
			DM400BD113Y63M	
			Shenzhen Yishengbang	2.4G :3.02dBi
			Technology	
			Company Limited	
			TX-	
			DM500BD113Y63M	
			Shenzhen Yishengbang	2.4G :3.04dBi
			Technology	
			Company Limited	

Authentication

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-AL7663BWGA" 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

List of applicable FCC rules

- FCC Part 15 Subpart C 15.247
- FCC Part 15 Subpart C 15.407

Specific operational use conditions
The module is a WIFI Module with 2.4G&5G function.

- WiFi Specification
- Operation Frequency
  2412~2462MHz; 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)
  BPSK/QPSK/16QAM/64QAM/256QAM(802.11ac)
- **Type:** WLAN Antennas are Metal Antenna and BT Antenna is PIFA Antenna
  Maximum Metal Antenna 1 gain: 1.99dBi@2.4G;1.96dBi@5G
  Maximum Metal Antenna 2 gain: 1.94dBi@2.4G;1.96dBi@5G

Maximum PIFA Antenna3 gain: 4.32dBi@2.4G;

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.

Limited module procedures
Not applicable.

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

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

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 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.

- **Manufacturer's Name:** Sichuan AI-Link Technology Co., Ltd.
- **Sample Description:** WIFI Module
- **Trade Mark:** Wireless-tag
- **Model number:** AL-7663B-WG-A;AL-7663B-WG-A(FCC);AL-7663B-WG-A-1(FCC);AL-7663B-WG-A-2(FCC); AL-7663B-WG-A-3(FCC);AL-7663B-WG-A-4(FCC);AL-7663B-WG-A-5(FCC).

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.

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-AL7663BWGA”.

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 show in this manual.

Documents / Resources

	OLink AL-7663B-WG-A USB Combo Module [pdf] User Guide AL-7663B-WG-A USB Combo Module, AL-7663B-WG-A, USB Combo Module, Combo Module, Module

References

- User Manual