XT-BL612

——2.4GHz Wi-Fi and BLE 5.0 Coexistence Module

Product Specification

Version: 1.0   Date: June.27, 2022

Features

- **General**
  - Chip: BL604
  - Module Size:16mm*24mm*3mm
- **Wireless**
  - 2.4GHz RF transceiver
  - Wi-Fi 802.11b/g/n
  - Bluetooth Low Energy 5.0
  - Wi-Fi 20 MHz bandwidth and 72.2 Mbps PHY rate
  - Wi-Fi Security WPS/WEP/WPA/WPA2
  - STA, Soft-AP and sniffer modes
  - Wi-Fi fast connection with BLE assistance
  - Wi-Fi and BLE coexistence
  - Integrated balun, PA/LNA
  - Power saving mechanism
- **MCU**
  - 32-bit RISC CPU with FPU
  - Level-1 cache
  - Four DMA channels
  - One RTC timer update to one year
  - DFS from 1 MHz to 192 MHz
- **Peripheral Interfaces**
  - GPIO * 23;
  - UART * 2;
  - IIC * 1;
  - SPI * 1;
  - EN * 1;
  - PWM * 5;
  - 10-bit DAC * 2;
  - 12-bit ADC * 12
  - SDIO 2.0 * 1;
  - IR * 1;
  - PIR * 1;
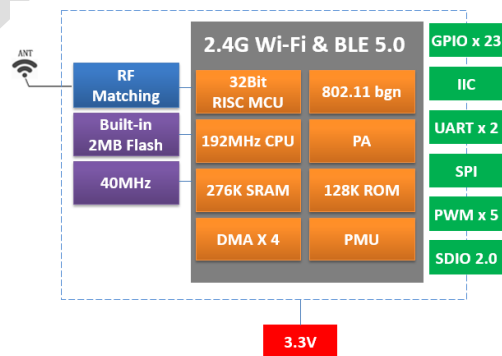- **Working temperature:** -20℃-85℃

Applications

- Serial transparent transmission;
- Wi-Fi prober;
- Smart power plug/Smart LED light;
- Mesh networks;
- Sensor networks;
- Wireless location recognition;
- Wireless location system beacon;
- Industrial wireless control;

Module Type

Name	Antenna Type
XT-BL612	PCB ANT
XT-BL612-E	IPEX V1

Module Structure

Update Record

Date	Version	Update
2022-06-27	V1.0	First released

Table of Contents

1. Introduction

XT-BL612 Wi-Fi and BLE coexistence module is a highly integrated single-chip low power 802.11 Wireless LAN (WLAN) network controller. It combines an RISC CPU, WLAN MAC, a 1T1R capable WLAN baseband, RF, and Bluetooth in a single chip. It also provides a bunch of configurable GPIO, which are configured as digital peripherals for different applications and control usage.

XT-BL612 Wi-Fi module use BL604 as Wi-Fi and BLE coexistence SOC chip.

XT-BL612 Wi-Fi module integrates internal memories for complete WI-FI protocol functions. The embedded memory configuration also provides simple application developments.

XT-BL612 Wi-Fi module supports the standard IEEE 802.11 b/g/n/e/i protocol and the complete TCP/IP protocol stack. User can use it to add the Wi-Fi function for the installed devices, and also can be viewed as an independent network controller. Anyway, XT-BL612 Wi-Fi module provides many probabilities with the best price.
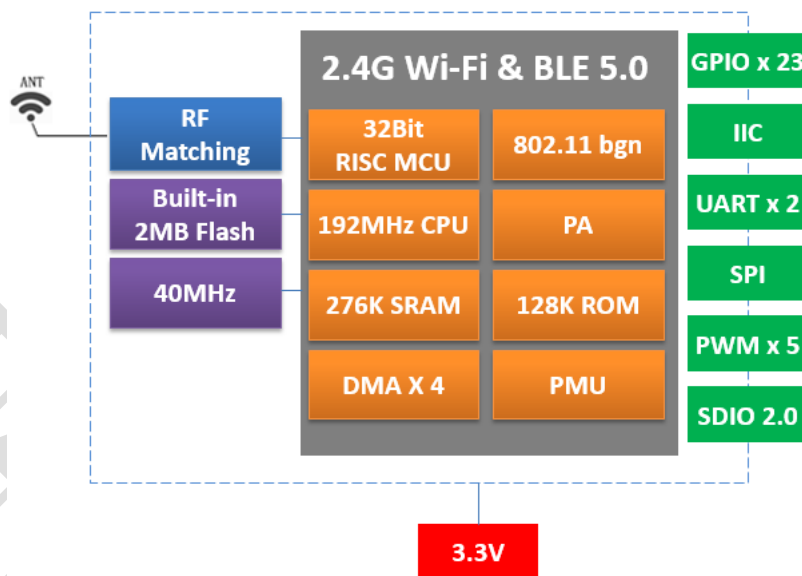
Fig.1.1 XT-BL612 Module Block

