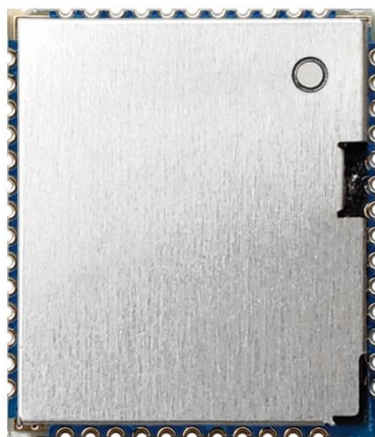




BL-M7661LS1

**802.11ac 2T2R 867Mbps WLAN + BT v5.0
SDIO Module Specification**

SHENZHEN BILIAN ELECTRONIC CO., LTD



(Top View)



(Bottom View)

(Note: BL-M7661LSN and BL-M7663BS1 are designed base on the same PCB)

Module Name: BL-M7661LS1	
Module Type: 802.11a/b/g/n/ac 867Mbps WLAN + Bluetooth v5.0 SDIO Module	
Revision: V1.1	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
0.1	Initial release	2021-02-24	
1.0	Official release	2021-03-02	
1.1	Update the specification version	2023-08-02	Drq

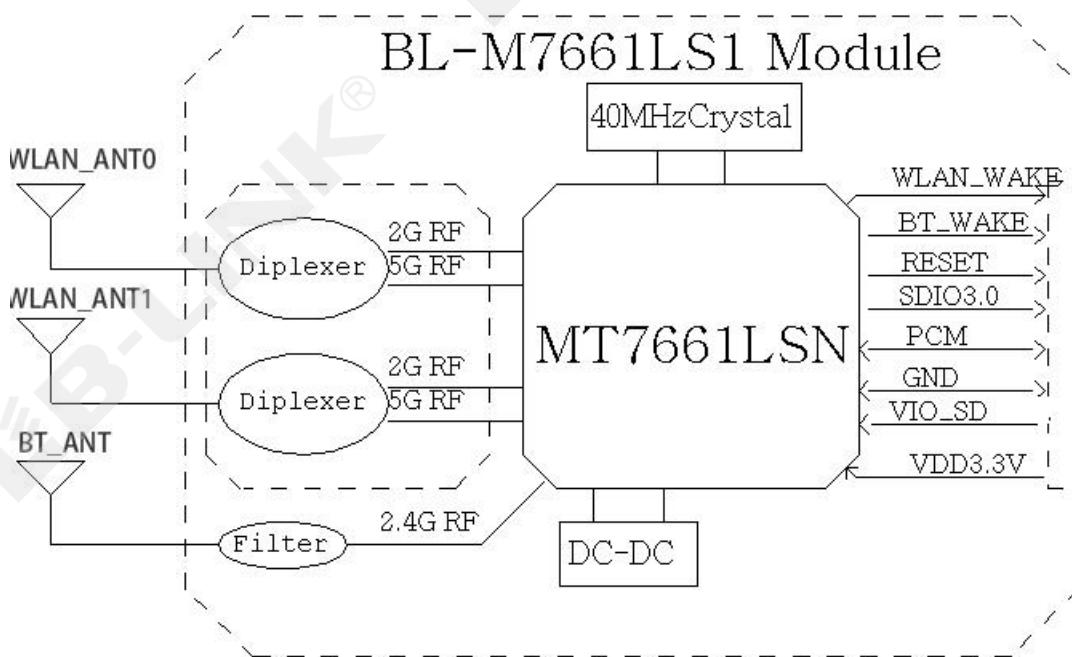
1. Introduction

The BL-M7661LS1 is a highly integrated 2T2R 802.11a/b/g/n/ac Wireless LAN (WLAN) network and Bluetooth combo module. The module's interface is SDIO1.1/2.0/3.0. It combines a WLAN MAC, a 2T2R capable WLAN base band. Bluetooth support 5.0 performance. The BL-M7661LS1 module provides a complete solution for a high throughput performance integrated WLAN and BT device.

