



BL-M8812CU2

802.11ac 867Mbps WiFi

USB Module Specification

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Top View

Module Name: BL-M8812CU2	
Module Type: 802.11ac 867Mbps 2T2R WiFi USB 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	2020-02-20
1.0	Official release (change product picture)	2020-03-10

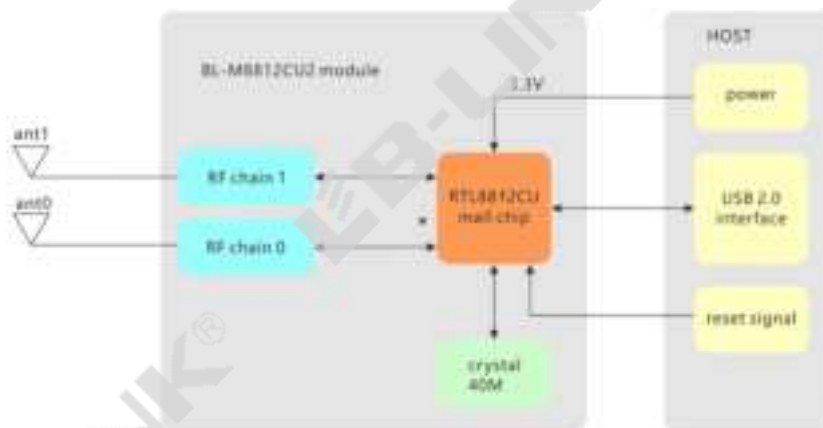
1. Introduction

BL-M8812CU2 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. It supports IEEE 802.11a/b/g/n/ac standard and provides the highest PHY rate up to 867Mbps, It can offer feature-rich wireless connectivity and reliable throughput from an extended distance.

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
- Connect to external antenna through IPEX connectors
- Power Supply: VDD33 3.3V±0.2V main power supply

1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8812CU2 WIFI Module
Chipset	RTL8812CU-CG
WiFi Standards	IEEE802.11a/b/g/n/ac, 2T2R MIMO, 2.4G/5GHz, 867Mbps (Max)
Host Interface	USB2.0
Antenna	Connect to the external antennas through IPEX connectors
Dimension	SMD 17Pins, 31.0*20.0*3.6mm (L*W*H), Tolerance: +/-0.15mm

Power Supply	DC 3.3V±0.2V @1000mA Max (TX mode 11a 6Mbps for 24dBm)
Operation Temperature	-20°C to +70°C
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



2.1 Pin Definition

No	Pin Name	Type	Description	Supply
1	GND	RF	Ground connections	
2	RF1	RF	WIFI RF1 port NC	
3	GND	RF	Ground connections	
4	GND	P	Ground connections	
5	GND	P	Ground connections	
6	GND	RF	Ground connections	
7	RF0	RF	WIFI RF0 port NC	
8	GND	RF	Ground connections	
9	GND	P	Ground connections	
10	NC	P	NC	
11	NC	P	NC	
12	NC	P	NC	
13	GND	P	Ground connections	
14	DP	I/O	USB 2.0 differential line	
15	DM	I/O	USB 2.0 differential line	

16	VDD33	P	3.3V Main power supply	VDD33
17	RESET	I	Reset signal active low	VDD33
	IPEX1	RF	ANT1 IPEX connector for 2.4G and 5G	
	IPEX0	RF	ANT0 IPEX connector for 2.4G and 5G	