Technical parameters for XT-BL612 are listed as follows.

Table 1.1 XT-BL612 Parameters

Types	Items	Parameters
Wi-Fi	Frequency	2.4G~2.5G(2400M~2483.5M)
	Transmit power	802.11b: +19 dBm
		802.11g: +18 dBm
		802.11n: +17 dBm
	Receiver sensitivity	802.11b: -91 dBm (11Mbps)
		802.11g: -77 dBm（54Mbps）
		802.11n: -73 dBm（MCS7）
	EVM	<-28dB @802.11g
		<-28dB @802.11n
	Antenna	PCB antenna
Hardware	CPU	32-bit RISC CPU
	Interface	UART/SDIO/SPI/I2C/GPIO/PWM
	Working voltage	3.0V ~ 3.6V
	Working current	Min Deep Sleep Mode:15uA
		Min Deep Standby Mode: 2mA
		Average Power Consumption: 120mA
		Peak Power Consumption: 315mA
		Recommended Power Supply: 500mA+
	Working temperature	-20°C ~85°C
	Environment temperature	-30°C ~ 105°C
	Shape	16mm x 24mm x 3mm
Software	Wi-Fi working mode	STA, Soft-AP and sniffer modes
	Security mode	WPS / WEP / WPA / WPA2 / WPA3
	Encryption type	AES
	Update firmware	UART Download
	Software develop	SDK
	Network protocol	IPv4, TCP/UDP/HTTP/FTP/MQTT

2. Interface Definition

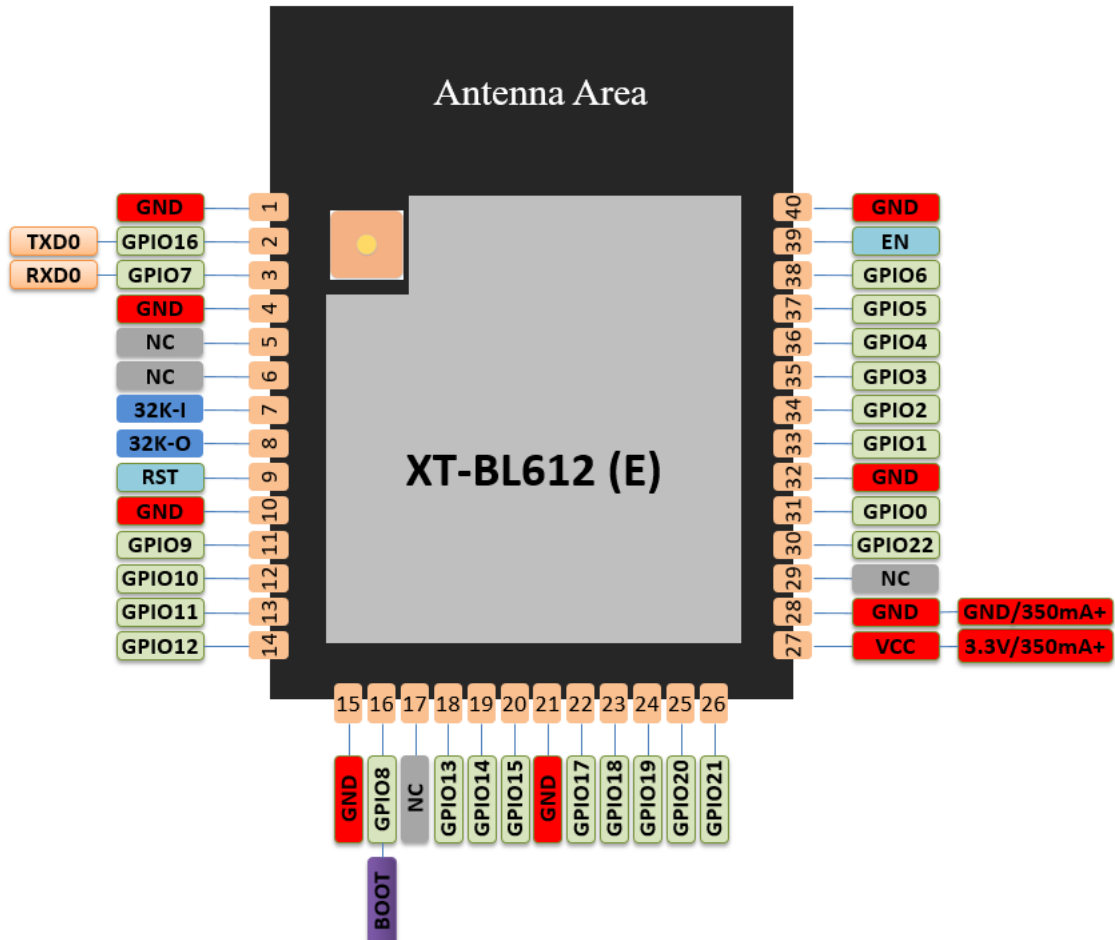XT-BL612 module interface definition is shown as below。

