- Up to 8GPIOs

# BL3351-P

Embedded

**Product**

Version：1.1          Release date： Jun 21, 2018

## Features

- Support IEEE802.11 b/g/n standards

- Support WEP, WPA and WPA2 encryption

- Support UART/PWM/ADC/GPIO/I2C

interfaces

- Support STA/AP/AP+STA modes

- Support SmartConfig

- Support TLS/SSL protocols

- Support PCB antenna

- 3.3V power supply

- Wi-Fi related features

  - Support 802.11 b/g/n with 20M

    and 40M bandwidth

  - Support station and soft AP

  - Support SmartConfig and AP

configuration

  - Integrated balun/PA/LNA

  - TCP/IP stack optimized for IoT

application

  - PCB antenna

- Peripheral

  - 2x UART

  - 1x ADC

  - 2x PWM

- Working temperature: -20℃ to +85℃

- 11-Pin golden finger type

## Applications

- Smart transportation

- Smart home / appliances

- Instruments

- Health care

- Industrial automation

- Intelligent security

- Smart energy

| Model | Antenna type | Note |
|-------|-------------|------|
| BL3351-P | PCB antenna | Default |

## Model

Content

# 1. Overview

BL3351-P is a cost-effective embedded Wi-Fi module designed by BroadLink, which supports 802.11 b/g/n standards and UART communication with other devices. The module integrates radio transceiver, MAC, baseband, all Wi-Fi protocols, configurations and network stack. It can be widely used in applications like smart home devices, remote monitoring devices and medical care instruments.

The module integrates an ARM Cortex-M4 processor speed up to 160MHz with 352KB SRAM and 1MB flash.

# 2. Basic Specifications

## 2.1. Power Consumption

Please refer to Table 1 for power consumption data.

Table 1　BL3351-P Power Consumption Data

| Specifications | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| VDD[1] | **3.3** | | **4** | V |
| VIL(input low voltage) | 0 | | 0.3VDD | V |
| VIH(input high voltage) | 0.7VDD | | VDD | V |
| VOL(output low voltage) | | 0 | | V |
| VOH(output high voltage) | | VDD | | V |
| Io | | | 10 | mA |
| Standby (SP mini) | | 80 | 85 | mA |
| pulse current @TX 11b @17dBm　11Mbps | | | 310 | mA |
| pulse current @TX 11g @15dBm　54Mbps | | | 270 | mA |
| pulse current @TX 11n @14dBm　65Mbps | | | 240 | mA |
| Networking | | | | mA |

**Note: Make sure VDD is not lower than 3.3V**

## 2.2. Working Environment

Please refer to Table 2 for working environment data.

Table 2    BL3351-P Working Environment Data

| Symbol | Description | Min. | Max. | Units |
|--------|-------------|------|------|-------|
| Ts | Storage temperature | -40 | 125 | ℃ |
| TA | Ambient operating temperature | -20 | 85 | ℃ |
| Vdd | Supply voltage | **3.3** | **4** | V |
| Vio | Voltage on IO pin | 0 | VDD | V |
| ESD | HBM | 1000 | 2000 | V |

# 3. Radio Specifications

## 3.1. Basic Radio Specification

Please refer to Table 3 for radio specification.

Table 3    BL3351-P Radio Specification

| Radio range | 2.412 GHz - 2.472 GHz |
|-------------|------------------------|
| Wireless standards | IEEE 802.11 b/g/n |
| Radio output | 802.11b :17dBm  ±1dBm<br>802.11g:14.5dBm±1dBm<br>802.11n:13.5dBm±1dBm |
| Antenna type | Internal: PCB antenna |
|  | External: Not supported |
| Receiving sensitivity | 802.11b<-83dBm@11Mbps<br>802.11g<-72dBm@54Mbps<br>802.11n<-71dBm@MCS7 |
| Stack | IPv4, TCP/UDP/FTP/HTTP/HTTPS/TLS/mDNS |
| Data rate (max) | 11M@802.11b, 54M@802.11g, MCS7@802.11n |
| Security | Encryption standard:<br>Open/WEP-Open/WPA/WPA2<br>Encryption algorithm:<br>WEP64/WEP128/TKIP/AES |
| Network types | STA/AP/STA+AP/WIFI Direct |

## 3.2. Radio Performance

### 3.2.1. IEEE 802.11b

Table 4 Basic specifications under IEEE802.11b

| ITEM | Specification |
|---|---|
| Modulation Type | DSSS / CCK |
| Frequency range | 2412MHz~2472MHz |
| Channel | CH1 to CH13 |
| Data rate | 1, 2, 5.5, 11Mbps |

