

## **BL-M8822CU3**

**802.11a/b/g/n/ac 867Mbps WLAN +  
Bluetooth v5.0 Combo USB2.0 Module  
Specification**

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(Top View)



(Bottom View)

Module Name: BL-M8822CU3	
Module Type: 802.11a/b/g/n/ac 867Mbps WLAN + Bluetooth v5.0 Combo USB2.0 Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
LB-link Approval:	
Title:	
Signature:	Date:

## Revision History

Revision	Summary	Release Date
0.1	Initial release	2022-11-04
1.0	Official release	2022-12-05

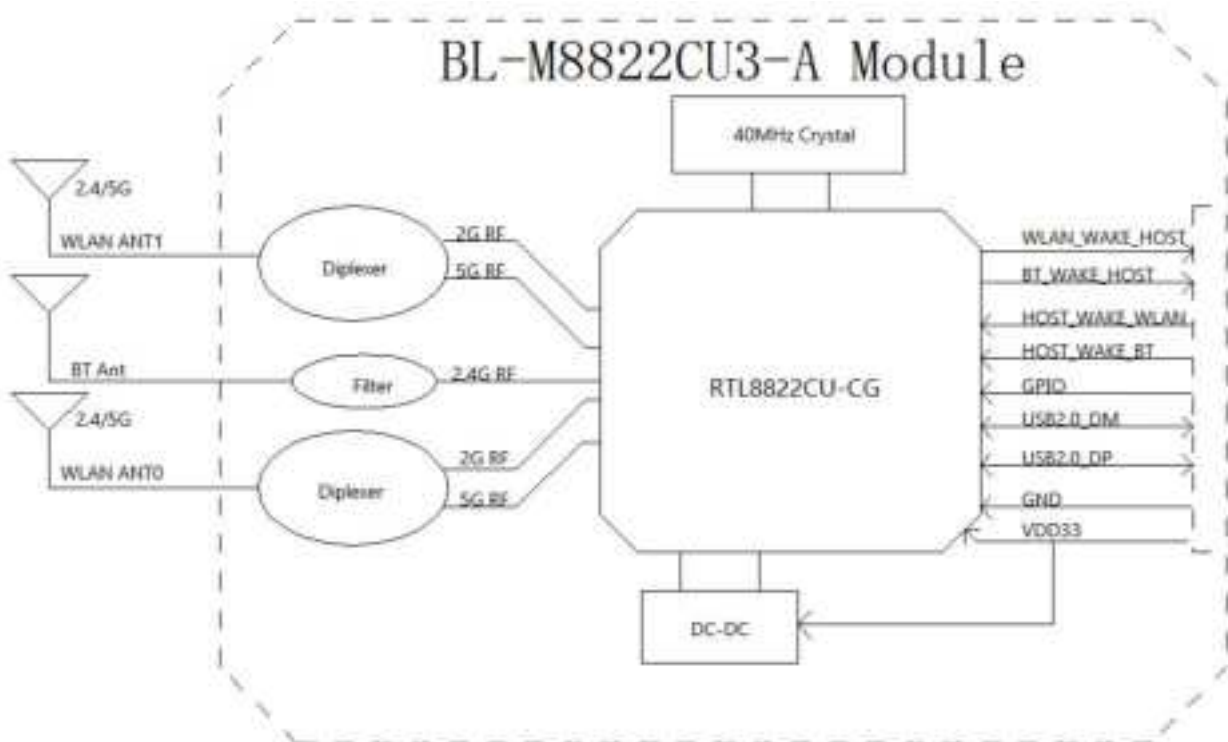
## 1. Introduction

BL-M8822CU3 is a highly integrated Dual-band WLAN + Bluetooth v5.0 Combo module. It combines a 2T2R Dual-band WLAN subsystem and a Bluetooth v5.0 subsystem. This module compatible with IEEE 802.11a/b/g/n/ac standard and provides the maximum PHY rate up to 867Mbps, it supports BT / BLE dual mode with BT v5.0/v4.2/v2.1 compliant, offering feature-rich wireless connectivity at high standards, and delivering reliable, cost-effective throughput from an extended distance.

