



BL-M7621AX7

**802.11ax 1800Mbps WLAN AP
Module Specification**

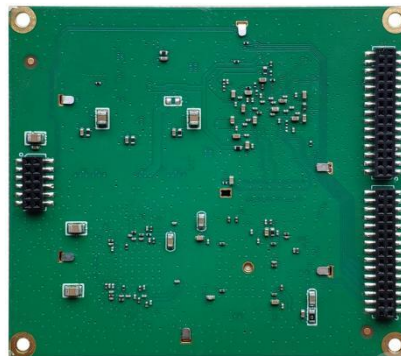
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(Top View)



(Bottom View)

Module Name: BL-M7621AX7	
Module Type: 802.11a/b/g/n/ac/ax 1800Mbps WLAN AP Module	
Revision: V1.1	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
LB-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
0.1	Initial release	2021-12-13	
1.0	Officials release	2022-3-26	
1.1	Officials release(add PHY MDI reserved circuit instruction for reduce radiation of Security Testing)	2022-12-16	
1.1	Content optimization	2023-3-21	Qx

1. Introduction

BL-M7621AX7 is a highly integrated Dual-band WLAN AP module, it build with MT7621DA ,MT7905 and MT7975 .It combines a 2T2R dual-band WLAN subsystem. This module integrates a dual-core MIPS1004Kc(880MHz),HNAT/HQoS/Samba/VPN accelerators,3-port GbE switch, One USB3.0 and 2 UART-port for debug. This module compatible IEEE 802.11 a/b/g/n/ac/ax standard .WLAN 2.4G RF chain with 40MHz bandwidth can support 573Mbps PHY rate. WLAN 5.8G RF chain with 80MHz bandwidth can support 1201Mbps PHY rate.

1.1 Features

- Operating Frequency: 2.4~2.4835GHz or 5.15~5.85GHz (5.926~7.125Ghz WLAN Band reserved)

- WLAN features:

- Support Dual-band 2T2R mode with 20/40/80Mhz bandwidth

- Support MU-MIMO RX, MU-OFDMA TX/RX

- Support TX/RX Beam former

- Support DBDC (dual band dual concurrent)

- Embedded MIPS1004Kc(880MHz,Dual-core)

- 32KB I-Cache and 32KB D-Cache per core

- 256KB L2 Cache(shared by Dual-core)

- SMP capable

- Single processor operation configurable

- Gigabit Switch

- 3-port with full-line rate

- 3-port 10/100/1000Mbps MDI transceivers

- Embedded DDR3-1200 128MBytes(KGD)

