BL-M6600XT1

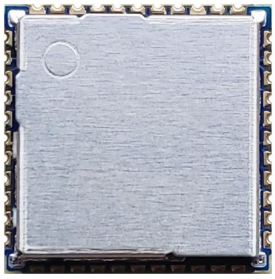
802.11ax 150Mbps WLAN +BLE v5.0

IoT Module Specification

SHENZHEN BILIAN ELECTRONIC CO., LTD

Add: 10~11/F, Building 1A, Huaqiang idea park, Guangming district, Shenzhen. Guangdong, China

Web: www.b-link.net.cn



（Top View）

（Bottom View）

Module Name: BL-M6600XT1	
Module Type: 802.11b/g/n/ax 150Mbps WLAN +BLE v5.0 Combo IoT Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
0.1	Initial release	2023-07-27	FNZ
1.0	Official release	2023-08-02	Qx

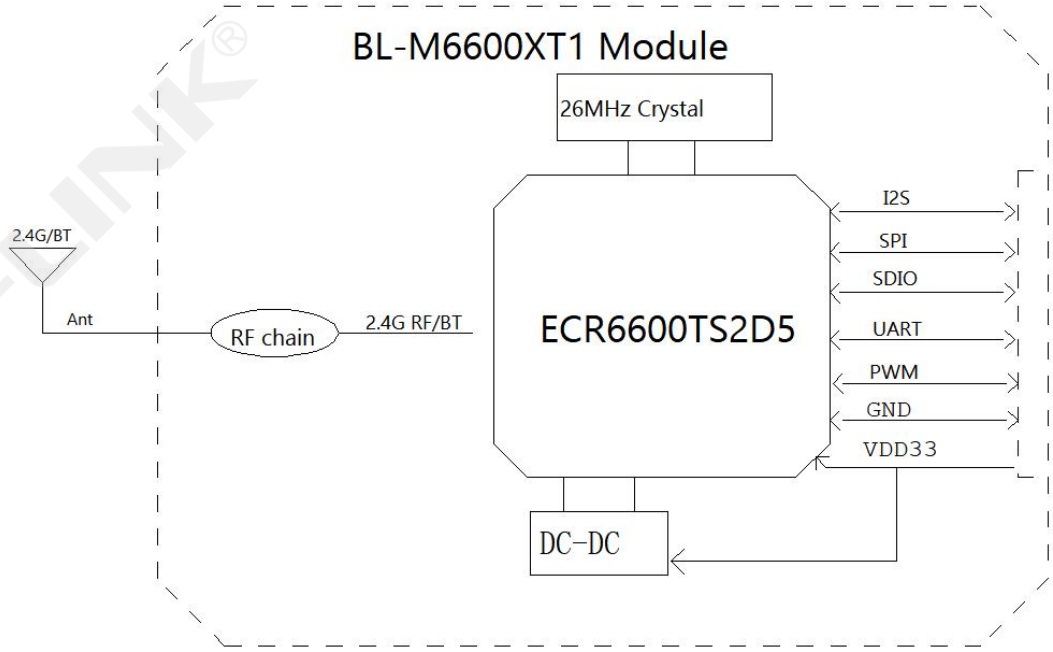
1. Introduction

BL-M6600XT1 is a fully integrated IOT module with 2.4GHz band 1T1R 11b/g/n/ax WLAN, MCU, Memory, PMU,BLE v5.0 and many other functional blocks with rich peripheral interfaces. Its features of small size, multi-functions, high performance, low power consumption and easy software development are ideal for flexible applications of the Internet of things based on WLAN of communication.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz
- Bluetooth v5.0 Low Energy
- Compatible IEEE 802.11b/g/n/ax
  - Support 802.11ax MCS0 up to MCS7 (20MHz band width only)
  - Maximum PHY rate up to 150Mbps（802.11n mode MCS7 HT40）
- MCU with a main frequency of 240 MHz comes with instruction cache and data cache
  - Embedded SRAM:512KB
  - Embedded Flash:2MB
- 3.3V±0.2V single power supply
- Connect to external antenna through half hole

