



User Manual

AL-7655B-WG-A&WF-M655-UWD1

IEEE 802.11 2x2 WiFi 5 Wireless LAN

and

Bluetooth 5.1

Combo Module

[SoC MT7655]

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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Please sign and return this page and the front page to our company by email or fax, or by courier to the following address:

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

Module Name		AL-7655B-WG-A WF-M655-UWD1	
	Designed by	Reviewed by	Approved by
Signature	QIN,Dakai	HUANG,Wei	DING, SHUANGPENG
Date	7/2/2025	7/2/2025	7/2/2025

Model

AL-7655B-WG-A&WF-M655-UWD1

➤ **Compatible WLAN Standards**

IEEE Std. 802.11 a/b/g/n/ac

Bluetooth V2.1/3.0/4.2/5.1

➤ **SoC**

MT7655

➤ **Product Size**

47mm×30mm×6.0mm

➤ **Product Weight**

5.95g

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Features

WLAN

- ✚ IEEE 802.11 a/b/g/n/ac compliant
- ✚ Support 20/40 bandwidth in 2.4GHz and 20/40/80M bandwidth in 5GHz band
- ✚ Dual bands 2T2R mode
- ✚ data rate up to 867Mbps
- ✚ Support MU-MIMO RX
- ✚ Support STBC, LDPC, TX Beamformer, and RX Beamformer
- ✚ Greenfield, mixed-mode, legacy modes support
- ✚ IEEE 802.11 d/e/h/i/j/k/r/v/w support
- ✚ Security support for WFA WPA/WPA2/WPA3 personal, WPS2.0
- ✚ QoS support of WFA WMM,WMM PS

Bluetooth

- ✚ Bluetooth v5.1 with BLE (BT low energy)
- ✚ Supports BT/BLE dual mode
- ✚ Supports BT/Wi-Fi coexistence
- ✚ Supports SCO and eSCO link with re-transmission
- ✚ Supports wide-band speech
- ✚ Supports mSBC and SBC including mono and stereo
- ✚ Supports Packet Loss Concealment (PLC) function for better voice quality
- ✚ Supports secure connection with AES128 and ECC256
- ✚ Channel quality driven data rate adaptation
- ✚ Channel assessment and WB RSSI for AFH

Revision Record

Revision	Date	Description	Edited by
V1.0	7/2/2025	Premier Release	QIN,Dakai

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1 General Description

1.1 System Overview

Model AL-7655B-WG-A is a highly integrated WiFi module by AI-Link, based on the MediaTek SoC MT7655, featuring a 2x2 a/b/g/n/ac dual-band Wi-Fi, and a Bluetooth v5.1 subsystems.

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, 47mm×30mm×6.0mm
Chipset	MT7655
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±5%
PCB Information	4-layers design (1+/-0.15mm)
Peripheral Interface	WIFI&BT@USB2.0
Rate	11b: 1, 2, 5.5 and 11Mbps 11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps 11ac: MCS0~9, Nss=2, BW=80MHz up to 866.7Mbps
Operating Temperature	-10°C to +70°C
Storage Temperature	-40°C to +85°C
ESD Protection	IEC: 2000V

1.3 Diagram

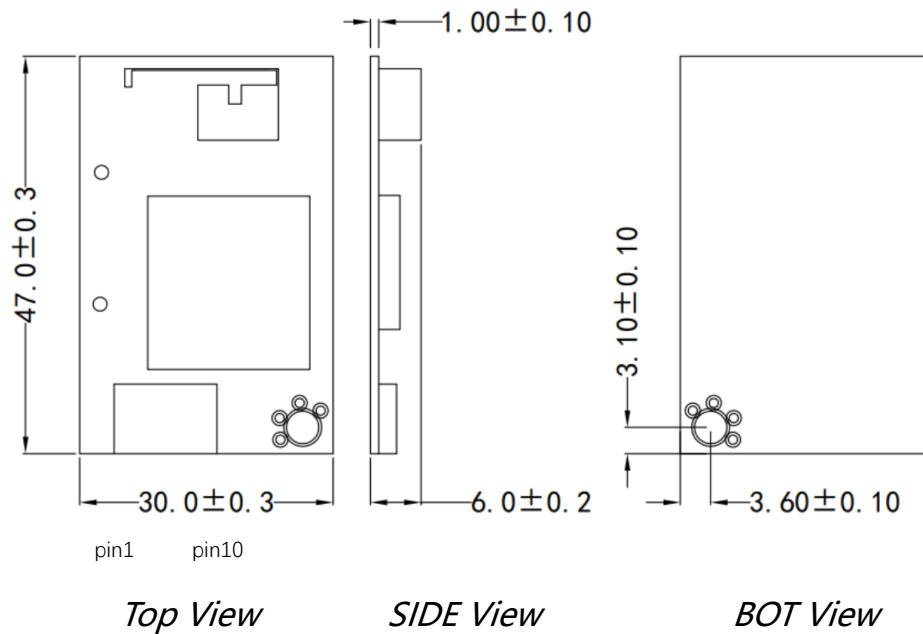
The hardware architecture for the module is shown in Figure 1. The AI-Link' s AL-7655B-WG-A module Complies with IEEE standards 802.11a/b/g/n/ac; it also supports 2x2 Multi-User Multiple-Input Multiple-Output (known as MU-MIMO) and could reach up to data rate of 867 Mbps. Meanwhile, it is also a module of Bluetooth v5.1 and Wi-Fi Dual-band.

