

XT-BL10

—2.4GHz Wi-Fi and BLE 5.0 Coexistence Module

Product Specification

Version: 2.0

Date: June.3, 2021

Features

■ General

- Chip: BL602C-20
- Module Size: 16mm*20mm*3mm

■ Wi-Fi Feature

- 2.4GHz RF transceiver
- Wi-Fi 802.11b/g/n
- 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

■ Bluetooth Feature

- Bluetooth Low Energy 5.0
- Bluetooth MESH

■ 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 * 16;
- UART * 2;
- IIC * 1;
- SPI * 1;
- EN * 1;
- PWM * 5;

- 10-bit DAC * 1;
- 12-bit ADC * 1
- SDIO 2.0 * 1;
- IR * 1;
- PIR * 1;

■ Working temperature: -20°C-85°C

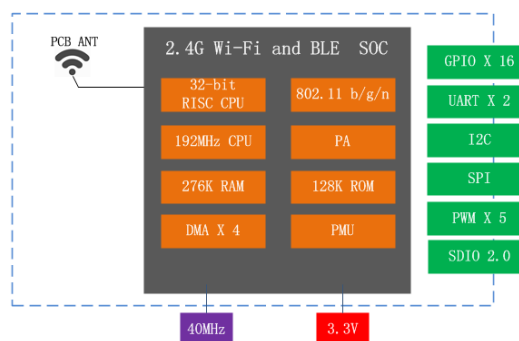
Applications

- 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-BL10	PCB ANT

Module Structure



Update Record

Date	Version	Update
2020-8-25	V1.0	First released
2021-6-3	V2.0	Pins definition revised

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1. Introduction

XT-BL10 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-BL10 Wi-Fi module use BL602 as Wi-Fi and BLE coexistence SOC chip.

XT-BL10 Wi-Fi module integrates internal memories for complete WI-FI protocol functions. The embedded memory configuration also provides simple application developments.

XT-BL10 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-BL10 Wi-Fi module provides many probabilities with the best price.

