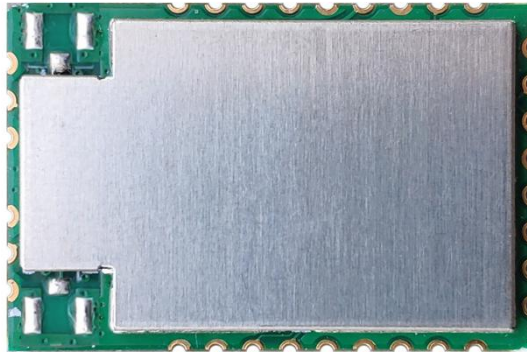




BL-M8822CU3

Module Specification



Module Name: BL-M8822CU3	
Module Type: 802.11a/b/g/n/ac 2T2R WiFi 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	2020-06-19
1.0	Final release	2020-07-29

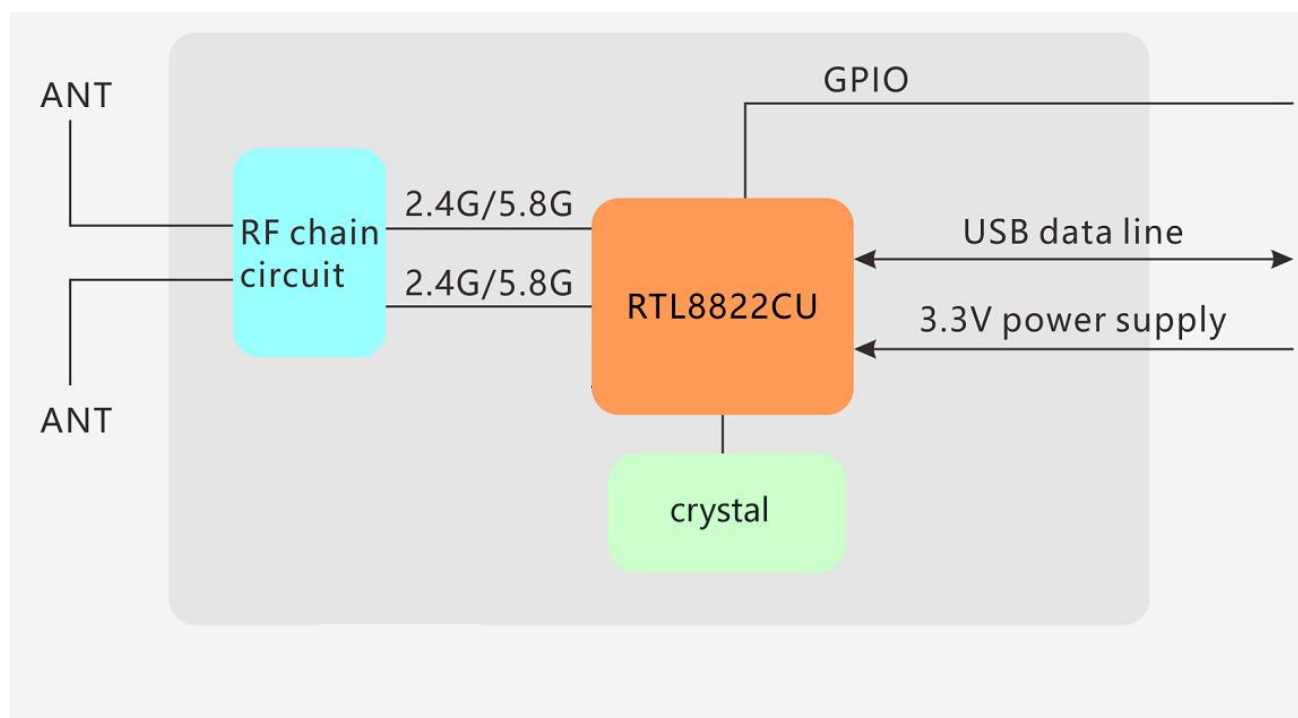
1. Introduction

BL-M8822CU3 is a highly integrated module that was built in a 2*2 dual-band wireless LAN radio. It combines a WLAN MAC, a 2T2R capable WLAN base band, and RF in a single chip. It supports IEEE 802.11a/b/g/n/ac standard and provides the highest PHY rate up to 867Mbps, offering feature-rich wireless connectivity and reliable throughput from an extended distance.

