BL-01S User manual

Version V1.1

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This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and

2) This device and its antenna(s) must not be co‑located with any other transmitters except in accordance with FCC multi‑transmitter product procedures. Referring to the multi‑transmitter policy, multiple‑transmitter(s) and module(s) can be operated simultaneously without C2P.

3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end‑user regarding to Regulatory Domain change.

USERS MANUAL OF THE END PRODUCT:
In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.
The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment . If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual:
This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.
LABEL OF THE END PRODUCT:
The final end product must be labeled in a visible area with the following " Contains FCC ID: 2AVTT-BL01S ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label:
This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

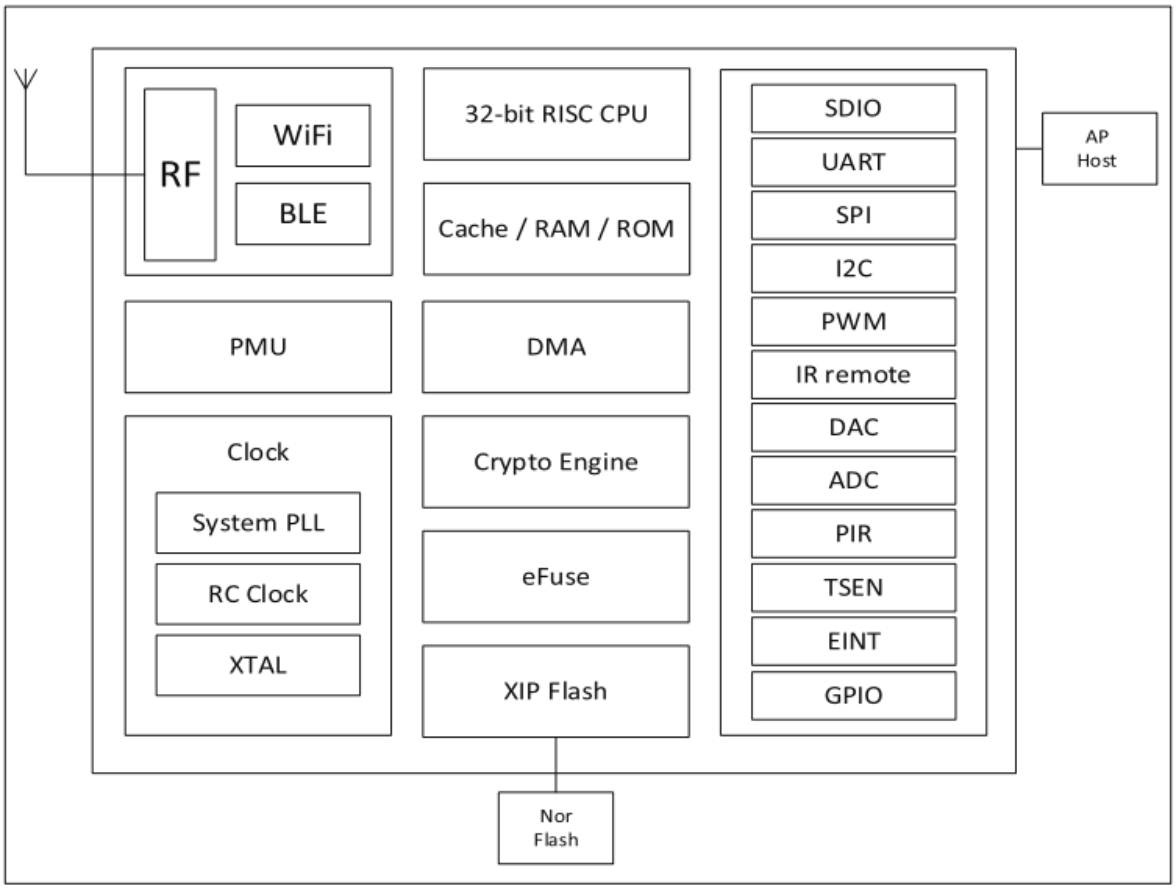
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body.

