BL-M8192EU9

802.11n WLAN 300Mbps

USB2.0 Module Specification
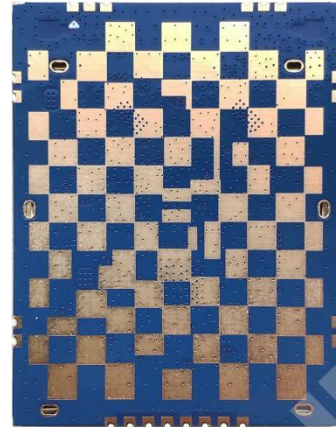
SHENZHEN BILIAN ELECTRONIC CO., LTD

（Top View）

（Bottom View）

Module Name: BL-M8192EU9	
Module Type: High-Power 802.11b/g/n 300Mbps WLAN 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	2022.10
1.0	Official release	2022.11

1. Introduction

BL-M8192EU9 Module is a High-power WLAN Module with USB2.0 interface Based on the Realtek RTL8192EU-VP-CG chipset. This module compatible IEEE 802.11 b/g/n standard and provides the maximum PHY rate up to 300Mbps, It has built-in high-power FEM to significantly extend the WLAN communication distance, ideal for long-range wireless video transmission applications of IP cameras and UAVs.

1.1 Features

• Operating Frequency:2.4~2.4835GHz

• Support IEEE 802.11n 2x2 MIMO with 20/40MHz bandwidth and Max PHY rate up to 300Mbps