- One USB3.0 compatible with USB2.0

- HW storage accelerator

- HW NAT

- 2Gbps wired speed

- L2 bridge

- IPv4 routing ,NAT,NAPT

- IPv6 routing ,DS-Lite,6RD,6to4

- HW QoS

- 16 hardware queues to guarantee the min/max bandwidth of each flow

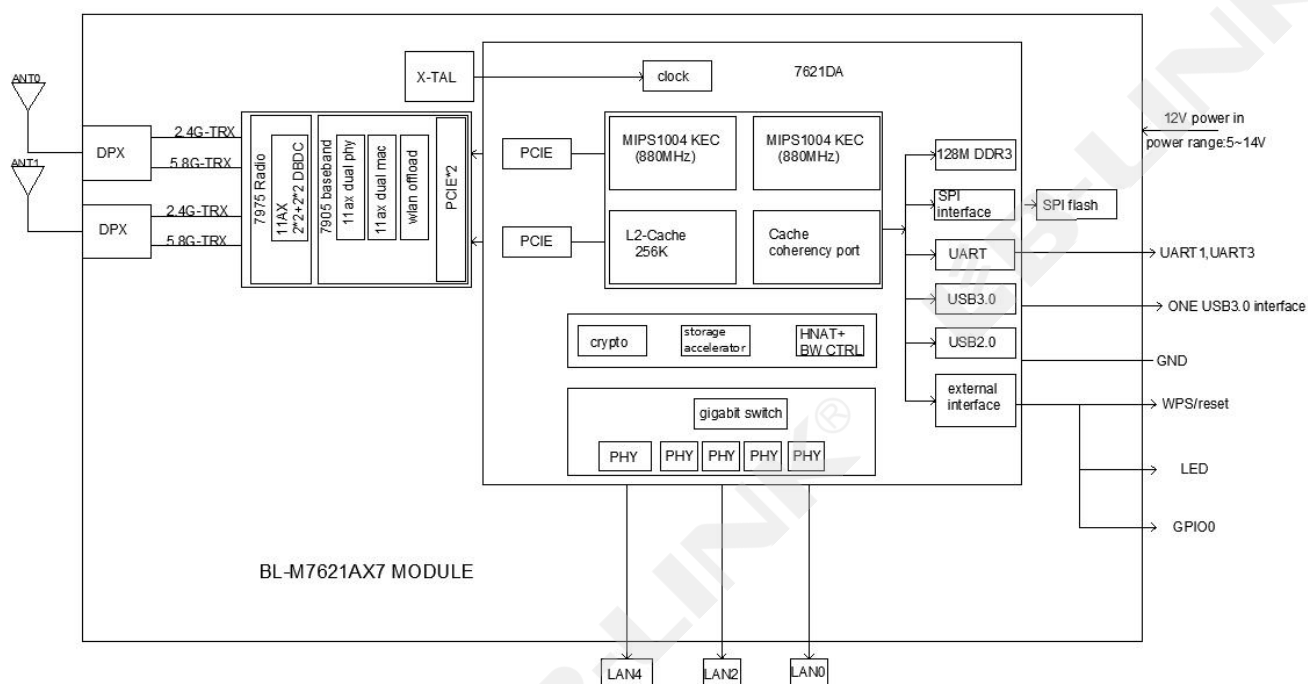
- Seamlessly co-work with HW NAT engine

- HW Crypto Engine

Deliver 400~500Mbps IPSec throughput

- 2 UART interface
- One system LED, three LAN-port LED, one 2.4GHz wireless LED, one 5.8GHz wireless LED

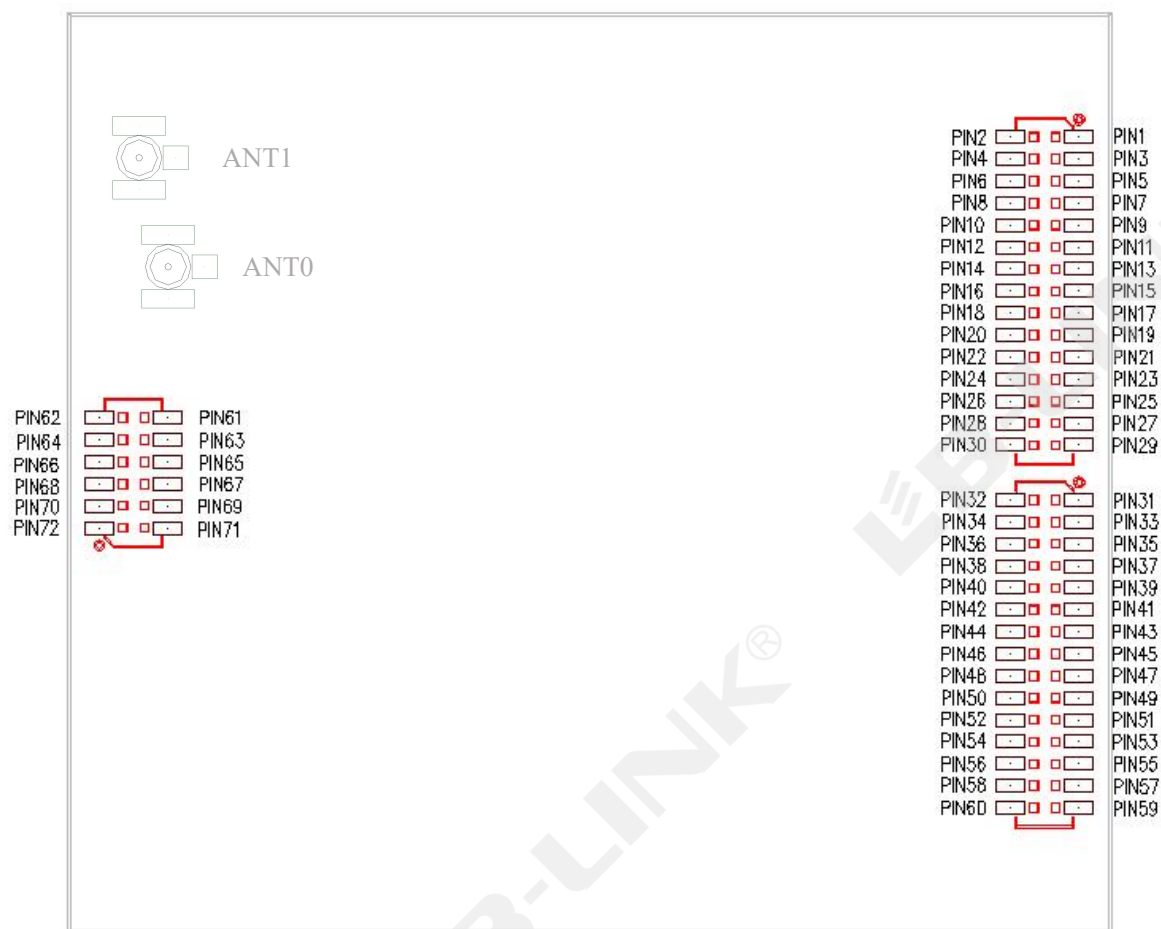
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M7621AX7
Chipset	MT7621DA, MT7905DAN, MT7975DN
WLAN Standard	IEEE 802.11 a/b/g/n/ac/ax
I/O Interface	Giga Eth PHY/USB3.0 compatible with USB2.0/UART
Antenna	IPEX connector for external WLAN antenna
Dimension	60*53*5.7mm (L*W*H)
Power Supply	DC 12V±0.5V(power range 5~14V) @ 1500 mA (Peak for 12V)
Operation Temperature	-10°C to +50°C
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
	ANT0	RF		2.4&5.8GHz RF Port0 IPEX connector.
	ANT1	RF		2.4&5.8GHz RF Port1 IPEX connector.
1	GND	P		Ground.
2	GND	P		Ground.
3	LED_WLAN_5G	I/O	3.3V	5G_WLAN_LED output signal active high,WLAN up LED always on,WLAN transfer data LED twinkle.
4	LED_WLAN_2G	I/O	3.3V	2G_WLAN_LED output signal active high,WLAN up LED always on,WLAN transfer data LED twinkle.
5	RXD1		3.3V	1. UART RX input signal (for debug and logo print use).

