



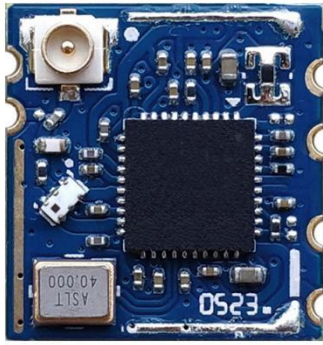
B-LINK®

BL-M8731BU4

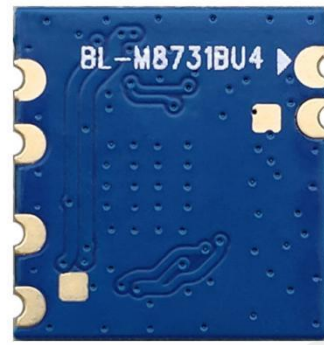
**802.11n 72.2Mbps Dual-band
WLAN USB2.0 Module Specification**

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(Top View)



(Bottom View)

Module Name: BL-M8731BU4	
Module Type: 802.11a/b/g/n dual-band 72.2Mbps 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	2023-2-15
1.0	Official release	2023-2-22

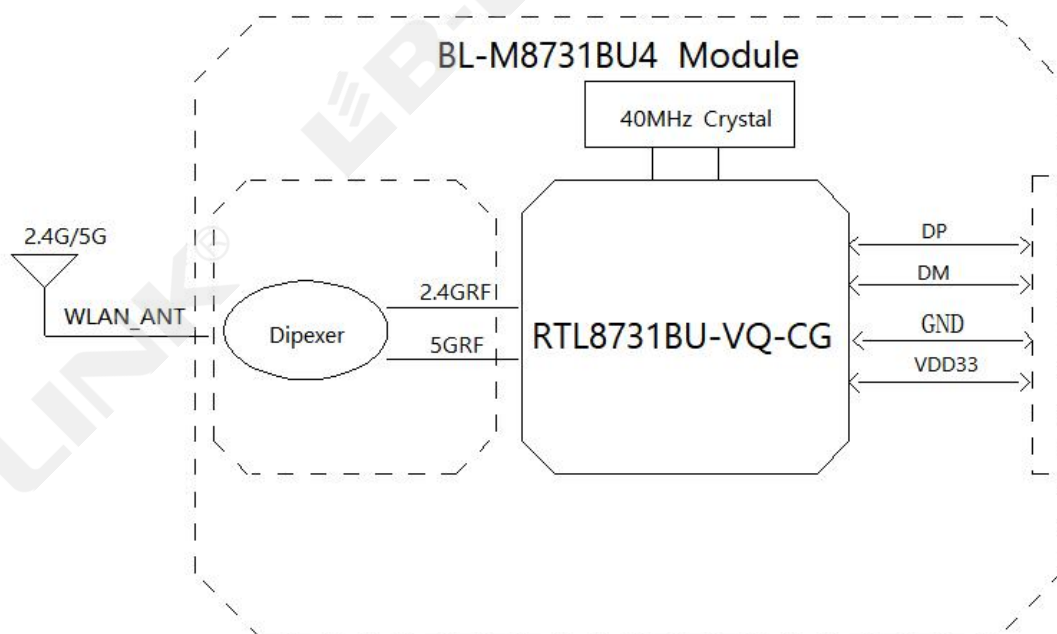
1. Introduction

BL-M8731BU4 is a highly integrated dual-band WLAN module base on RTL8731BU, which combines WLAN MAC, 1T1R Baseband and Radio in single chip. It compatible IEEE 802.11a/b/g/n standard and supports Maximum PHY rate up to 72.2Mbps. The module provides excellent WLAN performance and lower cost ideal for wireless network applications such as set-top boxes, OTT boxes, IP cameras, LED projectors.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz or 5.15~5.85GHz
- Host Interface is USB2.0
- Wireless PHY rate up to 72.2Mbps
- Connect to external antenna through IPEX / MHF-1 connector
- DC 3.3V±0.2V power supply

