博流智能
BouffaloLab

BL602C40IT16P00

Bouffalo Lab Product Specification

IEEE 802.11b/g/n WLAN IoT Module

Bouffalo Lab

1. Product Overview

BL602 is a highly integrated Wi-Fi + BLE combo chipset for low-power application.
Wireless subsystem contains 2.4G radio, Wi-Fi 802.11b/g/n and BLE baseband/MAC designs. Microcontroller subsystem contains a low-power 32-bit RISC CPU, high-speed cache and memories. Power Management Unit controls low-power modes. Moreover, variety of security features are supported.
Peripheral interfaces include SDIO, SPI, UART, I2C, IR remote, PWM, ADC, DAC, PIR, and GPIOs.

2. Features

- IEEE 802.11 b/g/n (2.4GHz, 1x1)
- Wi-Fi Security WEP / WPA / WPA2 Personal / WPA2 Enterprise / WPS
- Support SoftAP and sniffer modes
- Simultaneously STA and SoftAP modes
- Support P2P
- Smart connection
- Multi-cloud connectivity
- Wi-Fi fast connection with BLE assistance
- Wi-Fi and Bluetooth LE coexistence
- Integrated balun, PA/LNA
- Low power operation supporting hibernate and idle modes

3. Applications

- Low-power WiFi applications
- Imaging platforms
- Internet of Things
- Smart Home
- Connected Appliances

