



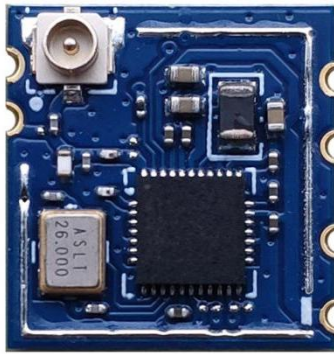
BL-M8800DU5-L

**802.11ax 287Mbps WLAN +BLE v5.2 Combo
USB2.0 Module Specification**

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(Top View)



(Bottom View)

Module Name: BL-M8800DU5-L	
Module Type: 802.11b/g/n/ax 287Mbps WLAN + BLE v5.2 Combo USB2.0 Module	
Revision: V1.1	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
B-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
1.1	Official release	2024-3-22	Ch

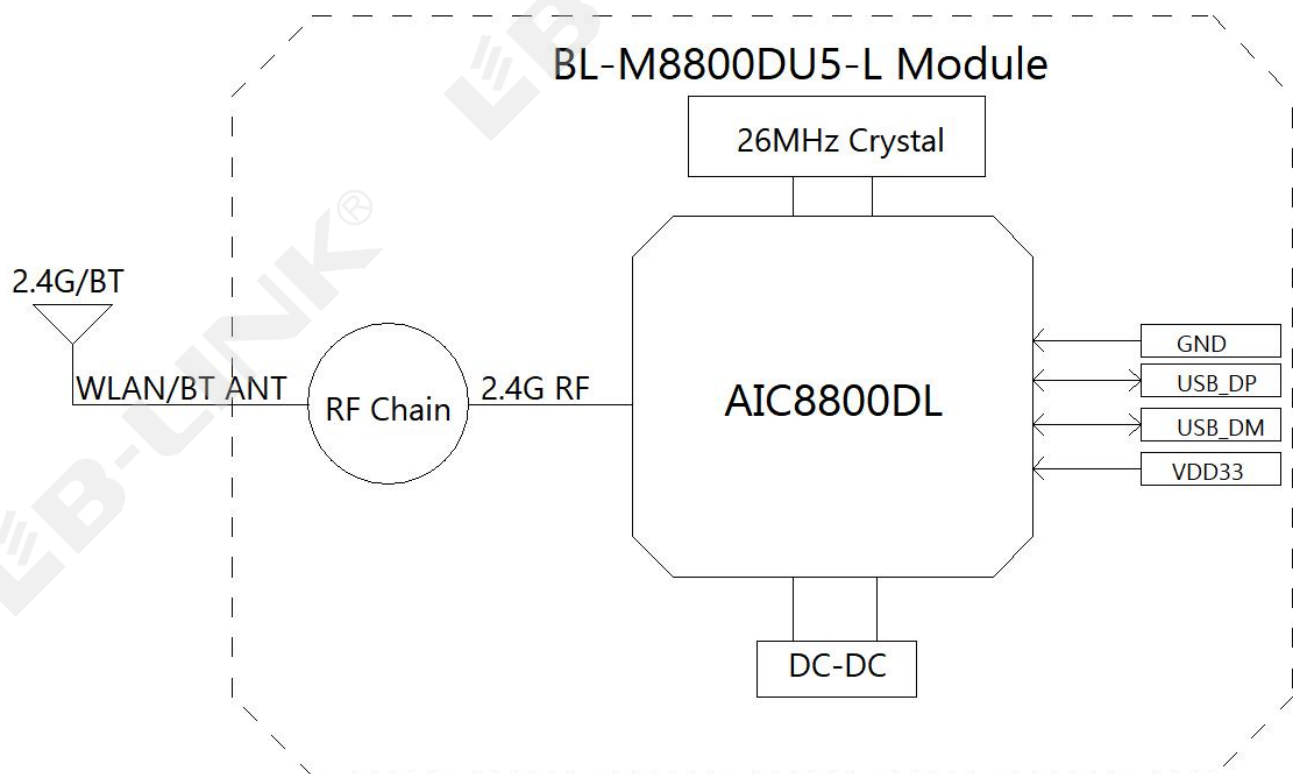
1. Introduction

BL-M8800DU5-L is a highly integrated WLAN + Bluetooth Combo module base on AIC8800DL chip, which combines a 1T1R WLAN subsystem and a BLE v5.2 subsystem. This module compatible IEEE 802.11b/g/n/ax standard and provides the maximum PHY rate up to 287Mbps, offering feature-rich wireless connectivity at high standards, delivering reliable, cost-effective and high throughput from an extended distance.