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

3. Electrical and Thermal Specifications

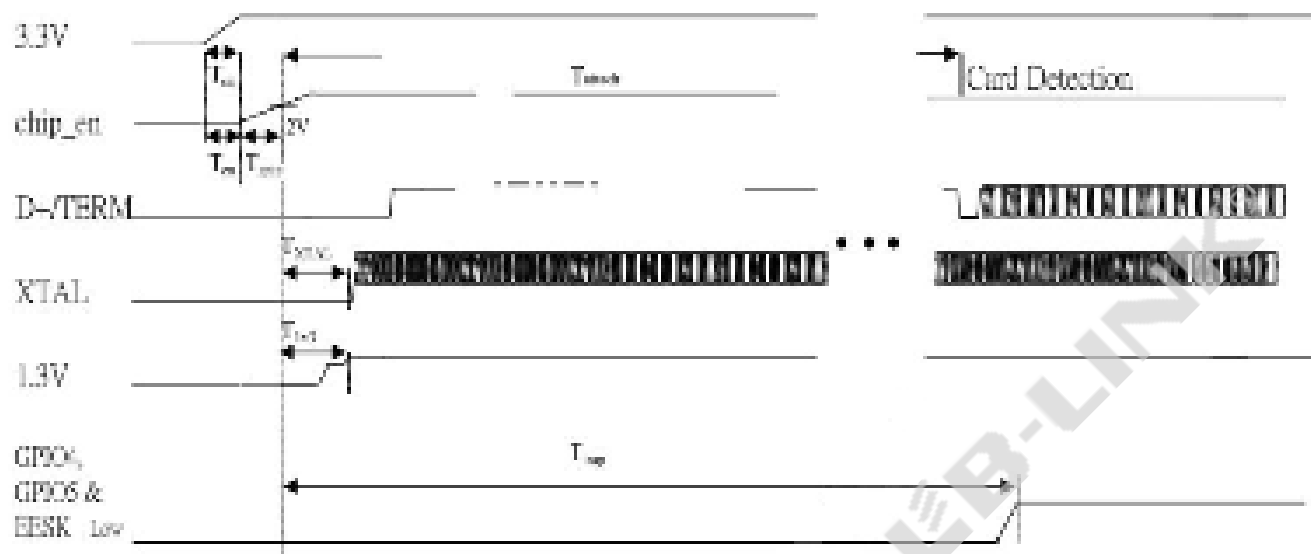
3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	°C
External Antenna Voltage Standing Wave Ratio		1	1.92	2.5	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 System Power On Sequence



	Unit	Min.	Typical	Max.
T_{on}	ms	-	1.5	5
T_{off}	ms	0	0	5
T_{idle}	ms	0	1.5	8
T_{attach}	ms	100	250	-
T_{start}	ms	-	1.5	8
T_{1v3}	ms	-	3	11
T_{imp}	ms	400	500	-

3.4 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C			
Use Case	VDD33 Current (average)		
	Typ	Max	Units
WiFi Radio Off (Linux Driver)	20	50	mA
WiFi Unassociated (Linux Driver)	100	150	mA
2.4G 1Mbps TX (RF-Test) for 18dBm	420	450	mA
2.4G 1Mbps RX (RF-Test)	230	260	mA
2.4G 11Mbps TX (RF-Test) for 17dBm	370	400	mA
2.4G 11Mbps RX (RF-Test)	225	260	mA

2.4G 6Mbps TX (RF-Test) for 16dBm	350	400	mA
2.4G 6Mbps RX (RF-Test)	225	260	mA
2.4G 54Mbps TX (RF-Test) for 16dBm	310	350	mA
2.4G 54Mbps RX (RF-Test)	225	250	mA
2.4G MCS0(HT20) TX (RF-Test) for 16dBm	370	420	mA
2.4G MCS0(HT20) RX (RF-Test)	225	260	mA
2.4G MCS7(HT20) TX (RF-Test) for 16dBm	330	350	mA
2.4G MCS7(HT20) RX (RF-Test)	225	260	mA
2.4G MCS7(HT40) TX (RF-Test) for 16dBm	340	370	mA
2.4G MCS7(HT40) RX (RF-Test)	215	250	mA
2.4G MCS8(HT40) TX (RF-Test) for 16dBm	415	440	mA
2.4G MCS8(HT40) RX (RF-Test)	220	260	mA
2.4G MCS15(HT40) TX (RF-Test) for 16dBm	420	450	mA
2.4G MCS15(HT40) RX (RF-Test)	220	260	mA
5.8G 6Mbps TX (RF-Test RF0 and RF1) for 24dBm	720	800	mA
5.8G 6Mbps RX (RF-Test)	215	300	mA
5.8G 54Mbps TX (RF-Test) for 18dBm	420	500	mA
5.8G 54Mbps RX (RF-Test)	210	300	mA
5.8G MCS0(HT20) TX (RF-Test) for 18dBm	431	510	mA
5.8G MCS0(HT20) RX (RF-Test)	210	300	mA
5.8G MCS7(HT40) TX (RF-Test) for 18dBm	410	420	mA
5.8G MCS7(HT40) RX (RF-Test)	220	250	mA
5.8G MCS8(HT40) TX (RF-Test) for 18dBm	570	600	mA
5.8G MCS8(HT40) RX (RF-Test)	210	300	mA

