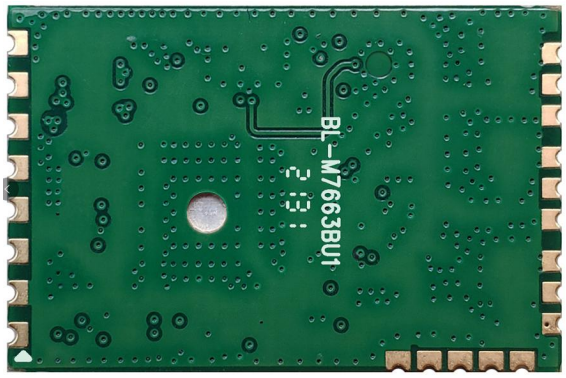
BL-M7663BU2

IEEE 802.11a/b/g/n/ac 2T2R USB WiFi +Bluetooth 5.0 Module Specification



Module Name: BL-M7663BU2	
Module Type: IEEE 802.11a/b/g/n/ac 2T2R USB WiFi+Bluetooth 5.0 Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date
0.1	Initial release	2021-07-30
1.0	Official version	2021-08-04

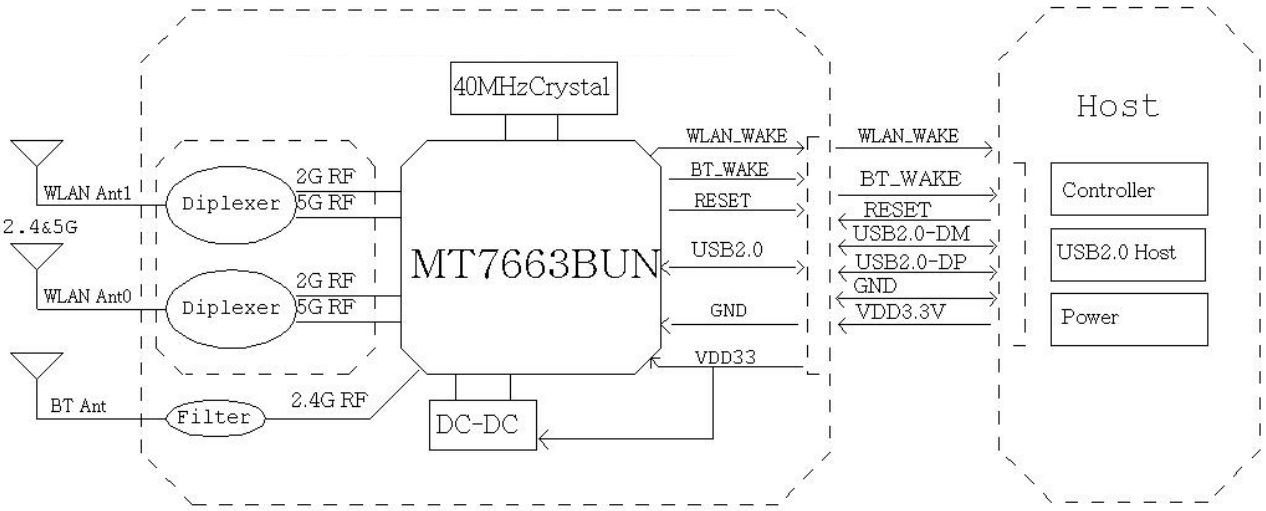
1. Introduction

The BL-M7663BU2 is a highly integrated 2T2R 802.11a/b/g/n/ac Wireless LAN (WLAN) network and bluetooth combo module. The module' s interface is USB 1.0/1.1/2.0. It combines a WLAN MAC, a 2T2R capable WLAN base band. Bluetooth support 5.1 performance. The BL-M7663BU2 module provides a complete solution for a high throughput performance integrated wireless LAN and BT device.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz and 5.15~5.85GHz
- Host Interface is USB2.0
- IEEE Standards: IEEE 802.11a/b/g/n/ac
- Wireless data rate can reach up to 867Mbps
- Bluetooth v2.1/4.1/4.2 and supports Bluetooth 5.1 system
- Connect to external antenna through IPEX connectors
- Power Supply: VDD33 3.3V±0.2V