Fig.2.1 XT-BL612 Pins Definition

Working mode and pins function are shown in Table 2.1.

Table.2.1 Working Mode

Mode	GPIO8
UART Download Mode	High
Flash Boot Mode	Low (Default)

Table.2.2 Pins Function Definition

Num.	Pin Name	Type	Function
1.4.10.15 21.28.32.40	GND	P	Power ground
2	GPIO16	I/O	TXD0 (download), SPI, I2C, PWM
3	GPIO7	I/O	RXD0 (download), SPI, I2C, PWM
5.6.17.29	NC	-	Not Connected

7	32K-I	A	CRYSTAL:32.768K INPUT
8	32K-O	A	CRYSTAL:32.768K OUTPUT
9	RST	-	Chip Reset; Built-in Pull-up
11	GPIO9	I/O	SPI, I2C, PWM, ADC, JTAG
12	GPIO10	I/O	SPI, I2C, PWM, ADC, JTAG,MIC_BIAS
13	GPIO11	I/O	SPI, I2C, UART, PWM, AUXADC, GPIO, Low-High when Reset
14	GPIO12	I/O	SPI, I2C, UART, PWM, AUXADC, GPIO
16	GPIO8	I/O	SPI, I2C, UART, PWM, AUXADC, Built-in Pull-down
18	GPIO13	I/O	SPI, I2C, UART, PWM, AUXADC
19	GPIO14	I/O	SPI, I2C, UART, PWM, AUXADC, JTAG
20	GPIO15	I/O	SPI, I2C, UART, PWM, AUXADC, JTAG
22	GPIO17	I/O	SFLASH, SPI, I2C, UART, PWM
23	GPIO18	I/O	SFLASH, SPI, I2C, UART, PWM
24	GPIO19	I/O	SFLASH, SPI, I2C, UART, PWM
25	GPIO20	I/O	SFLASH, SPI, I2C, UART, PWM
26	GPIO21	I/O	SFLASH, SPI, I2C, UART, PWM
27	VCC	P	POWER IN,3.3V
30	GPIO22	I/O	SFLASH, SPI, I2C, UART, PWM
31	GPIO0	I/O	SDIO, SFLASH, SPI, I2C, UART, PWM
33	GPIO1	I/O	SDIO, SFLASH, SPI, I2C, UART, PWM
34	GPIO2	I/O	SDIO, SFLASH, SPI, I2C, UART, PWM
35	GPIO3	I/O	SDIO, SPI, I2C, UART, PWM
36	GPIO4	I/O	SDIO, SPI, I2C, UART, PWM
37	GPIO5	I/O	SDIO, SPI, I2C, UART, PWM
38	GPIO6	I/O	SPI, I2C, UART, PWM
39	EN	-	Chip enable; Built-in Pull-up