5.8G MCS15(HT40) TX (RF-Test) for 18dBm	580	600	mA
5.8G MCS15(HT40) RX (RF-Test)	220	260	mA
5.8G MCS0(HT80) TX (RF-Test) for 16dBm	400	430	mA
5.8G MCS0(HT80) RX (RF-Test)	240	270	mA
5.8G MCS9(HT80) TX (RF-Test) for 15dBm	370	400	mA
5.8G MCS9(HT80) RX (RF-Test)	270	300	mA

4. WiFi RF Specifications

4.1 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		2.4~2.4835GHz (2.4GHz ISM Band)		
Channels		Ch1~Ch13 (For 20MHz Channels)		
Modulation		802.11b (DSSS): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM;		
Data 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		≤ ±25ppm		
2.4G Transmitter Specifications				
TX Rate		TX Power	TX Power Tolerance	EVM
802.11b@1~11Mbps		18dBm	±1.5dBm	≤-10dB
802.11g@6Mbps		16dBm	±1.5dBm	≤-10dB
802.11g@54Mbps		16dBm	±1.5dBm	≤-25dB
802.11n@HT20_MCS0		16dBm	±1.5dBm	≤-10dB
802.11n@HT20_MCS7		16dBm	±1.5dBm	≤-28dB
802.11n@HT40_MCS0		16dBm	±1.5dBm	≤-10dB

802.11n@HT40_MCS7	16dBm	±1.5dBm	≤-28dB
2.4G Receiver Specifications			
RX Rate	Min Input Level (Typ)	Max Input Level (Typ)	PER
802.11b@1Mbps	-94dBm	-10dBm	< 8%
802.11b@11Mbps	-86dBm	-10dBm	< 8%
802.11g@6Mbps	-92dBm	-15dBm	< 10%
802.11g@54Mbps	-74dBm	-15dBm	< 10%
802.11n@HT20_MCS0	-88dBm	-15dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-15dBm	< 10%
802.11n@HT40_MCS0	-86dBm	-15dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-15dBm	< 10%

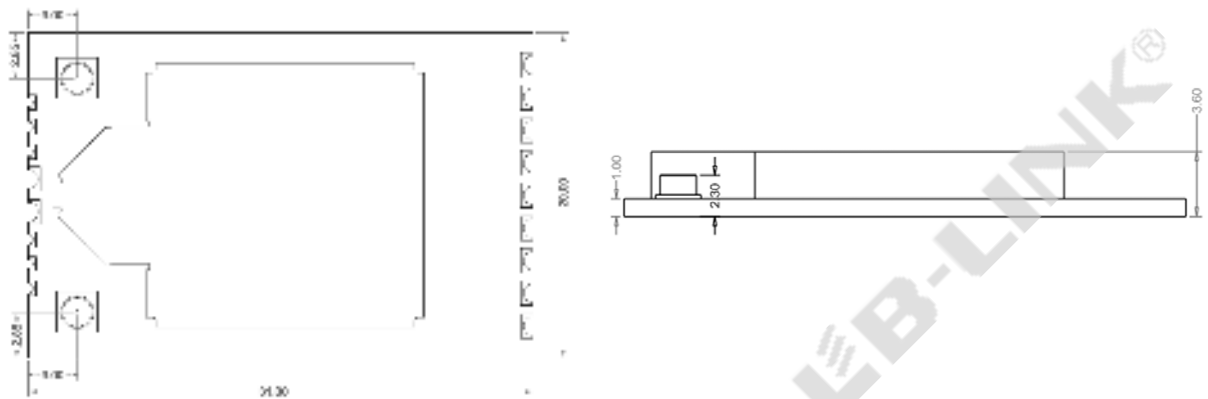
4.2 5G WiFi RF Specification

Conditions: VDD33=3.3V; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac CSMA/CA
Frequency Range	5.15~5.25GHz; 5.25~5.35GHz; 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;
Data 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;