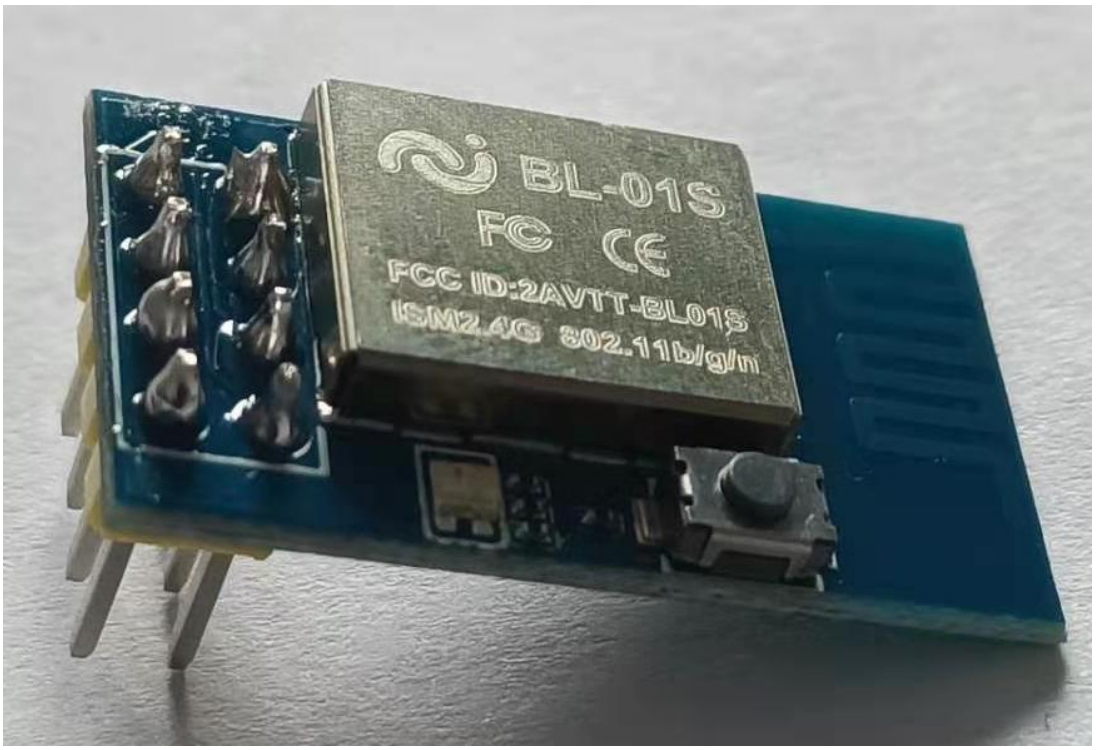
1. Product Overview

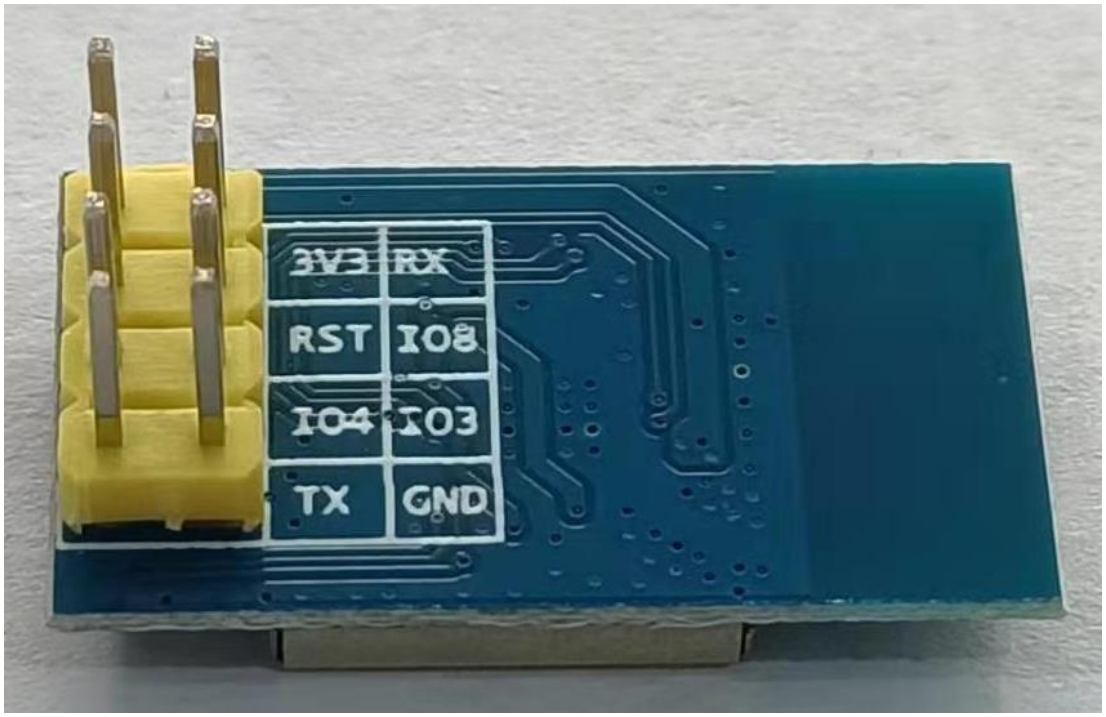
BL-01S is a wireless module based on WiFi+BLE single-chip SoC as the main control. It meets low-power, high-performance, low-cost IOT application scenarios. The module's core processor BL602C integrates 2.4G Wi-Fi (802.11 b/g/n) and BLE 5.0 wireless subsystem. Its microcontroller subsystem includes a high-performance and low-power 32-bit RISC-V CPU, high-speed cache and FLASH memory. It has an advanced power management unit and supports a variety of low-power Consumption mode. The module peripheral interface supports UART, GPIO, ADC, PWM, I2C, etc., onboard a switch and an RGB LED light.