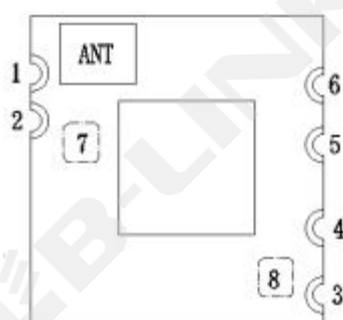
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8731BU4
Chipset	RTL8731BU-VQ-CG
WLAN Standard	IEEE 802.11 a/b/g/n
Host Interface	USB2.0 for WLAN
Antenna	Connect to external antenna through IPEX / MHF-1 connector
Dimension	13.0*12.3*2.1mm (L*W*H) ±0.15mm
Power Supply	DC 3.3V±0.2V @ 650 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_ANT
2	NC	RF		NC(Reserve 2.4G/5G RF PAD for WLAN_ANT)
3	VDD33	P		VDD 3.3V Power Supply
4	DM	AI/O		USB2.0 Transmitter/Receiver Differential Pair
5	DP	AI/O		USB2.0 Transmitter/Receiver Differential Pair
6	GND	P		Ground connection
7	GND	RF		Auxiliary RF Ground connection PAD for 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)
	ANT	RF		IPEX connector for 2.4G/5G RF to WLAN_ANT

P: Power or Ground; I/O: In/Output; I: Input; O :Output; AI/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	°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)	36	42	mA
2.4G WLAN TCP throughput TX 50Mbps (Linux Drive)	320	592	mA
2.4G WLAN TCP throughput RX 40Mbps (Linux Drive)	99	536	mA
5G WLAN TCP throughput TX 50Mbps (Linux Drive)	355	608	mA
5G WLAN TCP throughput RX 40Mbps (Linux Drive)	114	544	mA
2.4G 11b@1Mbps TX@20dBm (RF test)	416	450	mA
2.4G 11g@11Mbps TX@20dBm (RF test)	351	416	mA
2.4G 11g@6Mbps TX@20dBm (RF test)	422	528	mA
2.4G 11g@54Mbps TX@19dBm (RF test)	240	528	mA
2.4G 11n@HT20_MCS0 TX@20dBm (RF test)	387	424	mA
2.4G 11n@HT20_MCS7 TX@18dBm (RF test)	231	384	mA
2.4G 11n@HT20_MCS0 RX (RF test)	40	137	mA
5G 11a@6Mbps TX@19dBm (RF test)	389	392	mA

5G 11a@54Mbps TX@17dBm (RF test)	225	376	mA
5G 11n@HT20_MCS0 TX@18dBm (RF test)	394	424	mA
5G 11n@HT20_MCS7 TX@16dBm (RF test)	202	352	mA
5G 11n@HT20_MCS7 RX (RF test)	48	138	mA

4. WLAN 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		
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 6.5~72.2Mbps;		
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)			
TX Rate	Recommended Target TX Power ≤ (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1~11Mbps	20	±2	≤-10
802.11g@6Mbps	20	±2	≤-10
802.11g@54Mbps	19	±2	≤-25
802.11n@HT20_MCS0	20	±2	≤-10
802.11n@HT20_MCS7	18	±2	≤-28

2.4G Receiver Specifications			
RX Rate	Min Input Level (Typ dBm)	Max Input Level (Typ dBm)	PER
802.11b@1Mbps	-96	-5	< 8%
802.11b@11Mbps	-88	-5	< 8%
802.11g@6Mbps	-93	-5	< 10%
802.11g@54Mbps	-75	-5	< 10%
802.11n@HT20_MCS0	-92	-5	< 10%
802.11n@HT20_MCS7	-72	-5	< 10%