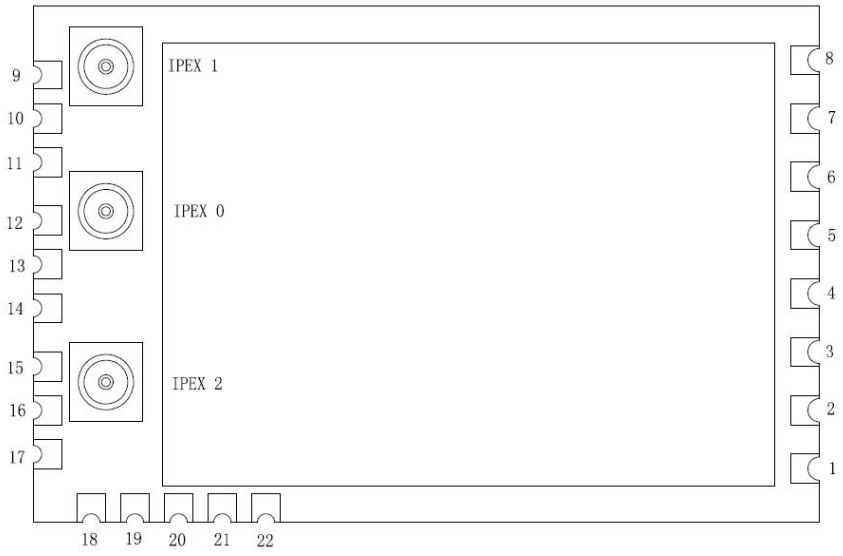
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M7663BU2
Chipset	MT7663BUN
WLAN Standard	IEEE 802.11 a/b/g/n/ac
BT Specification	Bluetooth Core Specification v5.1/4.2/4.1/2.1
Host Interface	USB2.0 for WiFi and Bluetooth
Antenna	Connect to the external antennas through IPEX connectors
Dimension	SMD 22Pins --27.0*17.7*3.1mm (L*W*H), Tolerance: +/-0.15mm
Power Supply	DC 3.3V±0.2V @ 1500 mA (Max)
Operation Temperature	-20℃ to +70℃
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



(TOP View)

2.1 Pin Definition

No.	Pin Name	Type	Level	Module Pin Description
1	BT_WAKE	O	3.3V	BT wake up host
2	GND	P		GND

3	USB_DP	I/O		USB differential data line
4	USB_DM	I/O		USB differential data line
5	RESET	I	3.3V	System reset Input(active low)
6	VDD33	P		Main Power supply
7	WLAN_WAKE	O	3.3V	WLAN wake up host
8	NC			NC
9	GND	RF		GND
10	NC	RF		NC (Reserved 2.4G / 5G RF PAD for WLAN_ANT1)
11	GND	RF		GND
12	GND	RF		GND
13	NC	RF		NC (Reserved 2.4G / 5G RF PAD for WLAN_ANT0)
14	GND	RF		GND
15	GND	RF		GND
16	NC	RF		NC (Reserved BT RF PAD)
17	GND	RF		GND
18	NC			NC
19	NC			NC
20	NC			NC
21	NC			NC
22	GND	P		GND
IPEX 0	WLAN_RF0	RF		IPEX connector for 2.4G / 5G RF to WLAN_ANT0
IPEX 1	WLAN_RF1	RF		IPEX connector for 2.4G / 5G RF to WLAN_ANT1
IPEX 2	BT_RF	RF		IPEX connector for BT RF to BT_ANT

P: Power or Ground; I/O: In/Output; I: Input; O:Output; RF: Analog RF Port or RF Ground;

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	℃
External Antenna VSWR			1.92		/
Supply Voltage	VDD33	3.1	3.3	3.5	V

