BL-M8188EUA

802.11n 150Mbps WLAN

USB2.0 Module Specification

SHENZHEN BILIAN ELECTRONIC CO., LTD

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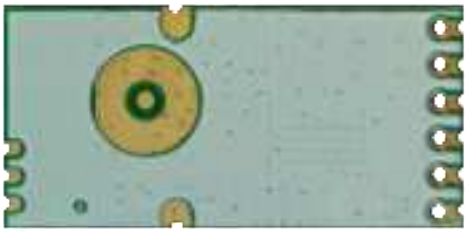
Web: www.b-link.net.cn

(Top View)



(Bottom View)

Module Name: BL-M8188EUA	
Module Type: 802.11b/g/n 150Mbps WLAN USB2.0 Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
1.0	Official release	2024-07-24	Xhg

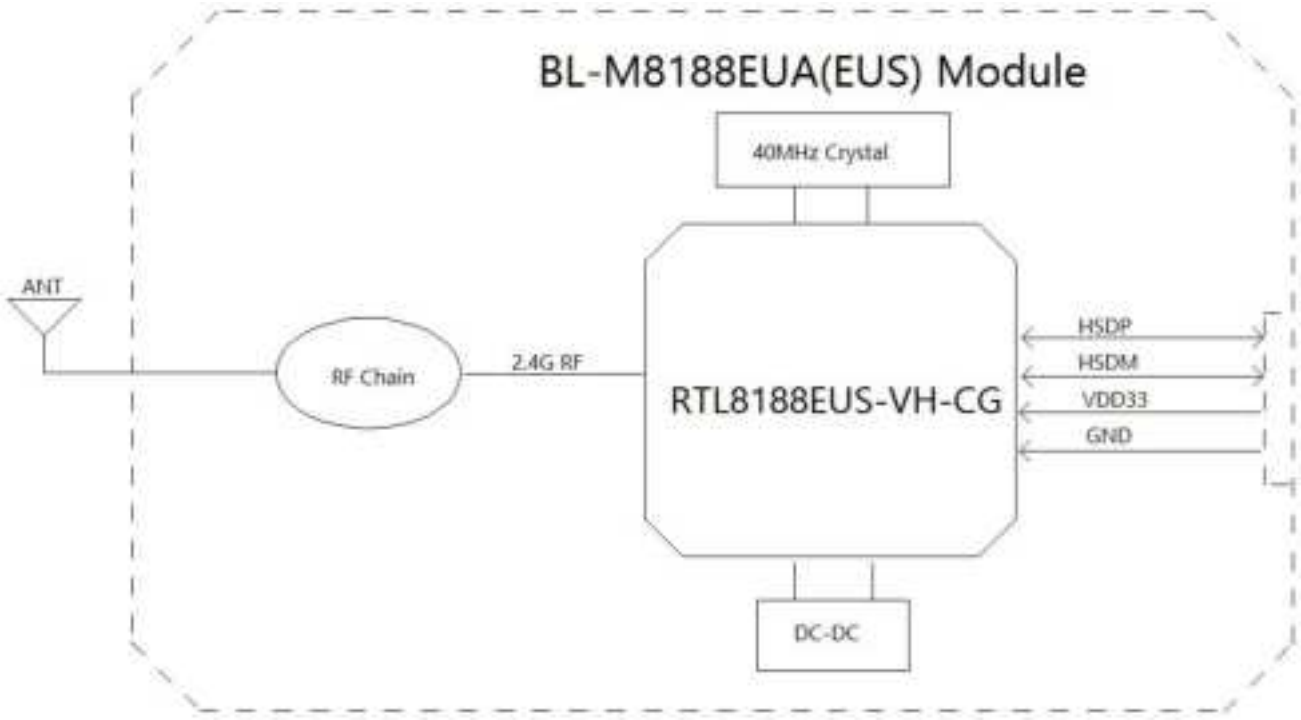
1. Introduction

The BL-M8188EUA is a highly integrated 1T1R Single-band WLAN module. It compatible IEEE 802.11b/g/n standard and provides the maximum PHY rate up to 150Mbps, offering feature-rich wireless connectivity and reliable throughput from an extended distance.