1.1 Features

- Operating Frequencies: 2.412~2.462GHz and 5.15~5.25GHz, 5.725~5.85GHz
- Host Interface is USB 2.0
- IEEE Standards: IEEE 802.11a/b/g/n/ac
- Wireless data rate can reach up to 867Mbps
- Connect to external antenna through Half hole pads
- Power Supply: VDD33 3.3V±0.2V main power supply

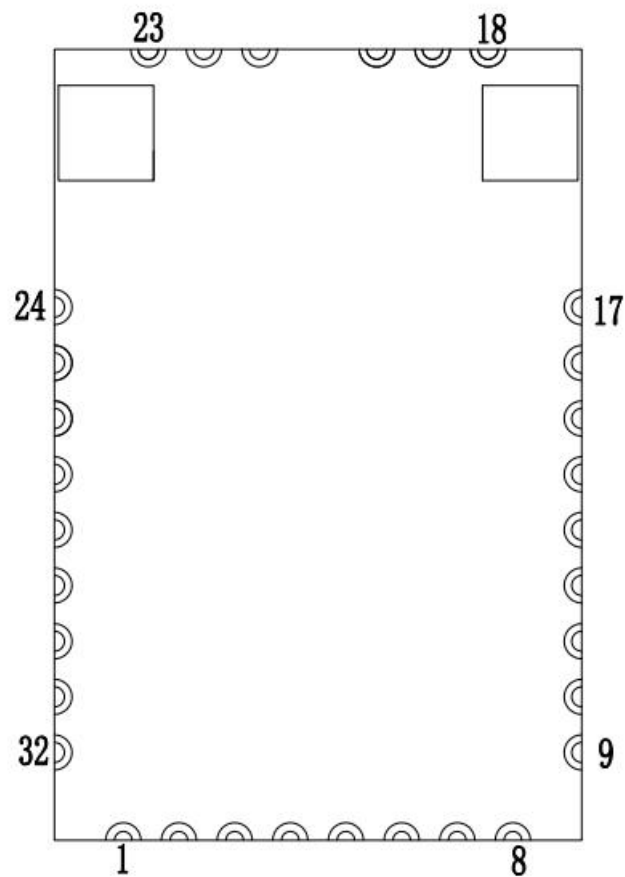
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8822CU3
Chipset	RTL8822CU-CG
WiFi Standards	IEEE802.11a/b/g/n/ac, 2T2R MIMO, 2.4G/5GHz, 866.7Mbps (Max)
Host Interface	USB2.0 for WiFi
Antenna	Connect to external antenna through Half hole pads
Dimension	SMD 32Pins, 27*18*2.0mm (L*W*H), Tolerance: +/-0.15mm
Power Supply	DC 3.3V±0.2V@ 950 mA Max
ESD	±2KV (Contact discharge)
Operation Temperature	-20°C to +70°C
Operation Humidity	10% to 95% RH (Non-Condensing)
Storage Temperature	-45°C to +85°C
Storage Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



2.1 Pin Definition

No	Pin Name	Type	Description	Supply
1	NC	/	NC	
2	NC	/	NC	
3	NC	/	NC	
4	NC	/	NC	
5	GND	p	Ground	
6	USB_DP	I/O	USB data+ (USB2.0)	
7	USB_DM	I/O	USB data- (USB2.0)	
8	GND	p	Ground	
9	NC	/	NC	

10	SUS_CLK	I	External 32K or RIC clock input	
11	GND	-	Ground	
12	RF	I/O	RF port	
13	GND	/	Ground	
14	WAKE_HOST	O	wake up HOST	
15	HOST_WAKE	I	Host wakes up	
16	EESK	I	WLAN efuse autoload	
17	GPIO4	I/O	General Purpose Input/ Output Pin	
18	GND	p	Ground	
19	WL-RF1	RF	WLAN RF1 port2.4G/5.8G	
20	GND	p	Ground	
21	GND	p	Ground	
22	WL-RF0	RF	WLAN RF0 port2.4G/5.8G	
23	GND	p	Ground	
24	GND	p	Ground	
25	GND	p	Ground	
26	WL-WAKE-HOST	O	WL functions to wake up the host when the remote wake function is enabled	
27	HOST-WAKE-WL	I	Host wakes up the WLAN controller in Remote Wakeup Mode	
28	GPIO5	I	General Purpose Input/ Output Pin	
29	GND	p	Ground	
30	VDD33	I	3.3V Voltage input	
31	NC	/	NC	
32	GND	p	Ground	

P: Power, I: Input, O: Output, I/O: 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 Voltage Standing Wave Ratio		1	1.7	1.9	1
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