1.1 Features

- Operating Frequency: 2.4~2.4835GHz
- compatible IEEE 802.11b/g/n/ax
- WLAN PHY rate reach up to 287Mbps@TX and 230Mbps@RX with 20/40MHz bandwidth
- Support STA, AP, WLAN Direct modes concurrently
- Compatible Bluetooth core specification v5.2, supports BLE only

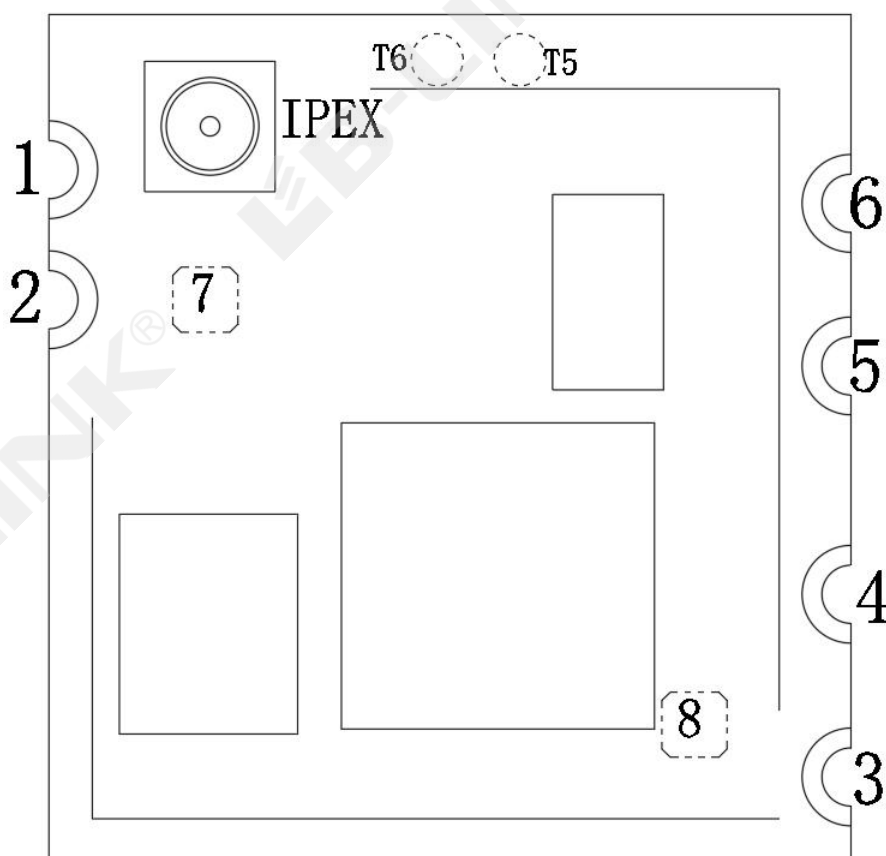
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8800DU5-L
Chipset	AIC8800DL
WLAN Standard	IEEE 802.11 b/g/n/ax
BT Specification	BLE v5.2
Host Interface	USB2.0 for WLAN & Bluetooth
Antenna	IPEX / MHF-1 connector for external WLAN/BT antenna
Dimension	13.0*12.3*2.1mm (L*W*H)
Power Supply	DC 3.3V±0.2V @ 500 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	I/O Level	Module Pin Description
1	GND	RF	/	RF Ground for WLAN/BT ANT
2	ANT	NC	/	NC (Reserved 2.4G RF PAD for WLAN/BT ANT)
3	VDD33	P	/	DC 3.3V Power Supply
4	USB_DM	A I/O	/	USB Transmitter/Receiver Differential Pair
5	USB_DP	A I/O	/	USB Transmitter/Receiver Differential Pair
6	GND	P	/	Power Ground
7	GND	RF	/	Auxiliary RF Ground connection PAD for WLAN ANT (It can be left floating, but grounding is strongly recommended to enhance ground connectivity and avoid RF interference)
8	GND	P	/	Auxiliary Ground connection PAD for power and USB (It can be left floating, but grounding is strongly recommended to reduce the power loop area and avoid interference with RF)
9	IPEX	RF	/	2.4G RF Connector for WLAN/BT ANT
T5	UART0_RX	I/O	VDD33	UART0 RX input signal reserved for testing, share with GPIOA8
T6	UART0_TX	I/O	VDD33	UART0 TX output signal reserved for testing, share with GPIOA9