3.2 Current Consumption

Conditions : VDD33=3.3V ; Ta:25℃ ;			
Use Case	VDD33 Current (average)		
	Typ	Max	Units
WLAN Unassociated (Linux Driver, BT_Disable)	68	75	mA
2.4G 11b 1Mbps TX @ 19dBm (1TX RF test)	368	398	mA
2.4G 11b 1Mbps RX (1RX RF test)	98	128	mA
2.4G 11g 6Mbps TX@18dBm (1TX RF test)	331	361	mA
2.4G 11g 6Mbps RX (1RX RF test)	96	126	mA
2.4G 11n HT20 MCS8 TX@14dBm (2TX RF test)	591	621	mA
2.4G 11n HT20 MCS8 RX (2RX RF test)	125	155	mA
2.4G 11n HT40 MCS15 TX@14dBm (2TX RF test)	384	414	mA
2.4G 11n HT40 MCS15 RX (2RX RF test)	119	149	mA
5G 11a 6Mbps TX @ 18dBm (1TX RF test)	456	506	mA
5G 11a 6Mbps RX (1RX RF test)	127	177	mA
5G 11n HT20 MCS8 TX@15.5dBm (2TX RF test)	703	753	mA
5G 11n HT20 MCS8 RX (2RX RF test)	144	194	mA
5G 11n HT40 MCS15 TX@14dBm (2TX RF test)	508	558	mA
5G 11n HT40 MCS15 RX (2RX RF test)	146	196	mA
5G 11ac VHT80 MCS9 TX@14dBm (2TX RF test)	476	526	mA
5G 11ac VHT80 MCS9 RX (2RX RF test)	156	206	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25℃

Features	Description
WLAN Standard	IEEE 802.11b/g/n/ac, CSMA/CA
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Ch1~Ch13 (For 20MHz Channels)
Modulation	802.11b (DSSS): CCK, DQPSK, DBPSK; 802.11g (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256;
Date Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT20): MCS8~MCS15(2T2R_MIMO) 13~144.4Mbps; 802.11n (HT40): MCS0~MCS7(1T1R) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R) 27~300Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R) 6.5~86.7Mbps; 802.11ac (VHT20): MCS0~MCS8(2T2R) 13~173.3Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R)13.5~200Mbps; 802.11ac (VHT40): MCS0~MCS9(2T2R)27~400Mbps;
Frequency Tolerance	≦±15ppm

2.4G Transmitter Specifications (WLAN_ANT0 & WLAN_ANT1)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dB)	EVM (dB)
802.11b@1~11Mbps	15dBm	±2dBm	≦-10dB
802.11g@6Mbps	19dBm	±2dBm	≦-10dB
802.11g@54Mbps	19dBm	±2dBm	≦-25dB
802.11n@HT20_MCS0	19dBm	±2dBm	≦-10dB
802.11n@HT20_MCS7	19dBm	±2dBm	≦-28dB
802.11n@HT40_MCS0	19dBm	±2dBm	≦-10dB
802.11n@HT40_MCS7	19dBm	±2dBm	≦-28dB
802.11ac@VHT40_MCS9	19dBm	±2dBm	≦-32dB

2.4G Receiver Specifications (WLAN_ANT0 & WLAN_ANT1)			
RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER
802.11b@1Mbps	-92dBm	-5	< 8%
802.11b@11Mbps	-86dBm	-5	< 8%
802.11g@6Mbps	-90dBm	-5	< 10%
802.11g@54Mbps	-74dBm	-5	< 10%
802.11n@HT20_MCS0	-88dBm	-5	< 10%
802.11n@HT20_MCS7	-70dBm	-5	< 10%

802.11n@HT40_MCS0	-86dBm	-5	< 10%
802.11n@HT40_MCS7	-68dBm	-5	< 10%
802.11ac@VHT40_MCS9	-63dBm	-5	< 10%