### 1.1 Features

- Operating Frequency: 2.4~2.4835GHz or 5.15~5.85GHz
- Support Dual-band 2T2R mode with 20/40/80Mhz bandwidth
- Wireless PHY rate can reach up to 867Mbps
- Support BT Classic / BT Low Energy dual mode
- Support Bluetooth v5.0 system
- Connect to external antennas through IPEX

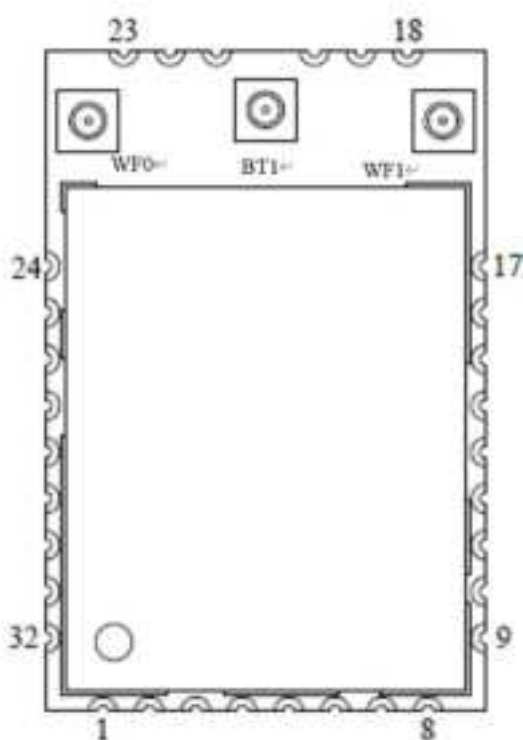
### 1.2 Block Diagram



## 1.3 General Specifications

Module Name	BL-M8822CU3
Chipset	RTL8822CU-CG
WLAN Standards	IEEE802.11a/b/g/n/ac
Bluetooth Standards	Bluetooth Core Specification v5.0/v4.2/v2.1
Host Interface	USB2.0 interface for WLAN & Bluetooth
Antenna	Connect to external antennas through IPEX connectors
Dimension	SMD 32Pins, 27*18*2.2mm (L*W*H), Tolerance: +/-0.15mm
Power Supply	DC 3.3V±0.2V@ 1200 mA( Max)
Operation Temperature	-20°C to +70°C
Operation Humidity	10% to 95% RH (Non-Condensing)

## 2. Pin Assignments



(Top View)

## 2.1 Pin Definition

No	Pin Name	Type	Level	Description
1	NC	/		NC
2	NC	/		NC
3	NC	/		NC
4	NC	/		NC
5	GND	P		Ground connections
6	USB2.0_DP	A I/O		USB Transmitter/Receiver Differential Pair
7	USB2.0_DM	A I/O		USB Transmitter/Receiver Differential Pair
8	GND	P		Ground connections
9	NC	/		NC
10	SUS_CLK	I	VDD33	External 32K or RTC clock input
11	GND	RF		RF Ground
12	BT RF	RF		NC (RF pad Reserved for BT_ANT)
13	GND	RF		RF Ground
14	BT_WAKE_HOST	O	VDD33	Shared with GPIO14. This pin is shared with BT function to wake up the host when the remote wake function is enabled. The polarity can be defined by the customer.
15	HOST_WAKE_BT	I	VDD33	Shared with GPIO13. The host wakes up the BT controller in Remote Wake up Mode.
16	EESK	O	VDD33	Reserved for BT log
17	GPIO4	I/O	VDD33	A、General Purpose Input/ Output Pin4; B、Power-On Trap: 0: Normal operation mode ( Internal pull low ) 1: Test/debug mode ( Can't work properly, do not pull high during power on! )
18	GND	RF		RF Ground
19	WLAN ANT1	RF		NC (Reserved RF pad for WLAN_ANT1)
20	GND	RF		RF Ground
21	GND	RF		RF Ground
22	WLAN ANT0	RF		NC (Reserved RF pad for WLAN_ANT0)
23	GND	RF		RF Ground