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	70	°C
External Antenna VSWR		/	1.7	2	/
Supply Voltage	VDD33	3.1	3.3	3.5	V

3.2 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C ;

Use Case	VDD33 Current		
	Typ(I _{RMS})	Max(I _{Peak})	Units
WLAN Unassociated (Linux Driver)	88	116	mA
2.4G WLAN TCP throughput TX 140Mbps(Linux Driver)	296	468	mA
2.4G WLAN TCP throughput RX 149Mbps(Linux Driver)	147	476	mA
2.4G 11b 1Mbps TX @ 17dBm (WLAN RF test)	188	296	mA
2.4G 11b 1Mbps RX (WLAN RF test)	71.3	97	mA
2.4G 11b 11Mbps TX @ 17dBm (WLAN RF test)	102	296	mA
2.4G 11b 11Mbps RX (WLAN RF test)	69	101	mA
2.4G 11g 6Mbps TX @ 17dBm (WLAN RF test)	108	368	mA
2.4G 11g 6Mbps RX (WLAN RF test)	71	109	mA
2.4G 11g 54Mbps TX @ 14dBm (WLAN RF test)	79.4	328	mA
2.4G 11g 54Mbps RX (WLAN RF test)	67.5	107	mA
2.4G HT40_MCS0 TX@16dBm (WLAN RF test)	95.5	368	mA
2.4G HT40_MCS0 RX (WLAN RF test)	69	108	mA
2.4G HT40 MCS7 TX@14dBm (WLAN RF test)	76.9	366	mA
2.4G HT40 MCS7 RX (WLAN RF test)	69	106	mA
2.4G HE_SU 40MHz MCS11 TX @13dBm (WLAN RF test)	76.8	352	mA
2.4G HE_SU 40MHz MCS9 RX (WLAN RF test)	70	104	mA
LE_1M TX @7dBm(RF-Test)	90	131	mA
LE_1M RX(RF-Test)	38	113	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11b/g/n/ax		
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; 802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;		
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(1T1R) 13.5~150Mbps; 802.11ax (HE_MU,OFDMA 26~242RU): MCS0~MCS11(1T1R) 0.4~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(1T1R) 3.6~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 40MHz): MCS0~MCS11(1T1R) 7.3~286.8Mbps;		
Frequency Tolerance	≤±20ppm		
2.4G Transmitter Specifications (TX power tolerance calibrated, customers can define the target TX power within recommended range 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	Recommended Target TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1~11Mbps	17	±2	≤-10
802.11g@6Mbps	17	±2	≤-15
802.11g@54Mbps	14	±2	≤-25
802.11n@HT20_MCS0	16	±2	≤-10
802.11n@HT20_MCS7	14	±2	≤-28
802.11n@HT40_MCS0	16	±2	≤-10
802.11n@HT40_MCS7	14	±2	≤-28
802.11ax@HE_SU 40M_MCS0	16	±2	≤-15
802.11ax@HE_SU 40M_MCS11	13	±2	≤-35
2.4G Receiver Specifications			
RX Rate	Min Input Level (Typ, dBm)	Max Input Level (Typ, dBm)	PER

802.11b@1Mbps	-94	-5	< 8%
802.11b@11Mbps	-87	-5	< 8%
802.11g@6Mbps	-92	-5	< 10%
802.11g@54Mbps	-75	-5	< 10%
802.11n@HT20_MCS0	-91	-5	< 10%
802.11n@HT20_MCS7	-73	-5	< 10%
802.11n@HT40_MCS0	-88	-5	< 10%
802.11n@HT40_MCS7	-70	-5	< 10%
802.11ax@HE_SU 40M_MCS0	-84	-5	< 10%
802.11ax@HE_SU 40M_MCS9	-60	-5	< 10%