1.1 Features

- Operating Frequency: 2.4~2.4835GHz and 5.15~5.85GHz
- Host Interface is SDIO3.0 (comply with SDIO2.0)
- IEEE Standards: IEEE 802.11a/b/g/n/ac
- Support 20/40M bandwidth in 2.4G band and 20/40/80M bandwidth in 5G band
- Wireless data rate can reach up to 867Mbps
- Supports Bluetooth v5.0 and Compatible Bluetooth v4.2
- Connect to external antenna through the half hole pad
- Power Supply: 3.3V main power , 1.8or3.3V I/O power supply.

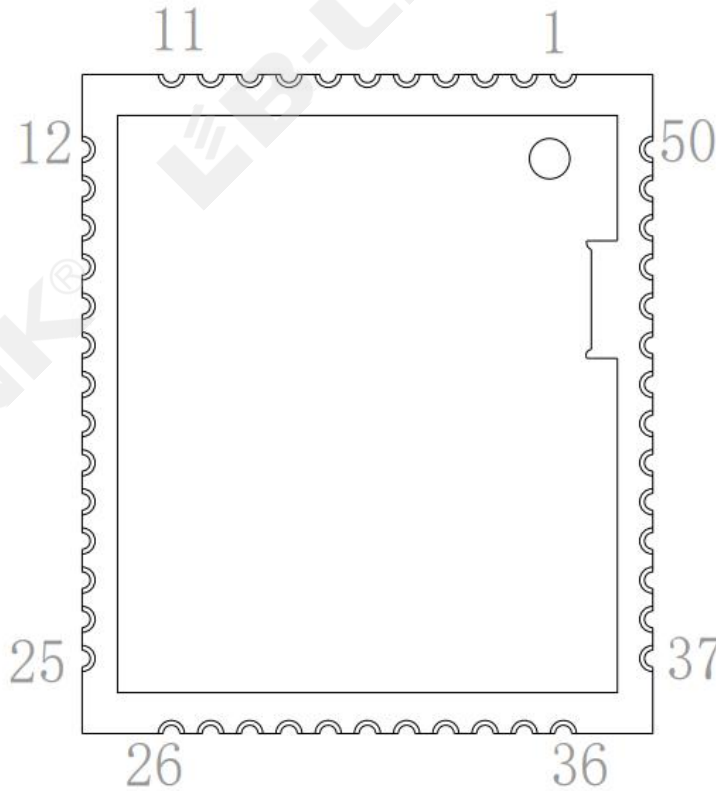
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M7661LS1
Chipset	MT7661LSN
WLAN Standard	IEEE 802.11 a/b/g/n/ac
BT Specification	Bluetooth Core Specification v5.0/4.2
Host Interface	Host Interface is SDIO3.0(comply with SDIO 2.0)
Antenna	Connect to the external antennas through the half hole pad
Dimension	13.10*15.10*2.6mm (L*W*H)
Power Supply	DC 3.3V±0.3V @ 1200 mA (Max) main power
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_ANT1
2	WLAN_RF1	RF		The RF pad for 2.4G/5G WLAN_ANT1
3	GND	RF		RF Ground for WLAN_ANT1
4	GND	P		Ground for Power and I/O
5	GND	P		Ground for Power and I/O
6	GND	P		Ground for Power and I/O
7	GND	P		Ground for Power and I/O
8	GND	RF		RF Ground for WLAN_ANT0
9	WLAN_RF0	RF		The RF pad for 2.4G/5G WLAN_ANT0
10	GND	RF		RF Ground for WLAN_ANT0
11	GND	P		Ground for Power and I/O
12	BT_ANT	RF		RF PAD for BT_ANT
13	GND	RF		RF Ground for BT_ANT
14	UART_DBG	I/O	VIO_SD	Function1: Boot Strap Pin,internal pull Low,do not pull High during power on! Function2: GPIO3 reserved for "UART Debug" ; This Pin can be left floating
15	RST_N	I	VIO_SD	External system reset active low. Internal pull High,If not used, this Pin can be left floating.
16	WF_WAKE_HOST	O	VIO_SD	WLAN wake up host output; If not used, this Pin can be left floating
17	SDIO_CMD	I/O	VIO_SD	SDIO Interface for WLAN/BT control and data; SDIO command line
18	SDIO_CLK	I/O	VIO_SD	SDIO clock line
19	SDIO_DAT3	I/O	VIO_SD	SDIO data line 3
20	SDIO_DAT2	I/O	VIO_SD	SDIO data line 2
21	SDIO_DAT0	I/O	VIO_SD	SDIO data line 0
22	SDIO_DAT1	I/O	VIO_SD	SDIO data line 1
23	GND	P		Ground for Power and I/O
24	WLAN_INT_B	I	VIO_SD	WLAN interrupt input
25	NC	/		NC
26	NC	/		NC