24	GND	P		Ground connections
25	GND	P		Ground connections
26	WLAN WAKE HOST	O	VDD33	Shared with GPIO6. This pin is shared with WLAN function to wake up the host when the remote wake function is enabled. The polarity can be defined by the customer.
27	HOST WAKE WLAN	I	VDD33	Shared with GPIO7. The host wakes up the WLAN controller in Remote Wake up Mode.
28	GPIO5	I/O	VDD33	General Purpose Input/ Output Pin.
29	GND	P		Ground connections
30	VDD33	P		3.3V main power supply.
31	NC	/		NC
32	GND	P		Ground connections
	WF0	RF		IPEX connector for 2.4G / 5G WLAN_ANT0
	WF1	RF		IPEX connector for 2.4G / 5G WLAN_ANT1
	BT1	RF		IPEX connector for BT_ANT

P: Power, I: Input, O: Output, I/O: In/Output, A I/O: Analog In/Output ,RF: Analog RF Port

## 3. Electrical and Thermal Specifications

### 3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	°C
External Antenna VSWR			1.7	2.0	/
Supply Voltage	VDD33	3.1	3.3	3.5	V

### 3.2 Digital I/O DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	2.0	3.3	3.6	V
VIL	Input Low Voltage	--	0	0.9	V
VOH	Output High Voltage	2.97	--	3.3	V
VOL	Output Low Voltage	0	--	0.33	V

### 3.3 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C ;			
Use Case	VDD33 Current		
	Typ(I <sub>RMS</sub> )	Max(I <sub>peak</sub> )	Units
WLAN Unassociated (Linux Driver)	189	236	mA
2.4G WLAN TCP throughput TX 200Mbps (Linux Drive, BT disable)	379	540	mA
5G WLAN TCP throughput TX 260Mbps (Linux Drive, BT disable)	424	700	mA
2.4G 11b@1Mbps TX @18dBm (1TX RF test)	400	420	mA
2.4G 11b@11Mbps TX @18dBm (1TX RF test)	402	460	mA
2.4G 11n@HT20_MCS8 TX@18dBm (2TX RF test)	529	820	mA
2.4G 11n@HT20_MCS8 RX (2RX RF test)	226	231	mA
2.4G 11n@HT40_MCS15 TX@16dBm (2TX RF test)	390	1080	mA
2.4G 11n@HT40_MCS15 RX (2RX RF test)	212	260	mA
5G 11a@6Mbps TX @18dBm (1TX RF test)	417	520	mA
5G 11a@6Mbps RX (1RX RF test)	208	240	mA
5G 11ac@VHT20_MCS8 TX@17dBm (2TX RF test)	650	1000	mA
5G 11ac@VHT20_MCS8 RX (2RX RF test)	212	260	mA
5G 11ac@VHT80_MCS9 TX@14dBm (2TX RF test)	250	400	mA
5G 11ac@VHT80_MCS9 RX (2RX RF test)	211	230	mA

## 4. WLAN & Bluetooth RF Specification

### 4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11b/g/n
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: 64QAM, 16QAM, QPSK, BPSK 802.11n OFDM: 64QAM, 16QAM, QPSK, BPSK

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_SISO) 13.5~150Mbps ; 802.11n (HT40) : MCS8~MCS15(2T2R_MIMO) 27~300Mbps ;		
Frequency Tolerance	≤ ±20ppm		
2.4G Receiver Specifications (WLAN_ANT0&WLAN_ANT1)			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11b@1Mbps	-95dBm	-10dBm	< 8%
802.11b@11Mbps	-86dBm	-10dBm	< 8%
802.11g@6Mbps	-92dBm	-10dBm	< 10%
802.11g@54Mbps	-74dBm	-10dBm	< 10%
802.11n@HT20_MCS0	-91dBm	-10dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-10dBm	< 10%
802.11n@HT40_MCS0	-88dBm	-10dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-10dBm	< 10%