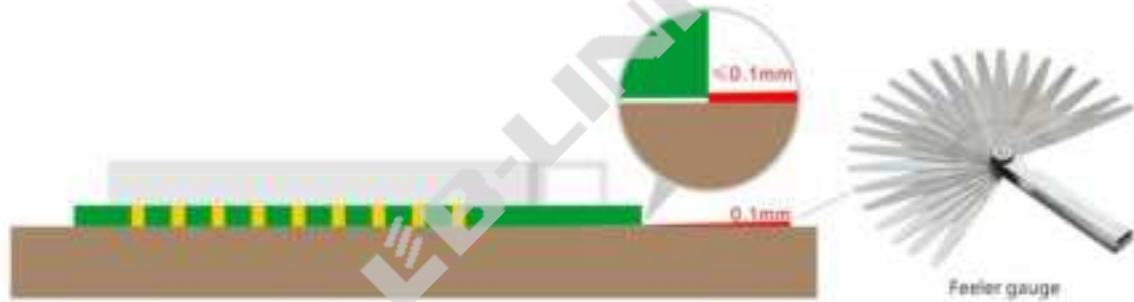
	802.11ac (VHT80): MCS0~MCS9(2T2R_MIMO)58.5~866.7Mbps;		
Frequency Tolerance	≤ ±20ppm		
5G Transmitter Specifications			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11a@6Mbps	24dBm	±2dBm	≤-10dB
802.11a@54Mbps	18dBm	±2dBm	≤-25dB
802.11n@HT20_MCS0 802.11ac@VHT20_MCS0	18dBm	±2dBm	≤-10dB
802.11n@HT20_MCS7 802.11ac@VHT20_MCS7	18dBm	±2dBm	≤-28dB
802.11n@HT40_MCS0 802.11ac@VHT40_MCS0	18dBm	±2dBm	≤-10dB
802.11n@HT40_MCS7 802.11ac@VHT40_MCS7	18dBm	±2dBm	≤-28dB
802.11ac@VHT20_MCS8	18dBm	±2dBm	≤-30dB
802.11ac@VHT40_MCS8 802.11ac@VHT40_MCS9	15dBm	±2dBm	≤-32dB
802.11ac@VHT80_MCS0	18dBm	±2dBm	≤-10dB
802.11ac@VHT80_MCS9	15dBm	±2dBm	≤-32dB
5G Receiver Specifications			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11a@6Mbps	-92dBm	-20dBm	< 10%
802.11a@54Mbps	-74dBm	-20dBm	< 10%
802.11n@HT20_MCS0	-88dBm	-20dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-20dBm	< 10%
802.11n@HT40_MCS0	-86dBm	-20dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-20dBm	< 10%
802.11ac@VHT20_MCS8	-88dBm	-20dBm	< 10%
802.11ac@VHT40_MCS9	-68dBm	-20dBm	< 10%
802.11ac@VHT80_MCS0	-84dBm	-20dBm	< 10%
802.11ac@VHT80_MCS9	-58dBm	-20dBm	< 10%

5. Mechanical Specifications

5.1 Module Outline Drawing

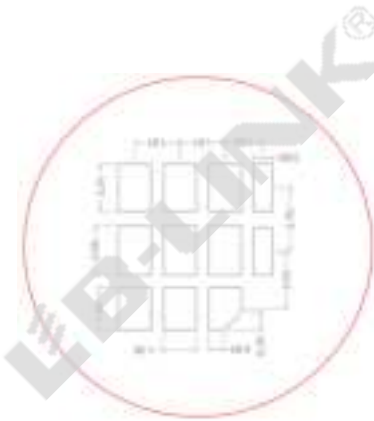
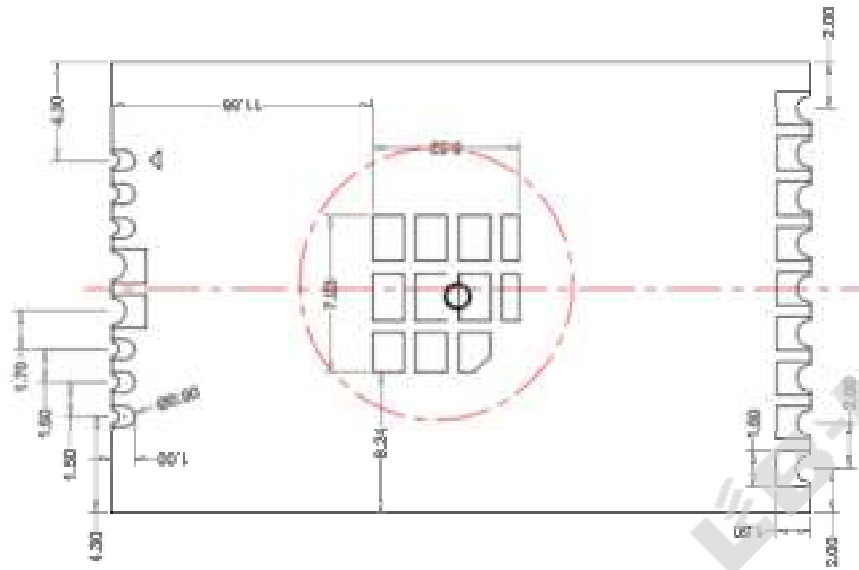