27	PCM_SYNC	I/O	VIO_SD	PCM Interface reserved for BT; If not used, this interface can be left floating. PCM sync signal;
28	PCM_IN	I	VIO_SD	PCM data input;
29	PCM_OUT	O	VIO_SD	1: Boot Strap Pin,internal pull Low,do not pull High during power on! 2: PCM data output;
30	PCM_CLK	I/O	VIO_SD	PCM clock;
31	NC	/		NC
32	GND	P		Ground for Power and I/O
33	NC	/		NC
34	VIO_SD	P	1.8/3.3V	1.8V $\pm$ 0.1V or 3.3V $\pm$ 0.2V power for SDIO interface and other I/Os
35	NC	/		NC
36	VDD3.3	P	3.3V	3.3V $\pm$ 0.2V main power supply
37	NC	/		NC
38	NC	/		NC
39	GND	P		Ground for Power and I/O
40	UART_TXD	I	VIO_SD	1: Boot Strap Pin,internal pull High,do not pull Low during power on! 2: Reserved for "UART_TXD" ; This Pin can be left floating
41	NC	/		NC
42	UART_RTS_N	I/O	VIO_SD	Reserved for "UART_RTS" ; This Pin can be left floating
43	UART_CTS_N	I/O	VIO_SD	Reserved for "UART_CTS" ; This Pin can be left floating
44	NC	/		NC
45	NC	/		NC
46	GND	P		Ground for Power and I/O
47	NC	/		NC
48	GND	P		Ground for Power and I/O
49	NC	/		NC
50	BT_WAKE_HOST	O	VIO_SD	BT wake up host output; If not used, this Pin can be left floating

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
	VIO_SD	1.7	1.8	1.9	V
		3.1	3.1	3.5	V

3.2 Digital I/O DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	VDD33*0.625 VDD18*0.65	--	VDD33+0.3 VDD18+0.3	V
VIL	Input Low Voltage	-0.3 -0.3	--	VDD33*0.25 VDD18*0.35	V
VOH	Output High Voltage	VDD33-0.4 VDD18-0.2	--	VDD33+0.3 VDD18+0.3	V
VOL	Output Low Voltage	-0.3 -0.3	--	0.4 0.2	V

3.3 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C			
Use Case	VBAT Current		
	Typ (I _{RMS})	Max (I _{Peak})	Units
2.4G WLAN UDP throughput TRX 150Mbps (Linux Drive, BT disable)	341	720	mA
5G WLAN UDP throughput TRX 300Mbps (Linux Drive, BT disable)	269	920	mA
2.4G 11b 1Mbps TX @ 19dBm (1TX RF test)	448	580	mA
2.4G 11b 1Mbps RX (1RX RF test)	116	125	mA