4. Product Specification

4.1 Block Diagram

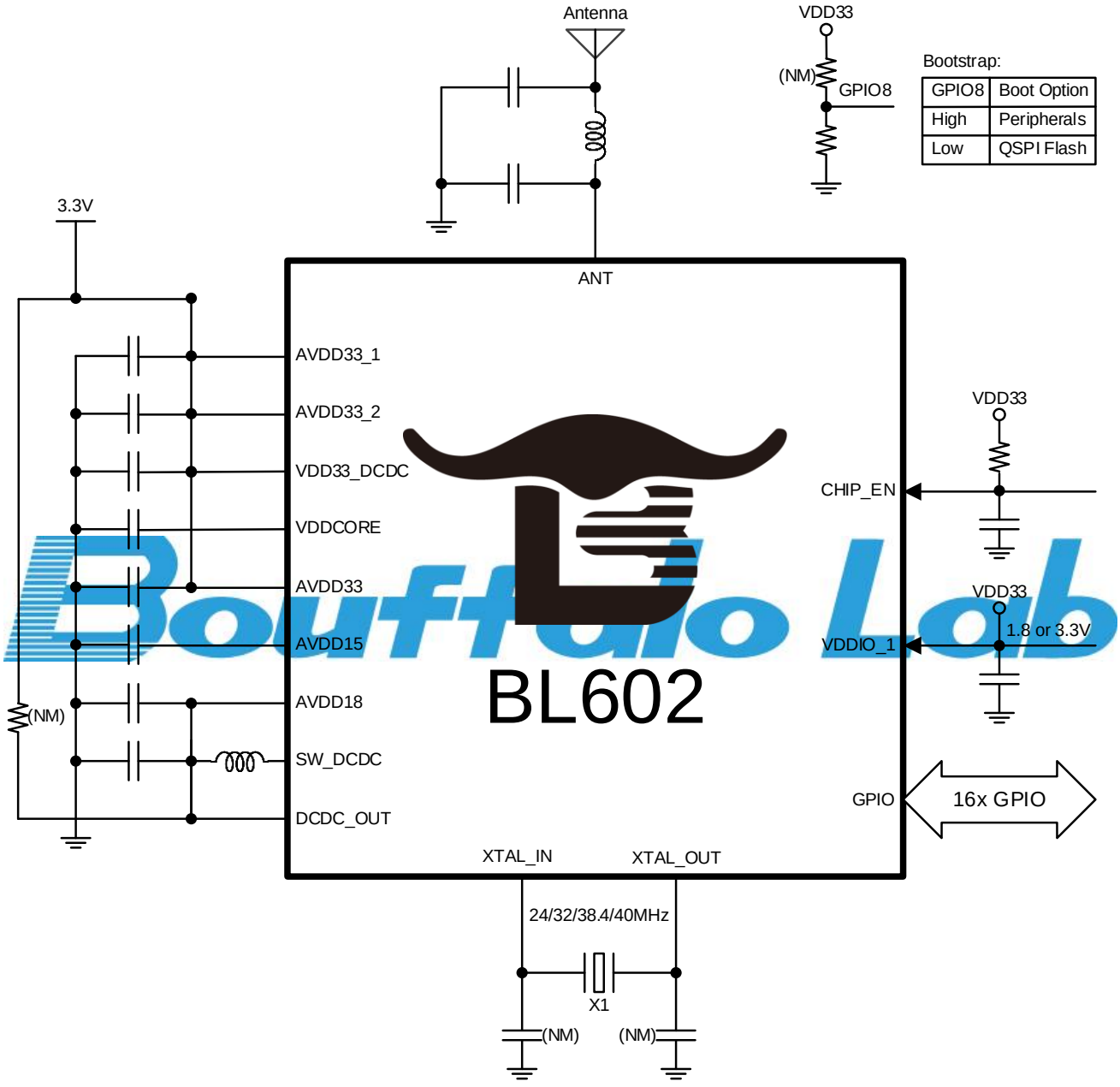


Figure 1. Block Diagram

4.2 Schematic

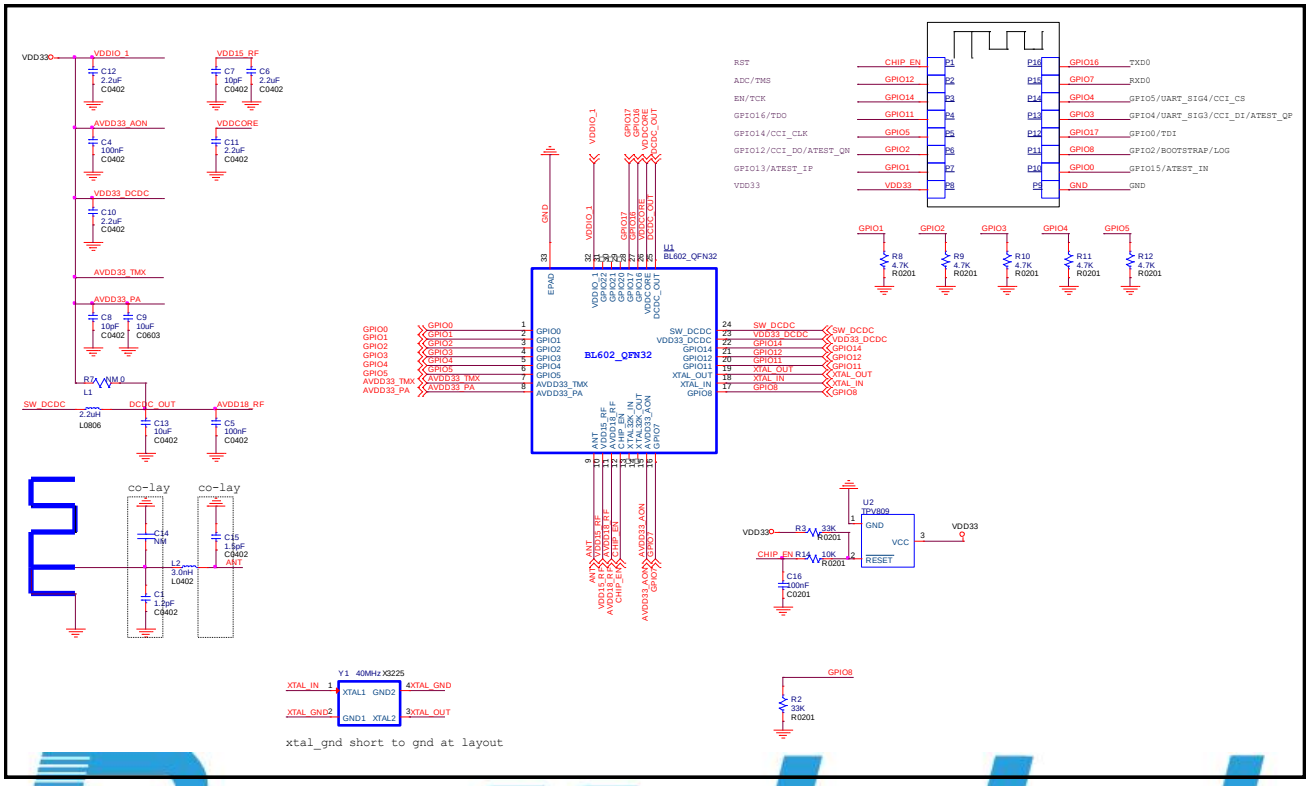


Figure 2. Schematic

4.3 Electrical Specification

Table 1. Electrical Specification

Parameters		Conditio	Min.	Typical value	Max.	Unit
Power Supply		VDD	2.7	3.3	3.6	V
I/O	VIL	-	-	-	0.3*VDDIO	V
	VIH	-	0.7*VDDIO	-	-	V
	VOL	-	-	0.1*VDDIO	-	V
	VOH	-	-	0.9*VDDIO	-	V
	IMAX	-	-	-	15	mA