1.1 Features

- Operating Frequency: 2.4~2.4835GHz
- Host Interface is USB2.0
- IEEE Standards: IEEE 802.11b/g/n
- Wireless PHY rate can reach up to 150Mbps
- On board printed PCB antenna
- Power Supply: DC3.3V±0.2V

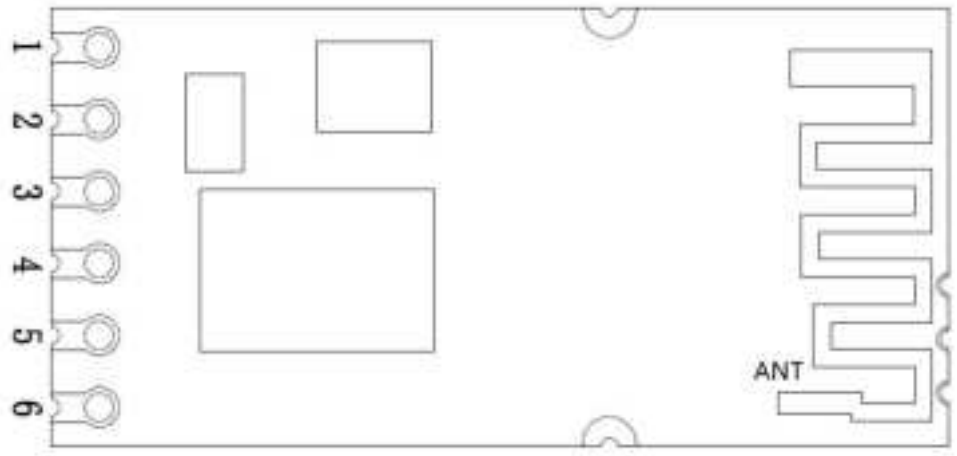
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8188EUA
Chipset	RTL8188EUS-VH-CG
WLAN Standards	IEEE802.11b/g/n
Host Interface	USB2.0
Antenna	On board printed PCB antenna for WLAN and max gain is 1.5dBi
Dimension	25.0*12.2*1.7mm (L*W*H)
Power Supply	DC 3.3V±0.2V @ 500 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	NC	-		No connection(floating)
2	GND	P		Ground connection
3	HSDP	A I/O		USB2.0 Transmitter/Receiver Differential Pair
4	HSDM	A I/O		USB2.0 Transmitter/Receiver Differential Pair

5	VDD33	P		DC 3.3V Power Supply
6	NC	-		No connection(floating)
	ANT	RF		2.4G WLAN antenna

P: Power or Ground; A I/O: Analog In/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	℃
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)	40	60	mA
2.4G 1Mbps TX @17dBm (RF-Test)	276	327	mA
2.4G 11Mbps TX@17dBm (RF-Test)	262	345	mA
2.4G 11Mbps RX (RF-Test)	85	95	mA
2.4G 6Mbps TX @17dBm (RF-Test)	268	343	mA
2.4G 54Mbps TX @14dBm (RF-Test)	195	302	mA
2.4G MCS7(HT20) TX @14dBm (RF-Test)	198	294	mA
2.4G MCS7(HT40) TX @14dBm (RF-Test)	194	297	mA
2.4G MCS7(HT40) RX (RF-Test)	91	101	mA

4. WLAN RF Specifications

Conditions : VDD33=3.3V ; Ta:25℃	
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 (HT40): MCS0~MCS7 13.5~150Mbps;
Frequency Tolerance	≦±20ppm

2.4G Transmitter Specifications (TX power of some rates is calibrated, customers can define the target TX power of other rates by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below)