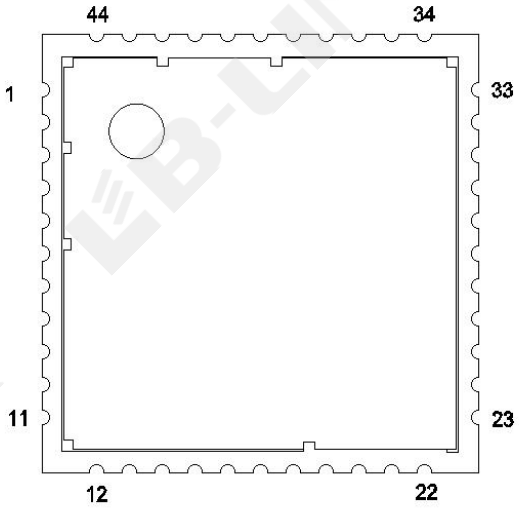
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M6600XT1
Chipset	ECR6600TS2D5
WLAN Standards	IEEE802.11b/g/n/ax
Host Interface	UART for WLAN/BT
Antenna	Connect to external antenna through half hole
Dimension	12.0*12.0*2.2mm (L*W*H)
Power Supply	DC 3.3±0.2V @450 mA (MAx)
Operation Temperature	-20℃ to +70℃
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 connections
2	ANT	RF		RF Pad for 2.4G WLAN_ANT and BT_ANT
3	GND	RF		RF Ground connections

4	VDD33	P	VDD33	VDD 3.3V Power Supply
5	GND	P		Ground connections
6	GPIO22	I/O	VDD33	1.General Purpose I/O GPIO22 2.SDIO data0 line 3.UART0_TXD 4.PWM_CTRL0 5.I2S_TXWS
7	GPIO21	I/O	VDD33	1.General Purpose I/O GPIO21 2.SDIO command line 3.UART0_RXD 4.I2C_SDA 5.I2S_TXD
8	GPIO13	I/O	VDD33	1.General Purpose I/O GPIO13 2.SDIO clock line 3.UART2_TXD 4.I2C_SCL 5.I2S_RXD
9	GPIO17	I/O	VDD33	1.General Purpose I/O GPIO17 2.WAKE UP:(Sleep state wake-up device) There is no pull-up resistance inside the module. 3.UART2_RXD 4.PWM_CTRL5 5.SPI1_WP 6.I2S_TXWS
10	GPIO25	I/O	VDD33	1.General Purpose I/O GPIO25 2.SDIO data3 line 3.PWM_CTRL3 4.I2C_SDA
11	GPIO24	I/O	VDD33	1.General Purpose I/O GPIO24 2.SDIO data2 line 3.UART1_CTS 4.PWM_CTRL2 5.I2S_MCLK
12	GPIO23	I/O	VDD33	1.General Purpose I/O GPIO23 2.SDIO data1 line 3.UART1_RTS 4.PWM_CTRL1 5.I2S_TXSCK

13	GPIO16	I/O	VDD33	1.General Purpose I/O GPIO16 2.UART1_CTS 3.IR_OUT 4.PWM_CTRL2
14	NC	/		NC
15	GND	P		Ground connections
16	NC	/		NC
17	GND	P		Ground connections
18	NC	/		NC
19	GND	P		Ground connections
20	NC	/		NC
21	GND	P		Ground connections
22	NC	/		NC
23	GND	P		Ground connections
24	VDD33	P	VDD33	VDD 3.3V Power Supply
25	GND	P		Ground connections
26	VEFUSE	P		eFuse program power supply, with a power supply of 1.8V, for testing use. It is recommended that NC
27	GND	P		Ground connections
28	GPIO6	I/O	VDD33	1.General Purpose I/O GPIO6 2.UART0_TXD: (Debug UART) 3.I2S_RX_SCK
29	GPIO5	I/O	VDD33	1.General Purpose I/O GPIO5 2.UART0_RXD: (Debug UART) 3.I2S_RXWS 4.IR_OUT
30	GND	P		Ground connections
31	GPIO4	I/O	VDD33	1.General Purpose I/O GPIO4 2.UART0_RTS 3.PWM_CTRL4 4.SPI1_CS1
32	GPIO3	I/O	VDD33	1.General Purpose I/O GPIO3 2.JTAG_TDI 3.UART0_CTS 4.PWM_CTRL3 5.SPI1_MISO