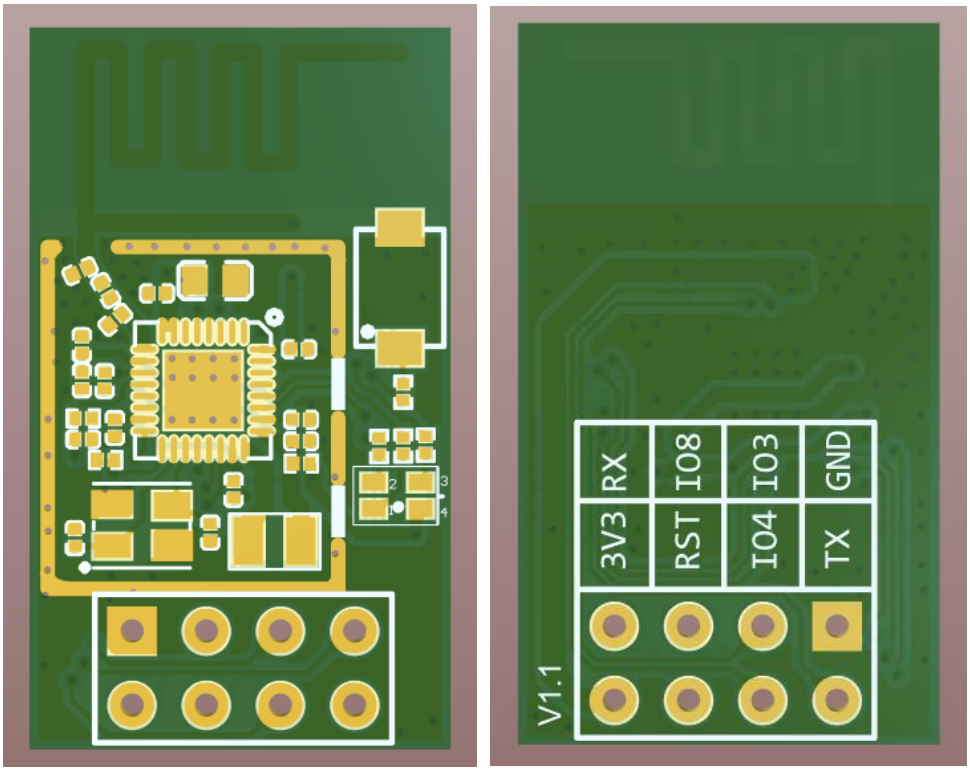
BL602C functional block diagram:

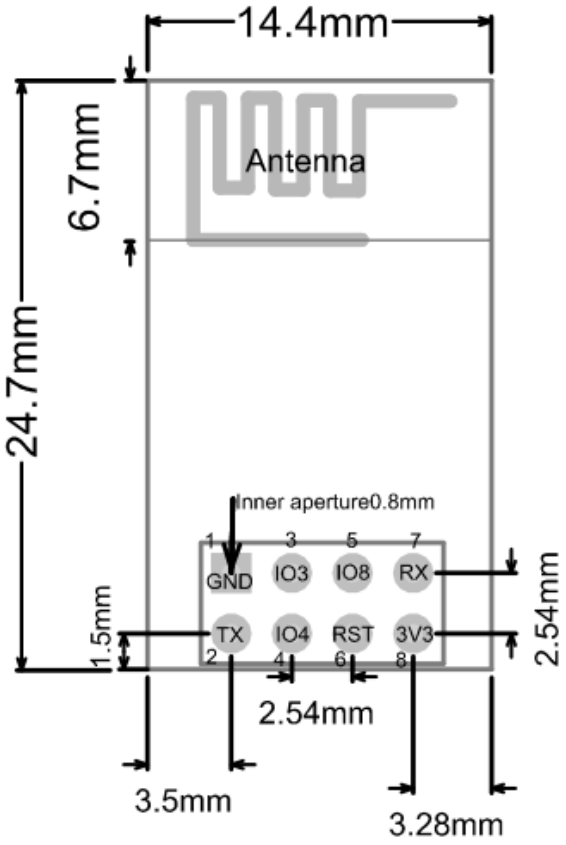


1.1 Appearance and Dimensions









1.2 Features

1.2.1 Wireless

- IEEE 802.11b/g/n, 1x1 SISO 2.4GHz
- Bluetooth® BLE 5.0
- Wi-Fi 20MHz bandwidth
- Wi-Fi security WPS/WEP/WPA/WPA2 Personal/ WPA2 Enterprise/WPA3
- STA，SoftAP and Sniffer mode
- Wi-Fi and BLE coexist, BLE assists in realizing Wi-Fi fast connection
- Integrated balun，PA/LNA
- Support Smart Config/AirKiss (WeChat)
- Support serial port local upgrade and remote firmware upgrade (FOTA)
- General AT commands can be used quickly
- Support secondary development, integrated Windows and Linux development environment

1.2.2 MCU Subsystem

- 32-bit RISC-V CPU with FPU (floating point unit)
- One RTC timer (cycle one year)
- Two 32-bit general-purpose timers
- Four DMA channels

- DFS (Dynamic Frequency Scaling) from 1MHz to 192MHz
- JTAG development support
- XIP QSPI Flash has hardware encryption support

1.2.3 Memory

- 276KB RAM
- 128KB ROM
- 1Kb eFuse
- Embedded 2M Byte flash

1.2.4 Security Mechanism

- QSPI Flash Instant AES Decryption (OTFAD)-AES-128, CTR mode
- Support AES 128/192/256 bit encryption engine
- Support SHA-1/224/256
- Real random number generator (TRNG)

Public Key Accelerator (PKA)

1.3 Key parameter

Table 1.1 Description of the main parameters

Module model	BL-01S
Mounting	DIP-8
Size	24.7*14.5*11.5(±0.2)mm
Cert.	FCC、CE
Flash	Chip built-in 2MB
Interface	UART/GPIO/ADC /PWM/ I2C
IO 口	5
Number of GPIO	9600/19200/38400/115200/921600 bps , Up to 5Mbps
Freq.	2400 ~2483.5MHz
Antenna	Onboard PCB antenna
Security	WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3
Power Supply	DC 3.0V ~ 3.6V， Imax >300mA
Temperature	-30 ℃ ~ 85 ℃
Storage Condition	-45℃ ~ 135℃ ,< 90%RH

2. Pin definition

BL-01S module has 8 pins in total, as shown in Figure 2.1. Peripherals include 5 GPIOs, 2 UARTs, 1 I2C master/slave, 4 PWM channels, and 1 12-bit general-purpose ADC. Each GPIO can be used as a general-purpose input and output function. Table 2.2 is the interface definition.