• Support WEP / WPA / WPA2 WLAN Security

• Support STA and Soft-AP mode

• Built-in high-power FEM for Long-range transmission

• Single DC5V±0.25V Power Supply input

• 45*35*3.5mm LCC+LGA form factor package

1.2 Block Diagram
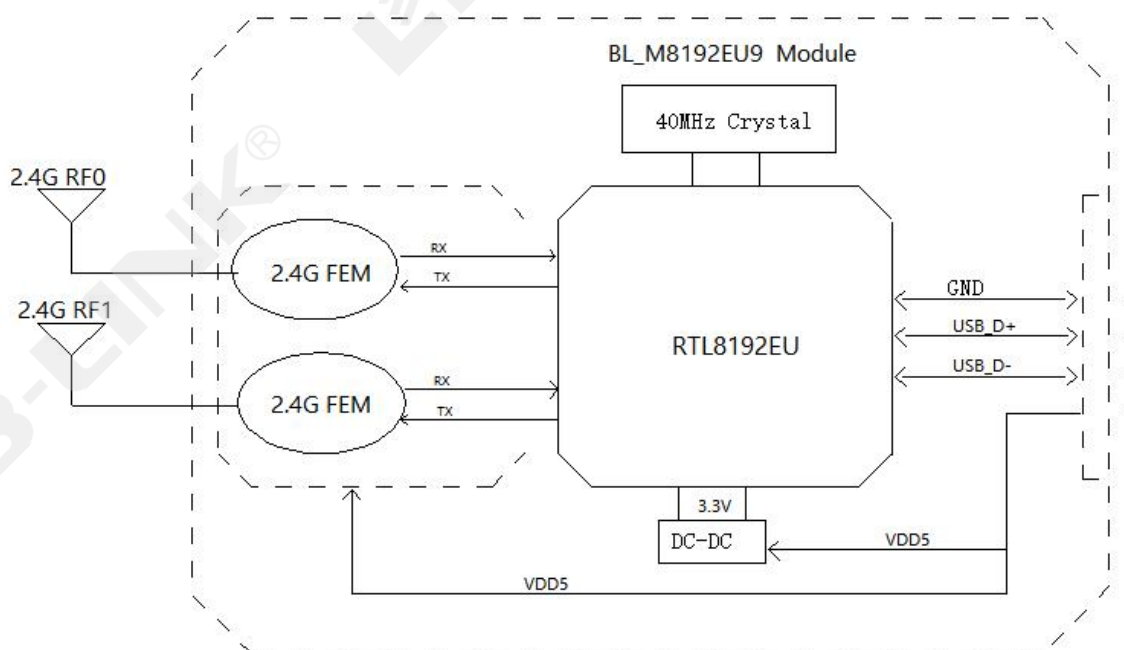
1.3 General Specifications

Module Name	BL-M8192EU9
Chipset	RTL8192EU-VP-CG
WLAN Standard	IEEE 802.11 b/g/n
Host Interface	USB 2.0
Antenna	IPEX / MHF-1 connectors for external antenna
Dimension	45*35*3.5mm (L*W*H)
Power Supply	DC 5.0V±0.25V @ 1800mA (Peak)
Consumption	<9W
Driver Support Platform	Linux: support Kernel 2.6.18~5.10(32&64Bit)
Operation Temperature	-20℃ to +50℃
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments
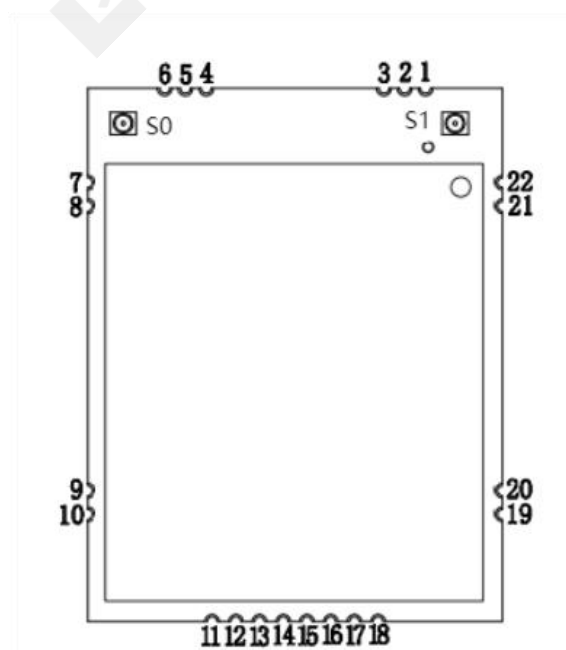
(Top View)

2.1 Pin Definition

No.	Pin Name	Type	I/O Level	Module Pin Description
1	GND	P		Ground for Power and I/O
2	NC	/		No connection
3	GND	P		Ground for Power and I/O
4	GND	P		Ground for Power and I/O
5	NC	/		No connection
6	GND	P		Ground for Power and I/O
7	GND	P		Ground for Power and I/O
8	GND	P		Ground for Power and I/O
9	GND	P		Ground for Power and I/O
10	GND	P		Ground for Power and I/O
11	GND	P		Ground for Power and I/O
12	USB_D+	AI/O		USB 2.0 differential data (+)
13	USB_D-	AI/O		USB 2.0 differential data (-)
14	GND	P		Ground for Power and I/O
15	NC	/		No connection
16	VDD5	P		DC 5.0V Power Supply
17	VDD5	P		DC 5.0V Power Supply
18	GND	P		Ground for Power and I/O
19	GND	P		Ground for Power and I/O
20	GND	P		Ground for Power and I/O
21	GND	P		Ground for Power and I/O
22	GND	P		Ground for Power and I/O
	S0 (left side)	RF		2.4G RF to IPEX / MHF-1 connector for WLAN_ANT0
	S1(right side)	RF		2.4G RF to IPEX / MHF-1 connector for WLAN_ANT1

P: Power or Ground;   I/O: In/Output;   I: Input;   O :Output;   O/D:Open Drain Output;   A I/O: Analog In/Output;

AI: Analog Input;   AO: Analog 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	50	℃
External Antenna VSWR		--	1.5	2	/
Supply Voltage	VDD5	4.75	5.0	5.25	V

Notice：* The built-in high-power FEMs will generate more heat, in order to ensure the module work stably within rated temperature range, additional heat dissipation devices must be added by customers.

Ensure that the junction temperature of module chipset is within rated value: Tj<125℃.