2.4G 11b 11Mbps TX @ 19dBm (1TX RF test)	442	580	mA
2.4G 11a 6Mbps TX @ 18dBm (1TX RF test)	411	580	mA
2.4G HT20 MCS8 TX@17dBm (2TX RF test)	676	860	mA
2.4G HT40 MCS15 TX@15dBm (2TX RF test)	553	820	mA
2.4G HT40 MCS15 RX (2RX RF test)	133	145	mA
5G 11a 6Mbps TX @ 18dBm (1TX RF test)	530	688	mA
5G 11a 6Mbps RX (1RX RF test)	140	151	mA
5G 11n HT20 MCS8 TX@17dBm (2TX RF test)	915	1130	mA
5G 11n HT20 MCS8 RX (2RX RF test)	144	189	mA
5G 11n HT40 MCS15 TX@15dBm (2TX RF test)	673	988	mA
5G 11n HT40 MCS15 RX (2RX RF test)	164	176	mA
5G 11ac VHT 80MHz MCS9 TX@14dBm (1TX RF test)	368	548	mA
5G 11ac VHT 80MHz MCS9 RX(1RX RF test)	147	158	mA
BT BR_1M TX@5dBm (BT0 RF test, WLAN disable)	108	163	mA
BT EDR_3M TX@5dBm (BT0 RF test, WLAN disable)	108	163	mA
BT LE_2M TX@8dBm (BT0 RF test, WLAN disable)	116	153	mA
BT LE_2M RX Active (BT0 RF test, WLAN disable)	111	119	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, 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;
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 (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	≤±20ppm		
2.4G Transmitter Specifications (WLAN_ANT0&WLANANT1)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1~11Mbps	19	±2	≤-10
802.11g@6Mbps	18	±2	≤-10
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
2.4G Receiver Specifications (WLAN_ANT0&WLANANT1)			
RX Rate	Min Input Level (Typ dBm)	Max Input Level (Typ dBm)	PER
802.11b@1Mbps	-92	-5	< 8%
802.11b@11Mbps	-86	-5	< 8%
802.11g@6Mbps	-90	-5	< 10%
802.11g@54Mbps	-74	-5	< 10%
802.11n@HT20_MCS0	-88	-5	< 10%
802.11n@HT20_MCS7	-70	-5	< 10%
802.11n@HT40_MCS0	-86	-5	< 10%
802.11n@HT40_MCS7	-68	-5	< 10%

4.2 5G WLAN RF Specification

Conditions: VDD33=3.3V; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac, 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;
Data 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;
Frequency Tolerance	$\leq \pm 20\text{ppm}$

5G Transmitter Specifications (WLAN_ANT0&WLANANT1)

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	≤ -10
802.11n@HT20_MCS7	15	± 2	≤ -28
802.11n@HT40_MCS0	17	± 2	≤ -10
802.11n@HT40_MCS7	15	± 2	≤ -28
802.11ac@VHT80_MCS0	17	± 2	≤ -10
802.11ac@VHT80_MCS9	14	± 2	≤ -32

5G Receiver Specifications (WLAN_ANT0&WLANANT1)

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	-90	-5	< 10%
802.11n@HT20_MCS7	-72	-5	< 10%

802.11n@HT40_MCS0	-86	-5	< 10%
802.11n@HT40_MCS7	-71	-5	< 10%
802.11ac@VHT80_MCS0	-86	-5	< 10%
802.11ac@VHT80_MCS9	-60	-5	< 10%