2.1 Figure 2.1 BL-01S Pin diagram

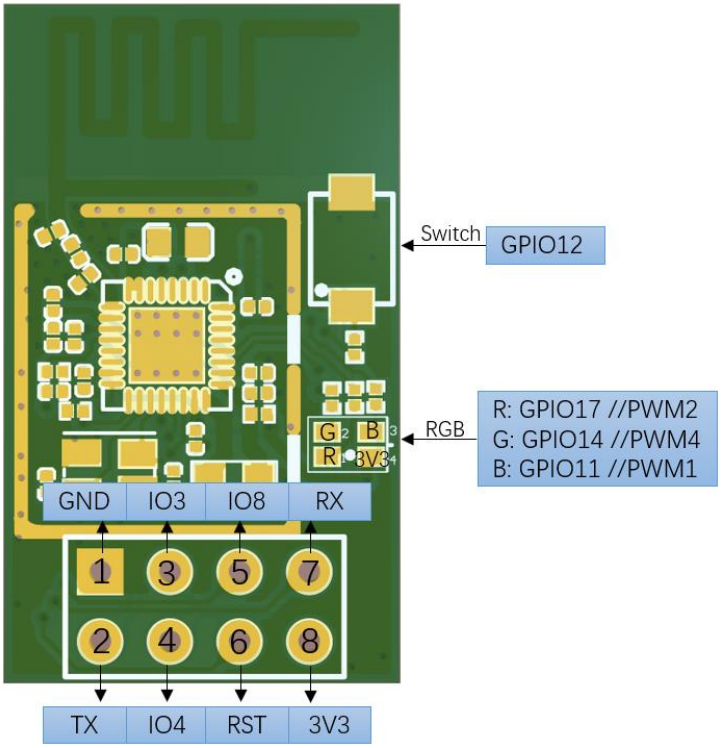


Table 2.2 Pin description

Number	Pin Name	Function description
1	GND	ground
2	TX	GPIO16; I2C_SCL; UART0_TX; PWM_CH1; (Only this UART0 can be used to burn firmware)

3	IO3	GPIO3; I2C_SDA; UART1_RX; PWM_CH3
4	IO4	GPIO4; I2C_SCL; UART1_TX; PWM_CH4; ADC_CH1
5	IO8	GPIO8; I2C_SCL; PWM_CH3; IO8 should be pulled high when downloading, and low when running (IO8 inside the module has been pulled low)
6	RST	Reset
7	RX	GPIO7; UART0_RX; I2C_SDA; PWM_CH2;(Only this UART0 can be used to burn firmware)
8	VCC	Power supply 3.3V

3. Electrical parameters

3.1 Electrical characteristics

parameter	test condition	min	Typ.	max	unit
Storage Temp.	-	-45	normal	135	℃
Work temp.	-	-30	20	85	℃
Max welding temp.	IPC/JEDEC J-STD-020	-	-	260	℃
Static Protection (HBM)				2000	V

Supply volt.		VCC	3.0	3.3	3.6	V
I/O	V_{IL}	VCC_IO=3.3V	-0.3	-	1.32	V
	V_{IH}	VCC_IO=3.3V	2.06	-	3.6	V
	V_{OL}	VCC_IO=3.3V, |IOL|=7.5~50 mA	-0.3	-	0.4	V
	V_{OH}	VCC_IO=3.3V, |IOL|=7.5~50 mA	2.9	-	3.4	V
	I_{MAX}	-	-	-	12	mA

3.2 Wi-Fi RF characteristic

Description	**Min**	**Typ.**	**Max**	**Unit**
Frequency	2400	-	2483.5	MHz
S11		<-10		dB
Transmit Power				
CCK, 1 Mbps	-	18.4	-	dBm
CCK, 11 Mbps	-	18.1	-	dBm
6 Mbps OFDM	-	16.6	-	dBm
54Mbps OFDM	-	15.4	-	dBm
HT20, MCS0	-	15.2	-	dBm

