

# BL3409-P

## Module characteristic

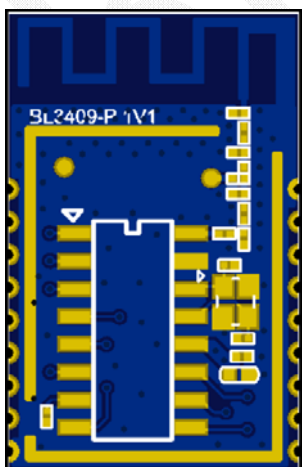
- MCU: 32bit Supports maximum 48 MHz  
16KB OTP  
16KB retention SRAM  
128KB FLASH
- Operating voltage: 1.8V~3.6V
- RF peculiarity
  - Frequency band: 2.400GHz~2.480GHz
  - Data rate: 1Mbps
  - Modulation mode: GFSK
  - TX POWER: MAX +11dBm  
(default  $8 \pm 1.5\text{dBm}$ )
  - Receiving sensitivity:  $-95 \pm 1.5\text{dBm}@1\text{M}$
- Peripheral:
  - 10x GPIO
  - 1x I2C
  - 1x ADC
  - 1x UART
  - 6x PWM
  - 1x IR
- Working temperature:  $-10^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Stamp style SMD for surface mounting production

## Applications

- Smart transportation
- Smart home / appliances
- Instruments
- Health care
- Industrial automation
- Intelligent security
- Smart energy

## Models

| Model    | Antenna type | Note    |
|----------|--------------|---------|
| BL3409-P | PCB antenna  | Default |



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## 1. Overview

BL3409-P is a BLE module launched by Hangzhou Broadlink, SOC uses 32-bit MCU, external leads 10 GPIO, 6 PWM and 1 group ADC interface, using stamp hole interface, 3.3V single power supply.

The module integrates RF transceiver, MAC, baseband processing, supports transparent data transmission, and can be based on BLE AD hoc network. Widely used in smart home equipment, medical equipment and other fields.

## 2. Basic Specifications

### 2.1 Power Consumption

Please refer to Table 1 for power consumption data.

Table 1 BL3409-P Power Consumption Data

| Specifications                       | Min.   | Typ. | Max.   | Units |
|--------------------------------------|--------|------|--------|-------|
| VDD                                  | 1.8    | 3.3  | 3.6    | V     |
| VIL(input low voltage)               | VSS    |      | 0.3VSS | V     |
| VIH(input high voltage)              | 0.7VDD |      | VDD    | V     |
| VOL(output low voltage)              | VSS    |      | 0.1VDD | V     |
| VOH(output high voltage)             | 0.9VDD |      | VDD    | V     |
| I <sub>o</sub>                       |        | 10   |        | mA    |
| RX@1M*                               |        | 12   |        | mA    |
| TX@8dBm*                             |        | 25   |        | mA    |
| Deep sleep with 16 KB SRAM retention |        | 1.5  |        | uA    |

\*Experimental test data, approximate values;

Please refer to Table 2 for working environment data.

| Symbol | Description                   | Min. | Max. | Units |
|--------|-------------------------------|------|------|-------|
| Ts     | Storage temperature           | -40  | 85   | °C    |
| TA     | Ambient operating temperature | -10  | 85   | °C    |
| Vdd    | Supply voltage                | 1.8  | 3.6  | V     |
| Vio    | Voltage on IO pin             | 0    | 3.3  | V     |

## Basic Radio Specification

### Table2 BL3409-PRadio Specification

| Normal RF Condition         |                                         |         |         |      |     |                             |
|-----------------------------|-----------------------------------------|---------|---------|------|-----|-----------------------------|
| type                        | Specification                           | Min     | default | Max  | uni | reference value             |
| FOP                         | frequency range                         | 2400    |         | 2480 | MHz | 2400~2480                   |
| FXTAL                       | crystal oscillator                      |         | 16M     |      | MHz | 16                          |
| Specification               |                                         | BLE 5.0 |         |      |     |                             |
| TX characteristic parameter |                                         |         |         |      |     |                             |
| PRF                         | RF power                                |         | 8.3     | 11   | dBm | $8 \pm 1.5\text{dBm}$ Notes |
| RX characteristic parameter |                                         |         |         |      |     |                             |
| SEN                         | RX sensitivity@PER<br>30.8% 1Mbps       |         | -94     |      | dBm | $-94 \pm 1.5\text{dBm}$     |
| FET                         | Frequency deviation<br>correction range | -250    |         | 300  | KHz |                             |
| Carrier rate offset         |                                         |         |         |      |     |                             |
| FOF                         | Center frequency<br>offset              | -150    |         | 150  | KHz | -150 ~ +150                 |
| Modulation characteristic   |                                         |         |         |      |     |                             |

|                           |     |      |     |     |            |
|---------------------------|-----|------|-----|-----|------------|
| Delta F1 Avg              | 225 |      | 275 | KHz | 225~275KHz |
| Delta F2 Max @99.9%       |     | ≥185 |     | KHz | ≥185       |
| Delta F2 Avg/Delta F1 Avg |     | ≥0.8 |     |     | ≥0.8       |