				6.I2C_SDA
33	GPIO2	I/O	VDD33	1.General Purpose I/O GPIO2 2.JTAG_TDO 3.UART1_TXD 4.PWM_CTRL2 5.SPI1_MOSI 6.I2C_SCL
34	GPIO1	I/O	VDD33	1.General Purpose I/O GPIO1 2.JTAG TMS 3.UART1_RXD 4.PWM_CTRL1 5.SPI1_CS0 6.I2S_RXD
35	GPIO0	I/O	VDD33	1.General Purpose I/O GPIO0 2.JTAG_TCK 3.UART2_TXD 4.PWM_CTRL0 5.SPI1_CLK 6.I2S_TXSCK
36	GND	P		Ground connections
37	RESET	I	VDD33	Module reset pin, with RC reset circuit inside the module, default high(4.7K), pull low to enter test mode, terminal customer NC processing
38	GPIO20	I/O	VDD33	1.General Purpose I/O GPIO20 2.PWM_CTRL3 3.AUX_2 4.VOUT_IP 5.I2S_MCLK
39	GPIO15	I/O	VDD33	1.General Purpose I/O GPIO15 2.AUX_1 3.VOUT_QN 4.PWM_CTRL5 5.I2S_TXWS
40	GPIO14	I/O	VDD33	1.General Purpose I/O GPIO14 2.AUX_0 3.VOUT_QP 4.PWM_CTRL4 5.I2S_TXD

41	VDD33	P	VDD33	VDD 3.3V Power Supply
42	GND	P		Ground connections
43	NC	/		NC
44	GND	P		Ground connections

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

RF: Analog RF Port or RF Ground;

2.2 Pin reuse function

Name	Module Pin	ALT1	ALT2	ALT3	ALT4	ALT5
GPIO0	35	TCK	UART2_TXD	SPI1_CLK	PWM_CTRL0	I2S_TXSCK
GPIO1	34	TMS	UART1_RXD	SPI1_CS0	PWM_CTRL1	I2S_RXD
GPIO2	33	TDO	UART1_TXD	SPI1_MOSI	PWM_CTRL2	I2C_SCL
GPIO3	32	TDI	UART0_CTS	SPI1_MISO	PWM_CTRL3	I2C_SDA
GPIO4	31	TRST	UART0_RTS	SPI1_CS2	PWM_CTRL0	-
GPIO5	29	UART0_RXD	-	-	I2S_RXWS	IR_OUT
GPIO6	28	UART0_TXD	-	-	I2S_RX_SCK	-
GPIO13	8	SD_H_CLK	UART2_TXD	I2C_SCL	I2S_RXD	-
GPIO14	40		AUX_0	VOUT_QP	PWM_CTRL4	I2S_TXD
GPIO15	39		AUX_1	VOUT_QN	PWM_CTRL5	I2S_TXWS
GPIO16	13	-	UART1_CTS	IR_OUT	PWM_CTRL2	-
GPIO17	9	WAKEUP	UART2_RXD	SPI1_WP	PWM_CTRL5	I2S_TXWS
GPIO20	38	I2S_MCLK	AUX_2	VOUT_IP	PWM_CTRL3	-
GPIO21	7	SD_H_CMD	UART0_RXD	I2C_SDA	I2S_TXD	-
GPIO22	6	SD_H_DATA0	UART0_TXD	PWM_CTRL0	I2S_TXWS	-
GPIO23	12	SD_H_DATA1	UART1_RTS	PWM_CTRL1	I2S_TXSCK	-
GPIO24	11	SD_H_DATA2	UART1_CTS	PWM_CTRL2	I2S_MCLK	-

GPIO25	10	SD_H_DATA3	I2C_SDA	PWM_CTRL3	-	-

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	℃
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℃			
Use Case	VDD33 Current		
	Typ(I_{RMS})	Max(I_{Peak})	Units
WLAN & BT Unassociated (Linux Driver)	38	48	mA
2.4G WLAN TCP throughput TX 15Mbps (Linux Drive, BT disable)	105	232	mA
2.4G WLAN TCP throughput RX 13Mbps (Linux Drive, BT disable)	62	224	mA
2.4G 11b_1Mbps TX@18dBm (RF-Test)	290	322	mA
2.4G 11b_1Mbps RX(RF-Test)	38	42	mA
2.4G 11b_11Mbps TX@18dBm (RF-Test)	287	322	mA
2.4G 11g_6Mbps TX@16dBm (RF-Test)	225	238	mA
2.4G 11g_54Mbps TX@14dBm (RF-Test)	182	214	mA
2.4G 11n_HT20_MCS0 TX@16dBm (RF-Test)	222	234	mA
2.4G 11n_HT20_MCS7 TX@14dBm (RF-Test)	185	202	mA
2.4G 11n_HT40_MCS0 TX@16dBm (RF-Test)	225	238	mA
2.4G 11n_HT40_MCS7 TX@14dBm (RF-Test)	192	214	mA
2.4G 11n_HT40_MCS7 RX(RF-Test)	41	52	mA
2.4G 11ax_HE_SU 20M_MCS0 TX@15dBm (RF-Test)	210	222	mA
2.4G 11ax_HE_SU 20M_MCS7 TX@13dBm (RF-Test)	182	198	mA