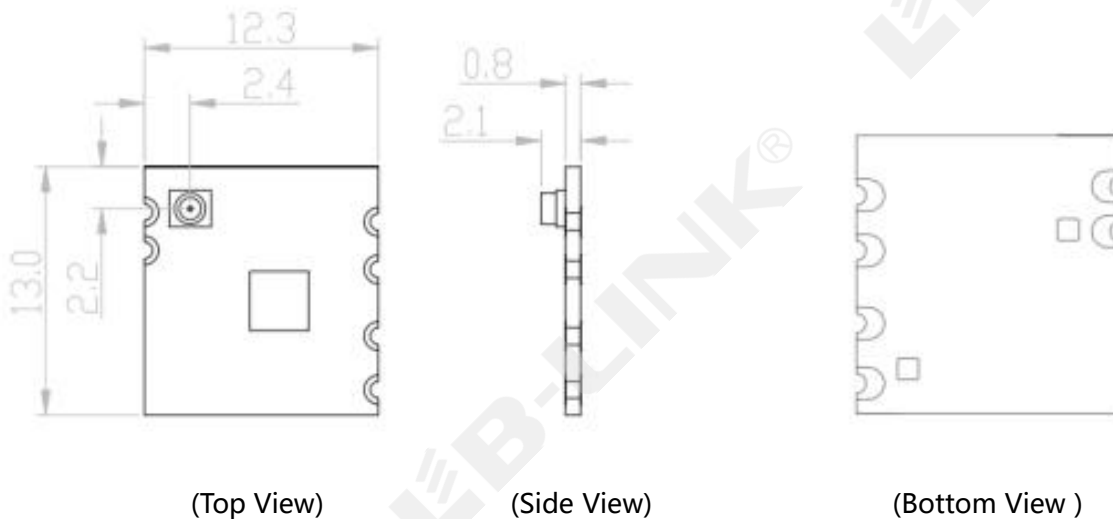
4.2 5G WLAN RF Specification

Conditions: VDD33=3.3V; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11a/n		
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, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;		
Date Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7 6.5~72.2Mbps;		
Frequency Tolerance	≤ ±20ppm		
5G Transmitter Specifications (TX power tolerance calibrated, customers can define the target TX power within recommended range by modifying configuration file of the driver software)			
TX Rate	Recommended Target TX Power ≤ (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11a@6Mbps	19	±2	≤-10
802.11a@54Mbps	17	±2	≤-25
802.11n@HT20_MCS0	18	±2	≤-10
802.11n@HT20_MCS7	16	±2	≤-28
5G Receiver Specifications			

RX Rate	Min Input Level (Typ dBm)	Max Input Level (Typ dBm)	PER
802.11a@6Mbps	-91	-5	< 10%
802.11a@54Mbps	-74	-5	< 10%
802.11n@HT20_MCS0	-89	-5	< 10%
802.11n@HT20_MCS7	-72	-5	< 10%