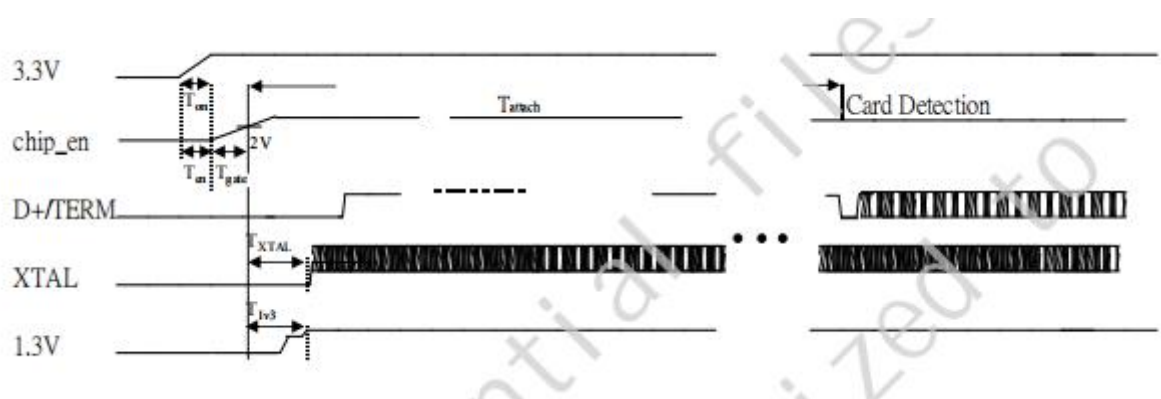
Conditions : VDD33=3.3V ; Ta:25°C			
Use Case	VBAT Current (average)		
	Typ	Max	Units
WiFi Unassociated (Linux Driver) 2g	278	890	mA
WiFi Unassociated (Linux Driver) 5g	322	940	mA
2.4G 1Mbps TX (RF-Test) 17	466	550	mA
2.4G 1Mbps RX (RF-Test)	218	256	mA
2.4G 11Mbps TX (RF-Test) 17	366	530	mA
2.4G 11Mbps RX (RF-Test)	225	272	mA
2.4G 6Mbps TX (RF-Test)16	383	570	mA
2.4G 6Mbps RX (RF-Test)	225	274	mA
2.4G 54Mbps TX (RF-Test)14	264	480	mA
2.4G 54Mbps RX (RF-Test)	230	272	mA
2.4G MCS0(HT20) TX (RF-Test)16	389	570	mA
2.4G MCS0(HT20) RX (RF-Test)	225	268	mA
2.4G MCS7(HT20) TX (RF-Test)14	262	490	mA
2.4G MCS7(HT20) RX (RF-Test)	228	272	mA
2.4G MCS8(HT20) TX (RF-Test)14	456	750	mA
2.4G MCS8(HT20) RX (RF-Test)	226	328	mA
2.4G MCS15(HT20) TX (RF-Test)14	293	748	mA
2.4G MCS15(HT20) RX (RF-Test)	230	380	mA
2.4G MCS0(HT40) TX (RF-Test)16	351	544	mA

2.4G MCS0(HT40) RX (RF-Test)	226	268	mA
2.4G MCS7(HT40) TX (RF-Test)14	253	456	mA
2.4G MCS7(HT40) RX (RF-Test)	232	268	mA
2.4G MCS8(HT40) TX (RF-Test)14	399	740	mA
2.4G MCS8(HT40) RX (RF-Test)	226	268	mA
2.4G MCS15(HT40) TX (RF-Test)14	278	752	mA
2.4G MCS15(HT40) RX (RF-Test)	232	278	mA
5G 6Mbps TX (RF-Test)15	415	600	mA
5G 6Mbps RX (RF-Test)	208	240	mA
5G 54Mbps TX (RF-Test)13	266	532	mA
5G 54Mbps RX (RF-Test)	210	254	mA
5G MCS0(HT20) TX (RF-Test)14	428	636	mA
5G MCS0(HT20) RX (RF-Test)	210	248	mA
5G MCS7(HT20) TX (RF-Test)12	268	526	mA
5G MCS7(HT20) RX (RF-Test)	206	272	mA
5G MCS8(HT20) TX (RF-Test)12	486	796	mA
5G MCS8(HT20) RX (RF-Test)	212	266	mA
5G MCS15(HT20) TX (RF-Test)12	296	836	mA
5G MCS15(HT20) RX (RF-Test)	210	268	mA
5G MCS0(HT40) TX (RF-Test)14	359	556	mA
5G MCS0(HT40) RX (RF-Test)	224	448	mA
5G MCS7(HT40) TX (RF-Test)12	248	524	mA
5G MCS7(HT40) RX (RF-Test)	226	468	mA
5G MCS8(HT40) TX (RF-Test)12	417	824	mA
5G MCS8(HT40) RX (RF-Test)	226	432	mA
5G MCS15(HT40) TX (RF-Test)12	276	836	mA
5G MCS15(HT40) RX (RF-Test)	232	428	mA
5G MCS0(VHT20) TX (RF-Test)14	398	580	mA
5G MCS0(VHT20) RX (RF-Test)	210	368	mA
5G MCS8(VHT20) TX (RF-Test)12	257	540	mA
5G MCS8(VHT20) RX (RF-Test)	212	436	mA
5G MCS0(VHT40) TX (RF-Test)14	367	562	mA
5G MCS0(VHT40) RX (RF-Test)	226	442	mA