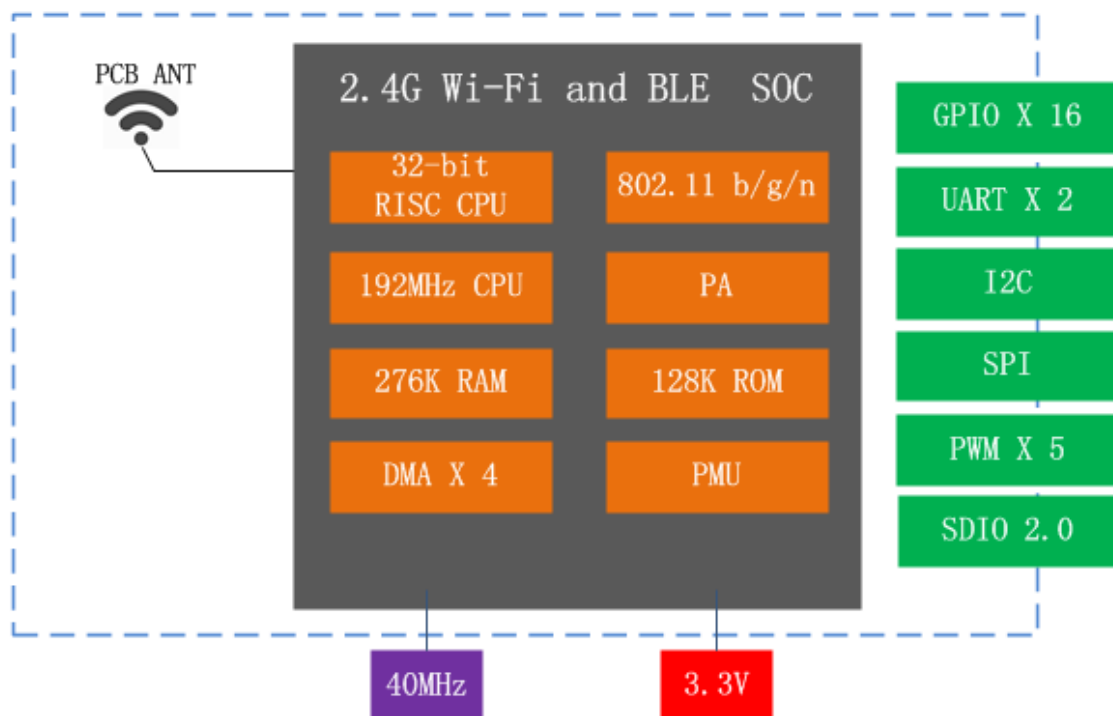


Fig.1.1 XT-BL10 Module Structure

Technical parameters for XT-BL10 are listed as follows.

Table 1.1 XT-BL10 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
Bluetooth	Transmit power	0~15 dBm
	Receiver sensitivity	-97 dBm (1Mbps)
	Others	Table 7.2
Hardware	CPU	32-bit RISC CPU
	Interface	UART/SDIO/SPI/I2C/GPIO/PWM
	Working voltage	3.0V ~ 3.6V
	Working current	Deep Sleep Mode:15uA
		Deep Standby Mode:2mA
		Average: 120mA
	Working temperature	-20°C ~85°C
	Environment temperature	-30°C ~ 105°C
	Shape	16mm x 20mm 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-BL10 module interface definition is shown as below.

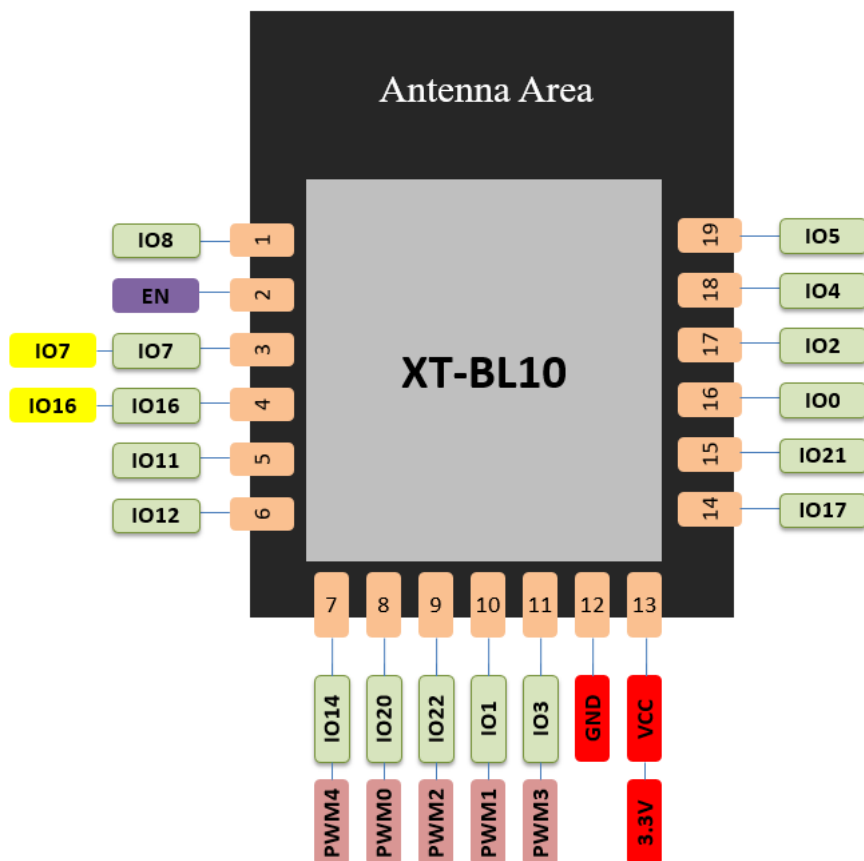


Fig.2.1 XT-BL10 Pins Definition

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	GPIO8	I/O	SPI, I2C, UART, PWM, AUXADC, GPIO. Pull-down
2	EN	I/O	Chip enable
3	GPIO7	I/O	SPI, I2C, UART, PWM, GPIO