3.2 Power On Sequence
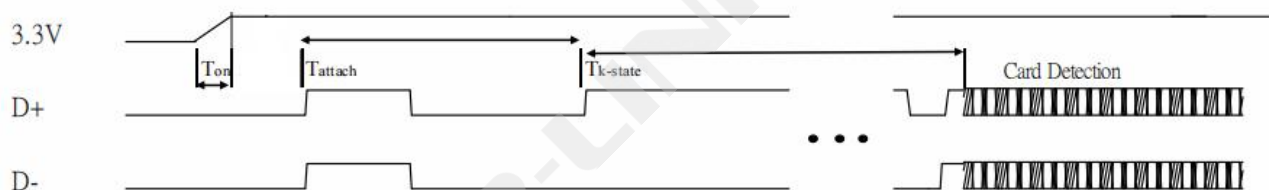
Power On Sequence

Ton: The main power ramp up duration

T_{sttch}: USB attach state

$T_{k-statte}$: the duration from resister attached to USB host starting card detection procedure

The power on flow description:

Symbol	Min	Typ	Max	Units
T_{on}	--	1.5	5	mS
T_{attch}	2	7	15	mS
$T_{k-state}$	50	250	--	mS

3.3 Current Consumption

Conditions : VDD5=5.0V ; Ta:25℃			
Use Case	**VDD5 Current**		
	I_{RMS}	**I_{peak}**	**Units**
WLAN Unassociated(Linux Driver)	163	200	mA
2.4G WLAN Link 300Mbps Web browsing(Linux Driver)	221	820	mA
2.4G WLAN UDP throughput TX 180Mbps(Linux Driver)	672	920	mA
2.4G WLAN UDP throughput RX 220Mbps(Linux Driver)	212	321	mA
2.4G 11b 1Mbps TX @ 28dBm (1TX RF test)	629	720	mA
2.4G 11b 11Mbps TX @ 26dBm (1TX RF test)	624	760	mA
2.4G HT20_MCS0 TX@27dBm (2TX RF test)	1210	1410	mA
2.4G HT20_MCS15 TX@24dBm (2TX RF test)	815	1100	mA
2.4G HT40 _MCS8 TX@27dBm (2TX RF test)	679	1140	mA
2.4G HT40_MCS15 TX@22dBm (2TX RF test)	457	820	mA
2.4G 11b 11Mbps RX (2RX RF test)	153	260	mA
2.4G HT20_MCS0 RX (2RX RF test)	153	260	mA
2.4G HT40 _MCS8 RX (2RX RF test)	158	260	mA
2.4G HT40_MCS15 RX (2RX RF test)	158	260	mA

4. 2.4G WLAN RF Specification

Conditions : VDD5=5.0V ; Ta:25℃	
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): BPSK, QPSK, QAM16, QAM64;
	802.11n (OFDM): BPSK, QPSK, QAM16, QAM64
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
Frequency Tolerance	≦±25ppm

2.4G Transmitter Specifications （WLAN_RF0&WLAN_RF1）

TX Rate	TX Power	TX Power Tolerance	EVM （dB）
802.11b@1Mbps	Recommended Target TX Power =28dBm	±2dBm	≦-10
802.11b@11Mbps	Calibrated TX Power =26dBm	±2dBm	≦-15
802.11g@6Mbps	Recommended Target TX Power ≤28dBm	±2dBm	≦-15
802.11g@54Mbps	Calibrated TX Power =24dBm	±2dBm	≦-25
802.11n@HT20_MCS0	Recommended Target TX Power ≤27dBm	±2dBm	≦-10
802.11n@HT20_MCS7	Calibrated TX Power =24dBm	±2dBm	≦-28
802.11n@HT40_MCS0	Recommended Target TX Power ≤27dBm	±2dBm	≦-10
802.11n@HT40_MCS7	Calibrated TX Power =23dBm	±2dBm	≦-28
802.11n@HT40_MCS15	Calibrated TX Power =22dBm	±2dBm	≦-28

2.4G Receiver Specifications （WLAN_RF0&WLAN_RF1）

RX Rate	Min Input Level （Typ）	Max Input Level （Typ）	PER
802.11b@1Mbps	-98dBm	-10dBm	< 8%
802.11b@11Mbps	-91dBm	-10dBm	< 8%
802.11g@6Mbps	-94dBm	-10dBm	< 10%
802.11g@54Mbps	-77dBm	-10dBm	< 10%
802.11n@HT20_MCS0	-93dBm	-10dBm	< 10%
802.11n@HT20_MCS7	-75dBm	-10dBm	< 10%
802.11n@HT40_MCS0	-91dBm	-10dBm	< 10%
802.11n@HT40_MCS7	-71dBm	-10dBm	< 10%