3. Size and Layout
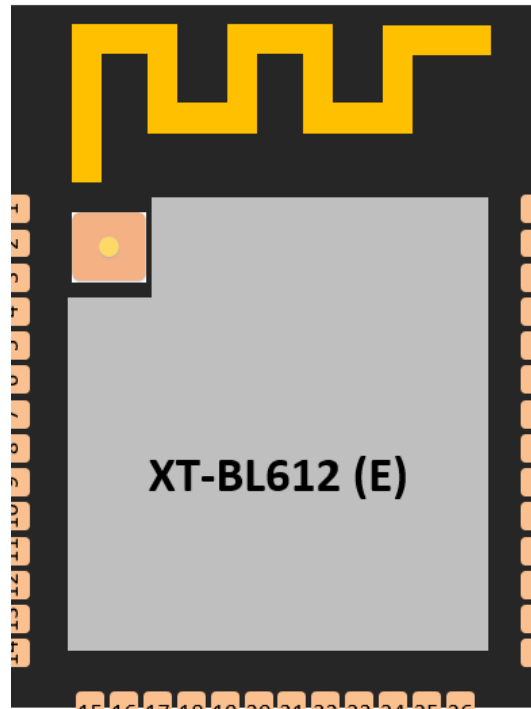
Size for XT-BL612 can be shown as follows.
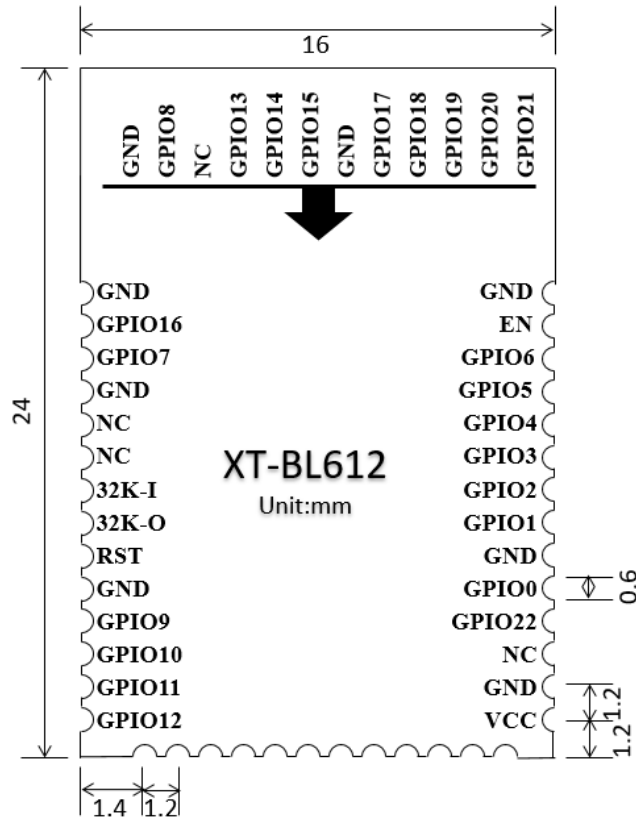