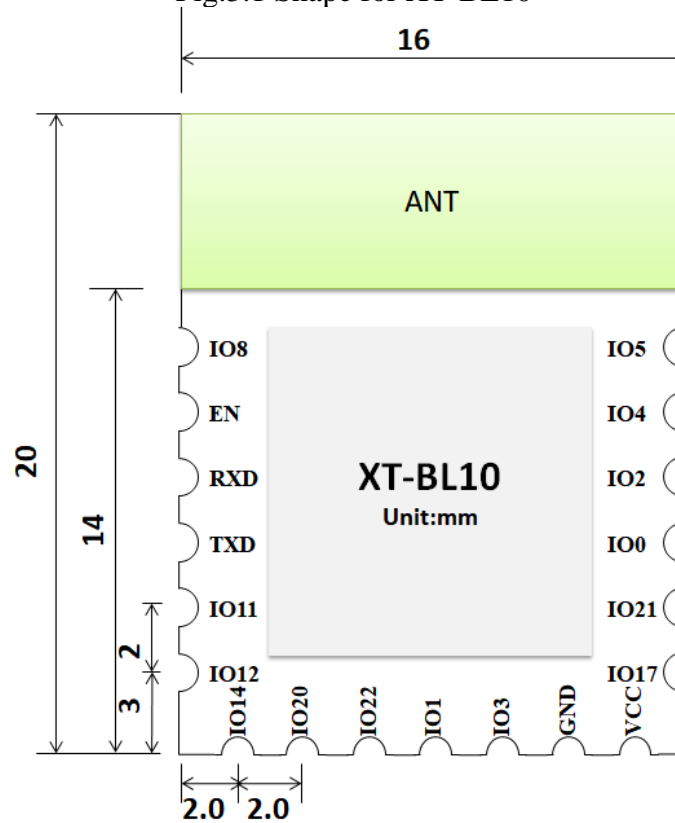
4	GPIO16	I/O	SPI, I2C, UART, PWM, GPIO
5	GPIO11	I/O	SPI, I2C, UART, PWM, AUXADC, GPIO, Low-High when Reset
6	GPIO12	I/O	SPI, I2C, UART, PWM, AUXADC, GPIO
7	GPIO14	I/O	SPI, I2C, UART, PWM, AUXADC, GPIO
8	GPIO20	I/O	SFLASH, SPI, I2C, UART, PWM, GPIO
9	GPIO22	I/O	SFLASH, SPI, I2C, UART, PWM, GPIO
10	GPIO1	I/O	SDIO, SFLASH, SPI, I2C, UART, PWM, GPIO
11	GPIO3	I/O	SDIO, SPI, I2C, UART, PWM, GPIO
12	GND	P	Power
13	VDD33	P	Power
14	GPIO17	I/O	SFLASH, SPI, I2C, UART, PWM, GPIO
15	GPIO21	I/O	SFLASH, SPI, I2C, UART, PWM, GPIO
16	GPIO0	I/O	SDIO, SFLASH, SPI, I2C, UART, PWM, GPIO
17	GPIO2	I/O	SDIO, SFLASH, SPI, I2C, UART, PWM, GPIO
18	GPIO4	I/O	SDIO, SPI, I2C, UART, PWM, GPIO
19	GPIO5	I/O	SDIO, SPI, I2C, UART, PWM, GPIO

3. Size and Layout

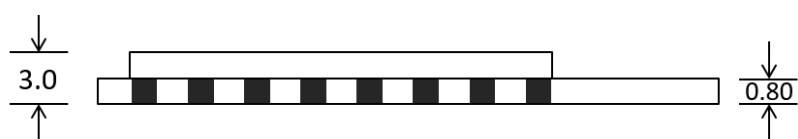
Size for XT-BL10 can be shown as follows.