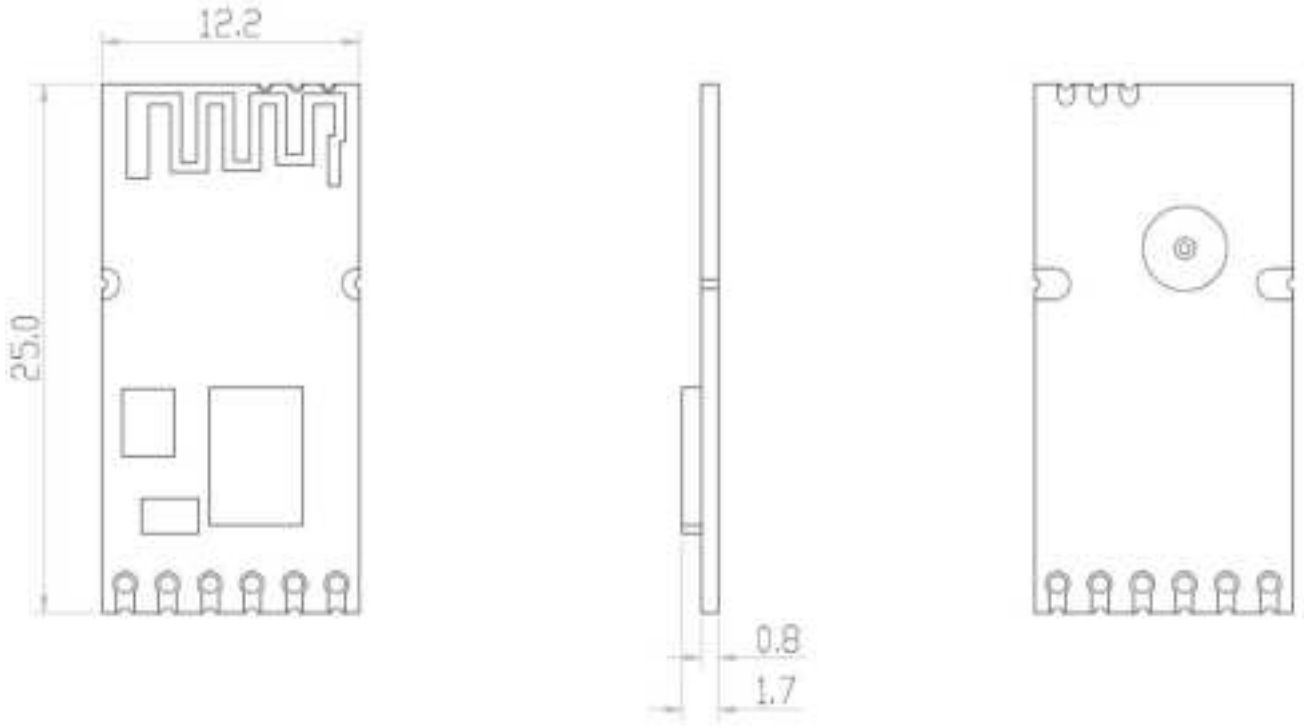
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1Mbps	Recommended Target TX Power :17	±2.0	≦-10
802.11b@11Mbps	Calibrated TX Power :17	±2.0	≦-10
802.11g@6Mbps	Recommended Target TX Power :17	±2.0	≦-10
802.11g@54Mbps	Calibrated TX Power :14	±2.0	≦-25
802.11n@HT20_MCS0	Recommended Target TX Power :16	±2.0	≦-10
802.11n@HT20_MCS7	Calibrated TX Power :14	±2.0	≦-28
802.11n@HT40_MCS0	Recommended Target TX Power :16	±2.0	≦-10
802.11n@HT40_MCS7	Calibrated TX Power :14	±2.0	≦-28

2.4G Receiver Specifications

RX Rate	Min Input Level (Typ)	Max Input Level (Typ)	PER
802.11b@1Mbps	-92dBm	-10dBm	< 8%
802.11b@11Mbps	-84dBm	-10dBm	< 8%
802.11g@6Mbps	-88dBm	-15dBm	< 10%
802.11g@54Mbps	-71dBm	-15dBm	< 10%
802.11n@HT20_MCS0	-86dBm	-15dBm	< 10%
802.11n@HT20_MCS7	-68dBm	-15dBm	< 10%
802.11n@HT40_MCS0	-85dBm	-15dBm	< 10%
802.11n@HT40_MCS7	-65dBm	-15dBm	< 10%