		I/O		2. GPIO1 (general purpose GPIO).
6	TXD1	I/O	3.3V	1. UART TX output signal (for debug and logo print use). 2. GPIO2 :soft frame-ware use this pin as system boot mode configuration input,internal has pulled high by 10K resistor with 3.3V,do not pulled low during system boot up. 3. GPIO2(general purpose GPIO).
7	I2C_SCLK	I/O	3.3V	1. GPIO4:soft frame-ware defined as SYSTEM LED output signal active low.internal has pulled high by 1K resistor with 3.3V. 2. I2C clock input/output signal.
8	I2C_SD	I/O	3.3V	1. GPIO3:soft frame-ware defined as System reset or WPS function input signal active low(internal has pulled high by 10K resistor with 3.3V ,short time pull low about 3 seconds for WPS;long time pull low about 10 seconds for reset). 2. I2C data output.
9	LAN0_LED	I/O	3.3V	1. ESW_P0_LED_0 defined as LAN0 LED output signal active low,when LAN0 linked LED always on;when LAN0 transfer data LED twinkle. 2. This pin also used as switch mode configuration input,internal pulled high by 10K resistor with 3.3V. do not pull low during system boot up.
10	GPIO0	I/O	3.3V	1. GPIO0 signal(general purpose GPIO) 2. Soft frame-ware also defined as System boot mode configuration input, internal pulled low by 10K resistor with 3.3V, do not pull high during system boot up.
11	LAN4_LED	I/O	3.3V	1. ESW_P4_LED_0 defined as LAN4 LED output signal active low,when LAN4 linked LED always on;when LAN4 transfer data LED twinkle. 2. Used as SWITCH clock frequency select input, internal pulled high by 10K resistor with 3.3V.
12	LAN2_LED	I/O	3.3V	1. ESW_P2_LED_0 defined as LAN2 LED output signal active low,when LAN2 linked LED always on;when LAN2 transfer data LED twinkle. 2. This pin also used as switch mode configuration input,internal pulled high by 10K resistor with 3.3V. do not pull low during system boot up.
13	GND	P		Ground
14	GND	P		Ground

15	P4_C-	I/O	Differential pair C- signal of LAN port4
16	P4_D-	I/O	Differential pair D- signal of LAN port4
17	P4_C+	I/O	Differential pair C+ signal of LAN port4
18	P4_D+	I/O	Differential pair D+ signal of LAN port4
19	GND	P	Ground
20	GND	P	Ground
21	P4_A+	I/O	Differential pair A+ signal of LAN port4
22	P4_B-	I/O	Differential pair B- signal of LAN port4
23	P4_A-	I/O	Differential pair A- signal of LAN port4
24	P4_B+	I/O	Differential pair B+ signal of LAN port4
25	GND	P	Ground
26	GND	P	Ground
27	P2_C+	I/O	Differential pair C+ signal of LAN port2
28	P2_D+	I/O	Differential pair D+ signal of LAN port2
29	P2_C-	I/O	Differential pair C- signal of LAN port2
30	P2_D-	I/O	Differential pair D- signal of LAN port2
31	GND	P	Ground
32	GND	P	Ground
33	P2_A-	I/O	Differential pair A- signal of LAN port2
34	P2_B-	I/O	Differential pair B- signal of LAN port2
35	P2_A+	I/O	Differential pair A+ signal of LAN port2
36	P2_B+	I/O	Differential pair B+ signal of LAN port2
37	GND	P	Ground
38	GND	P	Ground
39	P0_D-	I/O	Differential pair D- signal of LAN port0
40	P0_A+	I/O	Differential pair A+ signal of LAN port0
41	P0_D+	I/O	Differential pair D+ signal of LAN port0
42	P0_A-	I/O	Differential pair A- signal of LAN port0
43	GND	P	Ground
44	GND	P	Ground
45	P0_B-	I/O	Differential pair B- signal of LAN port0
46	P0_C-	I/O	Differential pair C- signal of LAN port0
47	P0_B+	I/O	Differential pair B+ signal of LAN port0