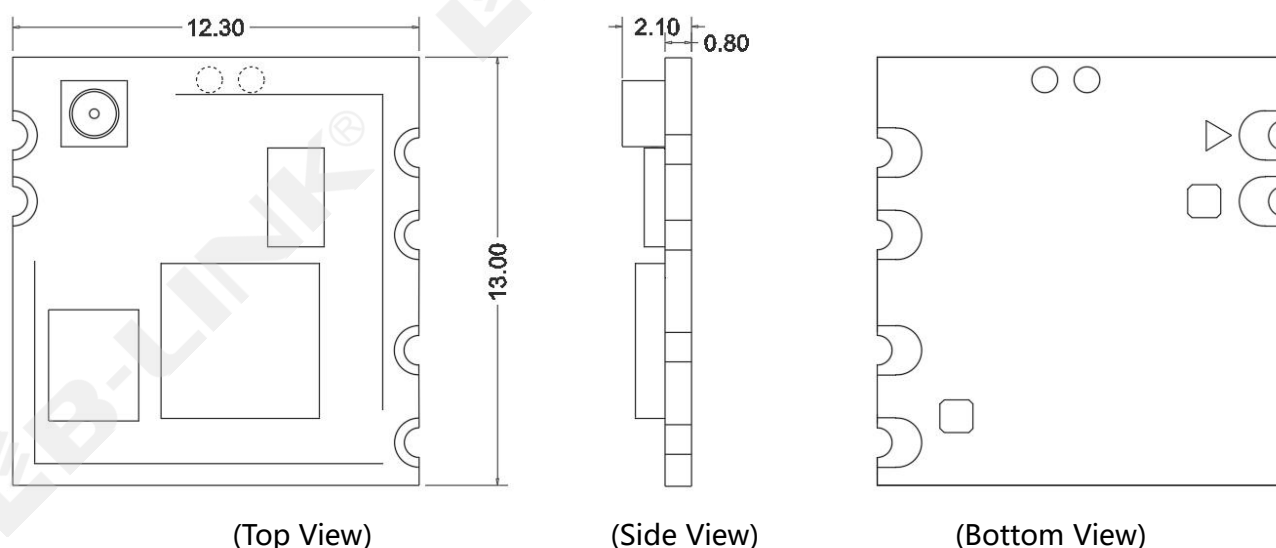
4.2 Bluetooth RF Specification

Conditions: VDD33=3.3V; Ta:25°C			
Features	Description		
Bluetooth Specification	Bluetooth v5.2 Low Energy		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	LE_125Kbps: GFSK (Coded_S=8); LE_500Kbps: GFSK (Coded_S=2); LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	Min	Typ	Max
TX Power			
BLE 1M/2M	4dBm	8dBm	10dBm
BLE 125K/500K	4dBm	8dBm	10dBm
Items	Min	Typ	Max
LE_1M Modulation Characteristics			
Δf1avg	225KHz	253KHz	275KHz
Δf2avg	185KHz	223.08KHz	/
Δf2max	185KHz	217.53KHz	/

$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.88	/	
LE_2M Modulation Characteristics				
Δf_{1avg}	450KHz	500.86KHz	550KHz	
Δf_{2avg}	370KHz	481.94KHz	/	
Δf_{2max}	370KHz	467.77KHz	/	
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.96	/	
Bluetooth Receiver Specifications				
Items	Sensitivity		Maximum Input Level	
	Input Level (Typ)	PER	Input Level (Typ)	PER
BLE_125/500K	-90dBm	≤5%	-5dBm	≤5%
BLE_1M	-88dBm	≤5%	-5dBm	≤5%
BLE_2M	-85dBm	≤5%	-5dBm	≤5%