4.4 Wi-Fi RF Specification

Table 2. Wi-Fi RF Specification

Description	Typical value			Unit
spectral range	2400 ~ 2483.5MHz			MHz
Output Power				
Mode	**Min.**	**Typical**	**Max.**	**Unit**
11n HT20	-	16	-	dBm
11g	-	17	-	dBm
11b	-	19	-	dBm
Receive Sensitivity				
Mode & Rate	**Min.**	**Typical**	**Max.**	**Unit**
11b，1 Mbps	-	-98	-	dBm
11b，11 Mbps	-	-90	-	dBm
11g, 6 Mbps	-	-93	-	dBm
11g，54 Mbps	-	-76	-	dBm
11n，HT20 (MCS7)	-	-73	-	dBm

4.5 BLE RF Specification

Table 3. BLE RF Specification

Description	Typical value			Unit
spectral range	2400 ~ 2483.5MHz			MHz
Output Power				
Rate Mode	**Min.**	**Typical**	**Max.**	**Unit**
1Mbps	-	9	15	dBm
Receive Sensitivity				
Rate Mode	**Min.**	**Typical**	**Max.**	**Unit**
1Mbps sensitivity@30.8%PER	-	-96	-	dBm

4.6 Pin Definition

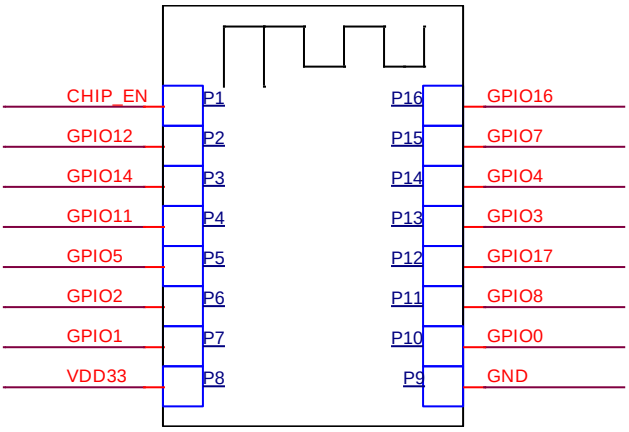


Figure 3. Pin Definition

Table 4. Pin Function Definition

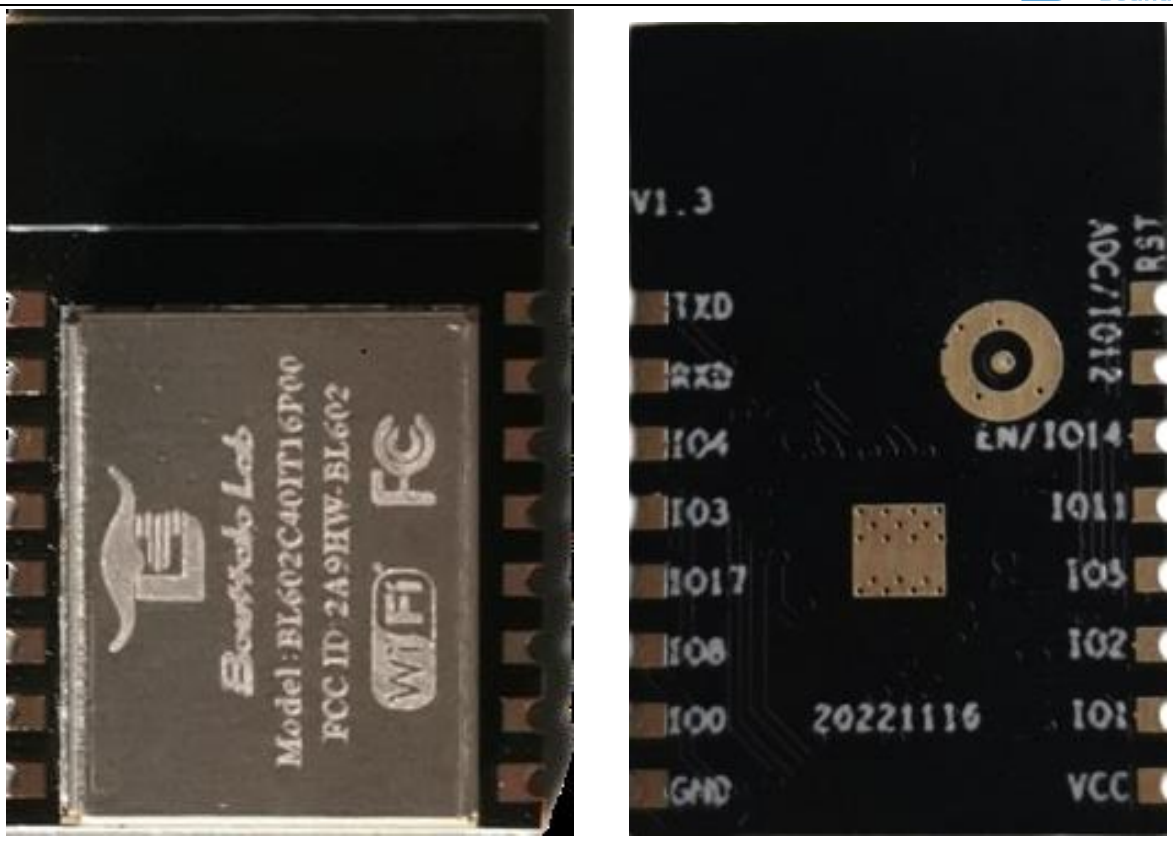
NO	Name	IO Type	Description
1	CHIP_EN	I/O	Chip enable pin (active high)