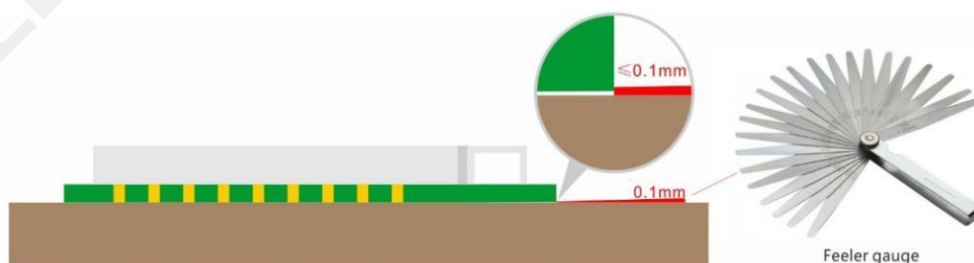
5. Mechanical Specifications

5.1 Module Outline Drawing



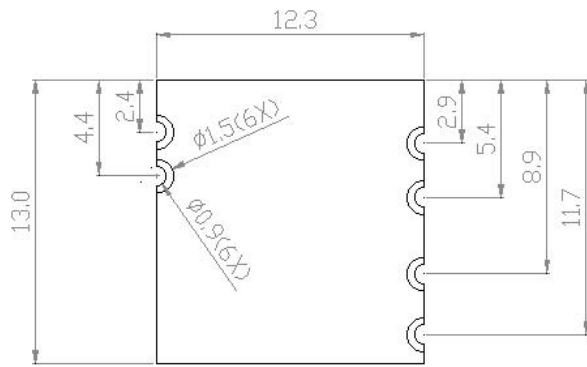
Module dimension: 13.0*12.3*2.1mm(L*W*H; Tolerance: $\pm 0.15\text{mm}$)

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

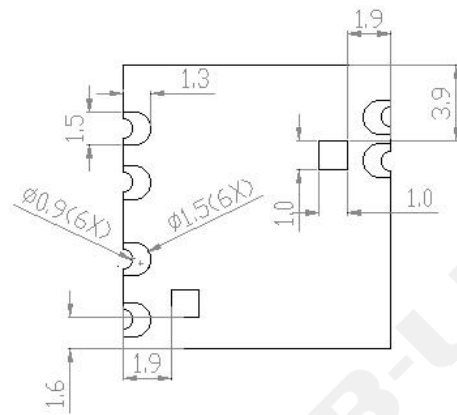


Module Bow and Twist: $\leq 0.1\text{mm}$

5.2 Mechanical Dimensions



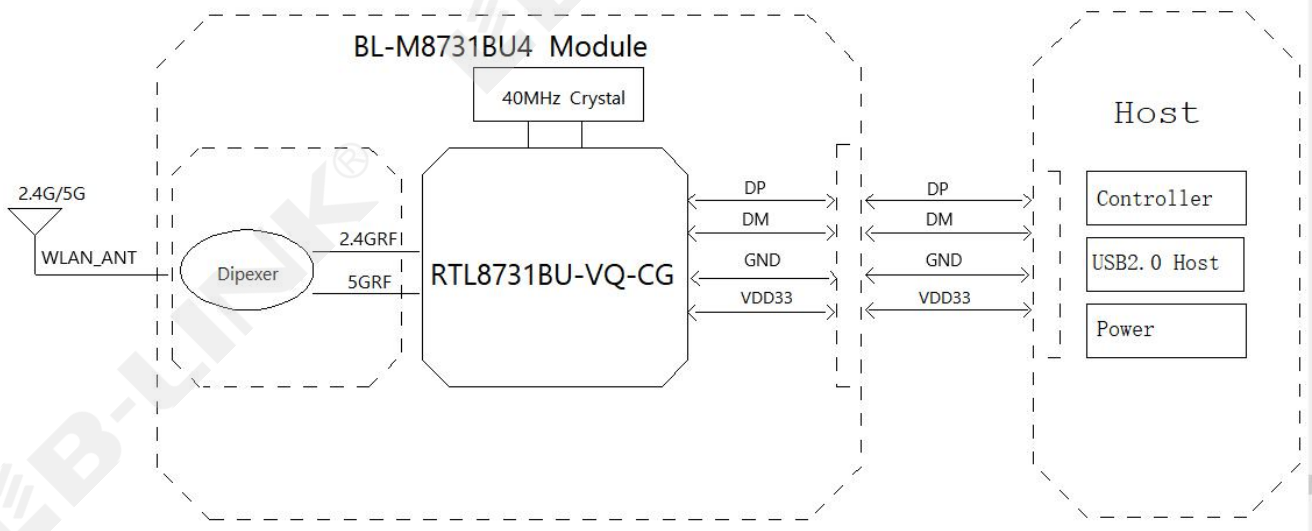
(Top View)