5. Mechanical Specifications

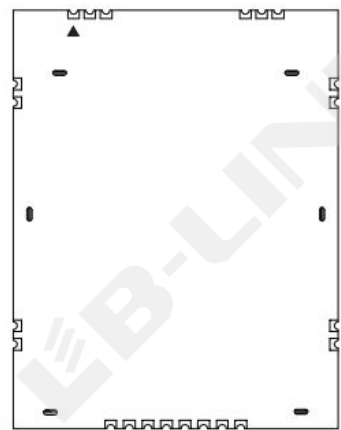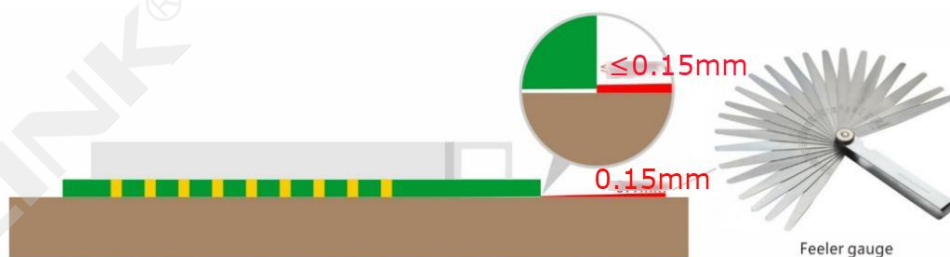## 5.1 Module Outline Drawing
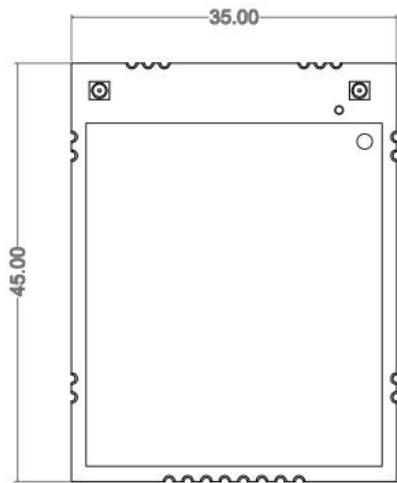
(Top View)　　　　(Side View)　　　　(Bottom View)
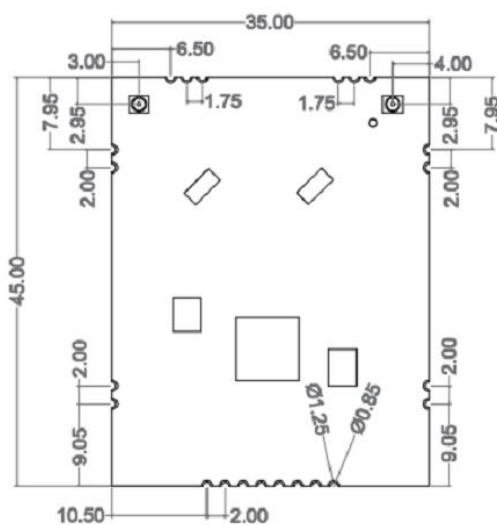
Module dimension: 45*35*3.5mm(L*W*H; Tolerance: ±0.15mm)

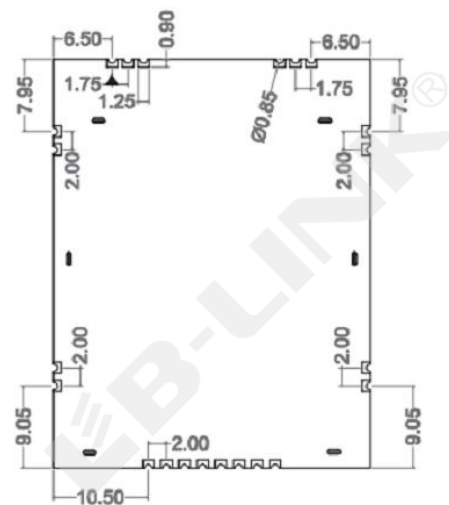IPEX / MHF-1 connector dimension: 2.6*3.0*1.2mm (L*W*H, Ø2.0mm)