2	GPIO12	I/O	GPIO12
3	GPIO14	I/O	GPIO14
4	GPIO11	I/O	GPIO11
5	GPIO5	I/O	GPIO5
6	GPIO2	I/O	GPIO2
7	GPIO1	I/O	GPIO1
8	VCC	P	Power supply. 3.3V is required
9	GND	P	Ground connections
10	GPIO0	I/O	GPIO0
11	GPIO8	I/O	GPIO8 (Boot option).
12	GPIO17	I/O	GPIO17
13	GPIO3	I/O	GPIO3
14	GPIO4	I/O	GPIO4
15	RXD	I	UART RX
16	TXD	O	UART TX

Note1: P means power pin, I/O means input/output pin, AI means analog input pin.

Note2: The pin state of GPIO8 is sampled on the rising edge of CHIP_EN. When GPIO8 is pulled to VCC, chip will boot from UART. Otherwise chip will boot from flash.

5. Dimension & Footprint

Module dimension: Typical (W x L x H): 24mm×16mm×1.0mm Tolerance : +/-0.15mm



(Top View) (Bottom View)

Figure 4. Module View

PCB land pattern:

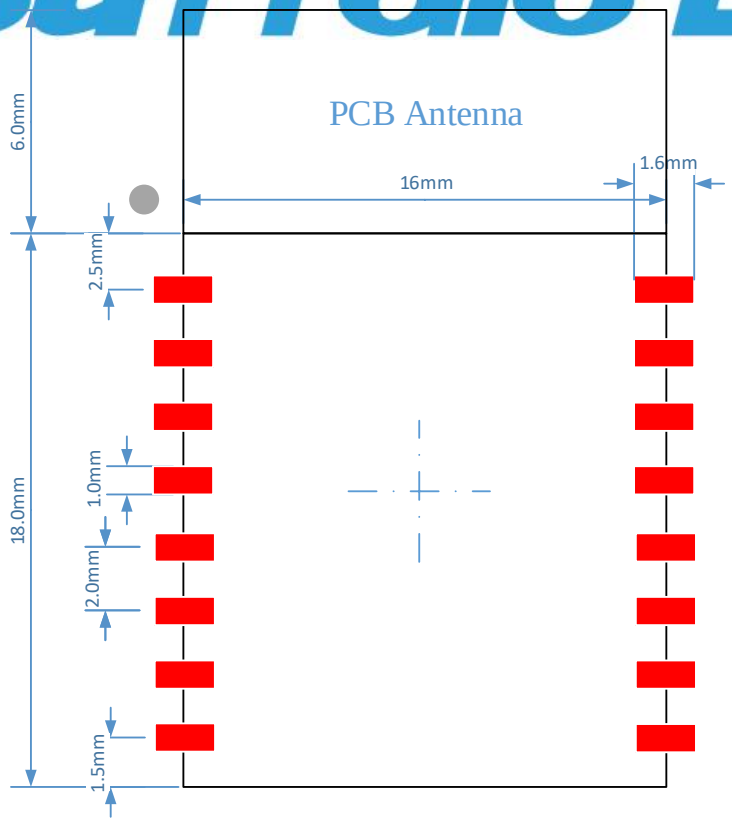


Figure 5. Recommended PCB Land Pattern

In order to meet the performance of onboard antenna, it is forbidden to place metal material or high frequency devices around the antenna and.