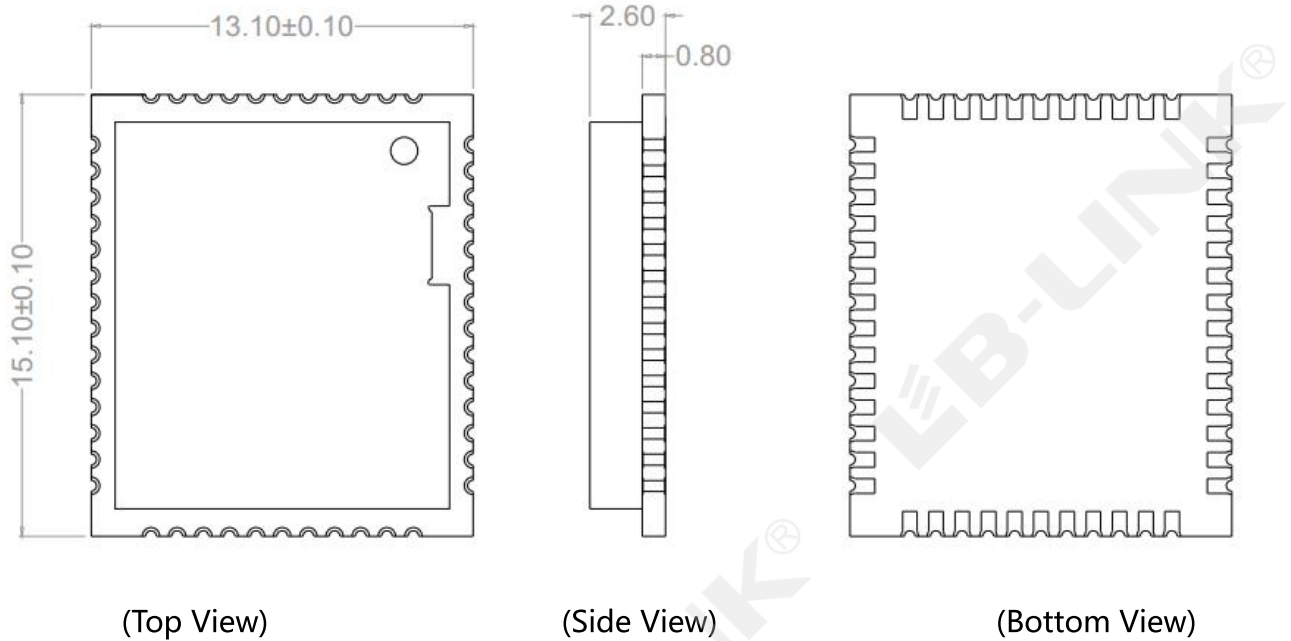
4.3 Bluetooth RF Specification

Conditions: VDD33=3.3V; Ta:25°C			
Features	Description		
Bluetooth Specification	Bluetooth Core Specification v5.0/4.2/2.1		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: $\pi/4$ -DQPSK; EDR_3Mbps: 8DPSK; LE_125Kbps: GFSK (Coded_S=8); LE_500Kbps: GFSK (Coded_S=2); LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications (BT_ANT)			
Items	Min	Typ	Max
TX Power			
BR_1M	3dBm	5dBm	8dBm
EDR_2/3M	3dBm	5dBm	8dBm
LE_125K/500K/1M/2M	3dBm	5dBm	8dBm
Items	Min	Typ	Max
BR_1M (DH1) Modulation Characteristics			
Δf_{1avg}	140KHz	158.6.kHz	175KHz
Δf_{2avg}	115KHz	160.6.kHz	/
Δf_{2max}	115KHz	157.1kHz	/

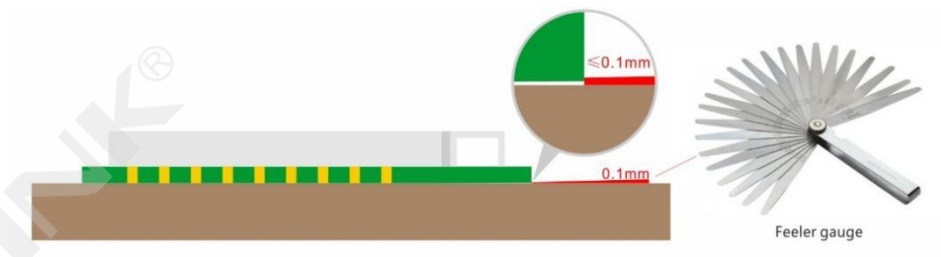
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.99	/	
BR_1M (DH1) Initial Carrier Frequency Tolerance				
Init Freq Error	-75kHz	-4.3kHz	+75kHz	
EDR_3M(3DH5) EDR Carrier Frequency Stability and Modulation Accuracy				
ω_i	-75KHz	-8.12kHz	+75KHz	
$\omega_i+\omega_o$	-75KHz	-9.02kHz	+75KHz	
ω_o	-10KHz	-0.9kHz	+10KHz	
8DPSK RMS DEVM	/	0.026	0.13	
8DPSK Peak DEVM	/	0.059	0.25	
LE_1M Modulation Characteristics				
Δf_{1avg}	225KHz	249.5KHz	275KHz	
Δf_{2avg}	185KHz	242.1KHz	/	
Δf_{2max}	185KHz	247.2KHz	/	
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.97	/	
LE_2M Modulation Characteristics				
Δf_{1avg}	450KHz	501.2KHz	550KHz	
Δf_{2avg}	370KHz	473.8KHz	/	
Δf_{2max}	370KHz	482.4KHz	/	
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.94	/	
Bluetooth Receiver Specifications (BT_RF0&BT_RF1)				
Items	Sensitivity		Maximum Input Level	
	Input Level(Typ)	BER	Input Level(Typ)	BER
BR_1M (DH1)	-91 dBm	≤0.1%	-5dBm	≤0.1%
EDR_3M (3DH5)	-80 dBm	≤0.01%	-5dBm	≤0.1%
	Input Level (Typ)	PER	Input Level (Typ)	PER
LE_125K	-90 dBm	≤5%	-5dBm	≤5%
LE_1M	-91 dBm	≤5%	-5dBm	≤5%
LE_2M	-89 dBm	≤5%	-5dBm	≤5%