Module Bow and Twist：≤0.15mm

5.2 Mechanical Dimensions

(Top View)

(Bottom View)

6. Application Information

## 6.1 Typical Application Circuit

![LB-LINK logo]
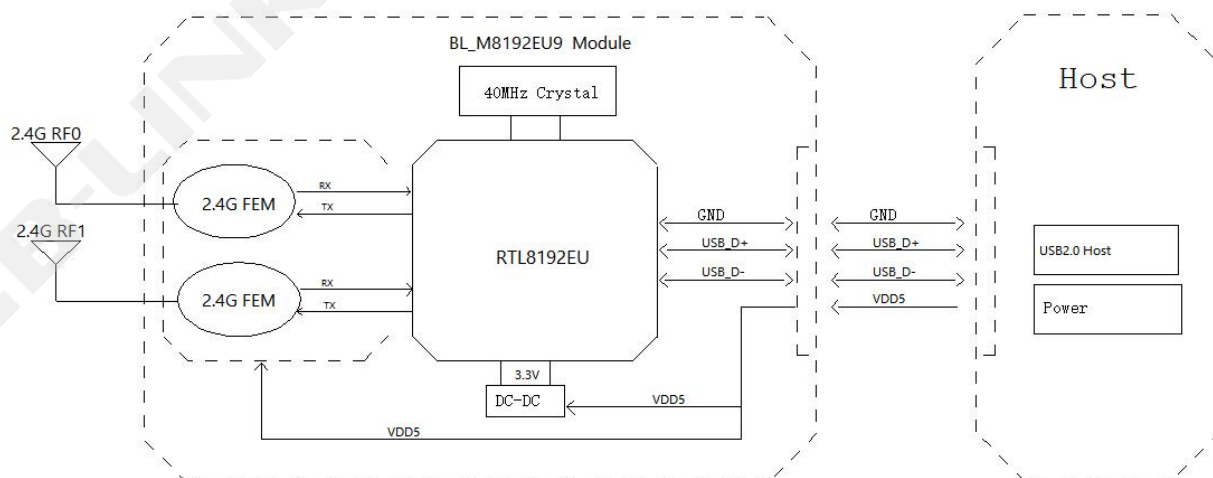
6.2 HW Application Note

6.2.1   Power requirement

Power Supply Voltage: DC 4.75~5.25V & Ripple Voltage <200mV；Peak current ≥1800mA; For achieve fast transient response，a current mode buck converter recommended.

6.2.2   USB interface Design Guidelines

A、Route the USB signal traces as differential pairs with ground surrounded. Route the USB signal pairs as short as possible, avoid interference from Power and other signals.

B、The USB high speed differential pair should be maintain 90Ω±5Ω differential impedance.

6.3 Recommend PCB Layout Footprint
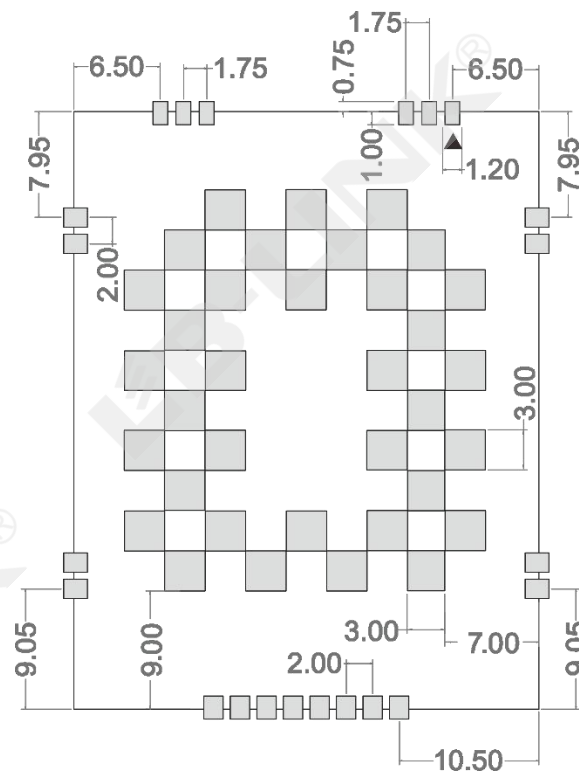
Units:mm

Notes:

A、3*3mm GND PAD area for heat dissipation are designed at the bottom of module,

they must be soldered to the customer's application main-board.