2.4G 11ax_HE_SU 20M_MCS7 RX(RF-Test)	40	50	mA
BLE_1M TX@10dBm (BT RF test)	95	130	mA
BLE_2M TX@10dBm (BT RF test)	75	130	mA
BLE_2M RX Active (BT RF test)	36	46	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25℃			
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): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11ax (OFDMA): BPSK, QPSK, 16QAM, 64QAM;		
Data 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; 802.11n (HT40) MCS0~MCS7: 13.5~150Mbps; 802.11ax (HE_MU,26~242RU) MCS0~MCS7: 0.4~86Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz) MCS0~MCS7: 3.6~86Mbps;		
Frequency Tolerance	≦ ±20ppm		
2.4G Transmitter Specifications			
TX Rate	**TX Power（dBm）**	**TX Power Tolerance（dBm）**	**EVM（dB）**
802.11b@1~11Mbps	18	±2	≦-10
802.11g@6Mbps	16	±2	≦-10
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 20M_MCS0	15	±2	≦ -10
802.11ax@HE_SU 20M_MCS7	13	±2	≦- 32

2.4G Receiver Specifications			
RX Rate	Min Input Level(Typ.dBm)	Max Input Level(Typ.dBm)	PER
802.11b@1Mbps	-93	-10	< 8%
802.11b@11Mbps	-85	-10	< 8%
802.11g@6Mbps	-88	-10	< 10%
802.11g@54Mbps	-72	-10	< 10%
802.11n@HT20_MCS0	-87	-10	< 10%
802.11n@HT20_MCS7	-69	-10	< 10%
802.11n@HT40_MCS0	-84	-10	< 10%
802.11n@HT40_MCS7	-67	-10	< 10%
802.11ax@HE_SU 20M_MCS0	-84	-10	< 10%
802.11ax@HE_SU 20M_MCS7	-67	-10	< 10%

4.2 Bluetooth RF Specification

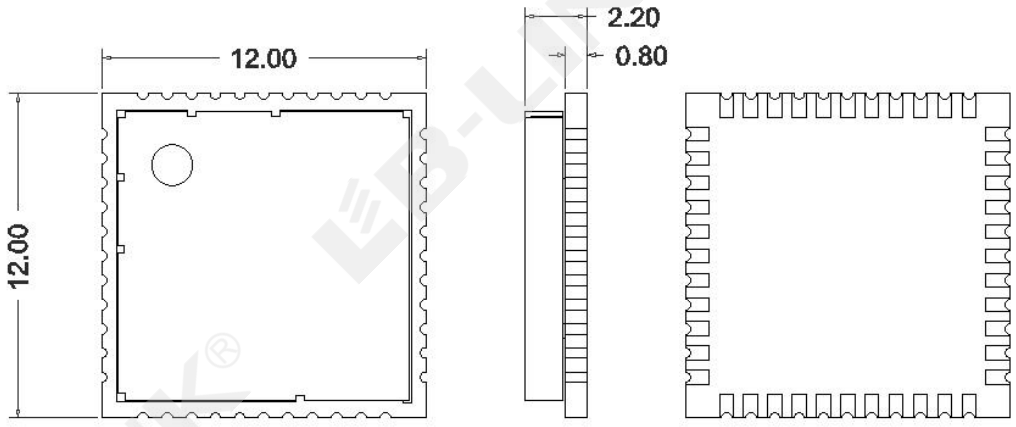
Conditions: VDD3.3=3.3V; Ta:25℃			
Features	Description		
Bluetooth Specification	Bluetooth v5.0 Low Energy		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	Min	Max	
TX Power			
BLE 1M	2dBm	12dBm	
BLE 2M	2dBm	12dBm	
Items	Min	Typ	Max
BLE_1M Modulation Characteristics			
Δf1avg	225KHz	249.73KHz	275KHz
Δf2avg	185KHz	222.4KHz	/
Δf2max	185KHz	233.33KHz	/
Δf2avg/Δf1avg	0.8	0.89KHz	/