5. Mechanical Specifications

5.1 Module Outline Drawing

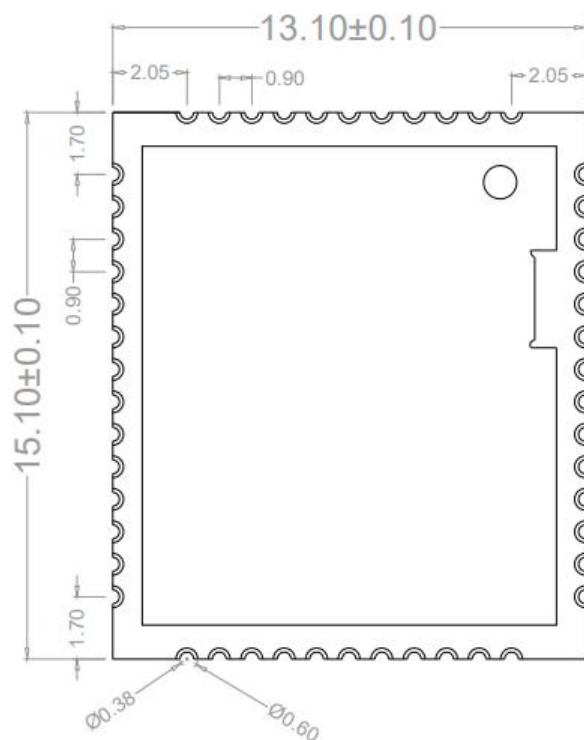


Module dimension: 13.10*15.10*2.6mm(L*W*H; Tolerance: ± 0.15 mm)