5G MCS9(VHT40) TX (RF-Test)12	243	512	mA
5G MCS9(VHT40) RX (RF-Test)	230	416	mA
5G MCS0(VHT80) TX (RF-Test)13	332	584	mA
5G MCS0(VHT80) RX (RF-Test)	238	556	mA
5G MCS9(VHT80) TX (RF-Test)11	248	564	mA
5G MCS9(VHT80) RX (RF-Test)	245	556	mA

4. Interface Timing Specifications

4.1 USB Bus during power on Sequence



Typical Timing Range

	Unit	Min.	Typ.	Max.
Ton	ms	-	1.5	5
Ten	ms	0	0	5
Tgate	ms	0	1.5	8
Tattch	ms	100	250	-
Txtal	ms	-	1.5	8
T1v3	ms	-	3	11

5. WiFi RF Specifications

5.1 2.4G WiFi RF Specification

Conditions: VDD33=3.3V; Ta:25°C

Features	Description		
WLAN Standard	IEEE 802.11b/g/n CSMA/CA		
Frequency Range	2.412~2.462GHz (2.4GHz ISM Band)		
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-2.4 HT20: MCS0~MCS7, 802.11n-2.4 HT40: MCS0~MCS7		
Frequency Tolerance	≤ ±25ppm		
2.4G Transmitter Specifications			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11b@11Mbps	16dBm	±2dBm	≤-10dB
802.11g@54Mbps	14dBm	±2dBm	≤-25dB
802.11n@HT20_MCS7	11dBm	±2dBm	≤-28dB
802.11n@HT40_MCS7	10dBm	±2dBm	≤-28dB
2.4G Receiver Specifications			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11b@11Mbps	-86dBm	-10dBm	< 8%
802.11g@54Mbps	-74dBm	-20dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-20dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-20dBm	< 10%