Module dimension: 31.0mm*20.0mm*3.6mm (L*W*H ; Tolerance: $\pm 0.15\text{mm}$)

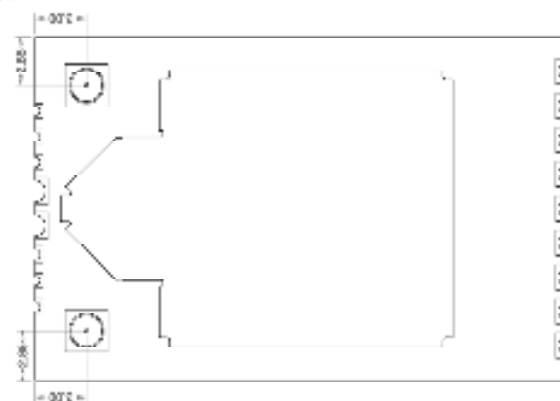


Module Bow and Twist : $\leq 0.1\text{mm}$

5.2 Mechanical Dimensions



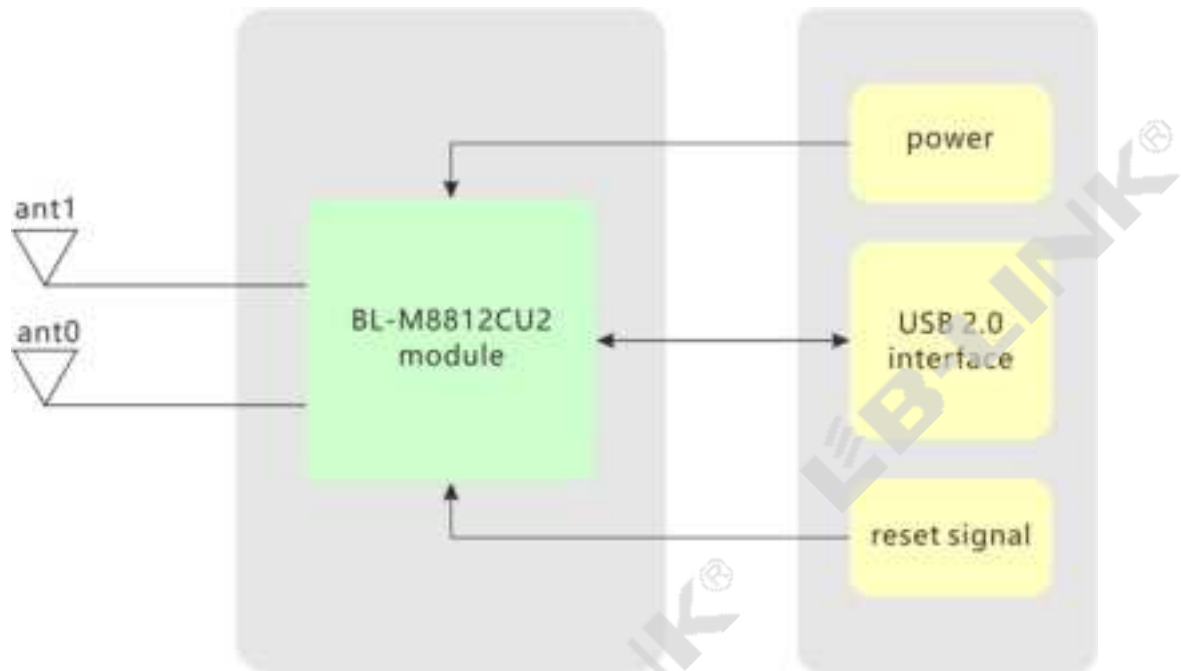
Bottom View



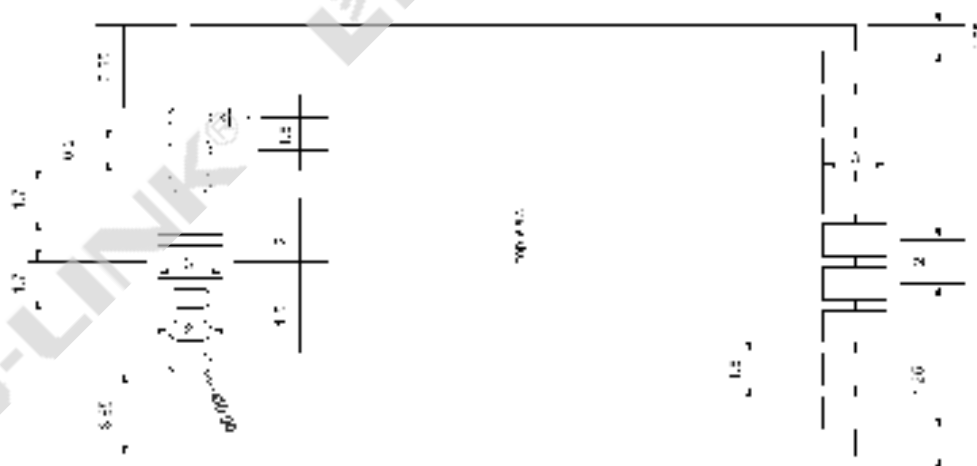
Top View

6. Application Information

6.1 Typical Application Circuit

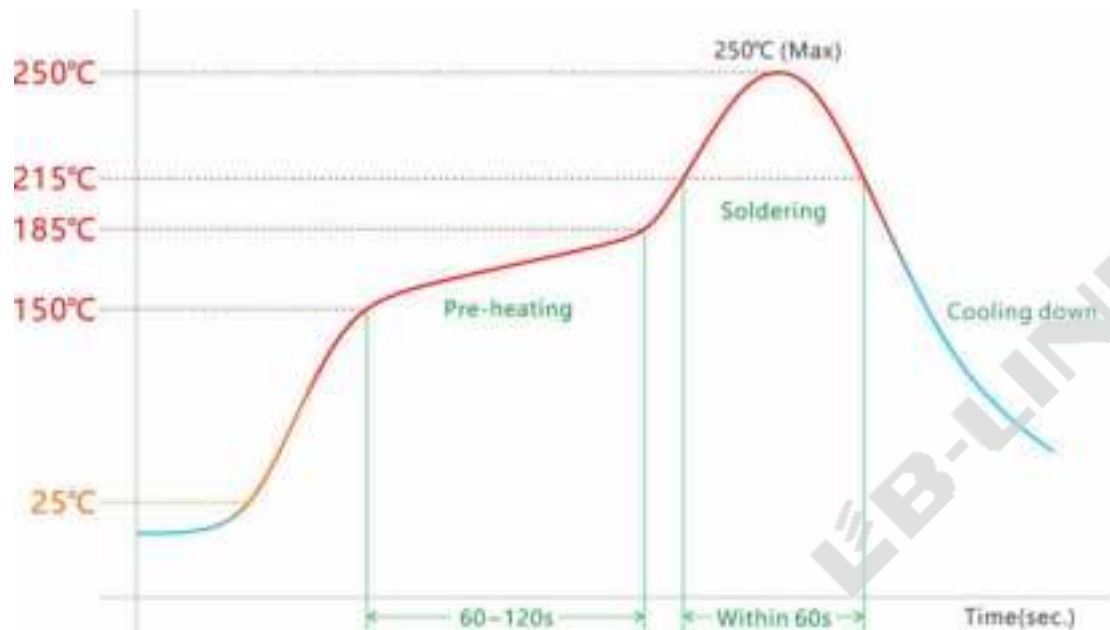


6.2 Recommend PCB Layout Footprint



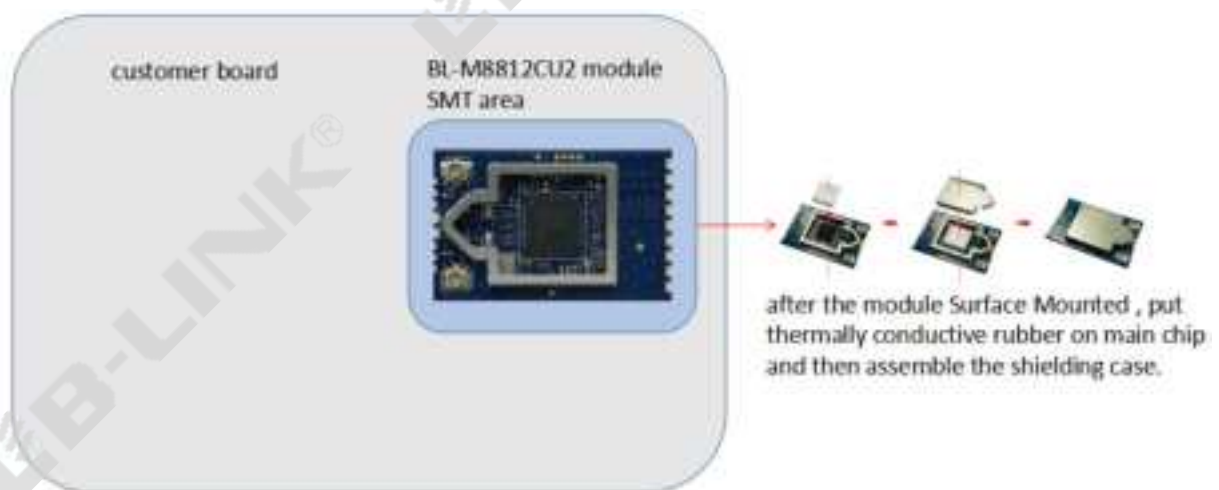
Note: If only use IPEX connectors. pin 1/2/3/6/7/8 do not need to design pads on customer board.

6.3 Reflow Soldering Standard Conditions



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

6.4 Accessory Assembly



7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8812CU-CG	Realtek	
2	PCB	BL-M8812CU2	Shen Zhen Tie Fa Technology limited	
			MILLION SOURCE PRINTED CIRCUIT BOARD CO., LTD	
			Quzhou Sunlord Electronics Co., Ltd	
3	Crystal	40MHz-10pF-10ppm-3225	HUBEI TKD ELECTRONICS TECHNOLOGY CO., LTD.	
			LUCKI CM ELECTRONICS CO., LTD	
			HOSONIC ELECTRONIC CO., LTD.	
4	Diplexer	DP1608-A2455BKH0T	TDK China Co., Ltd.	