## 4.2 5G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac
Frequency Range	5.15~5.25GHz ; 5.25~5.35GHz ; 5.47~5.73GHz ; 5.735~5.835GHz (5GHz ISM Band)
Channels	Ch36 , Ch40 , Ch44 , Ch48 ; Ch52~Ch64 ; Ch100~Ch140 ; Ch149~Ch165 (For 20MHz Channels)
Modulation	802.11a (OFDM) : BPSK , QPSK , 16QAM , 64QAM ; 802.11n (OFDM) : BPSK , QPSK , 16QAM , 64QAM ; 802.11ac (OFDM) : BPSK , QPSK , 16QAM , 64QAM , 256QAM ;
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_SISO) 13.5~150Mbps ; 802.11n (HT40) : MCS8~MCS15(2T2R_MIMO) 27~300Mbps ; 802.11ac (VHT20) : MCS0~MCS8(1T1R_SISO) 6.5~86.7Mbps ; 802.11ac (VHT20) : MCS0~MCS8(2T2R_MIMO) 13~173.3Mbps ; 802.11ac (VHT40) : MCS0~MCS9(1T1R_SISO)13.5~200Mbps ; 802.11ac (VHT40) : MCS0~MCS9(2T2R_MIMO)27~400Mbps ; 802.11ac (VHT80) : MCS0~MCS9(1T1R_SISO)29.3~433.3Mbps ; 802.11ac (VHT80) : MCS0~MCS9(2T2R_MIMO)58.5~866.7Mbps ;
Frequency Tolerance	$\leq \pm 20\text{ppm}$

5G Receiver Specifications (WLAN_ANT0&WLAN_ANT1)			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11a@6Mbps	-89dBm	-10dBm	< 10%
802.11a@54Mbps	-74dBm	-10dBm	< 10%
802.11n@HT20_MCS0	-88dBm	-10dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-10dBm	< 10%
802.11n@HT40_MCS0	-86dBm	-10dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-10dBm	< 10%
802.11ac@VHT20_MCS8	-66dBm	-10dBm	< 10%
802.11ac@VHT40_MCS9	-65dBm	-10dBm	< 10%
802.11ac@VHT80_MCS0	-83dBm	-10dBm	< 10%
802.11ac@VHT80_MCS9	-58dBm	-10dBm	< 10%

### 4.3 Bluetooth RF Specification

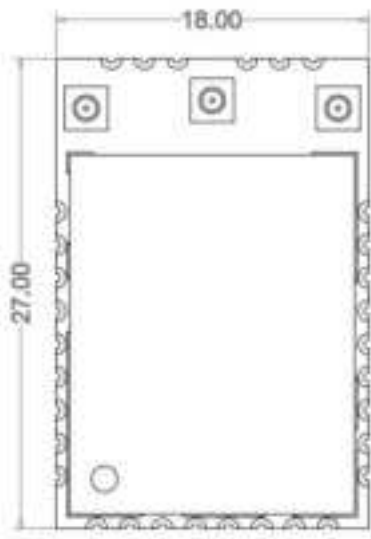
Conditions: VDD33=3.3V; Ta:25°C	
Features	Description
Bluetooth Specification	Bluetooth Core Specification v5.0/4.2/2.1
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);
Power Classes	Bluetooth Classic BR/EDR: Class1; Bluetooth Low Energy: Class1.5;