2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

Typical Dimension (W x L x T): 47.0mmx 30.0mm x 6.0mm

General tolerance: ± 0.2

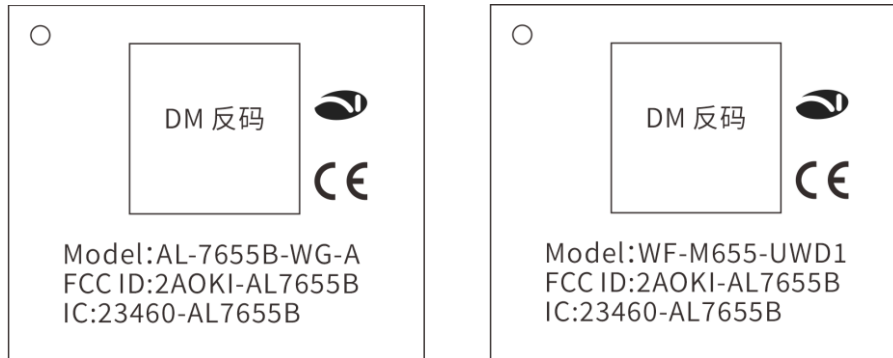


2.2 Pin definitions

Pin	Define	Description
1	GND	GND
2	HSDP	HSDP
3	HSDM	HSDM
4	VIN	+3.3V @1.5A
5	VIN	+3.3V @1.5A
6	VIN	+3.3V @1.5A
7	WL_WAKE_HOST	Wlan WAKE Host
8	HOST_WAKE_WL	Host WAKE Wlan
9	RESET	RESET
10	GND	GND

2.3 Label Information

Top Label



- WIFI MAC information DM code
- AI-LINK & CE logo
- Model: AL-7655-WG-A or WF-M655-UW1
- FCCID:2AOKI-AL7655B
- IC:23460-AL7655B

3 RF Characteristics

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11a/b/g/n/ac	
Frequency Range	2.400 GHz~2.4835 GHz (2.4 GHz)	
	5.150 GHz~5.850 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 Min& EVM	Power Value	EVM
	802.11b /11Mbps: 18 ±2 dBm	≤ -10dB
	802.11g /54Mbps: 17 ±2 dBm	≤ -25dB
	802.11a /54Mbps: 16 ±2 dBm	≤ -25dB
	802.11n HT20 /MCS7: @2.4G 16.5 ±2 dBm	≤ -28dB
	802.11n HT20 /MCS7: @5G 15 ±2 dBm	≤ -28dB
	802.11n HT40 /MCS7: @2.4G 16 ±2 dBm	≤ -28dB
	802.11n HT40 /MCS7: @5G 15 ±2 dBm	≤ -28dB
	802.11ac VHT20 /MCS8: @5G 13 ±2 dBm	≤ -30dB
	802.11ac VHT40 /MCS9: @5G 13 ±2 dBm	≤ -32dB
	802.11ac VHT80 /MCS9: @5G 13 ±2 dBm	≤ -32dB
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	-68dBm
	802.11n HT20 /MCS7 @5G	-68dBm
	802.11n HT40 /MCS7 @2.4G	-66dBm
	802.11n HT40 /MCS7 @5G	-66dBm
	802.11ac VHT20 /MCS8 @5G	-64dBm
	802.11ac VHT40 /MCS9 @5G	-58dBm
	802.11ac VHT80 /MCS9 @5G	-55dBm