Fig.3.1 Shape for XT-BL10



(a) Vertical View



(b) Side View

Fig.3.2 Size for XT-BL10

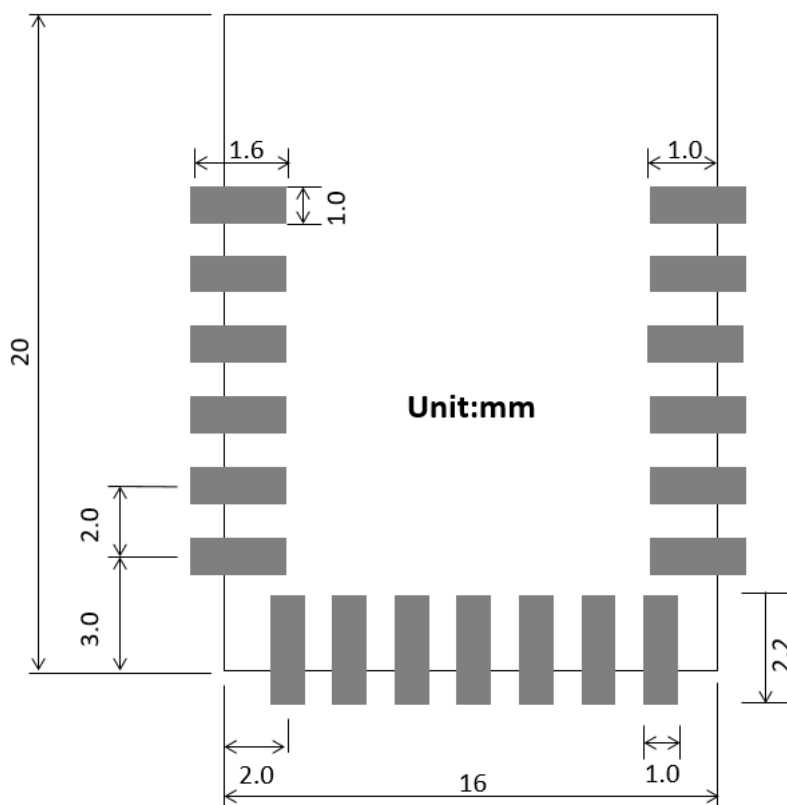


Fig.3.3 PCB Layout for XT-BL10

4. Electronica Characteristics

Table.4.1 Electronica Characteristics

Parameters	Condition	Min	Classical	Max	Unit
Store Temperature	-	-30	Normal	155	°C
Sold Temperature	IPC/JEDEC J-STD-020	-	-	260	°C
Working Voltage	-	2.5	3.3	3.6	V
I/O	V_{IL}/V_{IH}	-	-	0.8/-	V
	V_{OL}/V_{OH}	-	-	0.4/-	
Electrostatic release quantity (Human model)	TAMB=25°C	-	-	2	KV
Electrostatic release quantity (Machine model)	TAMB=25°C	-	-	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
Sleep PDS7	-	12	-	uA
Hibernate, HBN0, RTC/GPIO Wakeup	-	2	-	uA
Hibernate, HBN0, GPIO Wakeup ONLY	-	0.7	-	uA
Shut Down	-	0.2	-	uA

NOTE: The peak current consumption of XT-BL10 exceed 450mA when the module start work. 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. Wi-Fi 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, 1Mbps	-	20	-	dBm
At 11g mode, 6Mbps	-	19	-	dBm
At 11n mode, MCS0	-	19	-	dBm
At 11n mode, MCS7	-	17	-	dBm
TX EVM @11g, 54Mbps	-	-28	-	dB
TX EVM @11n, MCS7	-	-28	-	dB
Sensibility				
802.11b, 1Mbps	-	-98	-	dBm
802.11g, 64Mbps	-	-93	-	dBm
802.11n, MCS7	-	-73	-	dBm
MAX RX Level @11b, 1Mbps	-	5	-	dBm