(Bottom View)

6. Application Information

6.1 Typical Application Circuit



6.2 HW Application Note

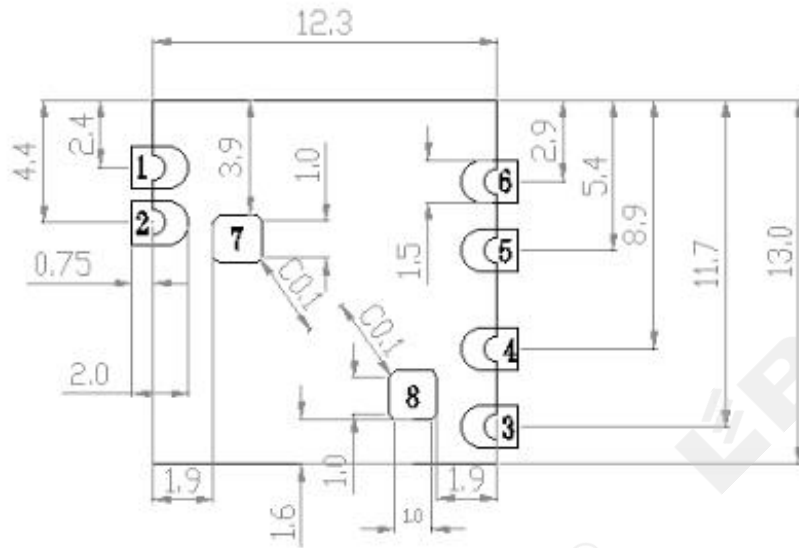
6.2.1 VDD33 Power requirement:

- A. DC 3.1~3.5V & Ripple Voltage <100mV power input, Maximum RMS current $\geq 0.5A$ and Maximum Peak current $\geq 0.65A$;
- B. For achieve fast transient response, a current mode buck converter recommended.
- C. 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.
- D. BL-M8731BU4 uses general packaging of USB_6Pin, which has the defect that GND Pins are too far away from Signal and Power Pins, therefore, soldering two auxiliary grounding PADS at the bottom of BL-M8731BU4 to customer's motherboard are strongly recommended.

6.2.2 USB interface Design Guidelines:

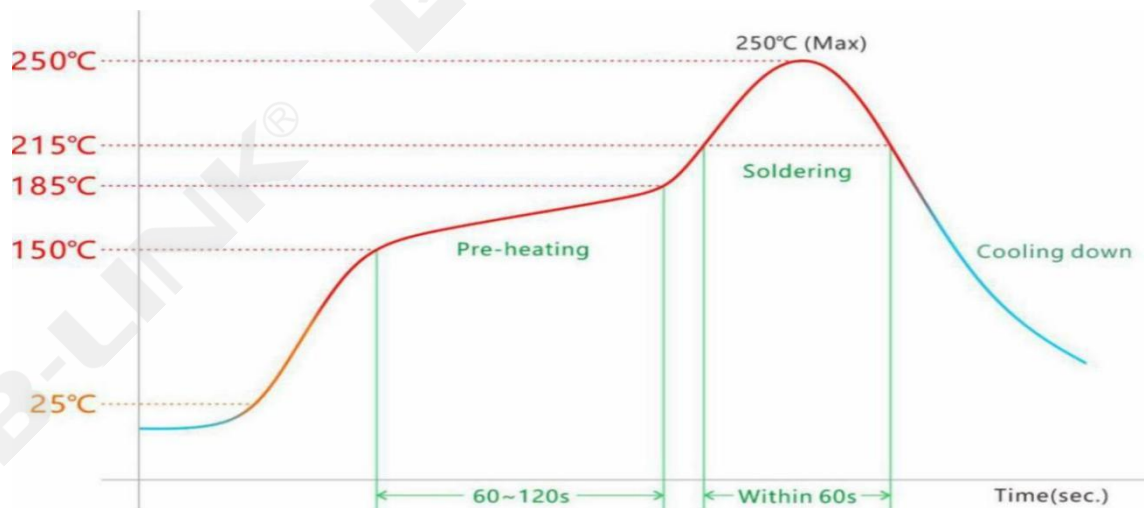
- A. BL-M8731BU4 provides a USB device interface which is compatible with USB2.0 specification, High-Speed mode supports data transmission rate up to 480Mbps.
- B. PCB traces of the USB high-speed signal pair should be maintain 90Ω differential impedance, structure of "Differential Coated Coplanar Wave-guide With Ground" with the advantages of impedance control and GND surrounding isolation interference may be an ideal choice.
- C. PCB traces of the USB high-speed signal pair as short as possible, minimize the length mismatch of signal pair, avoid layer change and maintain a complete reference plane 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.
- E. On customer's motherboard, keep complete GND copper area under and around the module, do not route Power, USB and other signals there to avoid interfering with the module causing RF performance derating problem.