3.2 Bluetooth Subsystem

Items	Contents			
Host Interface	USB			
TX Characteristics				
Channel	BR、 EDR:CH0 toCH78			
	LE:CH0 to CH39			
Modulation	GFSK、 $\pi/4$ -DQPSK 、 8DPSK			
TX Power	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1DH5		8	
	2DH5		8	
	3DH5		8	
	1LE		8	
	2LE		8	
RX Characteristics				
RX	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1DH5 (BER<0.1%)		-90	
	2DH5 (BER<0.01%)		-86	
	3DH5 (BER<0.01%)		-80	
	1LE (PER<30.8%)		-90	
	2LE (PER<30.8%)		-90	

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

4 Interface

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

5 Electrical Current Consumption

5.1 WLAN Current Consumption

Description	Value	Unit
Power Consumption (WIFI TX 5G TX NSS=2 HT20 MCS0)	813	mA
Power Consumption (WIFI RX 5G RX NSS=2 VHT80 MCS9)	165	mA

**Note:*

[1] Results are measured provided VDD33 is 3.3V. TX power is measured at the antenna port. The temperature is 25oC.

[2] The duty cycle for TX/RX measurement is 100%.

[3] The chip variation is +/- 25%.

5.2 Bluetooth Current Consumption

Description	Value	Unit
Power Consumption (BT TX)	82	mA
Power Consumption (BT RX)	29	mA

**Note:*

[1] Results are measured provided VDD33 is 3.3V. TX power is measured at the antenna port. The temperature is 25oC.

[2] The duty cycle for TX/RX measurement is 100%.

[3] The chip variation is +/- 25%

6 RF Connector Dimension

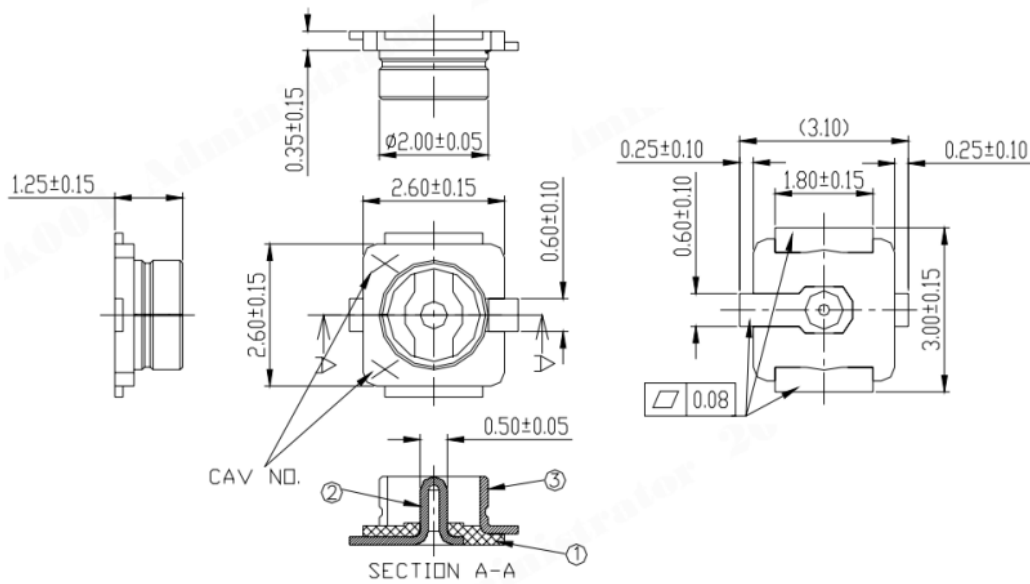


Figure 2: The dimensions of the connector

7 Appendix

Key Components List

NO.	Name	Model	Specification	Manufacturer
1	IC	MT7655B		MediaTek
2	PCB	JUI7.820.1646-1 series	4L 1.0mm	IQE RJX SUNKING MZBC
3	Crystal	2016 40M	2016 40M	ECEC TKD FAITH LONG HELE
4	DPX	1608	2G/5G diplexer	GLEAD ACX Walsin FTR
5	Power Inductor	2520	IND/SMD	Sunlord MICROGATE INPAQ TAIYO

8 Certification Information:

A、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-AL7655B**" 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.

B. ISED Regulatory Compliance

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-AL7655B**" 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-AL7655B** 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;

iii. 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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