MAX RX Level @11n, MCS7	-	-13	-	dBm
RX Adjacent Channel Rejection@11b,1Mbps	-	40	-	dB
RX Adjacent Channel Rejection@11b,11Mbps	-	40	-	dB
RX Adjacent Channel Rejection@11g,54Mbps	-	22	-	dB
RX Adjacent Channel Rejection@11n,MCS7	-	19	-	dB

7. BLE Characteristics

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

Table.7.2 BLE RF Characteristics

Parameters	Min	Classical	Max	Unit
TX				
RF power control range	0	9	15	dBm
In-band emissions @1Mbps + 2MHz	-	-48.4	-	dBm
In-band emissions @1Mbps + 3MHz	-	-51.1	-	dBm
Frequency characteristics @ 1Mbps, Fn	-	7.84	-	KHz
Frequency characteristics @ 1Mbps, F0-Fn	-	3.69	-	KHz
Frequency characteristics @ 1Mbps, F0-F1	-	1.43	-	KHz
Frequency characteristics @ 1Mbps, Fn-F(n-5)	-	3.1	-	KHz
Modulation characteristics @ Δf_{avg} , LE 1M	-	248.8	-	KHz
Modulation characteristics @ Δf_{2max} , LE 1M	-	226.4	-	KHz
Modulation characteristics @ $\Delta f_{2max}/\Delta f_{2max}$, LE 1M	-	0.91	-	KHz
RX				
Sensitivity @ 1Mbps	-	-97	-	dBm
Maximum received signal @ 1Mbps	-	0	-	dBm
Adjacent Channel Rejection @ 1Mbps	-	9	-	dB
Adjacent Channel Rejection @ 1Mbps+ 1MHz	-	-5	-	dB
Adjacent Channel Rejection @ 1Mbps- 1MHz	-	-1	-	dB
Adjacent Channel Rejection @ 1Mbps+ 2MHz	-	-44	-	dB
Adjacent Channel Rejection @ 1Mbps- 2MHz	-	-28	-	dB
Adjacent Channel Rejection @ 1Mbps+ 3MHz	-	-51	-	dB
Adjacent Channel Rejection @ 1Mbps- 3MHz	-	-31	-	dB

8. Recommended Reflow Profile

- (1) Reflow Times ≤ 2 times (Max.)
- (2) Max Rising Slope: $3^{\circ}\text{C}/\text{sec}$
- (3) Max Falling Slope: $-3^{\circ}\text{C}/\text{sec}$
- (4) Over 217°C Time: 60~120sec
- (5) Peak Temp: $240^{\circ}\text{C} \sim 250^{\circ}\text{C}$