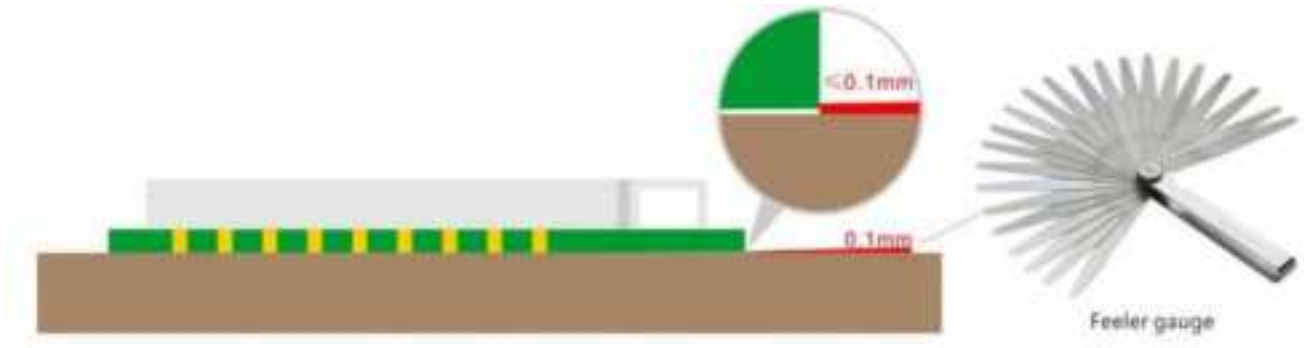
5.Mechanical Specifications

5.1 Module Outline Drawing



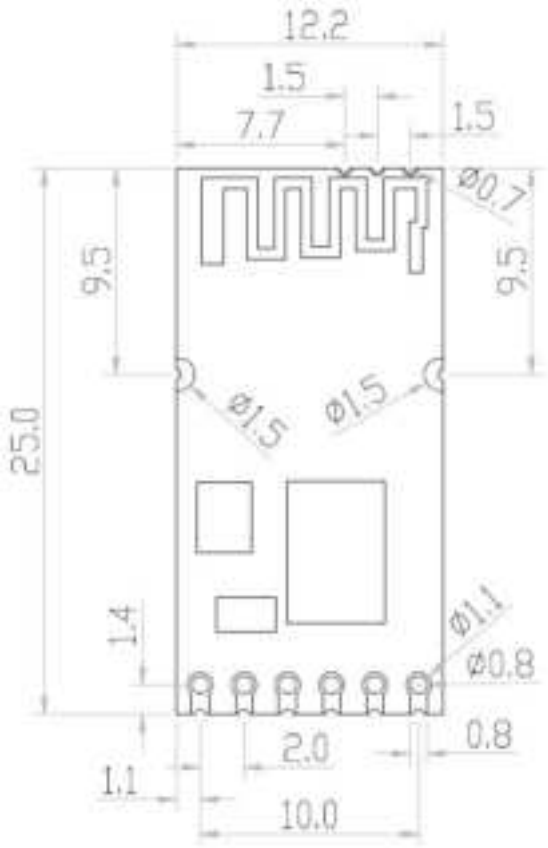
(Top View) (Side View) (Bottom View)

Module dimension: 25.0*12.2*1.7mm(L*W*H; Tolerance: ±0.3mm_L/W, ±0.2mm_H)