48	P0_C+	I/O		Differential pair C+ signal of LAN port0
49	GND	P		Ground
50	GND	P		Ground
51	SSUSB_RXN	I		USB 3.0 host differential pair RXN signal
52	USB_DP	I/O		USB 3.0 host compatible USB 2.0 port0 differential pair D+ signal
53	SSUSB_RXP	I		USB 3.0 host differential pair RXP signal
54	USB_DM	I/O		USB 3.0 host compatible USB 2.0 port0 differential pair D- signal
55	GND	P		Ground
56	GND	P		Ground
57	SSUSB_TXN	O		USB 3.0 host differential pair TXN signal
58	SSUSB_TXP	O		USB 3.0 host differential pair TXP signal
59	GND	P		Ground
60	GND	P		Ground
61	GND	P		Ground
62	GND	P		Ground
63	GND	P		Ground
64	GND	P		Ground
65	VDD33	POUT		Power for LED or GPIOs limit current 100mA(internal power output. do not need external power supply)
66	VIN	P		12V Main power supply and the power range is:5~14V
67	RXD3	I/O	3.3V	1. Uart3 RX input signal 2. GPIO8(general purpose GPIO)
68	VIN	P		12V Main power supply and the power range is:5~14V
69	TXD3	I/O	3.3V	1. Uart3 TX output signal 2. GPIO7(general purpose GPIO)
70	VIN	P		12V Main power supply and the power range is:5~14V
71	GND	P		Ground
72	GND	P		Ground

P: Power or Ground; I/O: In/Output; I: Input; 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		-10	25	50	°C
External Antenna VSWR			1.7	2	/
Supply Voltage	VIN	5	12	14	V

3.2 Digital I/O DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	2.0	--	3.63	V
VIL	Input Low Voltage	-0.3	--	0.8	V
VOH	Output High Voltage	2.4	--	--	V
VOL	Output Low Voltage	--	--	0.4	V

3.3 Current Consumption

Conditions : VIN=12V ; Ta:25°C ;			
Use Case	VIN=12V Current		
	Typ(IRMS)	Max(IPeak)	Units
WLAN Unassociated	461	700	mA
WLAN 2.4G TRX Throughput 420Mbps	595	940	mA
WLAN 5G TRX Throughput 940Mbps	655	980	mA
WLAN 2.4G+5G TRX Throughput 999Mbps	675	1120	mA

4. WLAN RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VIN=12V ; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11b/g/n/ax, CSMA/CA

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; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256; 802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;		
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; 802.11ac (VHT20): MCS0~MCS8(1T1R) 6.5~86.7Mbps; 802.11ac (VHT20): MCS0~MCS8(2T2R) 13~173.3Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R)13.5~200Mbps; 802.11ac (VHT40): MCS0~MCS9(2T2R)27~400Mbps; 802.11ax (HE_MU,26~242RU): MCS0~MCS11(1T1R) 0.4~143.4Mbps; 802.11ax (HE_MU,26~242RU): MCS0~MCS11(2T2R) 0.8~286.8Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(1T1R) 3.6~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(2T2R) 7.3~286.8Mbps; 802.11ax (HE_SU, non-OFDMA 40MHz): MCS0~MCS11(1T1R) 7.3~286.8Mbps; 802.11ax (HE_SU,non-OFDMA 40MHz): MCS0~MCS11(2T2R) 14.6~574Mbps;		
Frequency Tolerance	≤±20ppm		
2.4G Transmitter Specifications(ANT0 or ANT1)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dB)	EVM (dB)
802.11b@1~11Mbps	18	±2	≤-15
802.11g@6Mbps	18	±2	≤-15
802.11g@54Mbps	16	±2	≤-25
802.11n@HT20_MCS0	17	±2	≤-10
802.11n@HT20_MCS7	15	±2	≤-28
802.11n@HT40_MCS0	17	±2	≤-10
802.11n@HT40_MCS7	15	±2	≤-28
802.11ac@VHT20_MCS0	17	±2	≤-15
802.11ac@VHT20_MCS8	15	±2	≤-30
802.11ac@VHT40_MCS0	17	±2	≤-15
802.11ac@VHT40_MCS9	15	±2	≤-32

802.11ax@HE_SU 20M_MCS0	17	±2	≤-15
802.11ax@HE_SU 20M_MCS11	15	±2	≤-35
802.11ax@HE_SU 40M_MCS0	17	±2	≤-15
802.11ax@HE_SU 40M_MCS11	14	±2	≤-35
2.4G Receiver Specifications(ANT0 or ANT1)			
RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER
802.11b@1Mbps	-94	-5	< 8%
802.11b@11Mbps	-88	-5	< 8%
802.11g@6Mbps	-93	-5	< 10%
802.11g@54Mbps	-76	-5	< 10%
802.11n@HT20_MCS0	-92	-5	< 10%
802.11n@HT20_MCS7	-74	-5	< 10%
802.11n@HT40_MCS0	-90	-5	< 10%
802.11n@HT40_MCS7	-72	-5	< 10%
802.11ac@VHT40_MCS9	-66	-5	< 10%
802.11ax@HE_SU 20M_MCS0	-93	-5	< 10%
802.11ax@HE_SU 20M_MCS11	-63	-5	< 10%
802.11ax@HE_SU 40M_MCS0	-90	-5	< 10%
802.11ax@HE_SU 40M_MCS11	-61	-5	< 10%