B、Modules shield covers and thermal conductive silicone pads are delivered with

separately packaged. After the module soldered to main-board, assemble them manually by customer.
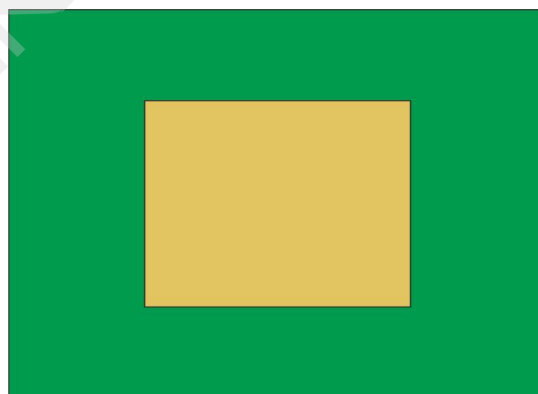
6.4 Thermal Dissipation

Module is designed to work on an extreme temperature range, to make sure the module can work properly for a long time and achieve a better performance on conditions like maximum power or high data transmission.This has two ways to enhance heat dissipation performance:

1、The module uses heat sink installed at the bottom of customer application mother-board to dissipate heat:

A、The green area in figure below represents customer application mother-board with recommended size ≧ 65*90mm. The GND PAD at bottom of module must be soldered to main-board Top Layer for full heat conduction.


(Top Layer of mother-board)   (Bottom Layer of mother-board)

B、Open a solder mask area with recommended size ≧ 40*50mm on the Bottom Layer of customer application mother-board. It is located directly below the module, gold-plated and connected with the Top Layer GND PAD through many vias to fully conduct heat.

C、Recommended to add thermal conductive silicone Grease between the heat-sink and solder mask area of mother-board for full heat conduction.
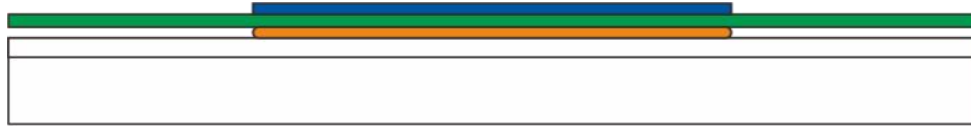
(Heat sink installed at the bottom of mother-board)

unit: mm
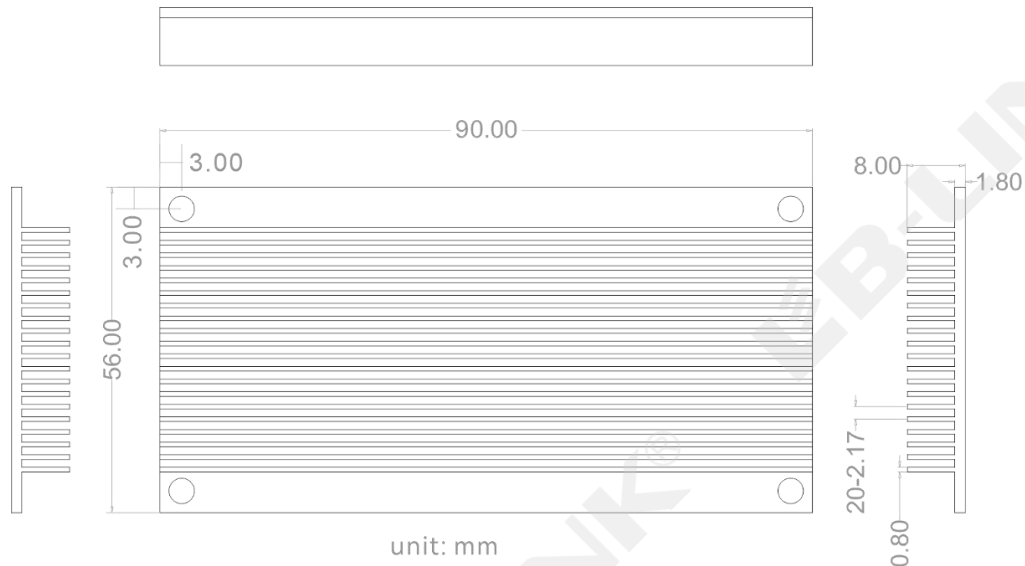
(The recommended Heat-sink: ≧ 90*56*8mm, aluminum-extruded heat-sink)