Note: The value of the output power is determined by the configuration of the relevant registers in the softwar;

## 4.BL3409-P Basic information

#### 4.1 Pin arrangement

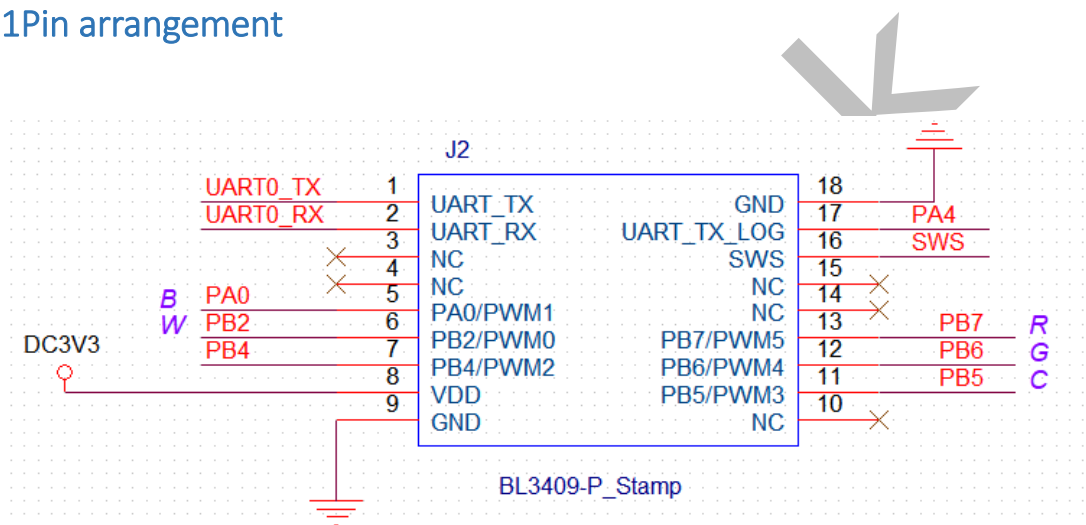


Figure 1 BL3409-P Pin arrangement diagram

## 4.2 Pin definition

Table4 BL3409-PPin definition Table

| PIN 序 | Feature 1 | Feature 2      | Feature 3       |
|-------|-----------|----------------|-----------------|
| 1     | PD3       | UART_TX        | All functions * |
| 2     | PD6       | UART_RX        | All functions * |
| 3     | NC        |                |                 |
| 4     | NC        |                |                 |
| 5     | PA0       | PWM1<br>(blue) | All functions * |
| 6     | PB2       | PWM0<br>(warm) | All functions * |
| 7     | PB4       | PWM2           | All functions * |
| 8     | VDD       |                |                 |

|    |     |                 |                |
|----|-----|-----------------|----------------|
| 9  | GND |                 |                |
| 10 | NC  |                 |                |
| 11 | PB5 | PWM3<br>(cold)  | All functions* |
| 12 | PB6 | PWM4<br>(green) | All functions* |
| 13 | PB7 | PWM5 (Red)      | All functions* |
| 14 | NC  |                 |                |
| 15 | NC  |                 |                |
| 16 | PA3 | SWS             |                |
| 17 | PA4 | UART_LOG        | All functions* |
| 18 | GND |                 |                |

**PS:**

1. All functions\* include 32 functions: SPI\_CN\_IO, SPI\_CK\_IO, SPI\_MOSI\_IO, SPI\_MISO\_IO, SWM\_IO, ANT\_SEL2, ANT\_SEL1, ANT\_SEL0, I2C\_SDA\_IO, I2C\_SCL\_IO, UART\_RX\_I, UART\_TX, UART\_RTS, UART\_CTS\_I, PWM5\_N, PWM4\_N, PWM3\_N, PWM2\_N, PWM1\_N, PWM0\_N, PWM5, PWM4, PWM3, PWM1, PWM0;
2. SWS is downloaded (3.3V/GND/SWS interface, burning with specified burner);
3. PA4 uses the UART\_LOG debugging interface simulated by GPIO by default to facilitate log viewing;