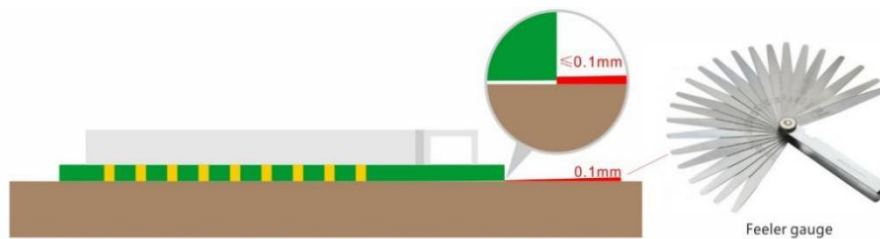
5. Mechanical Specifications

5.1 Module Outline Drawing



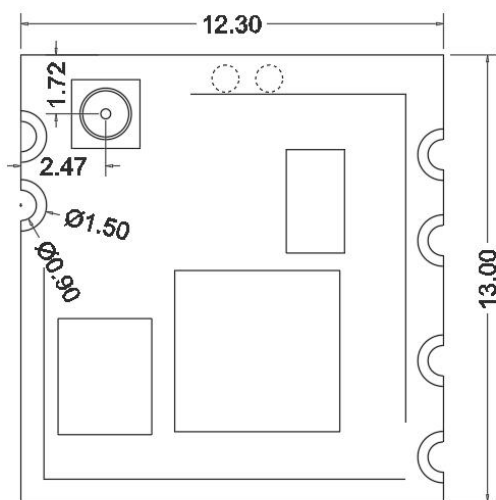
Module dimension: 13.0*12.3*2.1mm(L*W*H; Tolerance: $\pm 0.3\text{mm}_L/W$, $\pm 0.2\text{mm}_H$)

IPEX / MHF-1 connector dimension: 2.6*3.0*1.25mm (L*W*H, $\varnothing 2.0\text{mm}$)

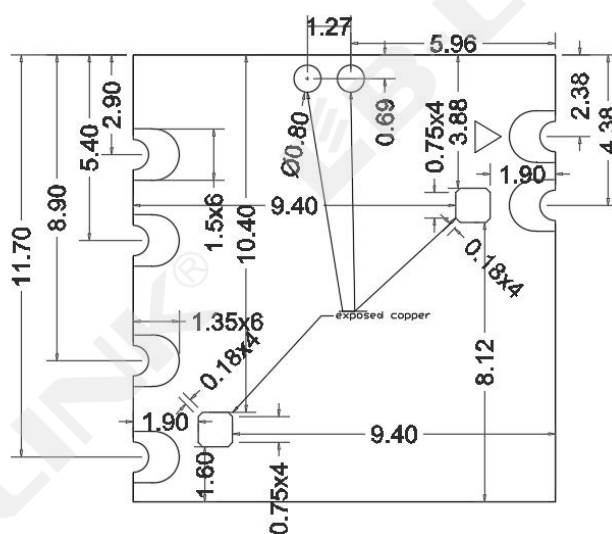


Module Bow and Twist: $\leq 0.1\text{mm}$

5.2 Mechanical Dimensions



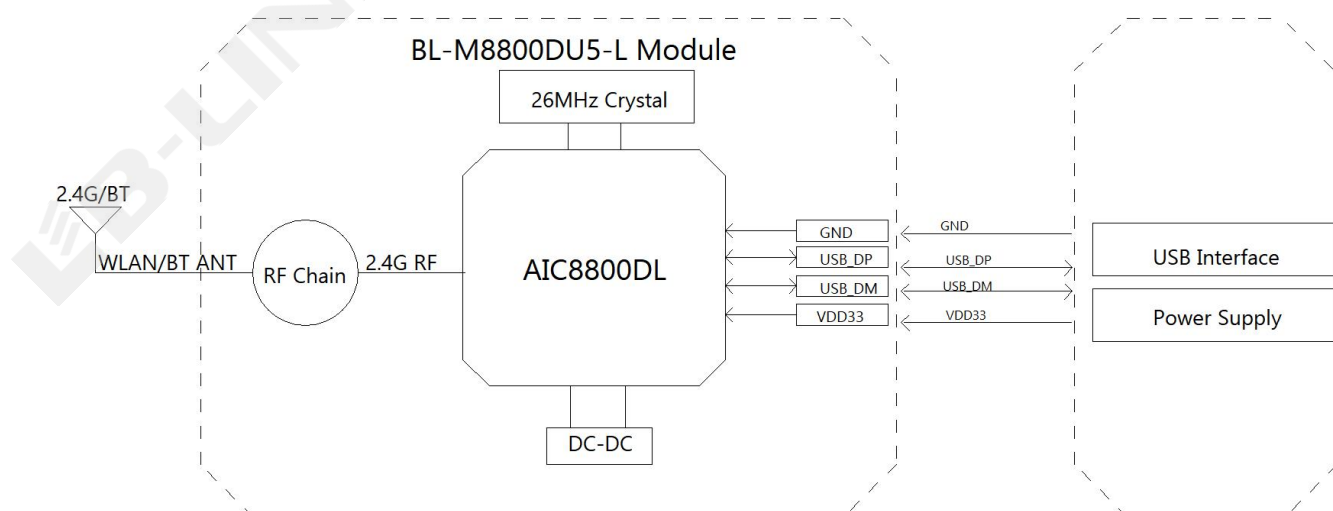
(Top View)