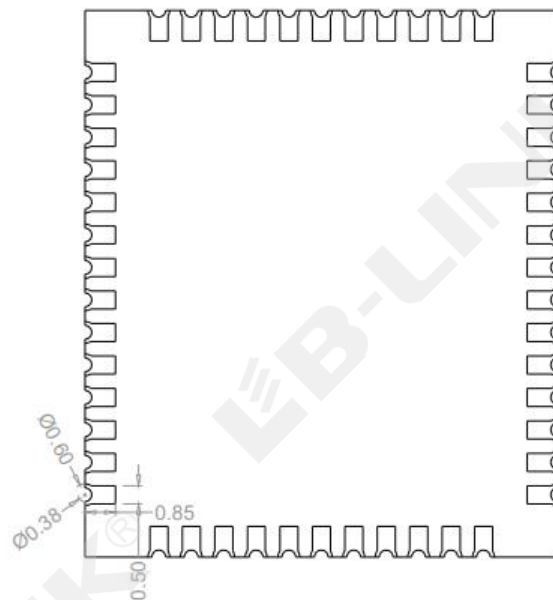


Module Bow and Twist: ≤ 0.1 mm

5.2 Mechanical Dimensions



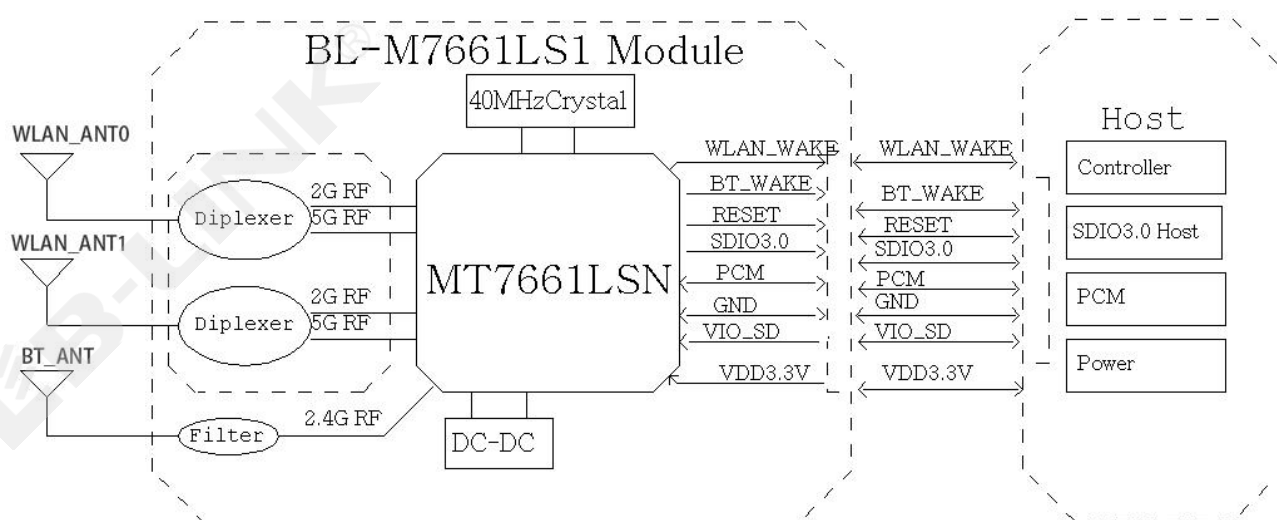
(Top View)



(Bottom View)

6. Application Information

6.1 Typical Application Circuit



6.2 HW Application Note

6.2.1 External Antenna Isolation

Isolation of BT_Ant and WLAN_Ant $\geq 30\text{dB}$ for better BT and WLAN T/RX con-current;

Isolation of WLAN_Ant0 and WLAN_Ant1 $\geq 17\text{dB}$ (2.4G band) & $\geq 20\text{dB}$ (5G band) for better MIMO Application;

Isolation of BT_Ant0 and BT_Ant1 $\geq 35\text{dB}$ for better BT TX and RX con-current .

6.2.2 VDD33 Power requirement

Supply Voltage: DC 3.1~3.5V & Ripple Voltage $< 160\text{mV}$;

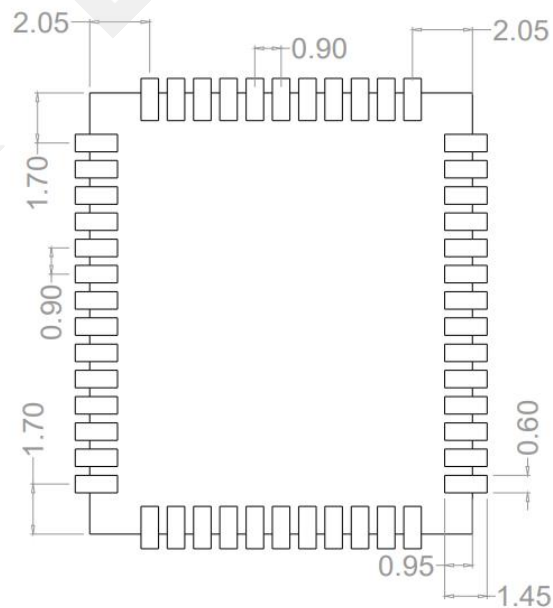
Maximum Peak current $\geq 1.2\text{A}$;