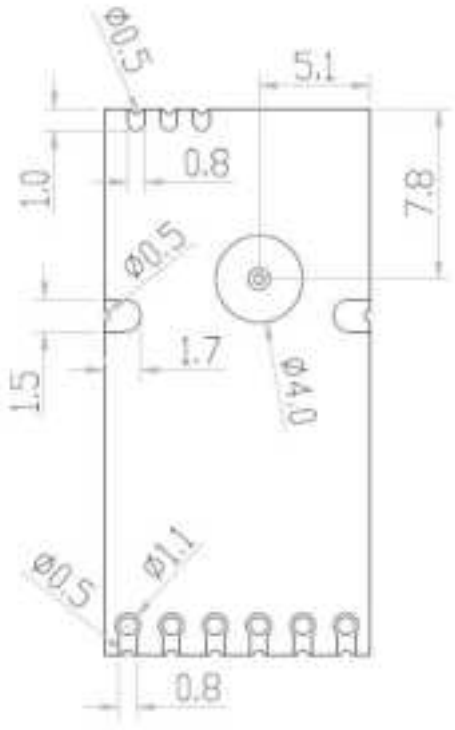


Module Bow and Twist：≤0.1mm

5.2 Mechanical Dimensions



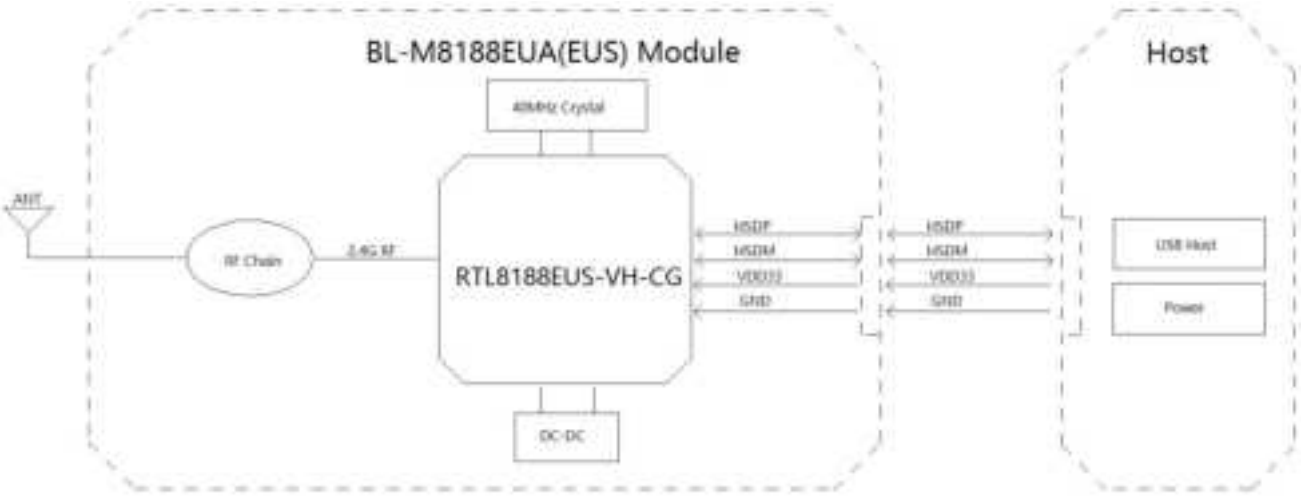
(Top View)



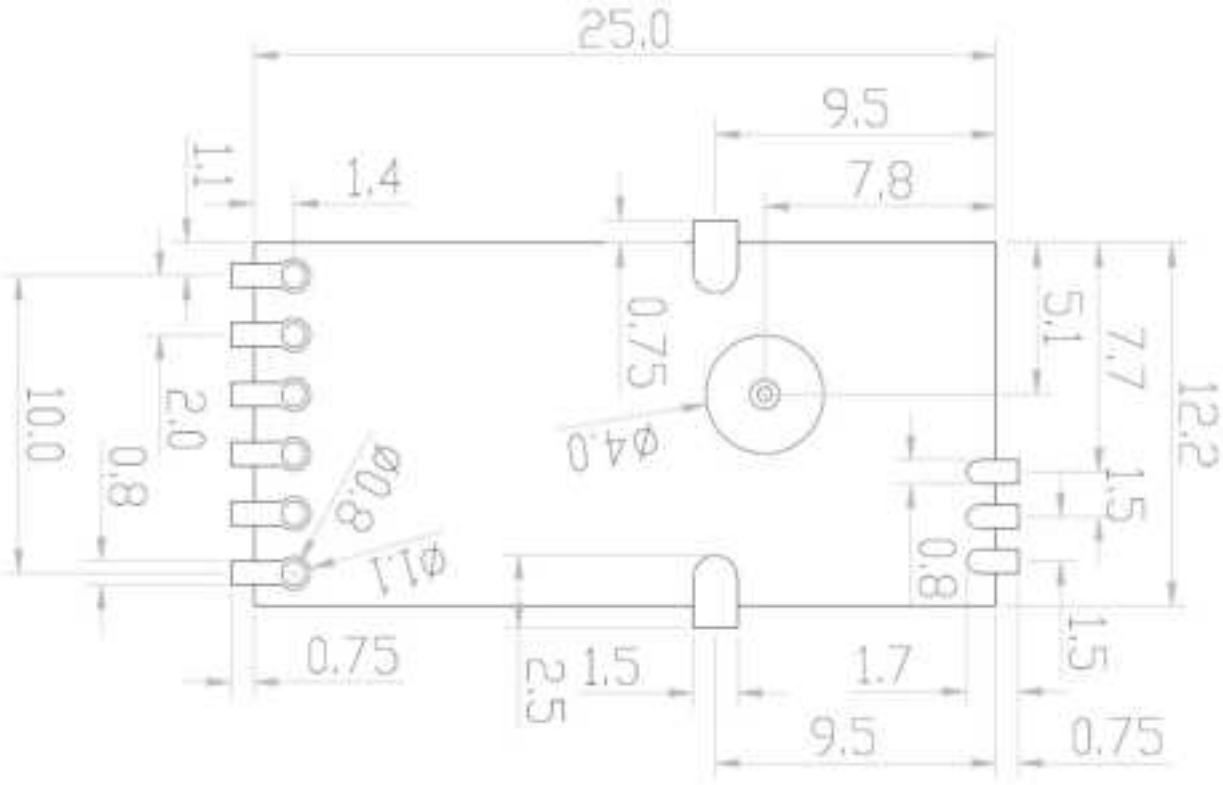
(Bottom View)