4.2 5G WLAN RF Specification

Conditions: VDD33=3.3V ; Ta:25℃			
Features	**Description**		
WLAN Standard	IEEE 802.11a/n/ac, CSMA/CA		
Frequency Range	5.15~5.25GHz; 5.735~5.835GHz (5GHz ISM Band)		
Channels	Ch36, Ch40, Ch44, Ch48; Ch149~Ch165		
Modulation	802.11a (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256;		
Date Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT20): MCS8~MCS15(2T2R_MIMO) 13~144.4Mbps; 802.11n (HT40): MCS0~MCS7(1T1R) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R) 27~300Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R) 6.5~86.7Mbps; 802.11ac (VHT20): MCS0~MCS8(2T2R) 13~173.3Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R)13.5~200Mbps; 802.11ac (VHT40): MCS0~MCS9(2T2R)27~400Mbps; 802.11ac (VHT80): MCS0~MCS9(1T1R)29.3~433.3Mbps; 802.11ac (VHT80): MCS0~MCS9(2T2R)58.5~866.7Mbps;		
Frequency Tolerance	≦ ±15ppm		
5G Transmitter Specifications (WLAN_ANT0 & WLAN_ANT1)			
TX Rate	**TX Power (dBm)**	**TX Power Tolerance (dB)**	**EVM (dB)**
802.11a@6Mbps	16dBm	±2	≦-10dB
802.11a@54Mbps	16dBm	±2	≦-25dB

802.11n@HT20_MCS0 802.11ac@VHT20_MCS0	16dBm	±2	≦-10dB	
802.11n@HT20_MCS7 802.11ac@VHT20_MCS7	16dBm	±2	≦-28dB	
802.11n@HT40_MCS0 802.11ac@VHT40_MCS0	16dBm	±2	≦-10dB	
802.11n@HT40_MCS7	16dBm	±2	≦-28dB	
802.11ac@VHT80_MCS0	16dBm	±2	≦-10dB	
802.11ac@VHT80_MCS9	16dBm	±2	≦-32dB	
5G Receiver Specifications (WLAN_ANT0 & WLAN_ANT1)				
RX Rate	**Min Input Level (dBm)**	**Max Input Level (dBm)**	**PER**	
802.11a@6Mbps	-91	-5	< 10%	
802.11a@54Mbps	-74	-5	< 10%	
802.11n@HT20_MCS0	-90	-5	< 10%	
802.11n@HT20_MCS7	-72	-5	< 10%	
802.11n@HT40_MCS0	-86	-5	< 10%	
802.11n@HT40_MCS7	-71	-5	< 10%	
802.11ac@VHT80_MCS0	-86	-5	< 10%	
802.11ac@VHT80_MCS9	-60	-5	< 10%	

4.3 Bluetooth RF Specification

Conditions: VDD33=3.3V ; Ta:25℃	
Features	**Description**
Bluetooth Specification	Bluetooth Core Specification v5.1/4.2/4.1/2.1
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;

Date Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: π/4-DQPSK; EDR_3Mbps: 8DPSK; LE_125Kbps: GFSK (Coded_S=8); LE_500Kbps: GFSK (Coded_S=2); LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	**Min (dBm)**	**Typ (dBm)**	**Max (dBm)**
TX Power			
BR_1M	-5	0	4
EDR_2/3M	-5	0	4
LE_125K/500K/1M/2M	-5	0	2
Items	**Min**	**Typ**	**Max**
BR_1M (DH1) Modulation Characteristics			
Δf1avg	140KHz	158.9.kHz	175KHz
Δf2avg	/	159.15.kHz	/
Δf2max	115KHz	154.3kHz	/
Δf2avg/Δf1avg	0.8	0.89	/
Items	**Min**	**Typ**	**Max**
EDR_3M(3DH5) EDR Carrier Frequency Stability and Modulation Accuracy			
ωi	-75KHz	-8.16kHz	+75KHz
ωi+ωo	-75KHz	-9.03kHz	+75KHz
ωo	-10KHz	-0.9kHz	+10KHz
8DPSK RMS DEVM	/	0.026	0.13
8DPSK DEVM	/	0.059	0.25
Items	**Min**	**Typ**	**Max**
LE_1M Modulation Characteristics			
Δf1avg	225KHz	250KHz	275KHz
Δf2avg	/	234.4KHz	/
Δf2max	185KHz	225KHz	/