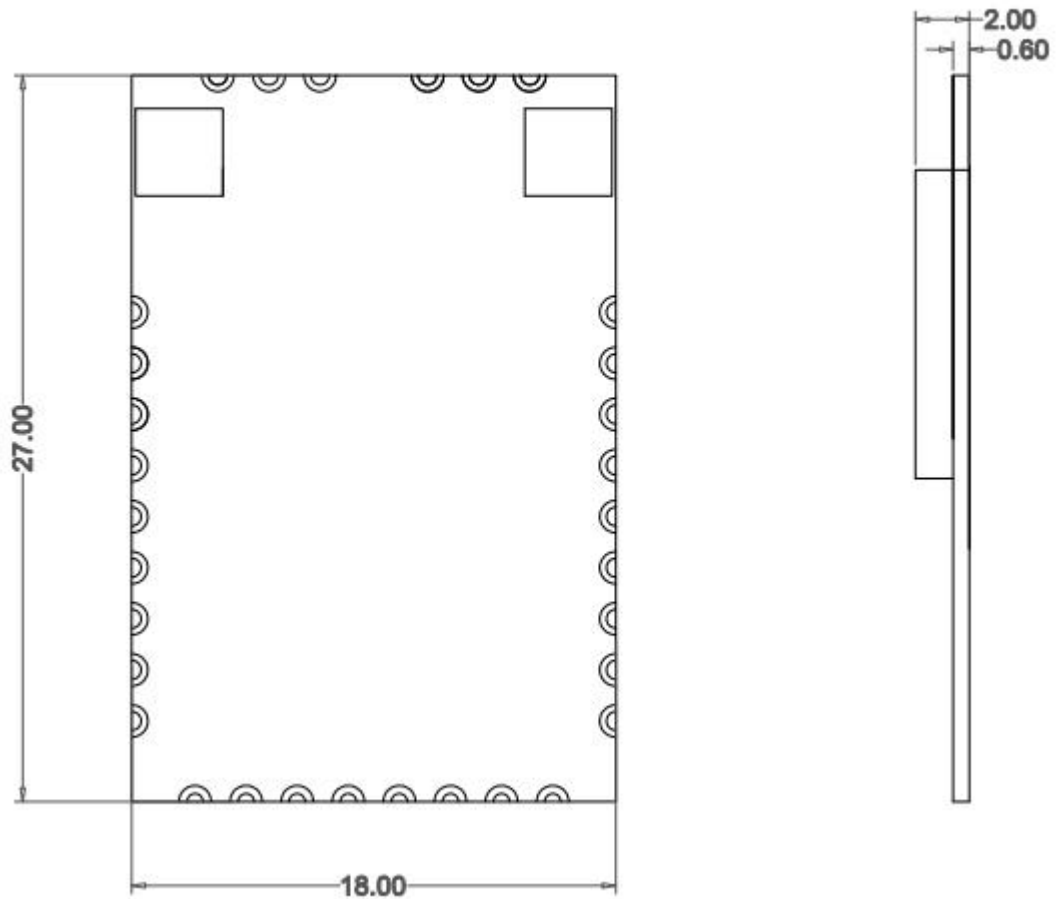
5.2 5G WiFi RF Specification

Conditions: VDD33=3.3V; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11a/n/ac CSMA/CA		
Frequency Range	5.15~5.25GHz; 5.725~5.85GHz (5GHz ISM Band)		
Channels	Ch36~Ch48; Ch149~Ch165 (For 20MHz Channels) Ch38~Ch46; Ch151~Ch159 (For 40MHz Channels) Ch42; Ch155 (For 80MHz 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	≤ ±20ppm		
5G Transmitter Specifications			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11a@6Mbps	11dBm	±2.0dBm	≤-10dB
802.11a@54Mbps	11dBm	±2.0dBm	≤-25dB
802.11n@HT20_MCS0 802.11ac@VHT20_MCS0	8dBm	±2.0dBm	≤-10dB
802.11n@HT20_MCS7 802.11ac@VHT20_MCS7	8dBm	±2.0dBm	≤-28dB

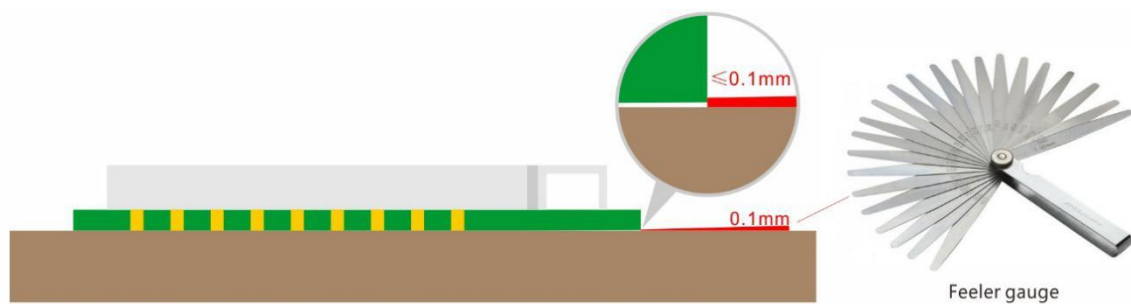
802.11n@HT40_MCS0 802.11ac@VHT40_MCS0	8dBm	±2.0dBm	≤-10dB
802.11n@HT40_MCS7 802.11ac@VHT40_MCS7	8dBm	±2.0dBm	≤-28dB
802.11ac@VHT80_MCS0	7dBm	±2.0dBm	≤-10dB
802.11ac@VHT80_MCS9	7dBm	±2.0dBm	≤-32dB
5G Receiver Specifications			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11a@6Mbps	-88dBm	-20dBm	< 10%
802.11a@54Mbps	-74dBm	-20dBm	< 10%
802.11n@HT20_MCS0	-86dBm	-20dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-20dBm	< 10%
802.11n@HT40_MCS0	-84dBm	-20dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-20dBm	< 10%
802.11ac@VHT20_MCS8	-66dBm	-20dBm	< 10%
802.11ac@VHT40_MCS9	-65dBm	-20dBm	< 10%
802.11ac@VHT80_MCS0	-70dBm	-20dBm	< 10%
802.11ac@VHT80_MCS9	-58dBm	-20dBm	< 10%

6. Mechanical Specifications

6.1 Module Outline Drawing

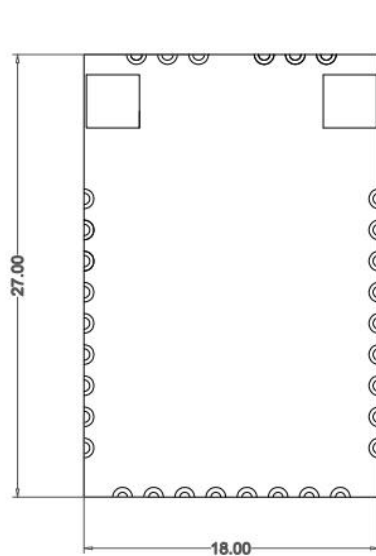


Module dimension: 27.0mm*18.0mm*2.0mm (L*W*H; Tolerance: $\pm 0.15\text{mm}$)