6.3 Recommend PCB Layout Footprint



(Design size: mm)

6.4 Reflow Soldering Standard Conditions



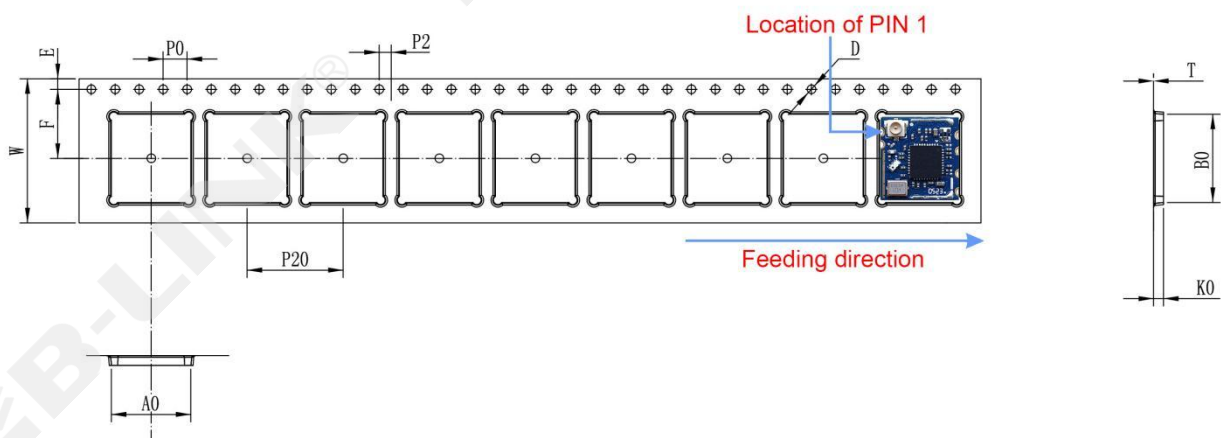
Please use the reflow within 2 times.
Set up the highest temperature within 250°C.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8731BU-VQ-CG	Realtek Semiconductor Corp.	
2	PCB	BL-M8731BU4	ShenZhen Tie Fa Technology Limited	
			Quzhou Sunlord Electronics Co.,Ltd	
			SHEN ZHEN QILI ELECTRON CO.,LTD	
			MILLION SOURCE PRINTED CIRCUIT BOARD CO.,LTD	
3	Crystal	40MHz-3225	Chengde oscillator Electronic Technology CO.,LTD	
			LUCKI CM ELECTRONICS CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
4	Diplexer	DIP1608	Walsin Technology Corporation	
			Dongguan Hekang Electronics Co.,LTD	

8. Package and Storage Information

8.1 Package Dimensions



ITEM	W	AO	BO	KO	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	01.5±0.1	0.30±0.05



Package specification:

1. 1,000 modules per roll and 5,000 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 28mm (with a width of 24mm 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 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: 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