Fig.3.1 Shape for XT-BL612

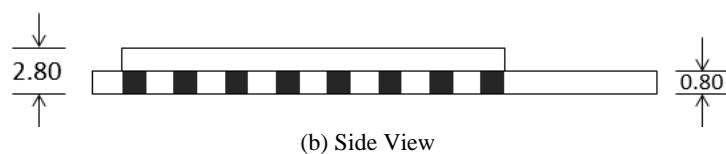(a) Vertical View

(b) Side View

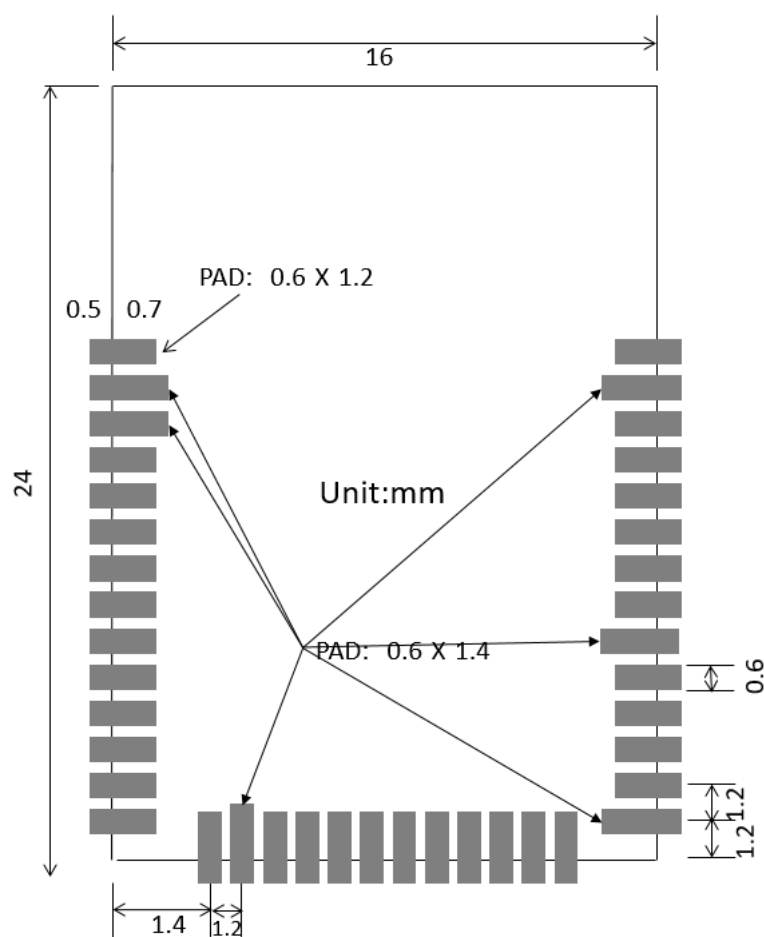Fig.3.2 Size for XT-BL612

Fig.3.3 PCB Layout for XT-BL612

4. Electronica Characteristics

Table.4.1 Electronica Characteristics

Parameters		Condition	Min	Classical	Max	Unit
Store Temperature		-	-30	Normal	155	℃
Sold Temperature		IPC/JEDEC J-STD-020	-	-	260	℃
Working Voltage		-	2.5	3.3	3.6	V
I/O	V_{IL}/V_{IH}	-	-/2.0	-	0.8/-	V
	V_{OL}/V_{OH}	-	-/2.4	-	0.4/-	
Electrostatic release quantity (Human model)		TAMB=25℃	-	-	2	KV
Electrostatic release quantity (Machine model)		TAMB=25℃	-	-	0.5	KV

5. Power Consumption

Table.5.1 Power Consumption

Parameters	Min	Classical	Max	Unit
RX 11b	-	35	-	mA
RX 11g		39		mA
RX 11n	-	39	-	mA
TX (11b - 11Mbps @20dBm)	-	310	450	mA
TX (11g - 54Mbps@18dBm)	-	230	-	mA
TX (11n - MCS7@17dBm)	-	215	-	mA
MCU (Run Freq. @ 192MHz)	-	22	-	mA
MCU (Standby Freq.@<10MHz)	-	2	-	mA

NOTE: The peak current consumption of XT-BL612 exceed 450mA when the module start work (RF calibration work consumes maximum current). Therefore, the recommended power supply is no less than 500mA. Insufficient current supply may cause the module to not work. And the symptom is that the module restarts frequently.

6. RF Characteristics

The data in the following Table is gotten when voltage is 3.3V in the indoor temperature environment.

Table.6.1 Wi-Fi RF Characteristics

Parameters	Min	Classical	Max	Unit
Input frequency	2412	-	2484	MHz
Input impedance	-	50	-	Ω
Input reflection	-	-	-10	dB
At 11b mode, output power consumption	-	20	-	dBm
At 11g mode, output power consumption	-	18	-	dBm
At 11n mode, output power consumption	-	17	-	dBm
Sensibility				
802.11b, 1Mbps	-	-98	-	dBm
802.11g, 64Mbps	-	-93	-	dBm
802.11n, MCS7	-	-73	-	dBm

7. Recommended Reflow Profile

(1) Reflow Times <= 2 times (Max.)