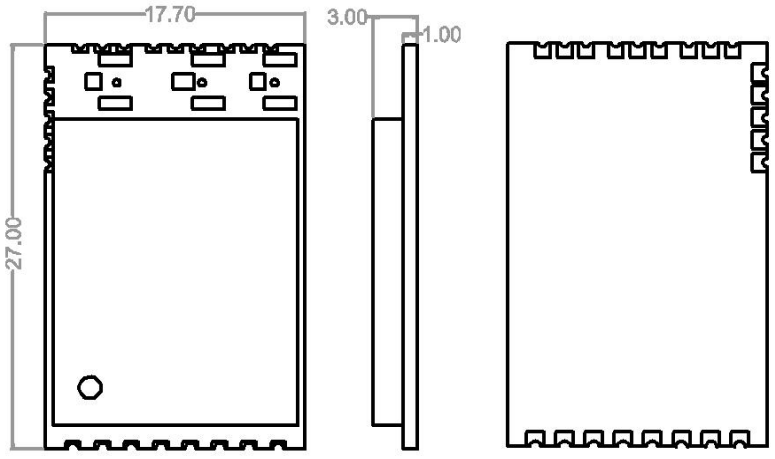
Δf2avg/Δf1avg	0.8	0.93	/
Items	**Min**	**Typ**	**Max**
LE_2M Modulation Characteristics			
Δf1avg	450KHz	501.3KHz	550KHz
Δf2avg	/	234.2KHz	/
Δf2max	370KHz	502.5KHz	/
Δf2avg/Δf1avg	0.8	0.99	/

Bluetooth Receiver Specifications(BT_ANT)

Items	Sensitivity		Maximum Input Level	
	Input Level(Typ)	BER	Input Level(Typ)	BER
BR_1M (DH1)	-91 dBm	≦ 0.1%	-5 dBm	≦ 0.1%
EDR_3M (3DH5)	-80 dBm	≦ 0.01%	-5 dBm	≦ 0.1%
	Input Level (Typ)	PER	Input Level (Typ)	PER
LE_125K	-90 dBm	≦ 5%	-5 dBm	≦ 5%
LE_1M	-91 dBm	≦ 5%	-5 dBm	≦ 5%
LE_2M	-89 dBm	≦ 5%	-5 dBm	≦ 5%

5. Mechanical Specifications

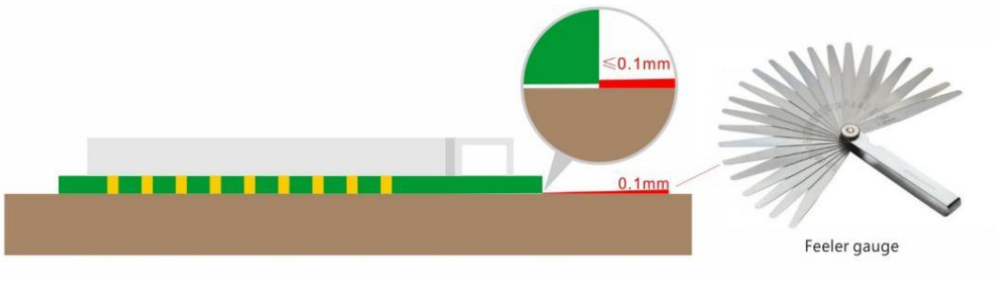
5.1 Module Outline Drawing



Top View Side View Bottom View

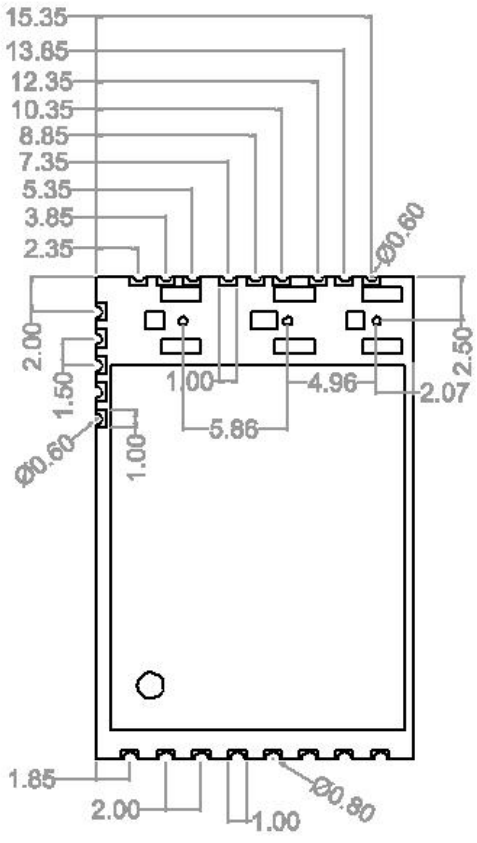
Module dimension: 27.0mm*17.7mm*3.0mm （L*W*H；Tolerance: ±0.15mm）