(Bottom View)

6. Application Information

6.1 Typical Application Circuit



6.2 HW Application Not:

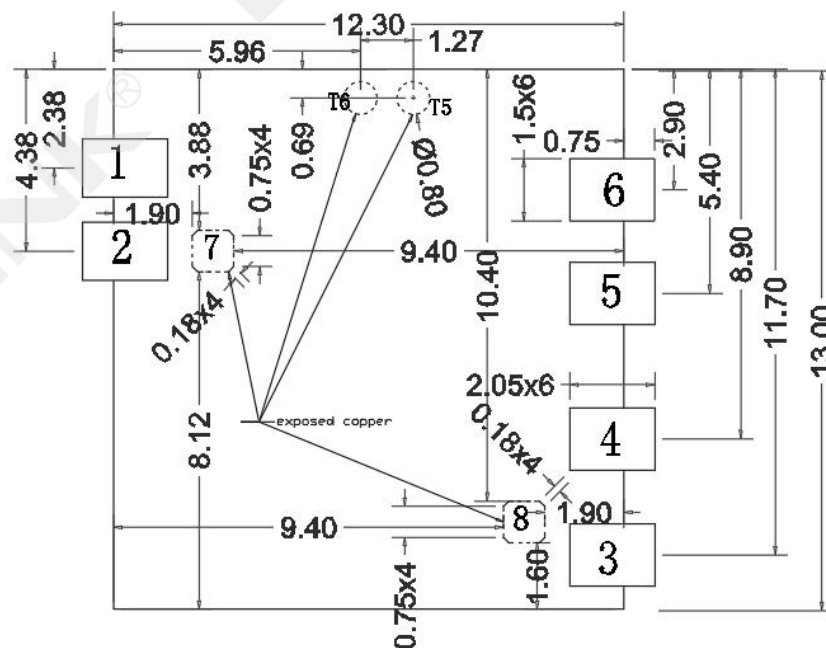
6.2.1 VDD33 Power requirement:

- A、DC 3.1~3.5V & Ripple Voltage <100mV power supply input, Maximum RMS current $\geq$ 0.4A and Maximum Peak current $\geq$ 0.5A.
- 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.

6.2.2 USB interface Design Guidelines:

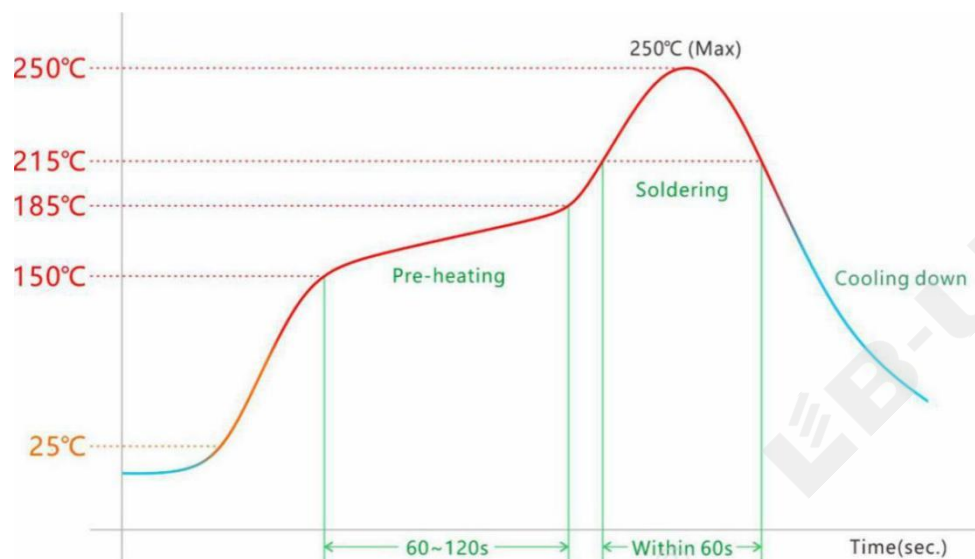
- A、The module provides a USB device interface which is compatible with USB2.0 specification, High-Speed mode supports data transmission rate up to 480Mbps.
- B、On customer's motherboard, PCB traces of the USB high-speed signal pair should be maintain 90Ω differential impedance, structure of "Differential 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 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.