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

6.2.3 Reset input requirement

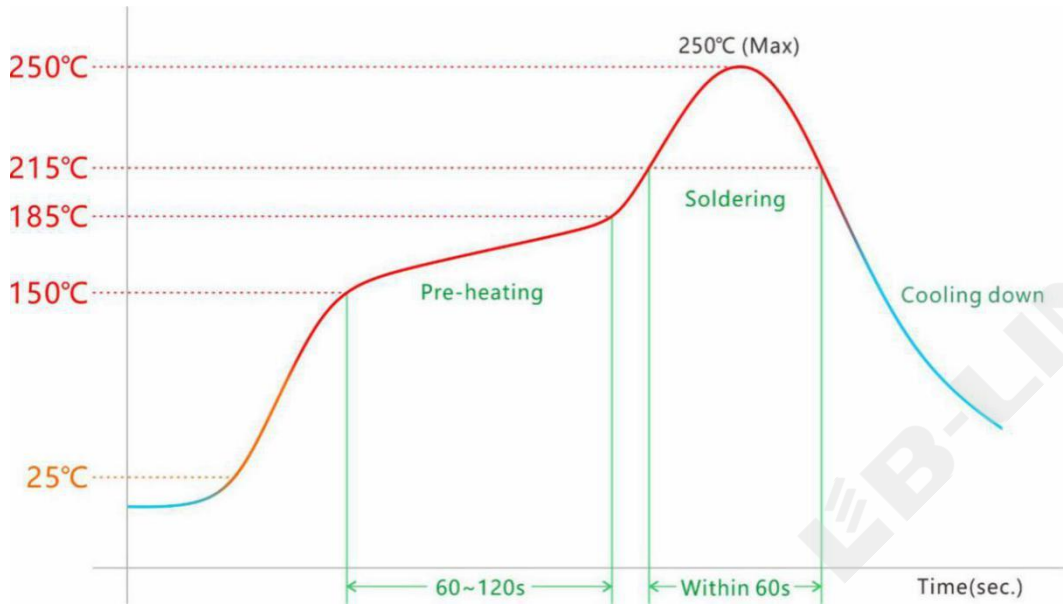
Internal power on reset function is integrated. if need external reset function, the external reset input signal should remain asserted ($< 2.75\text{V}$) for 1ms at least.

6.3 Recommend PCB Layout Footprint



(Design size: mm)

6.4 Reflow Soldering Standard Conditions



Please use the reflow within 2 times.

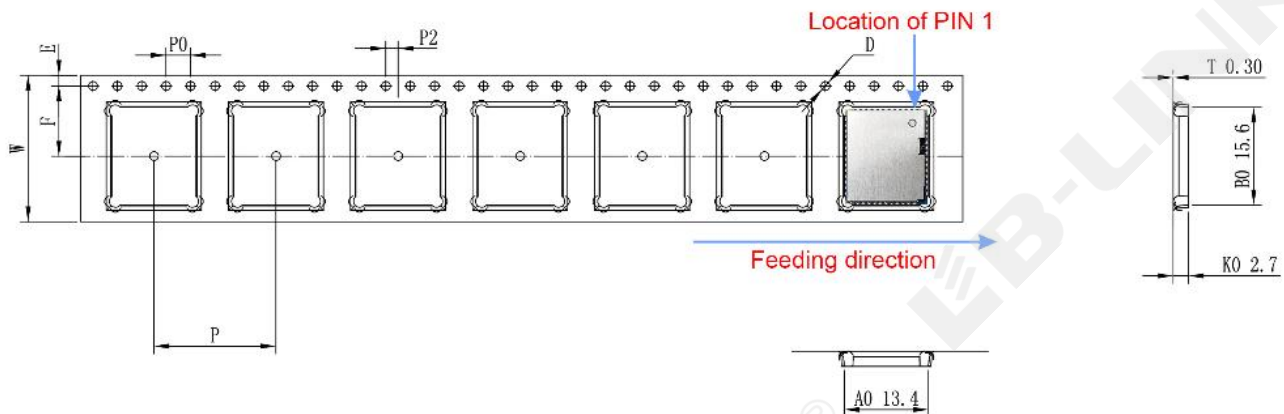
Set up the highest temperature within 250°C.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	MT7661LSN	MediaTek Inc.	
2	PCB	BL-M7663BS1	MILLION SOURCE PRINTED CIRCUIT BOARD CO.,LTD	
			Huizhou Dayawan Kexiang Technology Circuit Board Co., Ltd	
			Quzhou Sunlord Electronics Co.,Ltd	
3	Crystal	40MHz-2016	LUCKI CM ELECTRONICS CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
4	Diplexer	DIP1608	Shenzhen Feite Technology Co., Ltd	
			Advanced Ceramic X Corp.	
			Dongguan Hekang Electronics Co.,LTD	
			henzhen Sunlord Electronics 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	13.40±0.1	15.60±0.1	2.70±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. 1000 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**