2、The module uses metal case of the customer's product to dissipate heat :

A、Recommended to add thermal conductive silicone pad between the metal case and solder mask area of mother-board for full heat conduction. The recommended thermal conductivity is 4 and its thickness ≦ 2mm.

(Uses the metal case to dissipate heat)

6.5 Reflow Soldering Standard Conditions
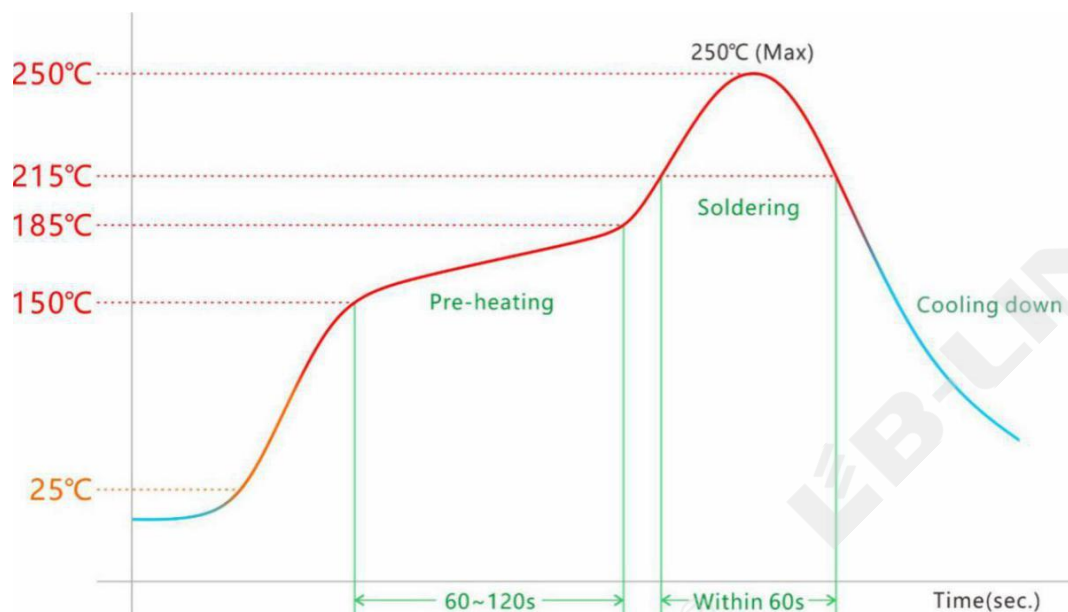
Please use the reflow within 2 times.
Set up the highest temperature within 250℃.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8192EU-VP-CG	Realtek	
2	PCB	BL-M8192EU9-FR4	Shenzhen Tie Fa Technology CO. LTD	
			Quzhou Sunlord Electronics CO., LTD	
3	Crystal	40MHz	Lucki Electronics Co., Ltd	
			Chengde Oscillator Electronic Technology Co., Ltd.	
4	FEM	KCT8243HE	Kxcomtech	

![LB-LINK logo]

8.Package and Storage Information

8.1 Package Dimensions

Package specification:
1. 24 modules per blister plate and 264 modules per box.
2. The blister is bound with wire membrane and put into anti-static vacuum bag.
3. Put 1 bag of dry beads (20g) and 1 pc 3 point humidity card in each anti-static vacuum bag.
4. Put 264 PCs thermally thermal conductive silicone pads and 264 PCs shielding covers on top of the antistatic vacuum bag.
5. The outer box size is 35.2*21.5*15.5cm.

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!

ESD CAUTION