Date Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: $\pi/4$ -DQPSK; EDR_3Mbps: 8DPSK; LE_1Mbps: GFSK (Uncoded);		
Items	Min	Typ	Max
<b>BR_1M (DH1) Modulation Characteristics</b>			
$\Delta f_{1avg}$	140KHz	170.5kHz	175KHz
$\Delta f_{2avg}$	115KHz	141.5kHz	175KHz
$\Delta f_{2max}$	115KHz	164.1kHz	/
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.829	/
<b>BR_1M (DH1) Initial Carrier Frequency Tolerance</b>			
Init Freq Error	-75kHz	6.5kHz	+75kHz
<b>EDR_3M(3DH5) EDR Carrier Frequency Stability and Modulation Accuracy</b>			
$\omega_i$	-75KHz	4.94KHz	+75KHz
$\omega_i + \omega_o$	-75KHz	6.41KHz	+75KHz
$\omega_o$	-10KHz	1.51KHz	+10KHz
8DPSK RMS DEVM	/	0.166	0.13
8DPSK DEVM	/	0.262	0.25
<b>LE_1M Modulation Characteristics</b>			
$\Delta f_{1avg}$	225KHz	249.95KHz	275KHz
$\Delta f_{2avg}$	225KHz	227.64KHz	275KHz
$\Delta f_{2max}$	185KHz	201.26KHz	/

Δf2avg/Δf1avg	0.8	0.91	/	
Bluetooth Receiver Specifications (BT_ANT)				
Items	Sensitivity		Maximum Input Level	
	Input Level(Typ)	BER	Input Level(Typ)	BER
BR_1M(1DH1)	-92dBm	≤0.1%	-5dBm	≤0.1%
EDR_2M(2DH1)	-90dBm	≤0.01%	-5dBm	≤0.1%
EDR_3M(3DH5)	-80dBm	≤0.01%	-5dBm	≤0.1%
	Input Level (Typ)	PER	Input Level (Typ)	PER
LE_1M	-92dBm	≤5%	-5dBm	≤5%

## 5. Mechanical Specifications

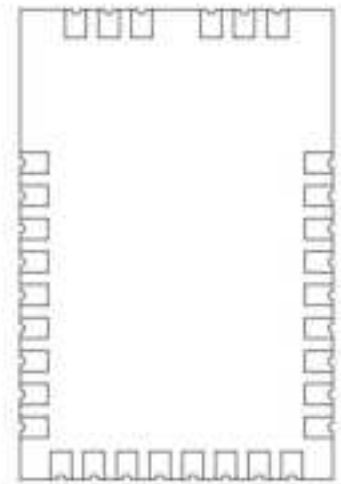
### 5.1 Module Outline Drawing



(Top View)



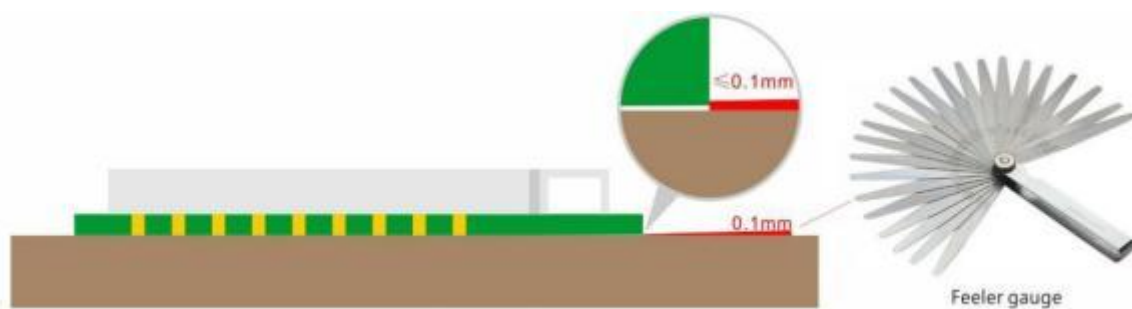
(Side View)



(Bottom View)