The figure shown as below is the recommended keep-out for users.

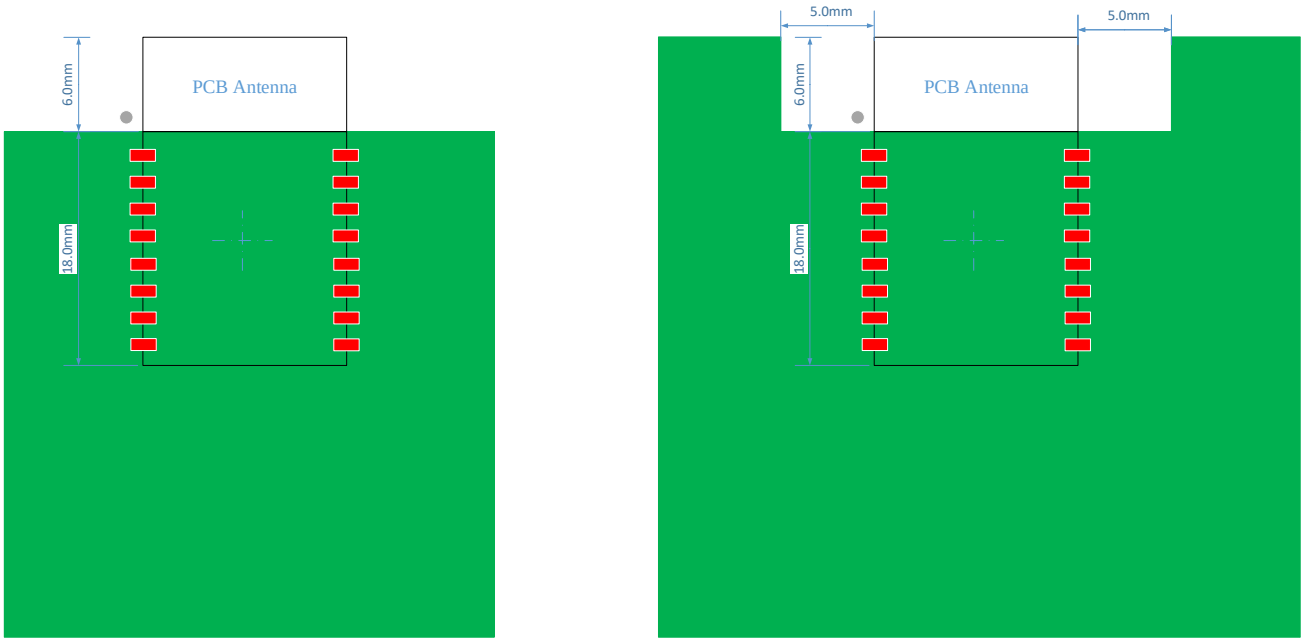


Figure 6. Recommended Keep-Out

6. Storage conditions

Products sealed in moisture-proof bags should be stored in a non-condensing atmosphere of <40 ° C /90%RH.

The module has a moisture sensitivity rating of MSL3.