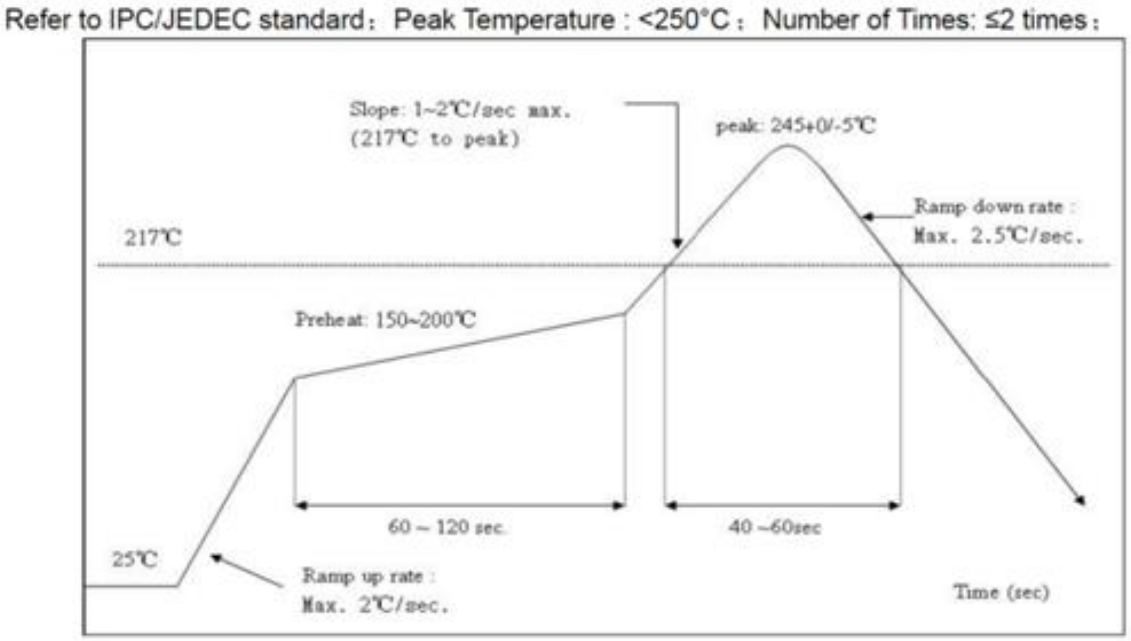
HT20, MCS7	-	14.5	-	dBm
EVM				
CCK, 1 Mbps	-	-21.8	-	dB
CCK, 11 Mbps	-	-21.2	-	dB
6 Mbps OFDM	-	-30.3	-	dB
54Mbps OFDM	-	-32	-	dB
HT20, MCS0	-	-30.2	-	dB
HT20, MCS7	-	-31	-	dB
Receiver Sensitivity				
CCK, 1 Mbps	-	-97	-	dBm
CCK, 11 Mbps	-	-92	-	dBm
6 Mbps OFDM	-	-92	-	dBm
54 Mbps OFDM	-	-76	-	dBm
HT20, MCS0	-	-92	-	dBm
HT20, MCS7	-	-74	-	dBm

3.3 Power dissipation

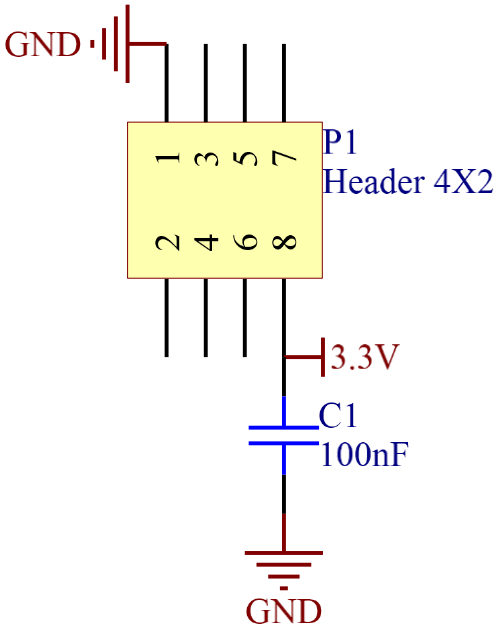
BL602, 25℃, VCC=3.3V

Work mode	Test condition	Min.	Typ.	Max.	unit
RX	11b	-	35	-	mA
	11g	-	39	-	
	11n	-	39	-	
TX	11b - 11Mbps @21dBm	Duty 50%	190	-	
		Duty 99%	310	-	
	11g - 54Mbps @18dBm	Duty 50%	145	-	
		Duty 99%	230		
	11n - MCS7 @17dBm	Duty 50%	130	-	
		Duty 99%	215	-	
MCU	Run	Freq@ 192MHz	22	-	
	Standby	Freq@<10MHz	2	-	
Sleep	PDS7	Fast recover	12	-	uA
Hibernate	HBN	RTC or GPIO wakeup	0.5	-	
Shut-down	-	-	0.1	-	

4. Reflow welding temperature curve



5. Application circuit



6. Contact Us

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