IPEX / MHF-1 connector dimension: 2.6*3.0*1.2mm (L*W*H, Ø2.0mm)

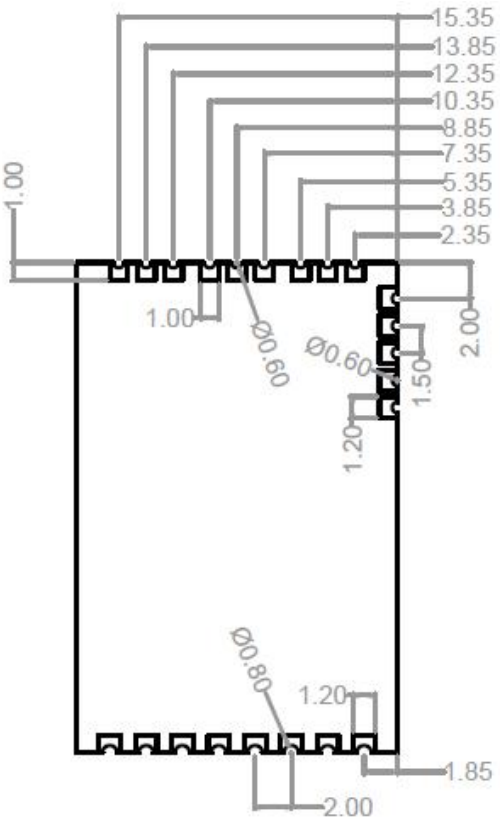


Module Bow and Twist：≤0.1mm

5.2 Mechanical Dimensions



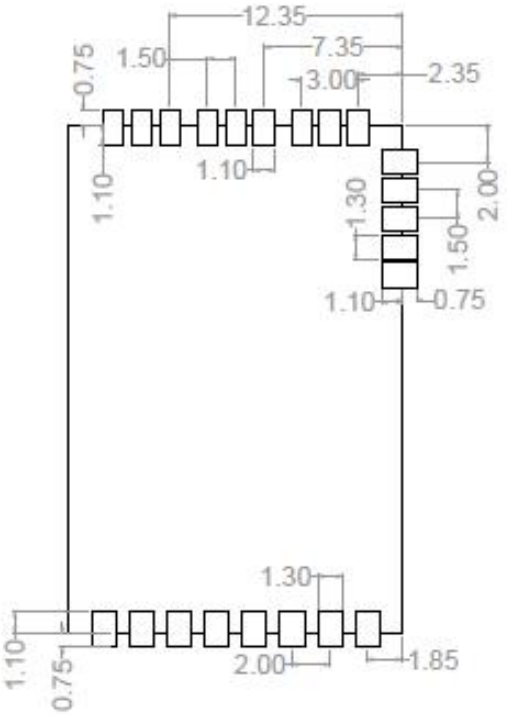
Top View



Bottom View

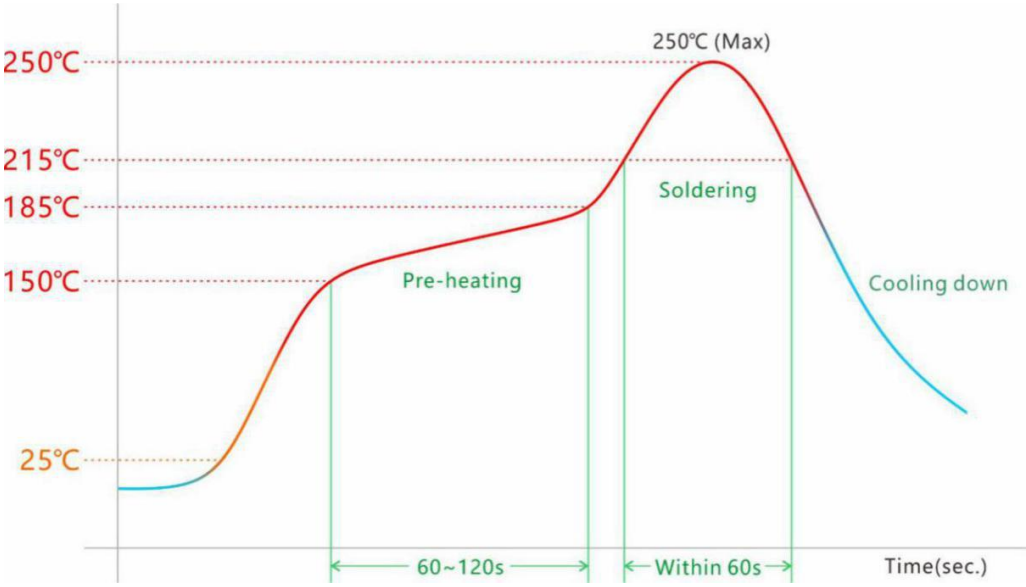