Table 5 Transmitting performance under IEEE802.11b

| TX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| Power@11Mbps | | 17 | | dBm |
| Frequency Error | -10 | | +10 | ppm |
| EVM@11Mbps | | | -20 | dB |
| Transmit spectrum mask | | | | |
| Pass | | | | |

Table 6 Receiving performance under IEEE802.11b

| RX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| Minimum Input Level Sensitivity | | | | |
| 11Mbps (FER≦8%) | | | -83 | dBm |
| Maximum Input Level (FER≦8%) | | | -3 | dBm |

### 3.2.2. IEEE 802.11g

Table 7 Basic specifications under IEEE802.11g

| ITEM | Specification |
|---|---|
| Modulation Type | OFDM |
| Frequency range | 2412MHz~2472MHz |

| Channel | CH1 to CH13 |
|---|---|
| Data rate | 6, 9, 12, 18, 24, 36, 48, 54Mbps |

Table 8 Transmitting performance under IEEE802.11g

| TX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| **Power@54Mbps** | | **14.5** | | dBm |
| **Frequency Error** | **-10** | | **+10** | ppm |
| **EVM@54Mbps** | | -31 | -29 | dB |
| **Transmit spectrum mask** | | | | |
| Pass | | | | |

Table 9 Receiving performance under IEEE802.11g

| RX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| **Minimum Input Level Sensitivity** | | | | |
| 54Mbps | | | -71 | dBm |
| Maximum Input Level (FER≦10%) | | | -8 | dBm |

### 3.2.3 IEEE802.11n

IEEE802.11n 20MHz bandwidth mode

Table 10 Basic specifications under IEEE802.11n with 20MHz

| ITEM | Specification |
|---|---|
| Modulation Type | OFDM |
| Frequency range | 2412MHz~2472MHz |
| Channel | CH1 to CH13 |
| Data rate | MCS0/1/2/3/4/5/6/7 |

Table 11 Transmitting performance under IEEE802.11n with 20MHz

| TX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| **Power@HT20, MCS7** | | **13.5** | | dBm |
| **Frequency Error** | **-10** | | **+10** | ppm |
| **EVM@HT20, MCS7** | | **-31** | **-30** | dB |
| **Transmit spectrum mask** | | | | |
| **Pass** | | | | |

Table 12 Receiving performance under IEEE802.11n with 20MHz

| RX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| **Minimum Input Level Sensitivity** | | | | |
| MCS7 | | | -69 | dBm |
| Maximum Input Level (FER≦10%) | | | -8 | dBm |

IEEE802.11n 40MHz bandwidth mode

Table 13 Basic specifications under IEEE802.11n with 40MHz

| ITEM | Specification |
|---|---|
| Modulation Type | OFDM |
| Frequency range | 2412MHz~2472MHz |
| Channel | CH1 to CH13 |
| Data rate | MCS0/1/2/3/4/5/6/7 |

Table 14 Transmitting performance under IEEE802.11n with 40MHz

| TX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| **Power@HT40, MCS7** | | **13.5** | | dBm |
| **Frequency Error** | **-10** | | **+10** | ppm |
| **EVM@HT40, MCS7** | | **-31** | **-30** | dB |
| **Transmit spectrum mask** | | | | |
| **Pass** | | | | |

Table 15 Receiving performance under IEEE802.11n with 40MHz

| RX Characteristics | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| **Minimum Input Level Sensitivity** | | | | |
| MCS7 | | | -67 | dBm |
| Maximum Input Level (FER ≦ 10%) | | | -8 | dBm |