Items	Min	Typ	Max
BLE_2M Modulation Characteristics			
Δf1avg	450KHz	494.51KHz	550KHz
Δf2avg	370KHz	479.65KHz	/
Δf2max	370KHz	462.2KHz	/
Δf2avg/Δf1avg	0.8	0.96KHz	/

Bluetooth Receiver Specifications				
Items	Sensitivity		Maximum Input Level	
	Input Level(Typ)	PER	Input Level(Typ)	PER
BLE_1M	-86dBm	≦ 5%	-10dBm	≦ 5%
BLE_2M	-84dBm	≦ 5%	-10dBm	≦ 5%

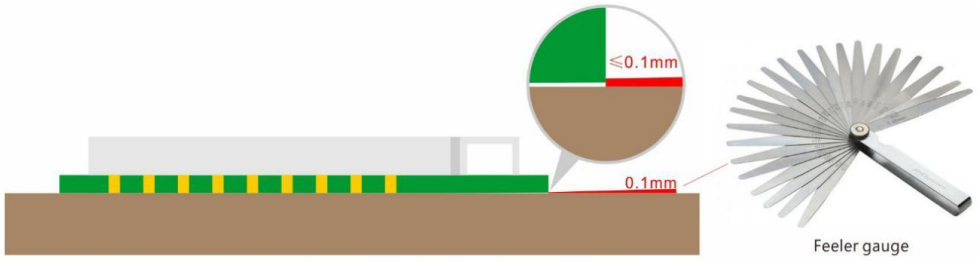
5. Mechanical Specifications

5.1 Module Outline Drawing



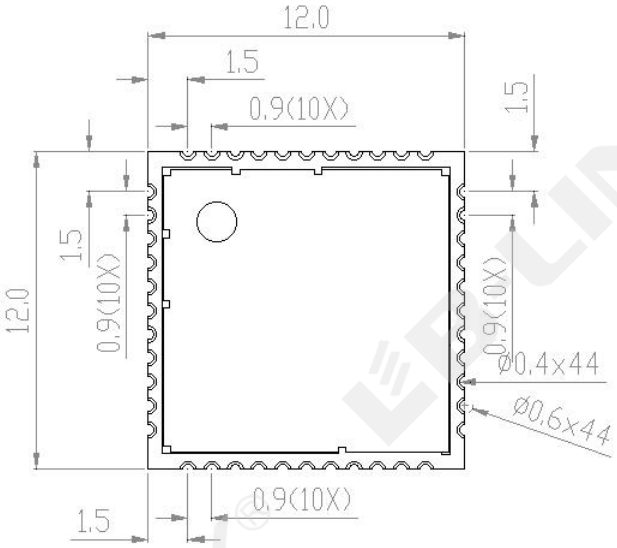
(Top View) (Side View) (Bottom View)

Module dimension: 12.0*12.0*2.2mm(L*W*H; Tolerance: ±0.15mm)