			Advanced Ceramic X	

8. Package and Storage Information

8.1 Package Dimensions



8.2 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.

Take proper ESD precautions!

The Module is designed to comply with the FCC statement. FCC ID is 2AL6KBL-M8812CU2. The host system using Module, should have label indicated it contain modular's FCC ID: 2AL6KBL-M8812CU2 . This radio module must not installed to colocate and operating simultaneously with other radios in host system additional testing and equipment authorization may be required to operating simultaneously with other radio.

The Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device.

The modular must be installed in the host that assign by Company name: Shenzhen Bilian Electronic Co.,Ltd. Model no.:BL-M8812CU2 if other host types used would need further evaluation and possible C2PC if they are not significantly similar to the one tested The WIFI Module is deaigned for a compact PCB design .It should be installed and operated with host or other minimum distance of 20 centimeters between the radiator and your body." To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed 2dBi in the 2.4G band and 2.75dBi in the 5G band. The module uses IPEX antenna interface and use dipole antenna,this antenna is sold with the module.

Notice to OEM integrator

The end user manual shall include all required regulatory information/warning as show in this manual. The OEM integrator is responsible for testing their end-product for any additional compliance requirements required with this module installed. If the final product contains circuits of other FCC PART 15 Subparts,the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed The intended use is generally not for the general public.It is generally for industry/commercial use. The connector is within the transmitter enclosure and can only be accessed by disassembly of the transmitter that is not nomally required, the user has no access to the connector.Installation must be controlled. Installation requires special training.

This device complies with Part 15 of the FCC Rules.

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body

Operations in the 5.15-5.35GHz band are restricted to indoors usage only.