(2) Max Rising Slope: 3℃/sec

(3) Max Falling Slope: -3℃/sec

(4) Over 217℃ Time: 60~120sec
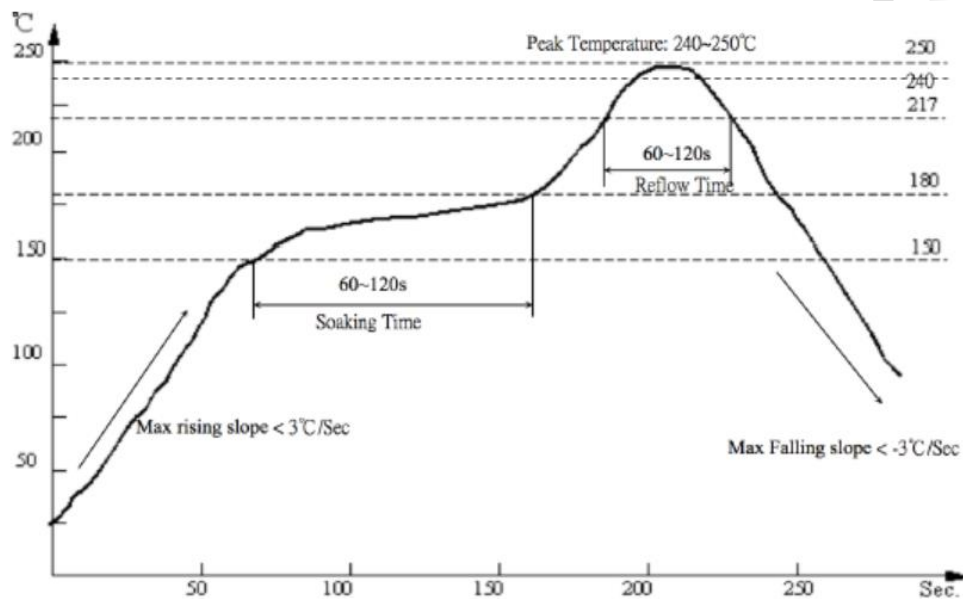
(5) Peak Temp:240℃~250℃