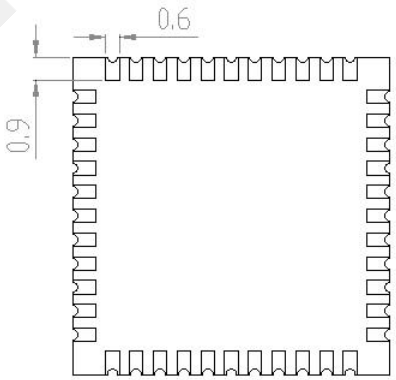


Module Bow and Twist：≤0.1mm

5.2 Mechanical Dimensions



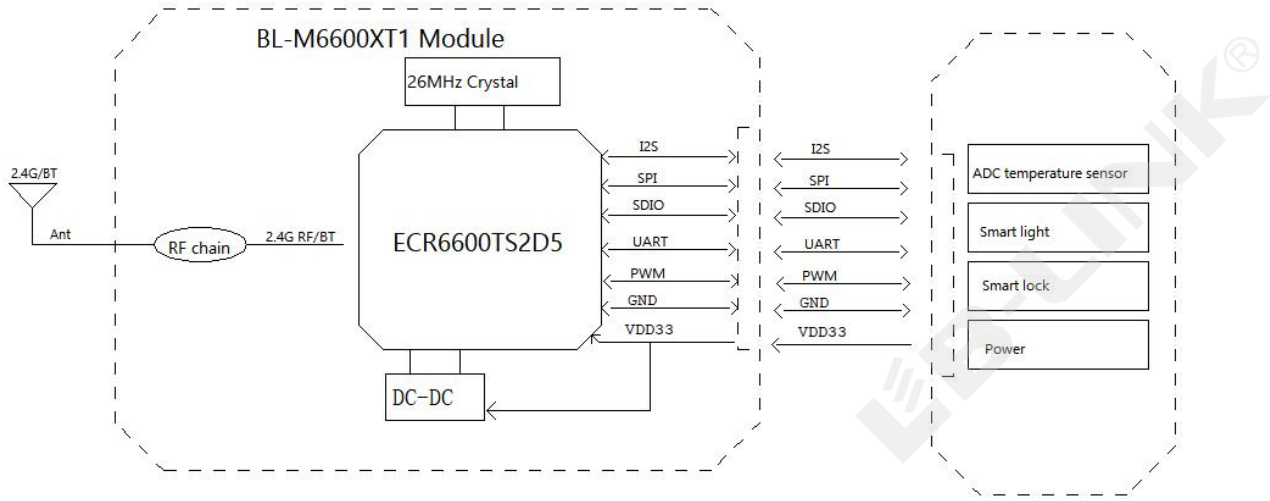
(Top View)



(Bottom View)

6. Application Information

6.1 Typical Application Circuit



6.2 VDD33 Power requirement:

A、DC 3.1~3.5V & Ripple Voltage <100mV power supply input, Maximum RMS current≥0.4A and Maximum Peak current≥0.45A.

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.

6.3 RF Path Design Guidelines:

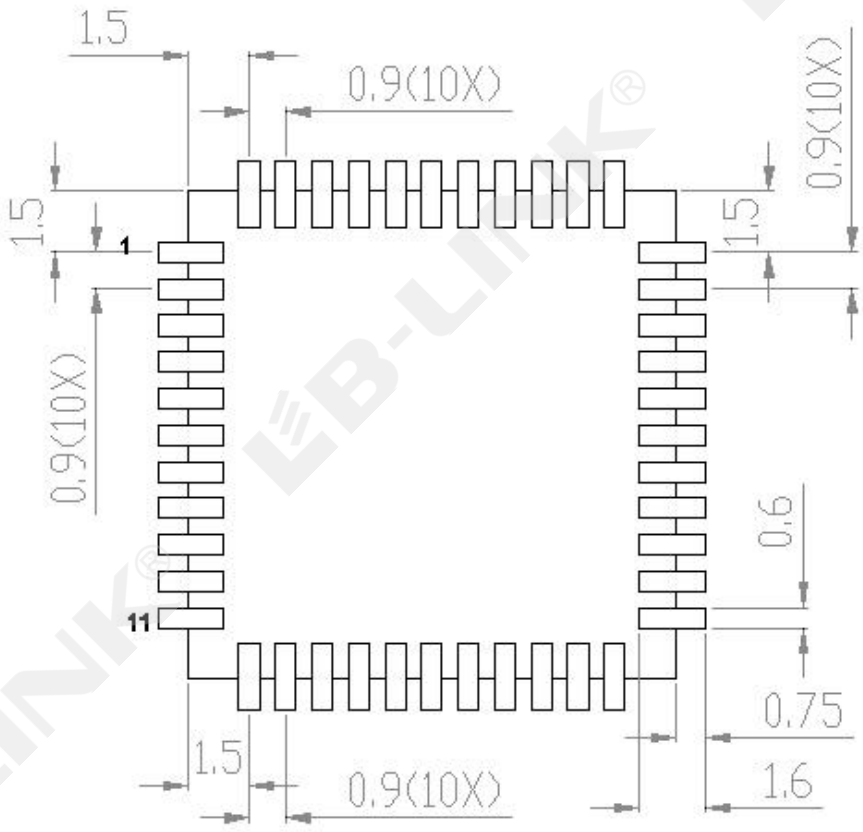
A、On customer's motherboard, keep complete GND copper area under and around the module, do not route Power, RF and other signals there to avoid interfering with the module causing RF performance derating problem.

B、PCB traces of the RF path as short as possible, as far away from other signal as possible, avoid layer change, and should be maintain continuous 50Ω characteristic impedance, structure of "Coated Coplanar Waveguide With Ground" with the advantages of impedance control and GND surrounding isolation

interference may be an ideal choice. It is necessary to maintain a complete GND reference layer below the RF path area.