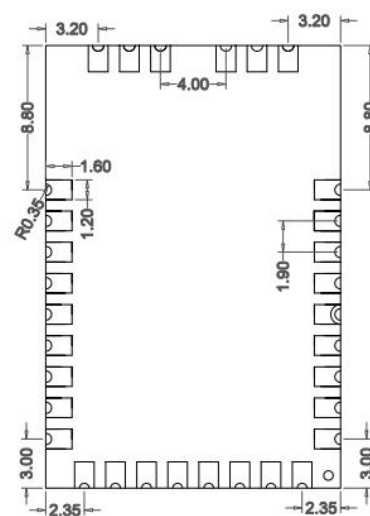
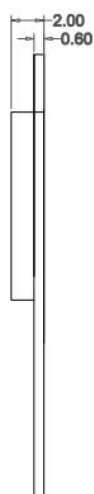


Module Bow and Twist: $\leq 0.1\text{mm}$

6.2 Mechanical Dimensions



Top View



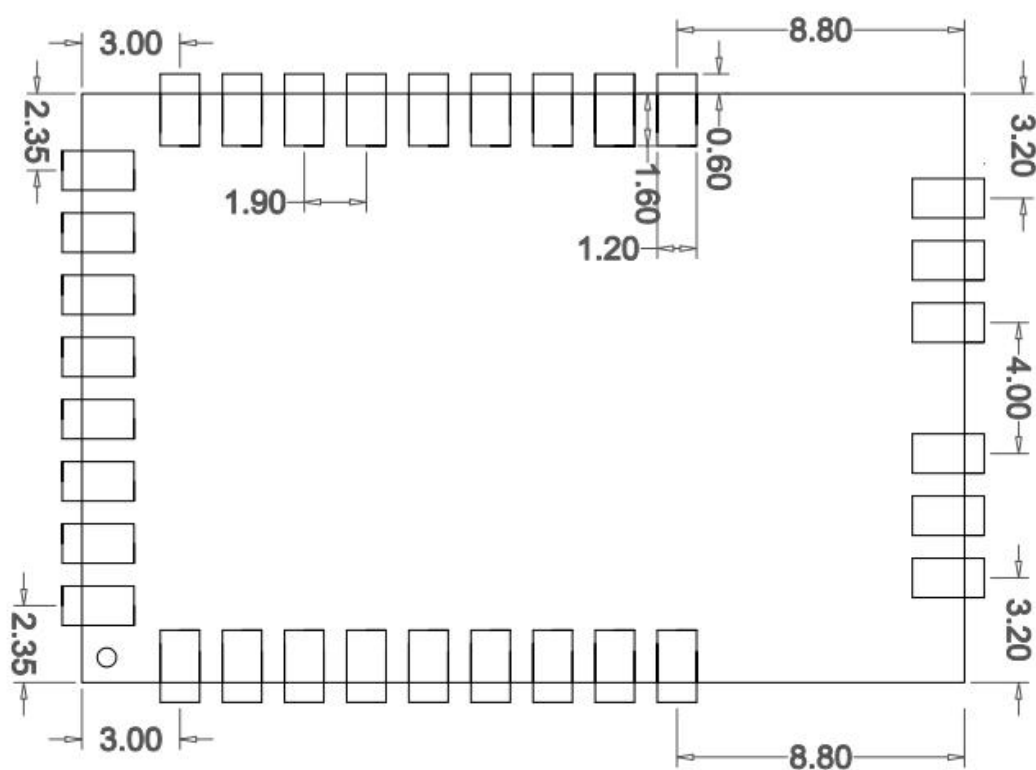
Bottom View

7. Application Information