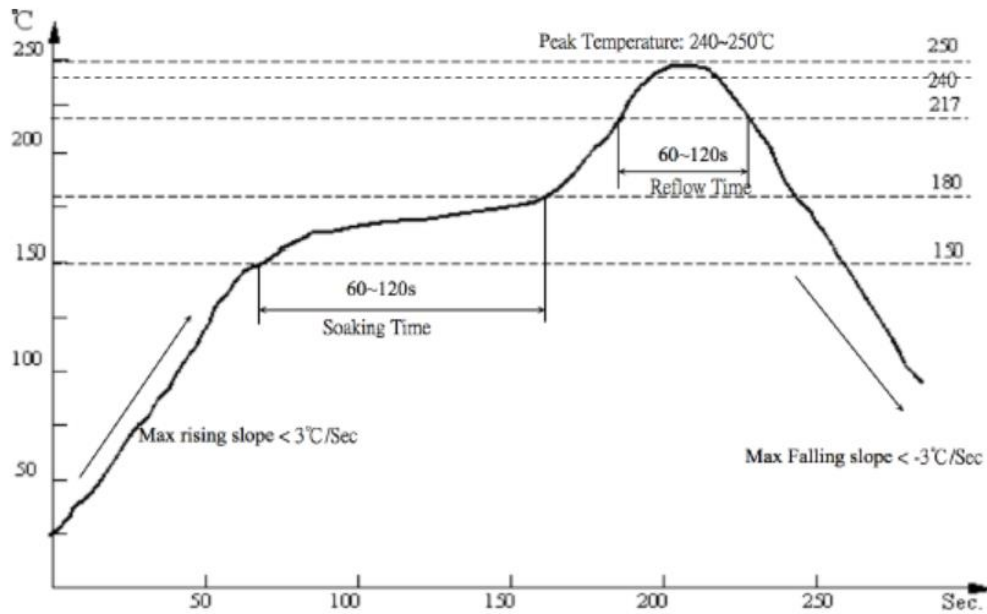


Fig.8.1 Recommended Reflow Profile

9. Minimum User System

This module can work just at 3.3V working voltage:

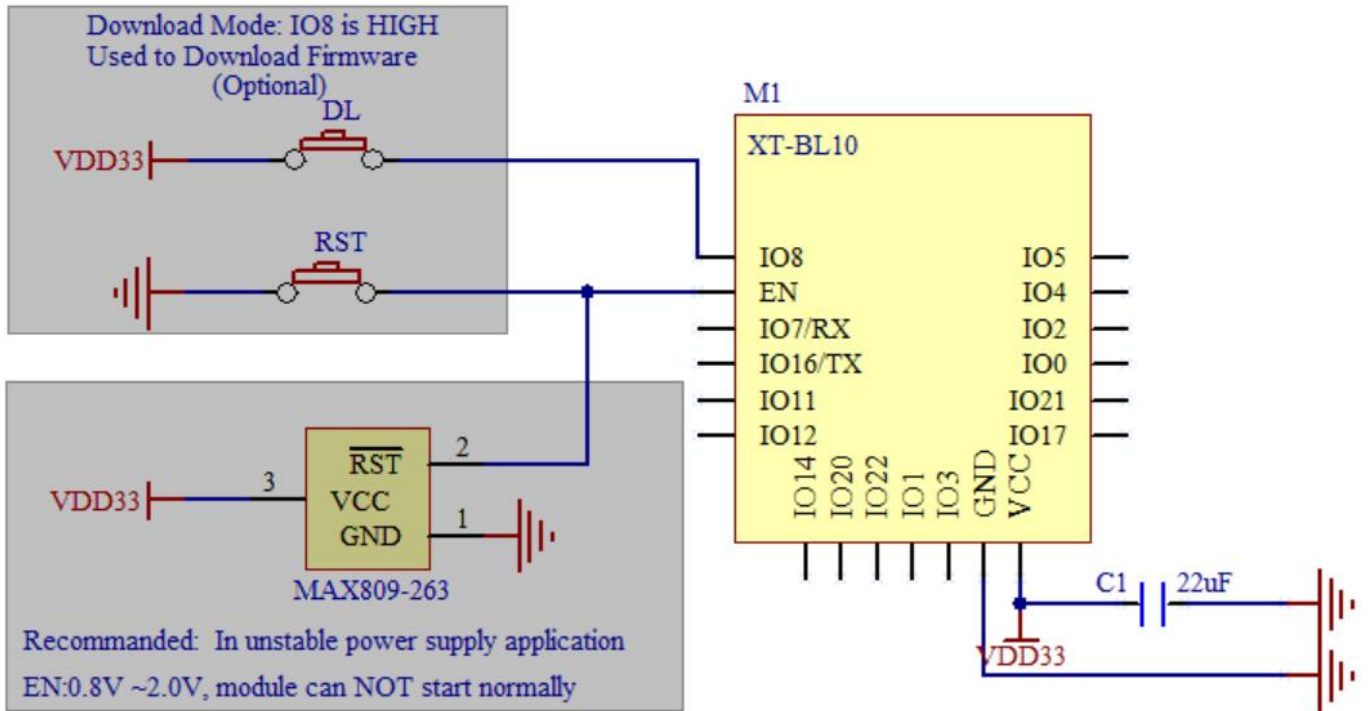


Fig.9.1 Minimum System

Note:

1. How to download firmware in BL602 download tool software.

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

Step 2: make IO8 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;

10. 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.