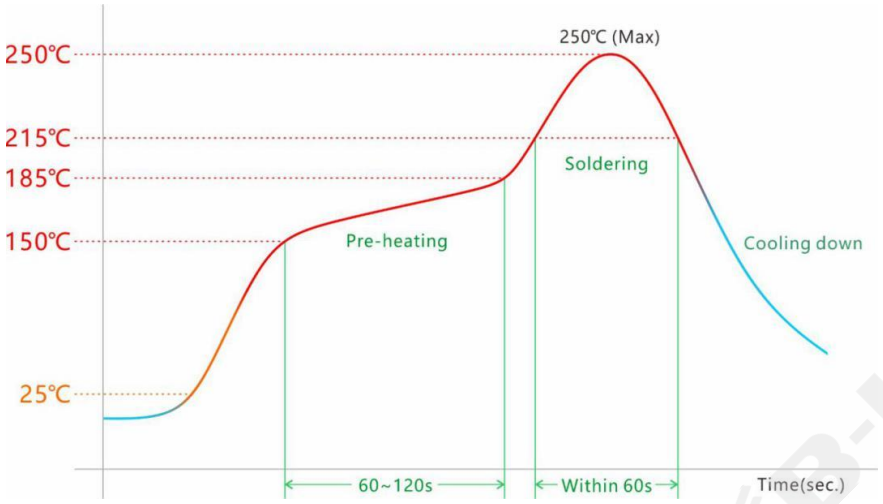
C、RF Pin and antenna PAD/RF connector PAD on customer's motherboard are significantly wider than PCB traces of the RF path, which will cause RF impedance discontinuity. To improve this problem, in addition to adjusting the local impedance of these PADs, a "π" circuit can be reserved near the antenna/RF connector which can match both RF path impedance and antenna impedance.

6.4 Recommend PCB Layout Footprin



(Design Unit: mm)

6.5 Reflow Soldering Standard Conditions



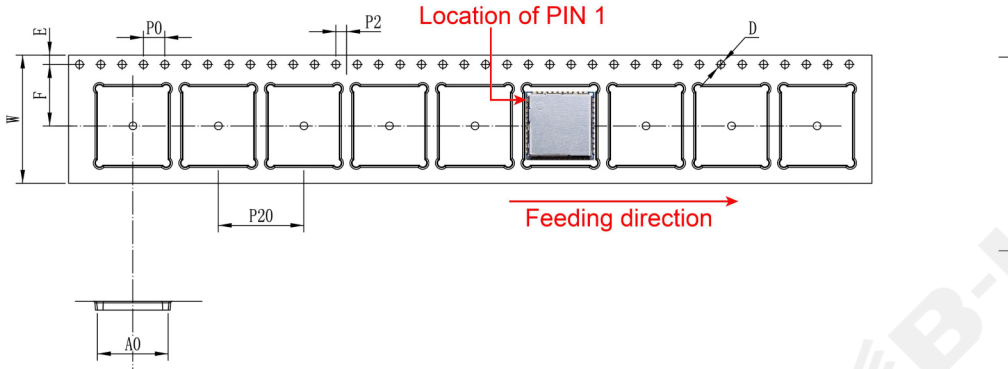
Please use the reflow within 2 times.
Set up the highest temperature within 250℃.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	ECR6600TS2D5	BEIJING ESWIN COMPUTING TECHNOLOGY CO.,LTD	
2	PCB	BL-M6600XT1	SHEN ZHEN QILI ELECTRON CO.,LTD	
			ShenZhen Tie Fa Technology Limited	
			Huizhou Dayawan Kexiang Technology Circuit Board Co., Ltd	
3	Crystal	26MHz-2016	LUCKI CM ELECTRONICS CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
			SHENZHEN KAIYUEXIANG ELECTRONICS CO.,LTD	

8. Package and Storage Information

8.1 Package Dimensions



ITEM	W	AO	BO	KO	E	F	P	PO	P2	D	T
DIM	24.00+0.3	12.40±0.1	12.40±0.1	2.90±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. 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 1 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℃ to +85℃
Storage humidity: 10% to 95% RH (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 CAUTION

ESD Sensitivity: (HBM ,Maximum rating)
The Module is a static-sensitive electronic device.
Do not operate or store near strong electrostatic fields.
Take proper ESD precautions!