### 4.3 Mechanical dimension

Unit mm。

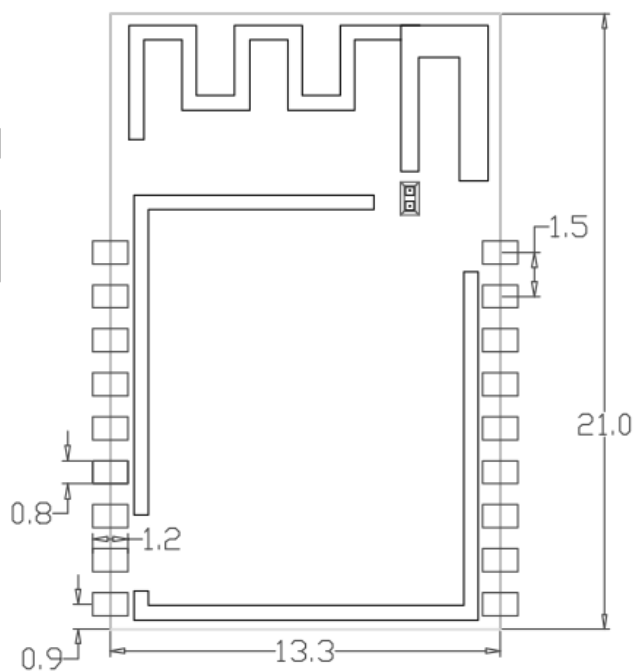


Figure 2 BL3409-P Module dimension drawing

dimension  $(13.3 \pm 0.2) \text{ mm} * (21 \pm 0.2) \text{ mm} * (3.2) \text{ MAXmm}$  (With a shield)

#### 4.4 Recommended pad

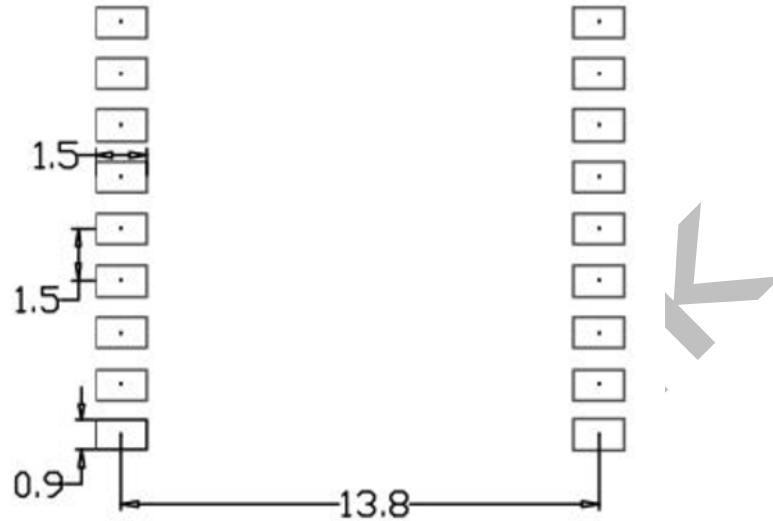


Figure 3 Recommended pad for module

#### 4.5 Instructions for use

1: There can be no metal, components around the onboard antenna 30mm, the bottom as far as possible, no high-speed clock line, large current power line, etc.

2: 3.3V power supply pins need 10uF-47uF capacitors in parallel with several 18pF to 100nF capacitors.