6.Application Information

6.1 Typical Application Circuit

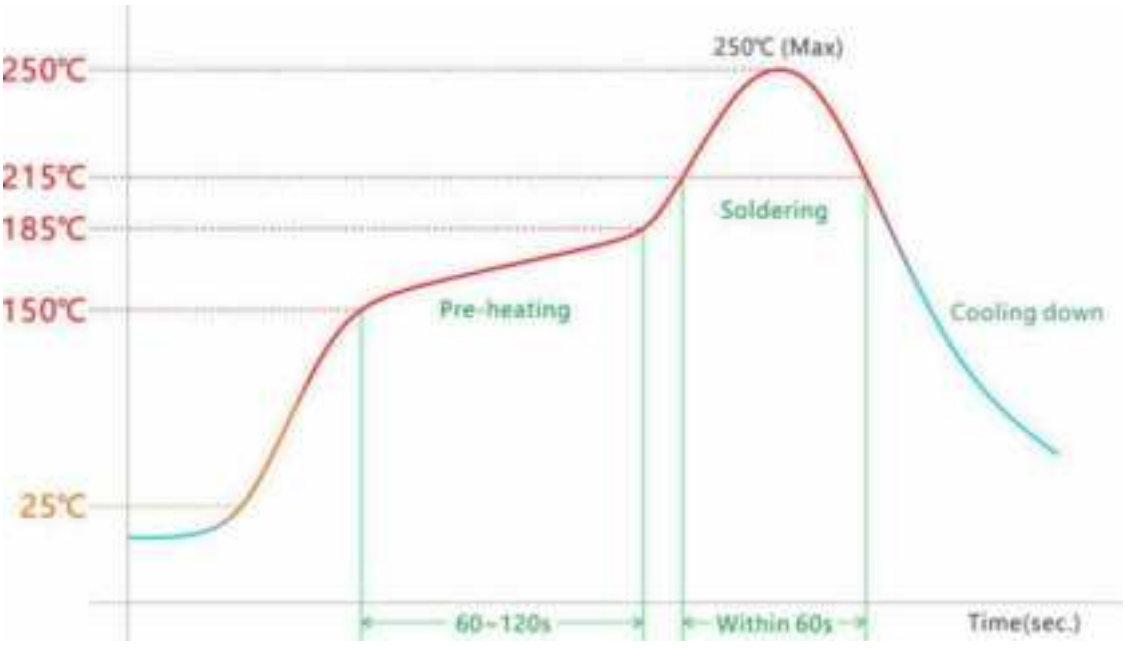


6.2 Recommend PCB Layout Footprint



(Design Unit : mm)

6.3 Reflow Soldering Standard Conditions



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

6.4 HW Application Note

6.4.1 VDD33 Power requirement:

A、DC 3.1~3.5V & Ripple Voltage <100mV power supply input, Maximum Peak current≥500mA.