Fig.7.1 Recommended Reflow Profile

8. Minimum User System
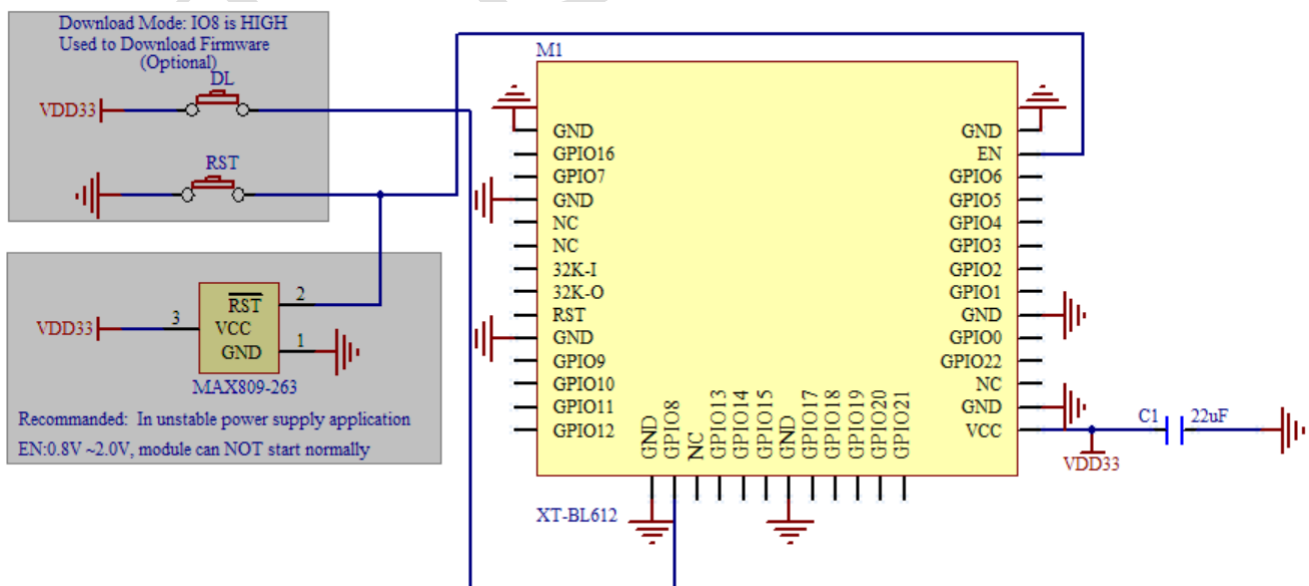
This module can work just at 3.3V working voltage:

Fig.8.1 Minimum System

Note**:**

1. How to download firmware in BL604 download tool software.

Step 1: choose the correct configuration option in software download tool, including correct flash size file, correct boot file, correct crystal file, correct communication UART.

Step 2: make D8 into High level, then reset the module.

Step 3: download the firmware.

2. When to use the MAX809-263 chip.

In some unstable power supply application, the power voltage may fall into 0V and then start up the module instantly. In that moment, the EN level will be in 0.8V~2.0V due to the capacitive effect, which cause the module cannot start normally.

3. The max current supply from IO of this module is 12mA;

9. Recommended Layout Design

XT-BL10 Wi-Fi module can be sold on PCB board directly. For the high RF performance for the device, please notice the placement of the module. There are three ways to use the module for Wi-Fi Module with PCB antenna.

Solution 1: optical solution. The Wi-Fi module is placed on the side of the board, and the antennas are all exposed, and there is no metal material around the antenna, including wires, metal casings, weight plates, and the like.

Solution 2: sub-optical solution. The Wi-Fi module is placed on the side of the board, and the antenna below is hollowed out. There is a gap of not less than 5 mm reserved with the PCB, and there is no metal material around the antenna, including wires, metal casings, weight plates, and the like.

Solution 3: The Wi-Fi module is placed on the side of the board, and the PCB area under the antenna is empty, and copper cannot be laid.
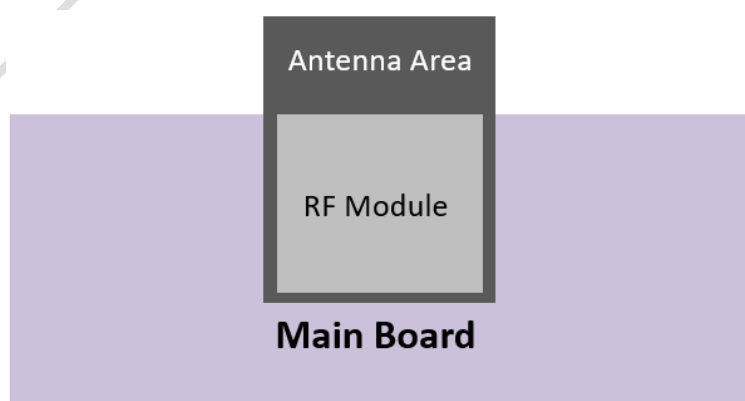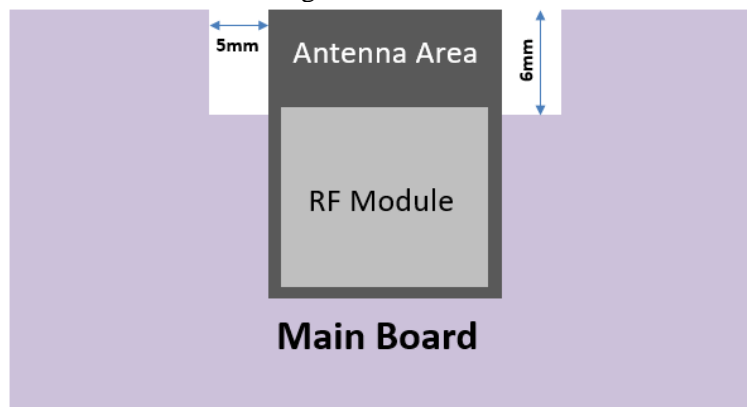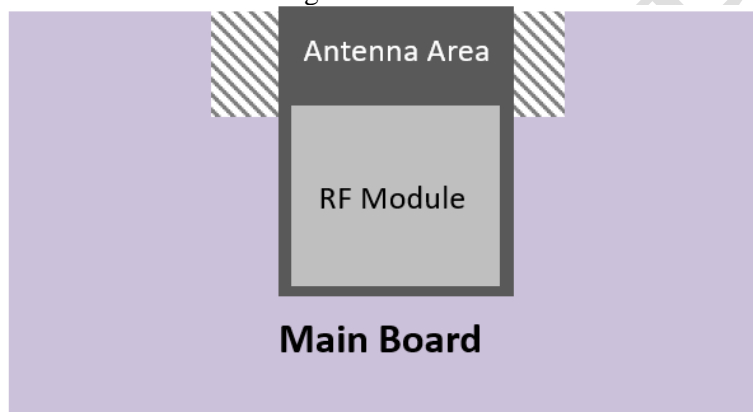
Fig.9.1 Solution 1