6. Application Information

6.1 Recommend PCB Layout Footprint



Bottom View

6.2 Reflow Soldering Standard Conditions



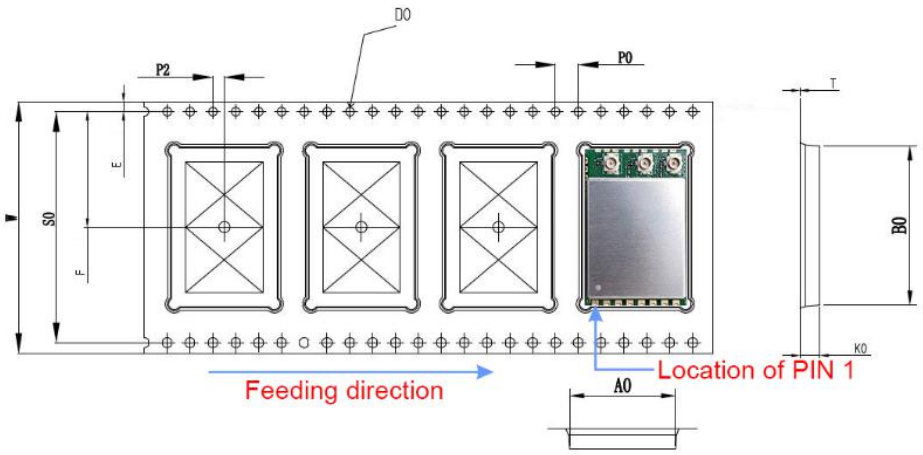
Please use the reflow within 2 times.
Set up the highest temperature within 250℃.