3: The preferred position of the module is shown in Figure 4

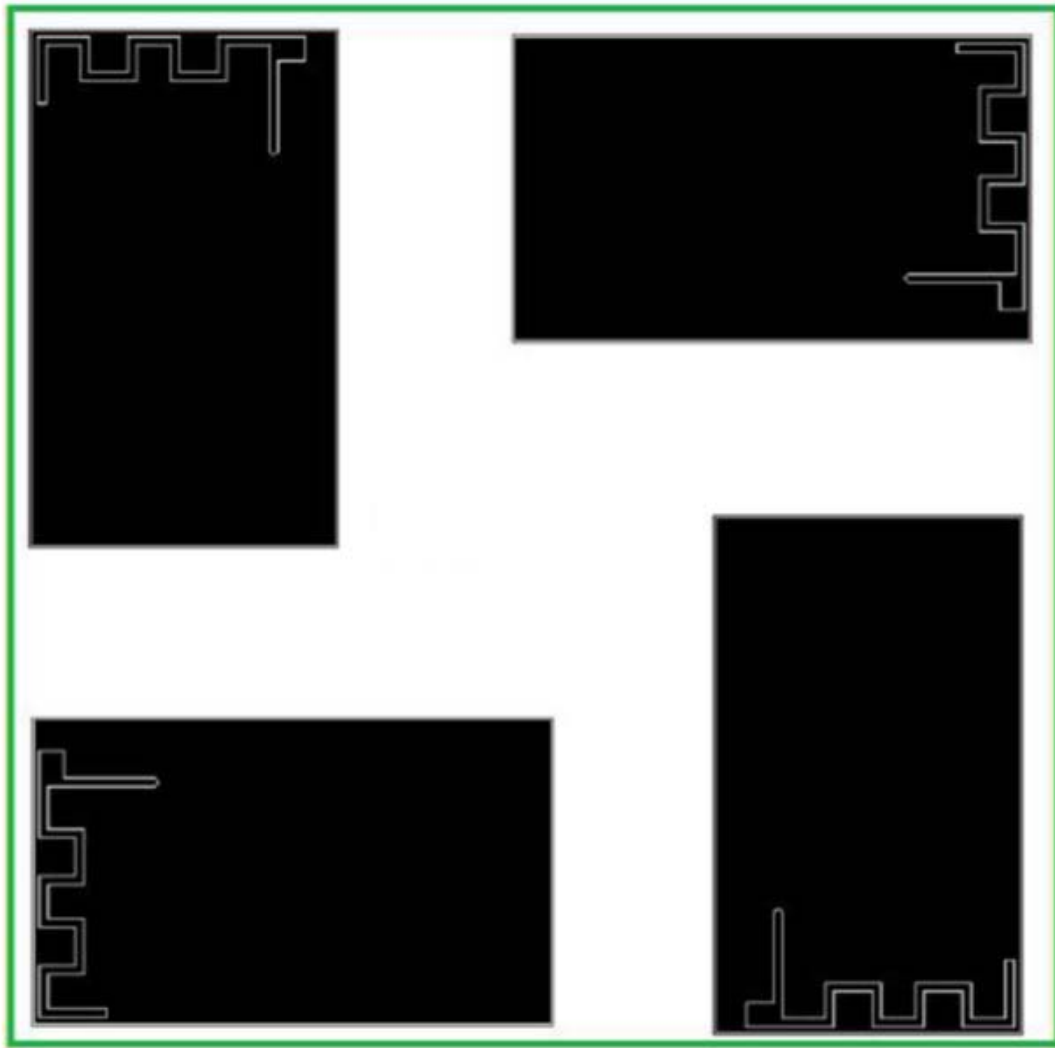


Figure 8 The preferred location of the module

## Version update note

| date      | Version | Update description     |
|-----------|---------|------------------------|
| 2023-5-30 | 1.0     | Initial document       |
| 2023-7-27 | 1.1     | Renewal transmit power |
|           |         |                        |
|           |         |                        |
|           |         |                        |

## Copyright

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For more information of BroadLink Wi-Fi modules, please visit our website:

[www.broadlink.com.cn](http://www.broadlink.com.cn)

**List of applicable FCC rules**

FCC Part 15.247

**Label and compliance information**

FCC ID label on the final system must be labeled with "Contains FCC ID:

2ATEV-BL3409-P" or "Contains transmitter module FCC ID: 2ATEV-BL3409-P".

**Information on test modes and additional testing requirements**

Contact Hangzhou BroadLink Technology Co., Ltd. will provide stand-alone modular transmitter test mode. Additional testing and certification may be necessary when multiple modules are used in a host.

**Additional testing, Part 15 Subpart B disclaimer**

To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier's Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, Hangzhou BroadLink Technology Co., Ltd. shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

**FCC Warning**

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.

NOTE 1: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

Note 1: This module certified that complies with RF exposure requirement under mobile or fixed condition, this module is to be installed only in mobile or fixed applications.

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

A fixed device is defined as a device is physically secured at one location and is not able to be easily moved to another location.

Note 2: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

Note 3: The module may be operated only with the antenna with which it is authorized. Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator.

Note 4: 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.

#### **IC WARNING**

This device contains licence-exempt transmitter(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### **IC Radiation Exposure Statement:**

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

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

This equipment complies with IC RSS-102 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.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre la source de rayonnement et votre corps.

This module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products. Additional testing and certification may be necessary when multiple modules are used.

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

The final end product must be labeled in a visible area with the following " Contains IC: 25062-BL3409P ".