B、For achieve fast transient response，a current mode buck converter recommended.

C、On customer's motherboard, use 10uF and 100nF MLCC capacitors close to the module`s VDD33 Pin for power input decoupling. Each GND Pin has three close vias to ensure connectivity and thermal conductivity.

6.4.2 USB interface Design Guidelines:

A、The module provides a USB device interface which is compatible with USB2.0 specification, High-Speed mode supports data transmission rate up to 480Mbps.

B、On customer's motherboard, PCB traces of the USB high-speed signal pair should be maintain 90Ω differential impedance, structure of "Differential Coated Coplanar Waveguide With Ground" with the advantages of impedance control and GND surrounding isolation interference may be an ideal choice. To avoid interference, USB signal pair must be far away from power, RF and other signals, GND copper can be used to surround and isolate them.

C、PCB traces of the USB high-speed signal pair as short as possible, as far away from other signal as possible, minimize the length mismatch of signal pair, avoid layer change and maintain a complete reference layer to reduces signal reflections and impedance changes.

D、If It is necessary to change layers for USB signal pair routing, use GND vias close to signal pair`s vias as the shortest return path.

6.4.3 Antenna requirement:

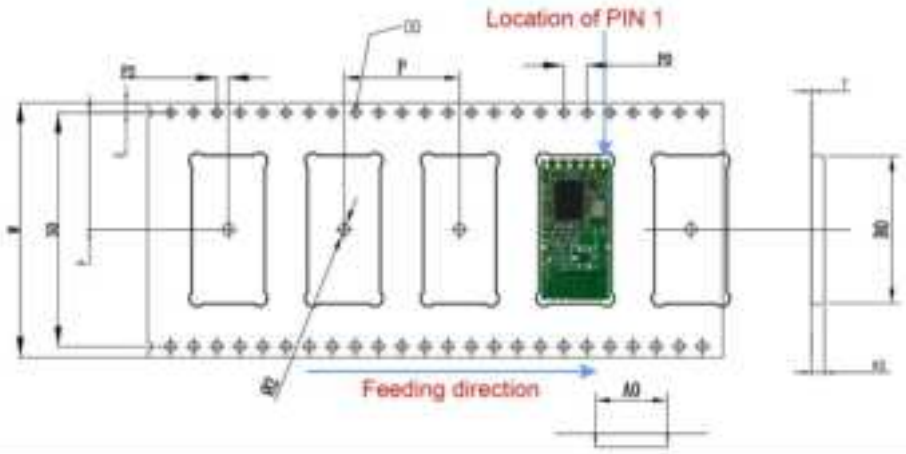
A、The antenna area needs to be clear, and there should be no copper or metal around it.

7.Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8188EUS-VH-CG	Realtek Semiconductor Corp.	
2	PCB	BL-M8188EUA	ShenZhen Tie Fa Technology Limited	
			SHEN ZHEN QILI ELECTRON CO.,LTD	
			Huizhou Dayawan Kexiang Technology Circuit Board Co., Ltd	
3	Crystal	40MHz-3225	LUCKI CM ELECTRONICS CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	
			HUBEI TKD CRYSTAL ELECTRONIC SCIENCE AND TECHNOLOGY CO.,LTD	
			HARMONY ELECTRONICS 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	12.40±0.1	25.40±0.1	2.30±0.1	1.75±0.1	20.2±0.1	20.00±0.1	4.00±0.1	2.00±0.1	Ø1.5±0.1	0.30±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 1 humidity card in each anti-static vacuum bag.
5. Each carton is packed with 4 plates.

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：

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!

9 FCC Statement

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.

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.

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

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.

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,For all products market in Us, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band

3. by supplied firmware programming tool. OEM shall not supply any tool or info to the end-userregarding 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-locationwith another transmitter), then the fCC authorization is no longer considered valid and the fCc iD cannot beused on the final product. in these circumstances, the OEM integrator will be responsible for re-evaluating theend product (including the transmitter) and obtaining a separate fCC authorization.