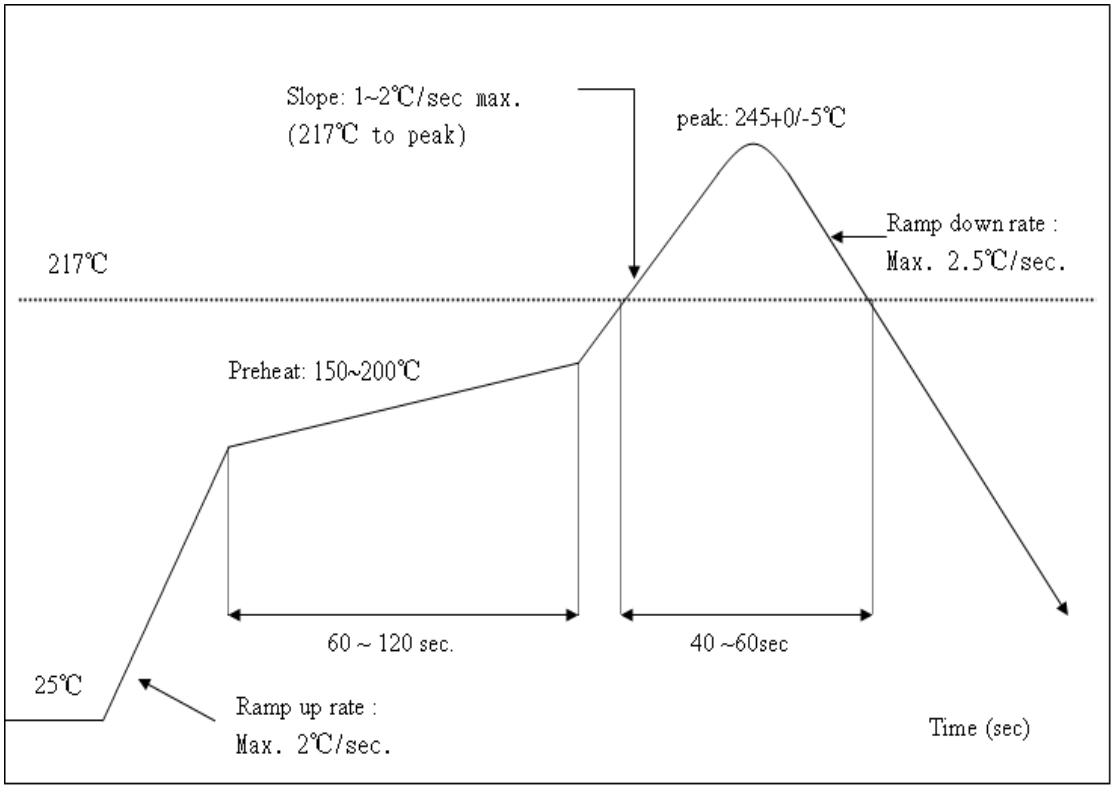
Once the vacuum bag is opened, it must be used within 168 hours at 25±5°C/60%RH, otherwise it should be baked again.

7. Recommended Reflow Profile

Refer to IPC/JEDEC standard.

Peak Temperature: <250°C

Number of Times : ≤2 times



8. Contact us

1、Bouffalolab official account：https://www.bouffalolab.com

2、Intelligent Technology Forum：https://bbs.bouffalolab.com

3、Open source community：https://github.com/bouffalolab

4、Developer community：https://dev.bouffalolab.com/home

5、Video tutorial support：https://space.bilibili.com/411372413

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Bouffalo Lab (Nanjing) Co., Ltd. reserves the right to modify the contents of this manual without any notice or prompt.

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Federal Communication Commission Statement (FCC, U.S.)

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 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.

This device complies with Part 15 of the 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.

FCC Caution:

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

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

IMPORTANT NOTES

Co-location warning:

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

OEM integration instructions:

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

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End product labeling:

The final end product must be labeled in a visible area with the following: “Contains Transmitter Module FCC ID: 2A9HW-BL602”.

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufactures according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247

2.3 Specific operational use conditions

The module is a Bluetooth module with WiFi & BLE 2.4G function.

WiFi Specification：

Operation Frequency: 2412~2462MHz

Number of Channel: 11

Modulation: DSSS, OFDM

Type: PCB Antenna

Gain: 2.36 dBi

BLE Specification：

Operation Frequency: 2402~2480MHz

Number of Channel: 40

Modulation: GFSK

Type: PCB Antenna

Gain: 2.36 dBi

The module can be used for mobile or applications with a maximum 2.36dBi antenna. The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operaition. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Not applicable. The module has its own antenna, and doesn’t need a host’s printed board microstrip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users’ body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take

responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization

2.7 Antennas

Antenna Specification are as follows:

Type: PCB Antenna

Gain: 2.36 dBi

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.)

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains Transmitter Module FCC ID: 2A9HW-BL602" with their finished product.

2.9 Information on test modes and additional testing requirements

BLE

Operation Frequency: 2402~2480MHz

Number of Channel: 40

Modulation: GFSK

WIFI

Operation Frequency: 2412~2462MHz

Number of Channel: 11

Modulation: DSSS, OFDM

Host manufacturer must perfom test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.