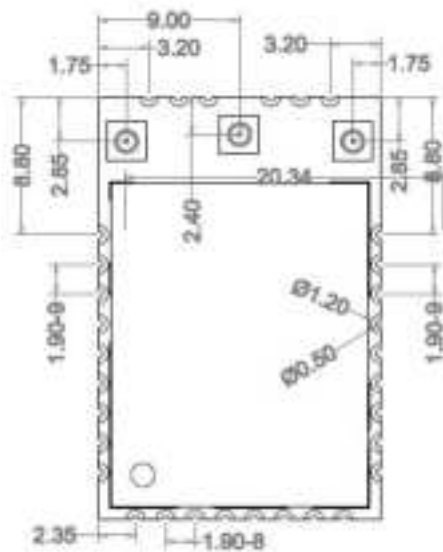
Module dimension: 27mm\*18mm\*2.2mm (L\*W\*H; Tolerance:  $\pm 0.15\text{mm}$ )

IPEX / MHF-1 connector dimension: 3.0\*2.6\*1.2mm (L\*W\*H,  $\varnothing 2.0\text{mm}$ )

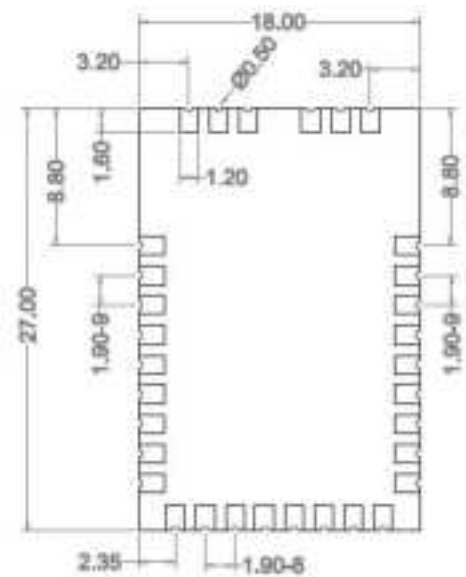


Module Bow and Twist:  $\leq 0.1\text{mm}$

## 5.2 Mechanical Dimensions



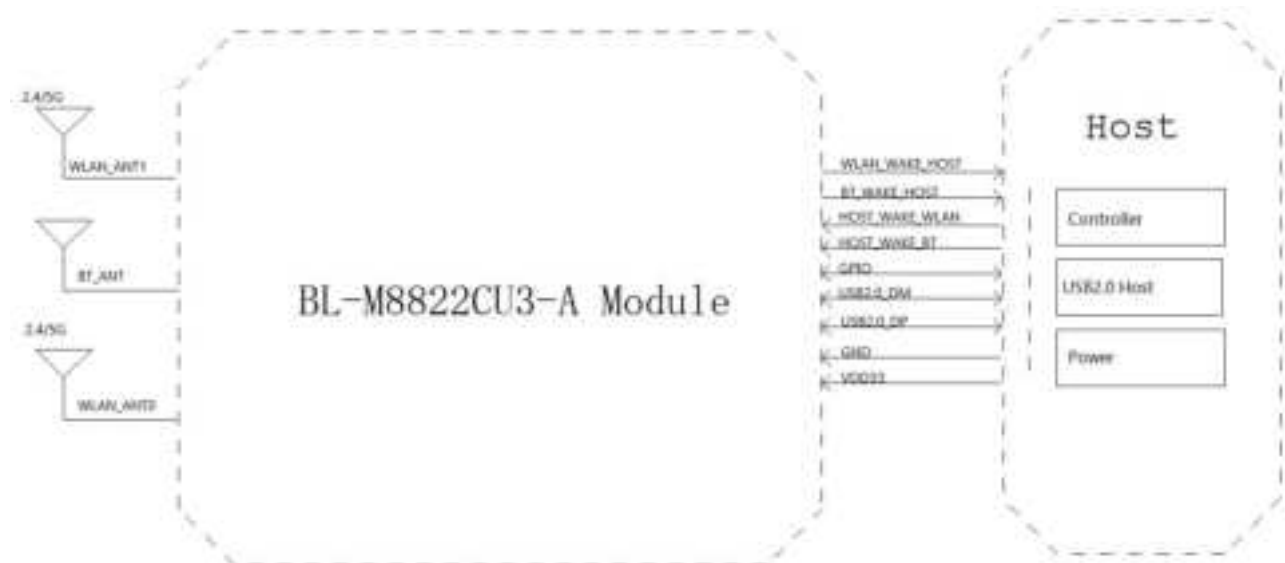
(Top View)