7. Key Components Of Module

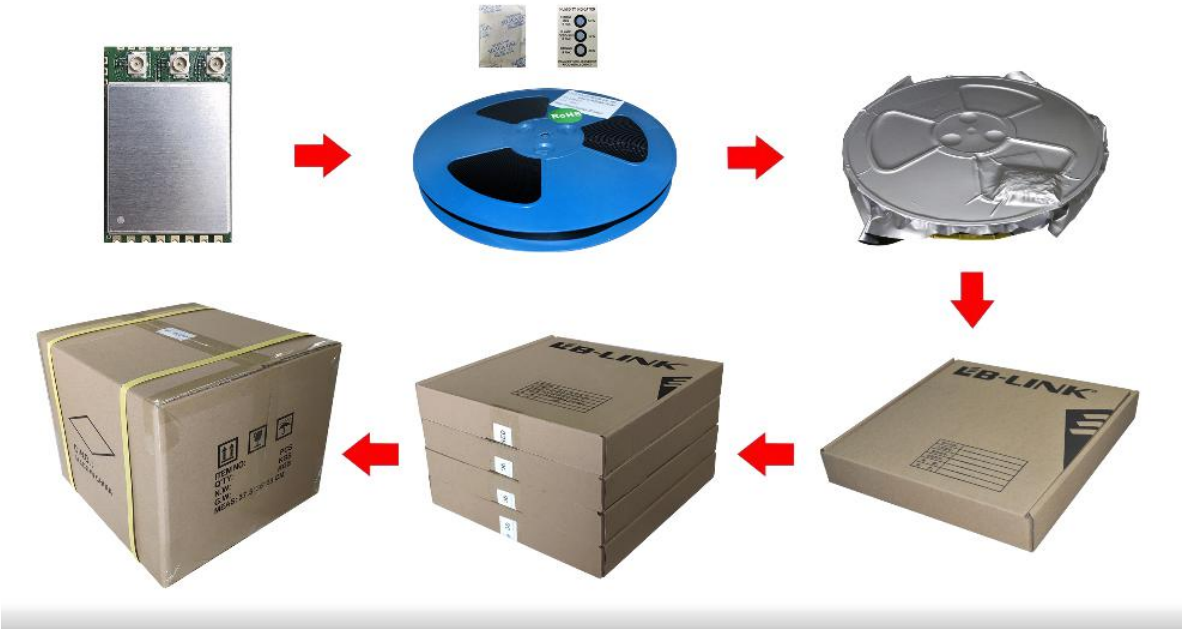
No.	Parts	Specification	Manufacturer	Note
1	Chipset	MT7663BUN	MediaTek Inc.	
2	PCB	BL-M7663BU2 V1.0	Shenzhen Tie Fa Technology CO. LTD	
			Guangdong KINGSHINE ELECTRONICS CO., LTD	
			Quzhou Sunlord Electronics CO., LTD	
3	Crystal	40MHz-12pF-10ppm-3225	Lucki Electronics Co., Ltd	
			Shenzhen Kaiyuexiang Electronics Co., Ltd	
			Chengde Oscillator Electronic Technology Co., Ltd.	
4	Diplexer	DP1608-A2455DTB2	Advanced Ceramic X Corp.	
		RFDIP160806ELM6T63	Walsin Technology CORP.	

8. Package and Storage Information

8.1 Package Dimensions



ITEM	W	A0	B0	K0	E	F	P	P0	P2	D0	T
DIM	44.00+0.3	18.10±0.1	27.40±0.1	3.50±0.1	1.75±0.1	20.2±0.1	24.00±0.1	4.00±0.1	2.00±0.1	Ø1.5±0.1	0.30±0.05



Package specification:

1. 1000 modules per roll and 5,000 modules per box.
2. Outer box size: 37.5*36*29cm.
3. The diameter of the blue environment-friendly rubber plate is 13 inches,
   with a total thickness of 48mm (with a width of 44mm carrying belt).
4. Put 1 package of dry agent (20g) and humidity card in each anti-static vacuum bag.

8.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40℃ to +85℃,
Storage humidity: 10% to 95 (Non-Condensing)

Recommended Storage Conditions:

Storage temperature: 5℃ to +40℃,
Storage humidity: 20% to 90% RH

Please use this Module within 12month after vacuum-packaged.

The Module shall be stored without opening the packing.
After the packing opened, the Module shall be used within 72hours.
When the color of the humidity indicator in the packing changed,
The Module shall be baked before soldering.
Baking condition: 60℃, 24hours, 1time.

ESD Sensitivity：

The Module is a static-sensitive electronic device.
Do not operate or store near strong electrostatic fields.
Take proper ESD precautions!

ESD CAUTION

FCC Statement

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

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursua nt to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful inte rference in a residential installation. This equipment generates uses and can radiate radio frequency energy a nd, if not installed and used in accordance with the instructions, may cause harmful interference to radio com munications. 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 turn ing 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 important announcement

Important Note:

Radiation Exposure Statement

This equipment complies with FCC 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.

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

Country Code selection feature to be disabled for products marketed to the US/Canada.

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

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing 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.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID 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 FCC ID: **2AVED-BLM7663BU2**"

Manual Information to the End User

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.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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

2.7 Antennas

This radio transmitter **FCCID: 2AVED-BLM7663BU2**has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Model	Type	Connector	Peak gain (dBi)				
			2400-2483.5 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz
2400-2483.5 MHz	External Antenna	/	2.00dBi	/	/	/	/
5000-6000 MHz	External Antenna	/	/	2.00dBi	/	/	2.00dBi

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AVED-BLM7663BU2".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.