Labeling

If the product is sold separately in the United States, product must be labeled in a visible area with the following

FCC ID:2AL6KBL-M8188EUA.

If it is used in other products and meets FCC regulations, The final end product must be labeled in a visible area with the following " Contains FCC ID: 2AL6KBL-M8188EUA"

10 Integration instructions for host product manufacturers according to KDB 996369 DO3 OEM Manual V01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C, PART 15 SUBPART E 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 transmiting condition or differentoperational condiions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturerfor the installation method in end system.

This module can only be used as client , and the host manufacturers can not modify information. Because the The software has encryption and the hardware is fixed. The encryption key is known by the module manufacturer only. The correct firmware is verified and installed by the module manufacturer.

2.4 Limited module procedures

This module is Limited modylar without shielding, host manufacturer have to consult with module manufacturer for the modulelmlting condltlons when integrate the module in the host. module manutacturer should reviews detalled test data or host desiansprior to giving the host manufacturer approval.

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontroled enyironment. This equioment should beinstalled and operated with minimum distance 20cm between the radiator & your body.

2.7 antenna:

This product has a PCB antenna, the antenna connection details are shown in the figure below.

Remark: The addition of any component will affect the result of the launch.

If have a gain greater than the maximum gain indicated are strictly prohibited for use with this device.

Antenna types and antenna gains are shown in the table below:

Frquency(MHz)	Antenna type	Antenna gain	Remark
2400-2500	PCB antenna	1.5dBi	

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AL6KBL-M8188EUA"

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to conirm compliance with FCC requirements for the transmiter when the module isinstalled in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

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

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 orremove 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.

11 Module maintenance declaration with host

When this Module is installed into the Special host, definded in section 12 Class ll Pemissive Change Integration Test Plan will act as following:

The specified host Device install this limited modular which has no shield.

FCC class ll permissive change filing by the Grantee is required for each new host confiquration.

Testing for CllPc filing must be done by an Fcc recognized testing Laboratory.

The host shall still meet the rule section part 15.247, part 15.209 standard， and not just “radiated spurious”

The host's fundamental maximum output power shall be confirmed under the worst case from module.

Host's AC Conducted emissions and radiated spurious emissions including radiate bandedges shall be test to be confim no parasitic emissions i.e., compliance emissions due toingress. Band edge compliance test shall also to be verified under the worst case from module. Host cannot change the RF Exposure use conditions. lf use conditions is changed.the separate Approval shall be required. Moudle integrated in other host need new FCC lD application.

12 Special host information

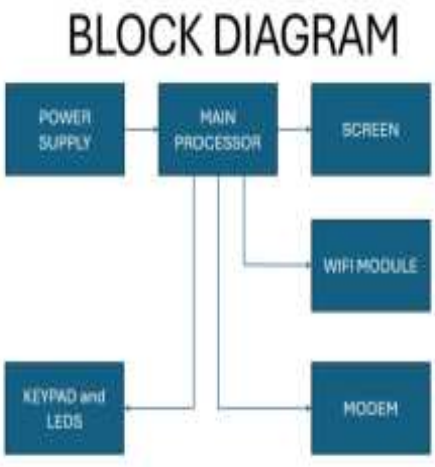
Host Name: Monitor

Manufacturer: Firmancos (Shanghai) Electronics Co., LTD

wireless function: Wifi2.4g （operating frequency: 2412-2462MHz）

BL-M8188EUA is a WLAN module used in an indoor unit called Monitor.
There are also outdoor units called video amplifier.
Video amplifier sends a call to the monitor.
Monitor shows video in its screen.
There is an additional function, because there is an app to forward audio and video conversatio by WLAN.

Function Blocking：



13 How to install the module on Host

The installation requirement is SMT mount

Fit the board into the casing.

Install the rear shell

14 Contact Information for host integrators

Contact Name: Firmancos (Shanghai) Electronics Co., LTD
Phone: 021-64659292-400
Website:www.fermax.com.cn
E-mail: sales@fermax.com.cn
Address:Building A, 1618 Yishan Road, Shanghai, China