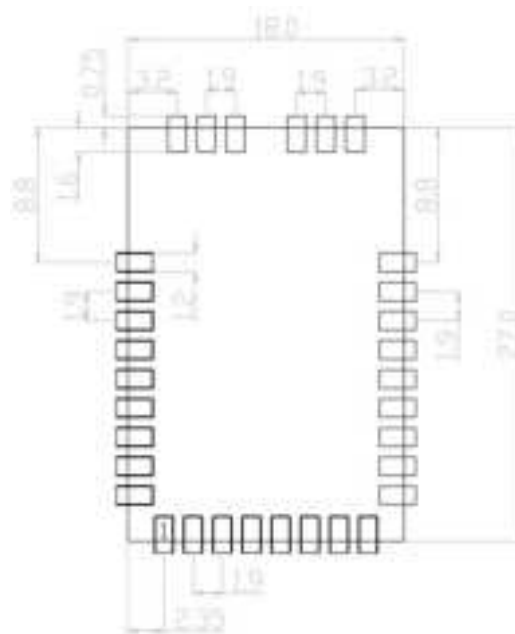
(Bottom View)

## 6. Application Information

### 6.1 Typical Application Circuit

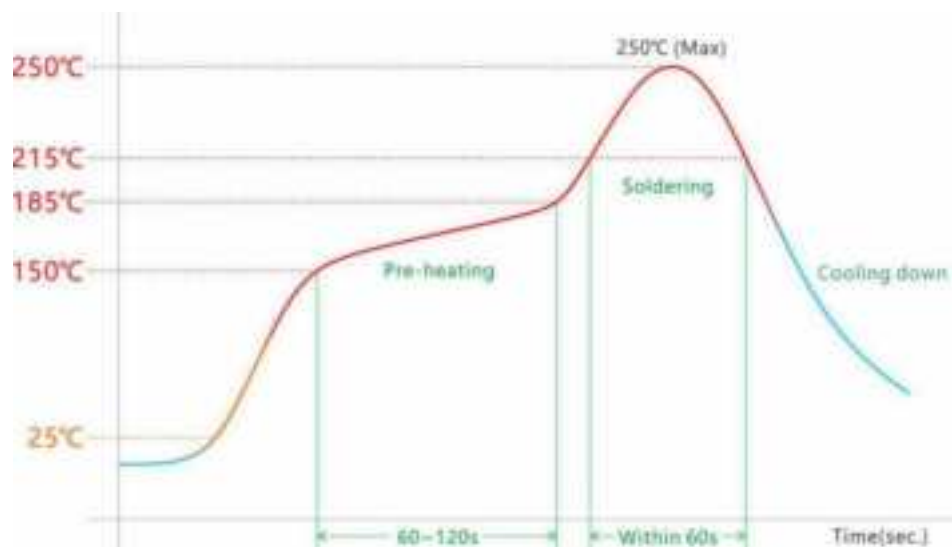


## 6.2 Recommend PCB Layout Footprint



Top View

## 6.4 Reflow Soldering Standard Conditions



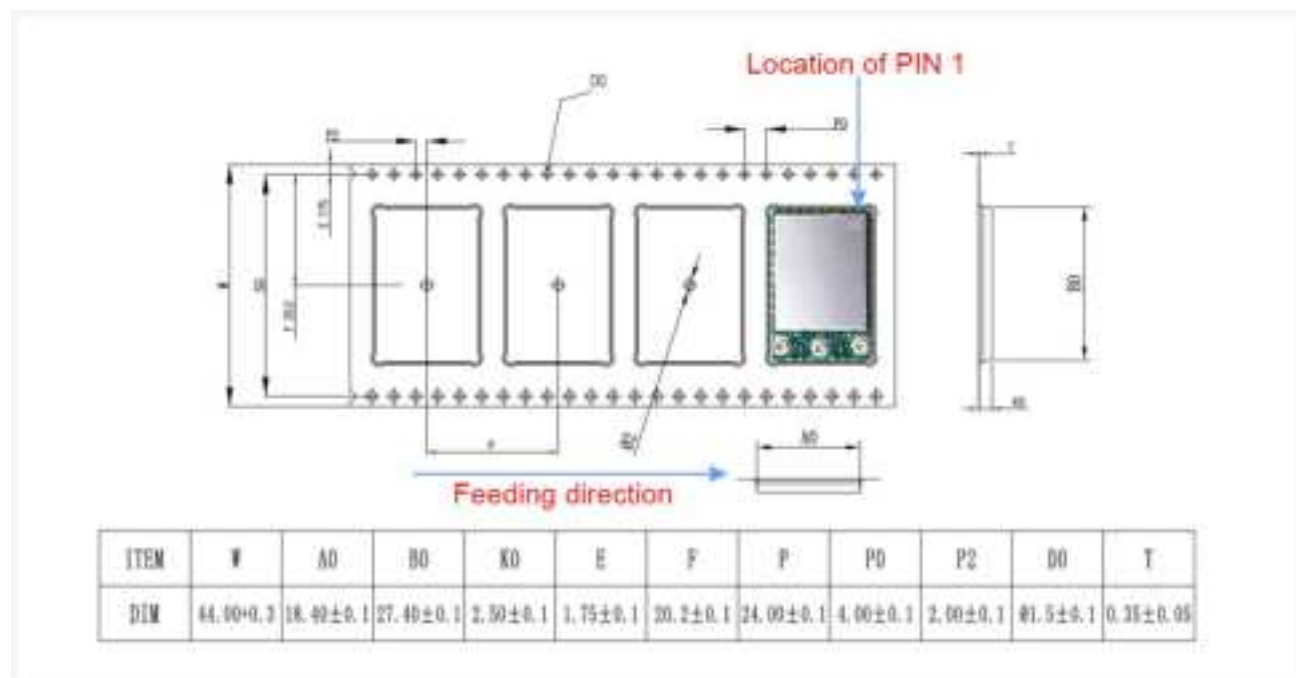
Please use the reflow within 2 times.  
Set up the highest temperature within 250°C.

## 7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8822CU-CG	Realtek	
2	PCB	BL-M8822CU3-A	Shen Zhen Tie Fa Technology limited	
			Million Source Printed Circuit Board Co., Ltd	
			Quzhou Sunlord Electronics Co., Ltd	
3	Crystal	40MHz-3225	ZheJiang East Crystal Electronic Co.,Ltd.	
			Lucki Electronics Co., Ltd	
			Chengde Oscillator Electronic Technology Co., Ltd.	
4	Diplexer	DP1608	HEK	
			Advanced Ceramic X	

## 8. Package and Storage Information

### 8.1 Package Dimensions







Package specification:

1. 1,000 modules per roll and 4,000 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.
5. Each carton is packed with 4 boxes.

## 8.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40°C to +85°C

Storage humidity: 10% to 95% RH (Non-Condensing)

Recommended Storage Conditions:

Storage temperature: 5°C to +40°C

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°C, 24hours, 1time.

ESD Sensitivity:

ESD Protection: 2KV(HBM ,Maximum rating)

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) this device may not cause harmful interference, and (2) this device must accept any interference received, including 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, 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 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: **2AL6KBL-M8822CU3**"

**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: 2AL6KBL-M8822CU3** 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	/	/	/	/
2400-2483.5 MHz 5000-6000 MHz	External Antenna	/	2.00dBi	2.00dBi	2.00dBi	2.00dBi	2.00dBi
2400-2483.5 MHz 5000-6000 MHz	External Antenna	/	2.00dBi	2.00dBi	2.00dBi	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:2AL6KBL-M8822CU3".

### 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.