Fig.9.2 Solution 2

Fig.9.3 Solution 3

10. Peripheral Design Suggestion

Wi-Fi module is already integrated into high-speed GPIO and Peripheral interface, which may be generated the switch noise. If there is a high request for the power consumption and EMI characteristics, it is suggested to connect a serial 10~100 ohm resistance, which can suppress overshoot when switching power supply, and can smooth signal. At the same time, it also can prevent electrostatic discharge (ESD).

11. Product Handling

11.1 Storage Conditions

The products sealed in moisture barrier bags (MBB) should be stored in a non-condensing atmospheric environment of < 40 °C and /90%RH. The module is rated at the moisture sensitivity level (MSL) of 3. After unpacking, the module must be soldered within 168 hours with the factory conditions 25±5 °C and /60%RH. If the above conditions are not met, the module needs to be baked.

11.2 Electrostatic Discharge (ESD)

• Human body model (HBM): ±2000 V

• Charged-device model (CDM): ±500 V

12. U.F.L RF Connector

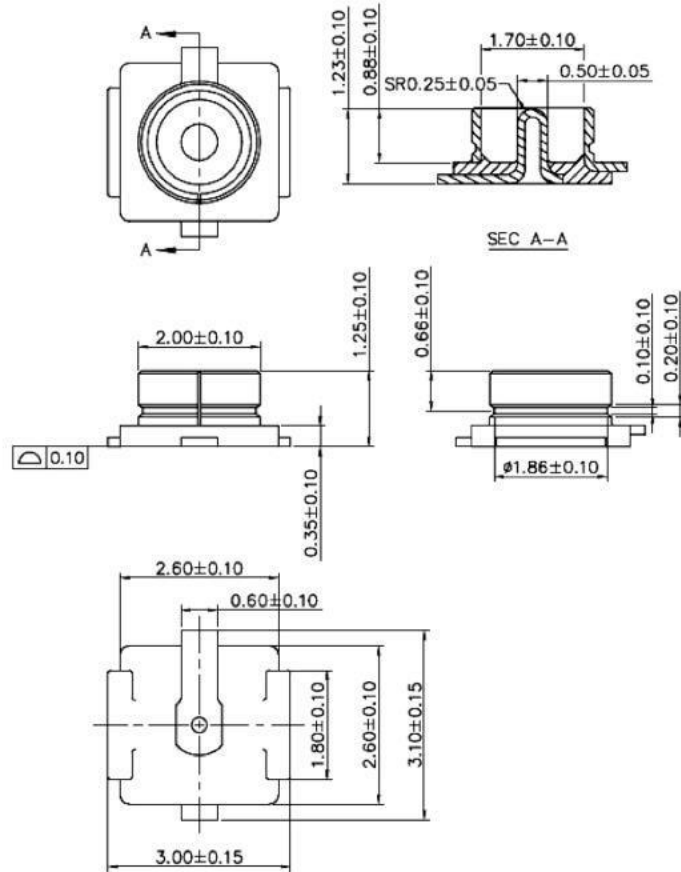XT-ZB6-E module use U.F.L type RF connector for external antenna connection. (IPEX V1.0).

Fig.12.1 U.F.L RF Connector