4.2 5G WLAN RF Specification

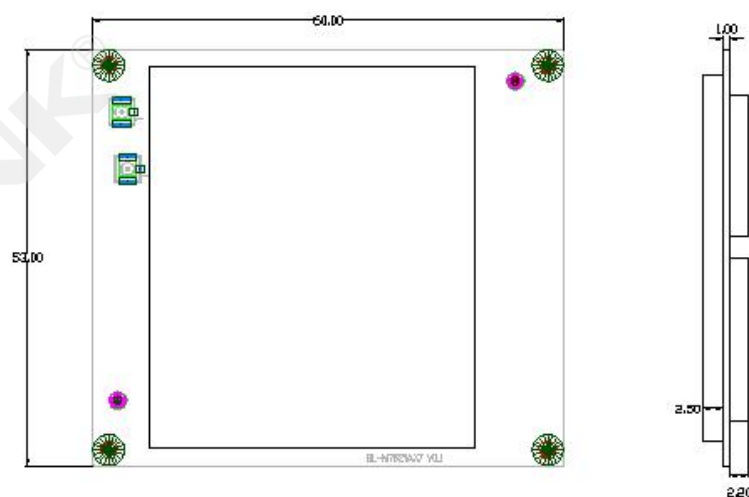
Conditions: VIN=12V; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac/ax, CSMA/CA
Frequency Range	5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.73GHz; 5.735~5.835GHz (5GHz ISM Band)
Channels	Ch36, Ch40, Ch44, Ch48; Ch52~Ch64; Ch100~Ch140; Ch149~Ch165 (For 20MHz Channels)
Modulation	802.11a (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256; 802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;

Date 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) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R) 27~300Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R) 6.5~86.7Mbps; 802.11ac (VHT20): MCS0~MCS8(2T2R) 13~173.3Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R)13.5~200Mbps; 802.11ac (VHT40): MCS0~MCS9(2T2R)27~400Mbps; 802.11ac (VHT80): MCS0~MCS9(1T1R)29.3~433.3Mbps; 802.11ac (VHT80): MCS0~MCS9(2T2R)58.5~866.7Mbps; 802.11ax (HE_MU,26~484RU): MCS0~MCS11(1T1R) 0.4~286.8Mbps; 802.11ax (HE_MU,26~484RU): MCS0~MCS11(2T2R) 0.8~573.5Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(1T1R) 3.6~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(2T2R) 7.3~286.8Mbps; 802.11ax (HE_SU, non-OFDMA 40MHz): MCS0~MCS11(1T1R) 7.3~286.8Mbps; 802.11ax (HE_SU,non-OFDMA 40MHz): MCS0~MCS11(2T2R) 14.6~574Mbps; 802.11ax (HE_SU,non-OFDMA 80MHz): MCS0~MCS11(1T1R) 15.3~600.4Mbps; 802.11ax (HE_SU, non-OFDMA 80MHz): MCS0~MCS11(2T2R) 30.6~1201Mbps;		
Frequency Tolerance	≤ ±20ppm		
5G Transmitter Specifications(ANT0 or ANT1)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11a@6Mbps	18	±2	≤-10
802.11a@54Mbps	16	±2	≤-25
802.11n@HT20_MCS0	17	±2	≤-13
802.11n@HT20_MCS7	15	±2	≤-28
802.11n@HT40_MCS0	17	±2	≤-13
802.11n@HT40_MCS7	15	±2	≤-28
802.11ac@VHT20_MCS0	17	±2	≤-13
802.11ac@VHT20_MCS8	15	±2	≤-32
802.11ac@VHT80_MCS0	17	±2	≤-13
802.11ac@VHT80_MCS9	14	±2	≤-32
802.11ax@HE_SU 20M_MCS0	17	±2	≤-13

802.11ax@HE_SU 20M_MCS11	15	±2	≤-35
802.11ax@HE_SU 80M_MCS0	17	±2	≤-13
802.11ax@HE_SU 80M_MCS11	14	±2	≤-35
5G Receiver Specifications(ANT0 or ANT1)			
RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER
802.11a@6Mbps	-92	-5	< 10%
802.11a@54Mbps	-73	-5	< 10%
802.11n@HT20_MCS0	-91	-5	< 10%
802.11n@HT20_MCS7	-72	-5	< 10%
802.11n@HT40_MCS0	-89	-5	< 10%
802.11n@HT40_MCS7	-69	-5	< 10%
802.11ac@VHT80_MCS0	-85	-5	< 10%
802.11ac@VHT80_MCS9	-60	-5	< 10%
802.11ax@HE_SU 80M_MCS0	-86	-5	< 10%
802.11ax@HE_SU 80M_MCS11	-56	-5	< 10%

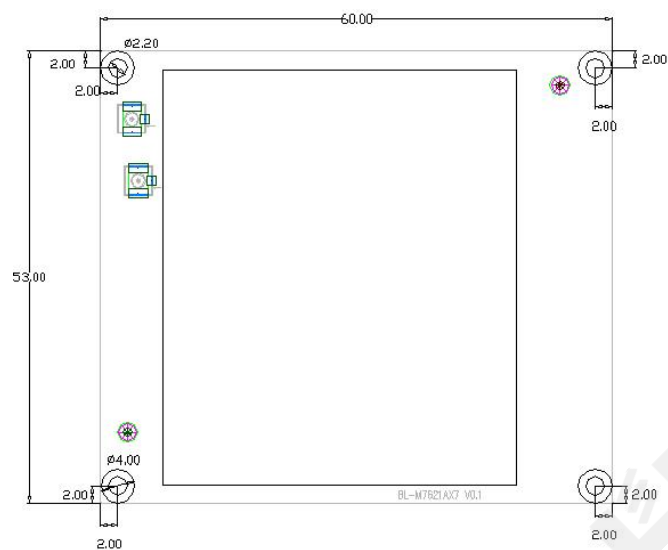
5. Mechanical Specifications

5.1 Module Outline Drawing

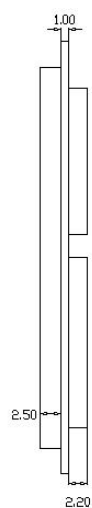


Module dimension: 60*53*5.7mm(L*W*H; Tolerance: L ±0.15mm;W ±0.15mm;H ±0.3mm)