6.3 Recommend PCB Layout Footprint



(Design Unit: mm)

6.4 Reflow Soldering Standard Conditions



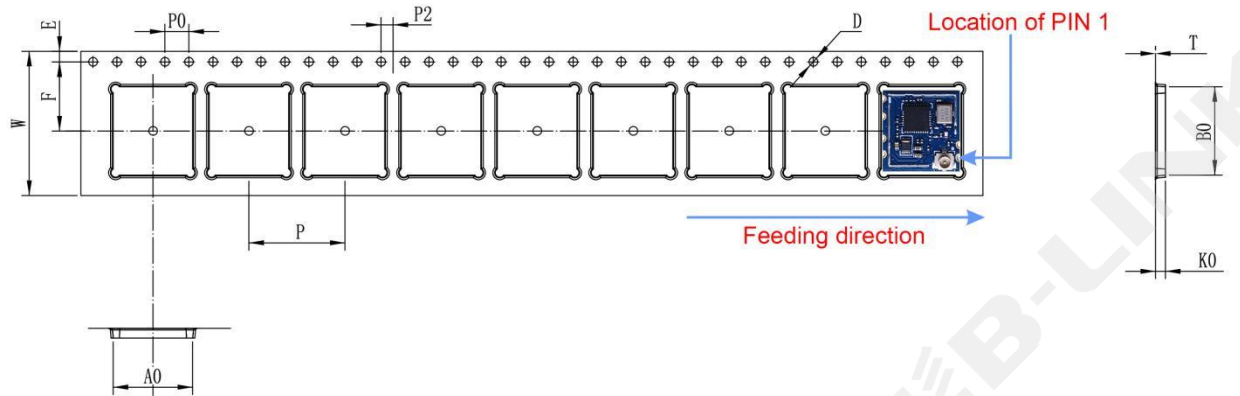
Please use the reflow within 2 times.
Set up the highest temperature within 250°C.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	AIC8800DL	AIC Semiconductor (Shanghai) CO.,LTD	
2	PCB	BL-M8800DU5	SHEN ZHEN QILI ELECTRON CO.,LTD	
			Huizhou Dayawan Kexiang Technology Circuit Board Co., Ltd	
			ShenZhen Tie Fa Technology Limited	
3	Crystal	26MHz-3225	Chengde oscillator Electronic Technology CO.,LTD	
			LUCKI CM ELECTRONICS CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	

8. Package and Storage Information

8.1 Package Dimensions



ITEM	W	A0	B0	K0	E	F	P	P0	P2	D	T
DIM	24.00±0.3	12.70±0.1	13.60±0.1	2.50±0.1	1.75±0.1	11.5±0.1	20.00±0.1	4.00±0.1	2.00±0.1	Ø1.5±0.1	0.30±0.05



Package specification:

- 1,000 modules per roll and 5,000 modules per box.
- Outer box size: 37.5*36*29cm.
- The diameter of the blue environment-friendly rubber plate is 13 inches, with a total thickness of 28mm (with a width of 24mm carrying belt).
- Put 1 package of dry agent (20g) and 1 humidity card in each anti-static vacuum bag.
- Each carton is packed with 5 boxes.

8.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40°C to +85°C,

Storage humidity: 10% to 95 (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: $\pm 2\text{KV}$ (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