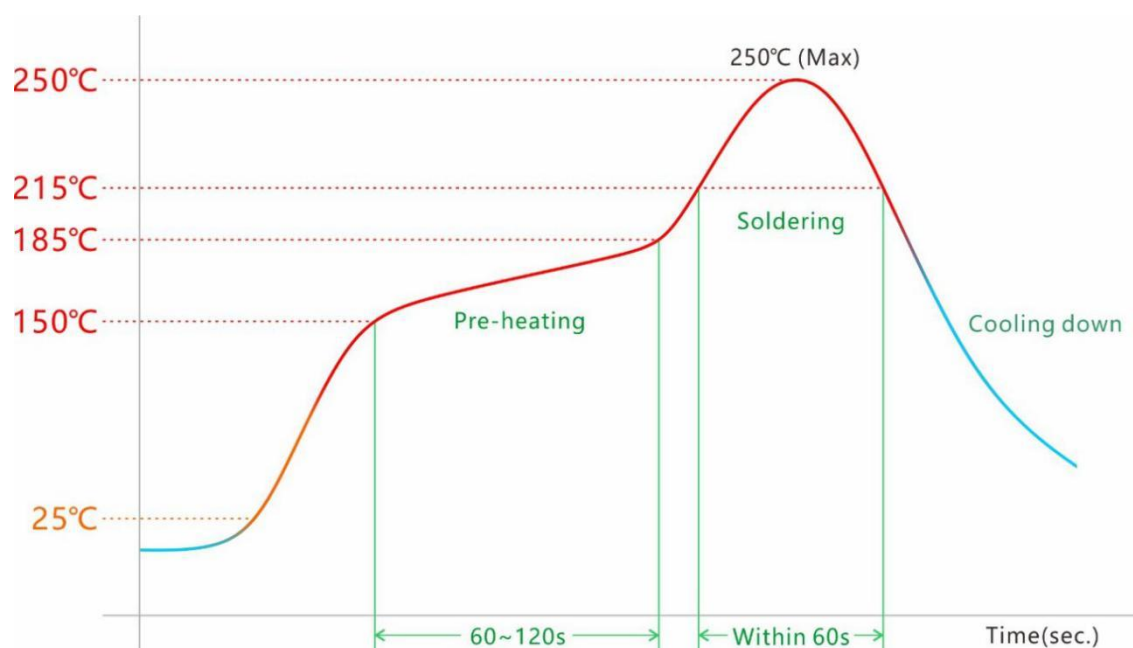
7.1 Typical Application Circuit



7.2 Recommend PCB Layout Footprint



7.3 Reflow Soldering Standard Conditions



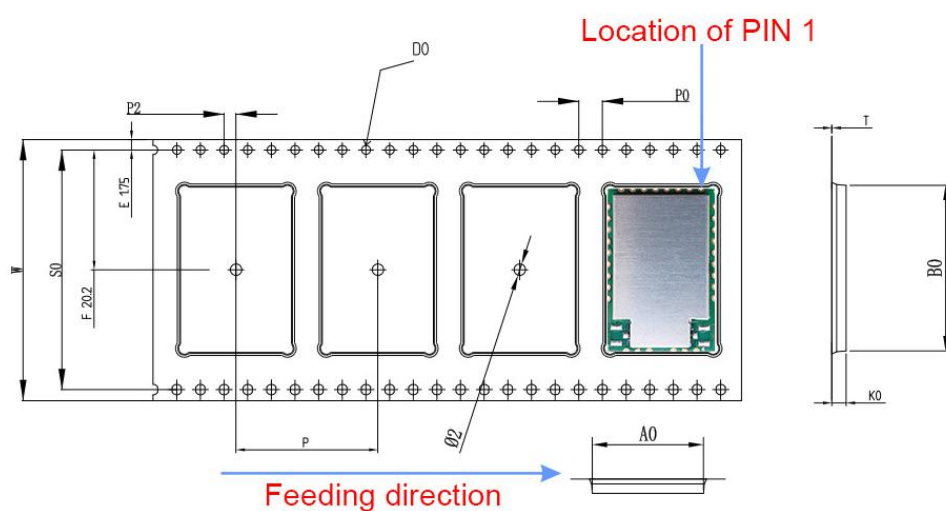
Please use the reflow within 2 times.
Set up the highest temperature within 250°C.