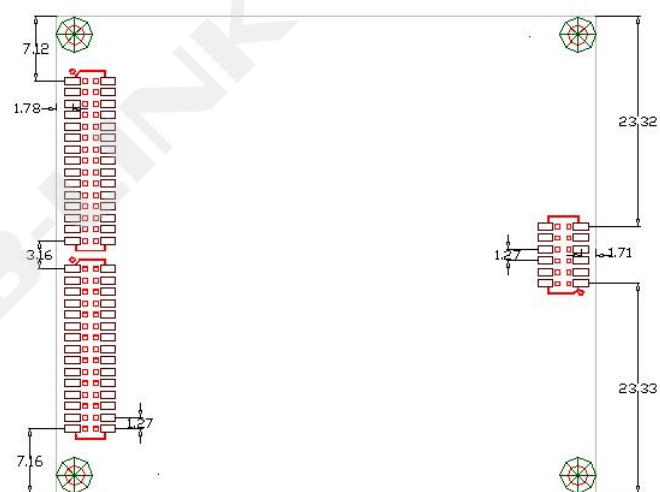
5.2 Mechanical Dimensions



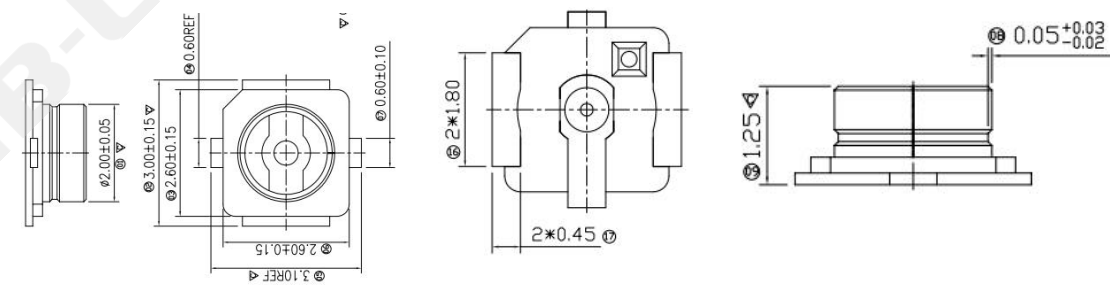
(Top View)



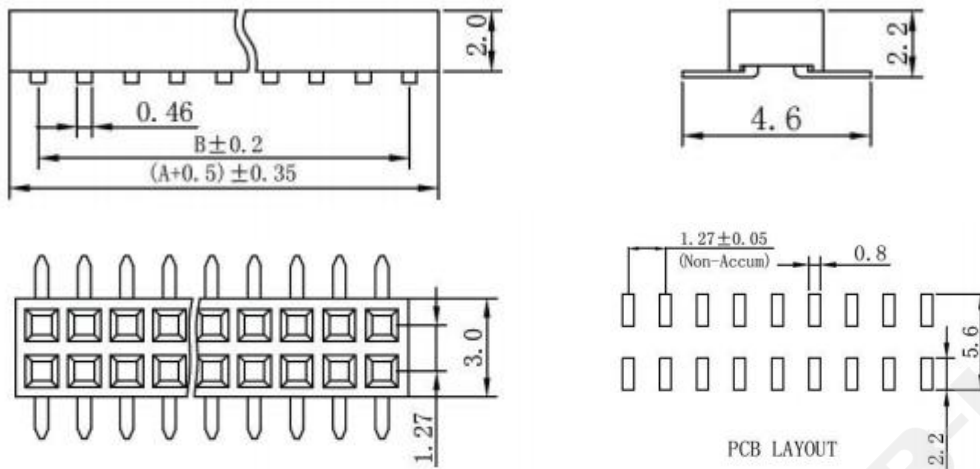
(Side View)



(Bottom View)