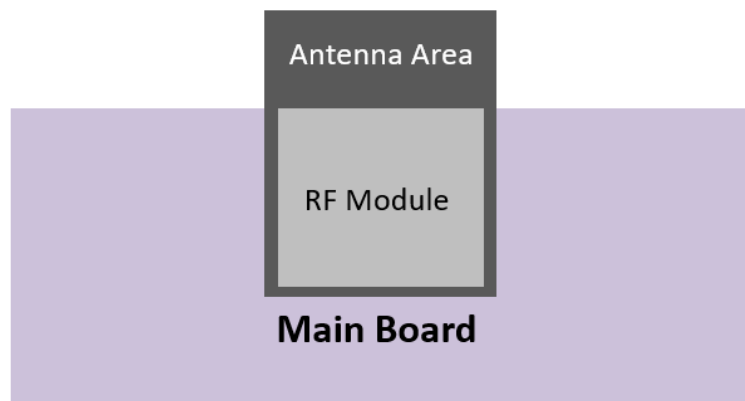


Fig.10.1 Solution 1

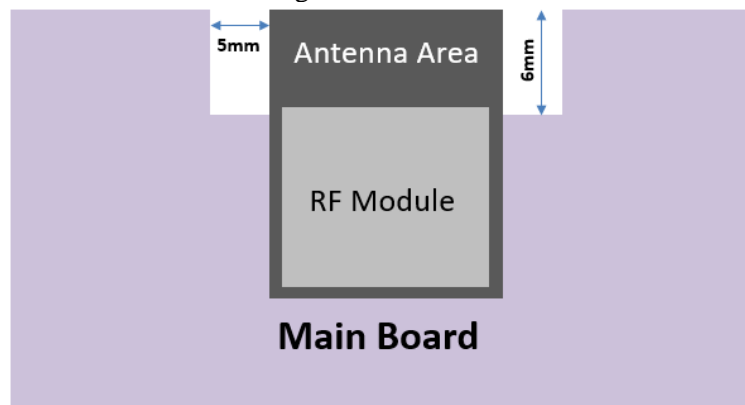


Fig.10.2 Solution 2

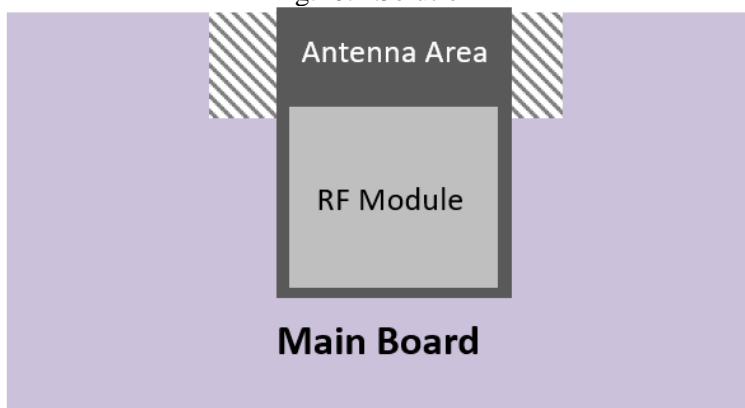


Fig.10.3 Solution 3

11. 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).

12. Product Handling

12.1 Storage Conditions

The products sealed in moisture barrier bags (MBB) should be stored in a non-condensing atmospheric environment of $< 40\text{ }^{\circ}\text{C}$ and $/90\%\text{RH}$. 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 $25\pm 5\text{ }^{\circ}\text{C}$ and $/60\%\text{RH}$. If the above conditions are not met, the module needs to be baked.

12.2 Electrostatic Discharge (ESD)

- Human body model (HBM): $\pm 2000\text{ V}$
- Charged-device model (CDM): $\pm 500\text{ V}$

13. Certification

FCC ID: 2A3UG-XT-BL10

CE: No.CTB211026021REX-ZS

SRRC: CMIIT ID: 2021DP16735