8. Key Components Of Module

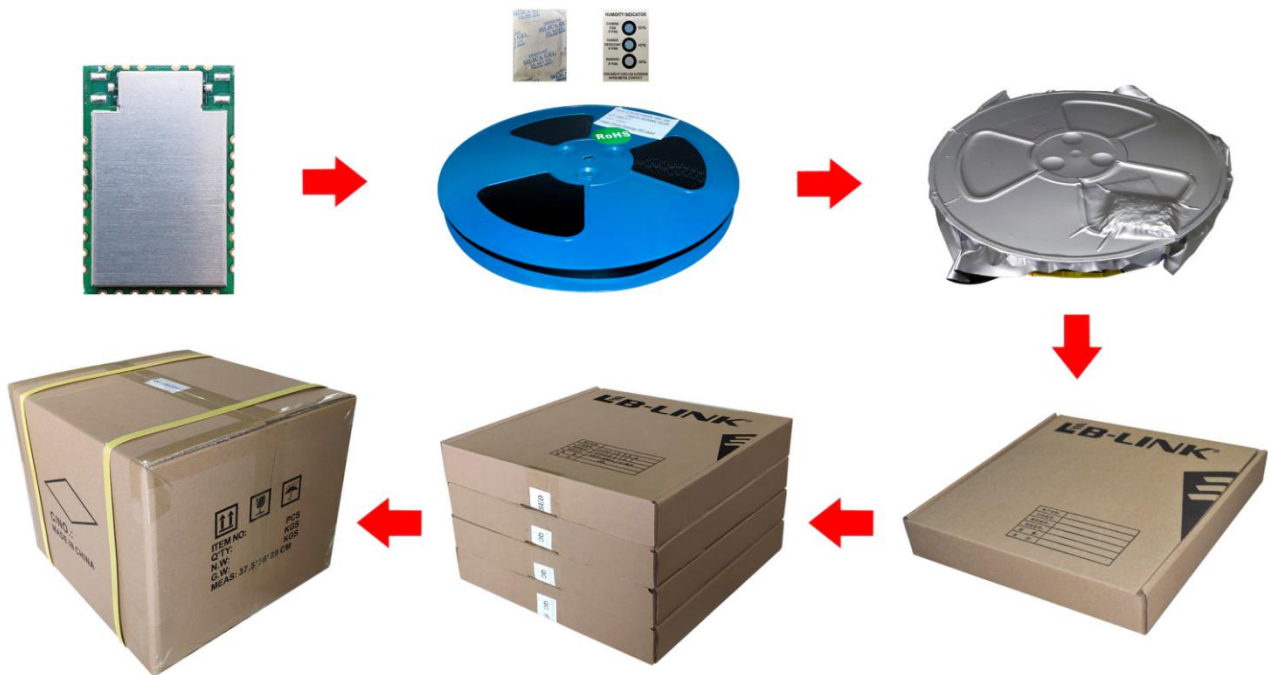
No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8822CU-CG, QFN-56pin-7*7mm	Realtek	
2	PCB	BL-M8822CU3, 27*18*0.6mm, 4L, AU, Green	MILLION SOURCE PRINTED CIRCUIT BOARD CO., LTD	
			Shen Zhen Tie Fa Technology Limited	
			Quzhou Sunlord Electronics Co., Ltd	
3	Crystal	40MHz-9pF-10ppm-3225	LUCKI CM ELECTRONICS CO., LTD	
			HUBEI TKD ELECTRONICS TECHNOLOGY CO., LTD	
			HOSONIC ELECTRONIC CO., LTD	
4	Diplexer	DP1608-A2455BKH0T-LF	TDK China Co., Ltd	
			Advanced Ceramic X	

9. Package and Storage Information

9.1 Package Dimensions



ITEM	W	A0	B0	K0	E	F	P	P0	P2	D0	T
DIM	44.00±0.3	18.40±0.1	27.40±0.1	2.50±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	0.35±0.05



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.

9.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -45°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.

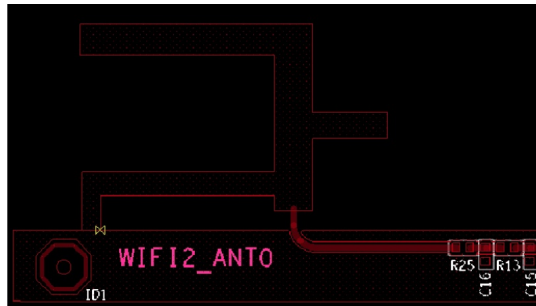
Baking condition : 60°C, 24hours, 1time.

ESD Sensitivity:

The Module is a static-sensitive electronic device.

Do not operate or store near strong electrostatic fields.

10. Antenna Information



PCB type: FR4 with 1.6mm thickness
Antenna pattern: PCB line with 20mm length x 13.7mm width
Antenna gain: **0.91dBi**
Antenna impedance: 50ohm
Radiation pattern: none



PCB type: FR4 with 1.6mm thickness
Antenna pattern: PCB line with 15.7mm length x 13.9mm width
Antenna gain: 1.18dBi
Antenna impedance: 50ohm
Radiation pattern: none

FCC Statement:

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

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.

(1) Operational use conditions

Module has professional users use condition limitations, Host product manufacturer please ensure giving such warning like "Product is limited to professional users use" in your product's instruction.

(2) Antenna used

	Antenna type	Max. Antenna Gain
2.4G Wi-Fi	PCB Antenna	Antenna 1: 0.91dBi
		Antenna 2: 1.18dBi
5G Wi-Fi	PCB Antenna	Antenna 1: U-NII-1: 0.45dBi U-NII-3: -1.03dBi
		Antenna 2: U-NII-1: -0.92dBi U-NII-3: -1.69dBi

(3) 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. For FCC, this exterior label should follow "Contains FCC ID: 2AL8S-0302C3XN-2".

§ 15.19 and RSS-Gen Labelling requirements shall be complied on end user device. Labelling rules for special device, please refer to §2.925, § 15.19 (a)(5) and relevant KDB publications. For E-label, please refer to §2.935.

(4) 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.

(5) 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 and IC ID (new application) procedure followed by a Class II permissive change application.

(6) 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.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 Information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

For Class B

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.

For Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.