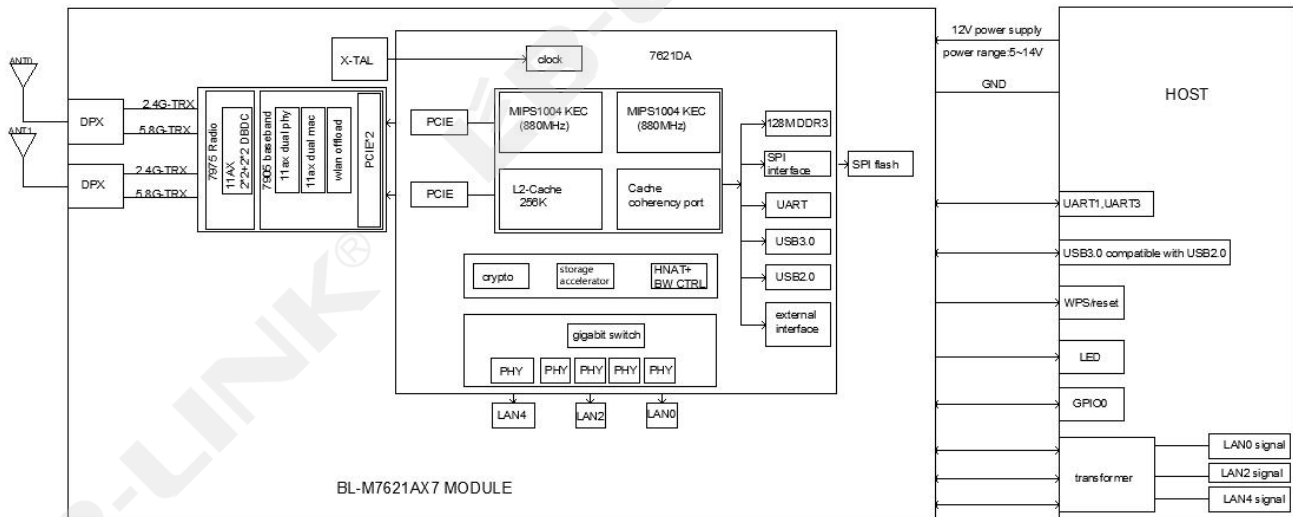
IPEX / MHF-1 connector dimension: 3.1*3.0*1.25mm (L*W*H, Ø2.0mm)



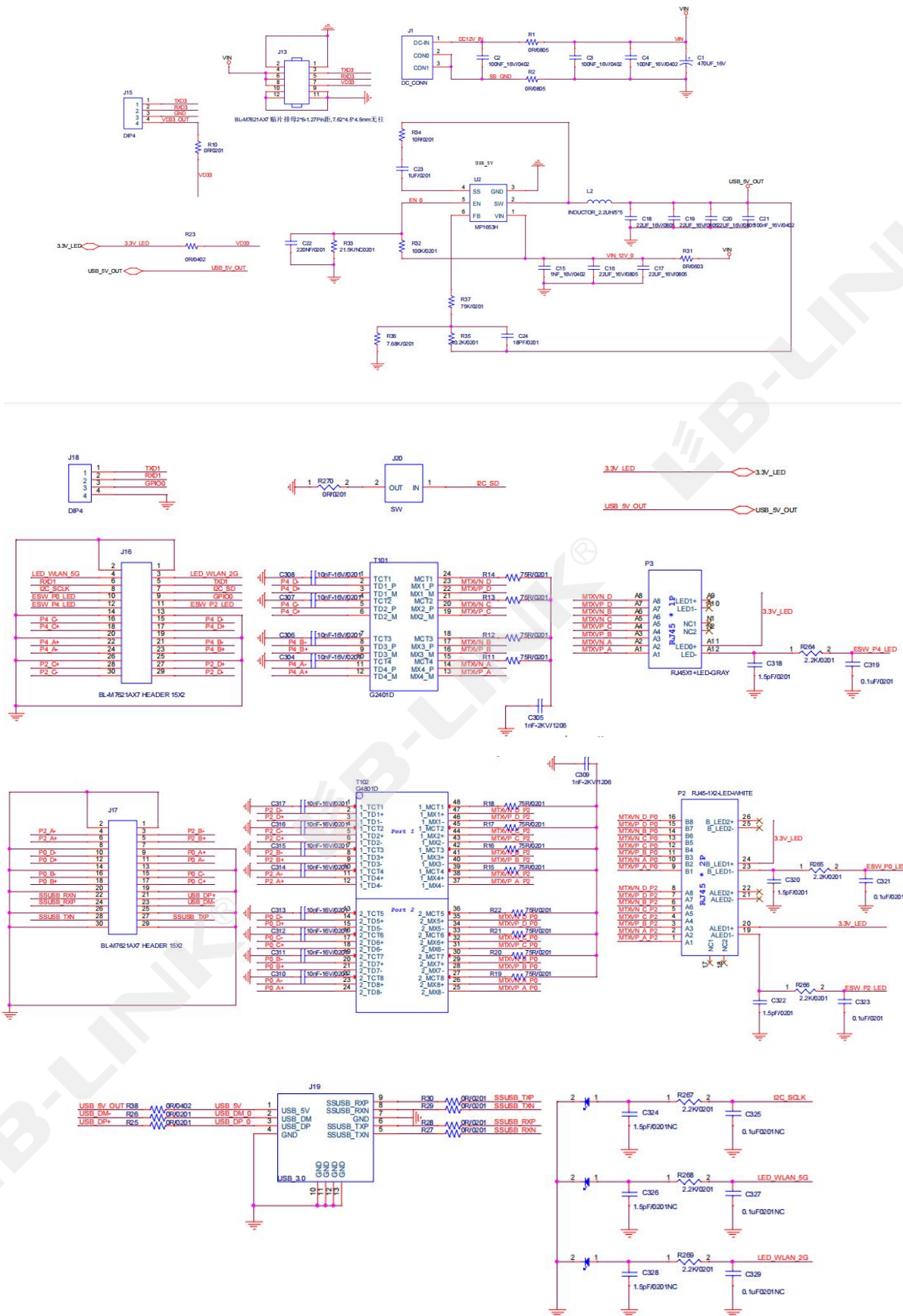
Module connector size

6. Application Information

6.1 Typical Application Circuit



User function block



Product reference design

6.2 HW Application Note

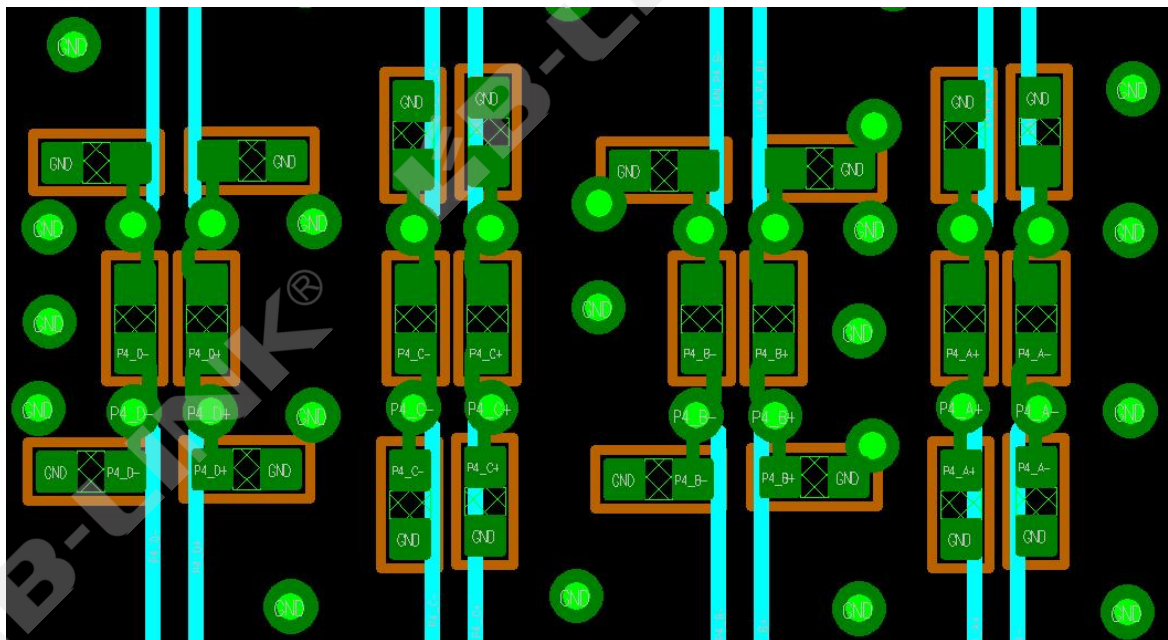
6.2.1 Increase module's heat dissipating capabilities need keep a solder mask area on customer's board . Add a thermal conductive silicone rubber between module and customer's board as below:



6.2.2 Our module's USB 3.0 interface already added filter components so customer do not need add again.

6.2.3 In order to reduce radiation of PHY MDI ports,PHY MDI ports signal lines need reserved a Π circuit between module's PHY MDI ports signal lines and transformer, lose to module side.

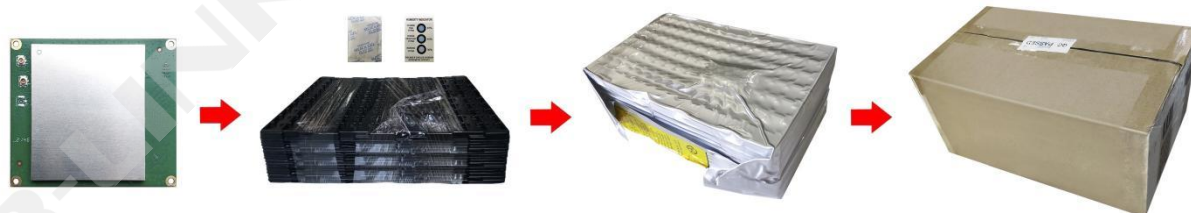
As picture shows below:



7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	MT7621DA,MT7905DAN,MT7975DN	MediaTek Inc.	
2	PCB	BL-M7621AX7 V1.0	MILLION SOURCE PRINTED CIRCUIT BOARD CO.,LTD	
			SHEN ZHEN QILI ELECTRON CO.,LTD	
			ShenZhen Tie Fa Technology Limited	
3	Crystal	40MHZ-3225	LUCKI CM ELECTRONICS CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
4	Diplexer	DIP1608	Advanced Ceramic X Corp.	
			Dongguan Hekang Electronics Co.,LTD	
			Walsin Technology Corporation	

8. Storage Information



Package specification:

1. 12 modules per blister plate and 144 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) in each anti-static vacuum bag. 1 pcs 3 point humidity card.
4. The outer box size is 35.2*21.5*15.5cm.

8.1 Storage Conditions

Absolute Maximum Ratings:

- Storage temperature: -10°C to +50°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 use.

Baking condition: 60°C, 24hours, 1time.

ESD Sensitivity:

ESD Protection: 4KV(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