# 4. BL3351-P Hardware Information

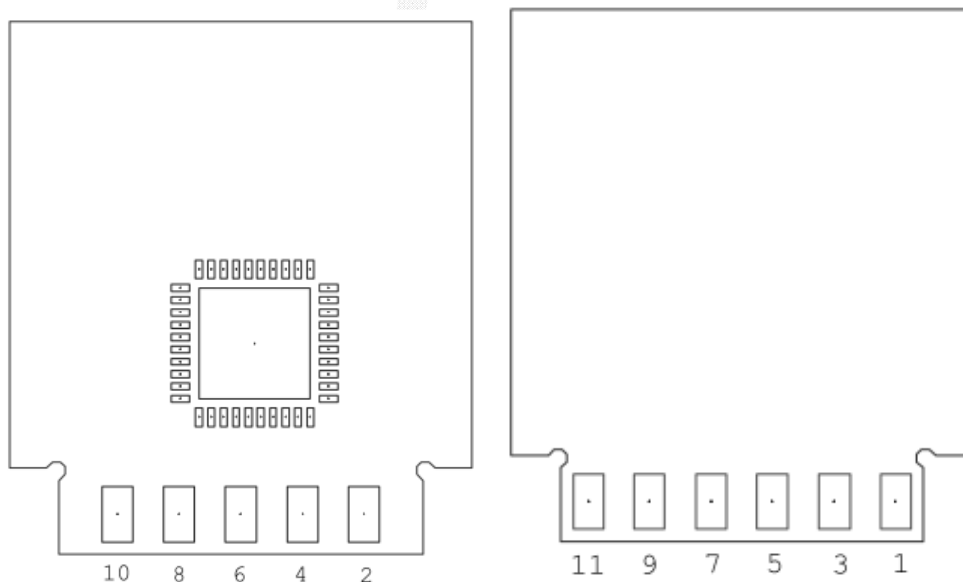## 4.1. PIN Sequence

Please refer to Fig 1 for the pin sequence of BL3351-P.



Fig 1    BL3335-P pin sequence

## 4.2. PIN Definitions

Please refer to Table 16 for the pin definitions of BL3335-P.

Table 16　BL3335-P pin definitions

| Pin | Function 1 | Function 2 | Function 5 | Default state |
|---|---|---|---|---|
| 1 | VDD | | | |
| 2 | GPIO2 | TX2 | | UP |
| 3 | GND | | | |
| 4 | GPIO1 | RX2 | | UP |
| 5 | GPIO5 | | | DOWN |
| 6 | GPIO8 | | PWM0 | DOWN |
| 7 | UART0_TX | GPIO_27 | | DOWN |
| 8 | GPADC | GPIO6 | | DOWN |
| 9 | UART0_RX | GPIO_26 | | UP |
| 10 | PDN | | | |
| 11 | GPIO13 | | PWM1 | DOWN |

1. In default, UART2 (pin2 and pin4) are used for bypass communication and UART0 (pin7 and pin9) are used for output of debugging information and burning firmware. Please refer to the description in DC Characteristics for UART output current level.

2. PDN is hardware reset for the module and will be effective with VIL. Configuration information will be remained after module reset. The module has pull-up process for PDN designed internally.

3. The pins for reset button and LED indication should be defined according to actual firmware and circuit design.

4. The module supports max 4 channels of external interruption simultaneously except UART0.

5. The ADC is 10-bit with input voltage 0-2V

6. The power supply VDD should not be lower than 3.3V.

## 4.3. PCB Antenna

Please refer to Fig 2 for PCB antenna. Please avoid to place any electrical components, wiring or grounding under PCB antenna area on main board and it's better to leave this area blank on PCB.
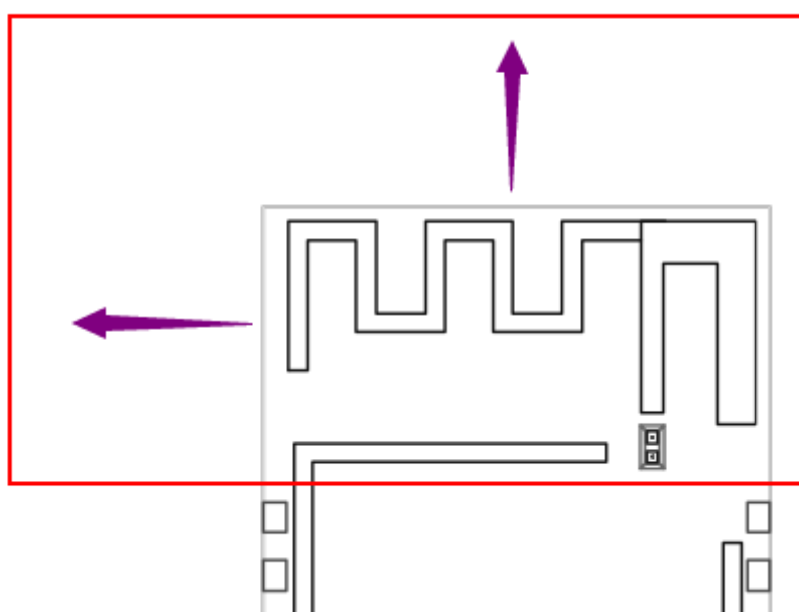


Fig 2 BL3351-P Antenna

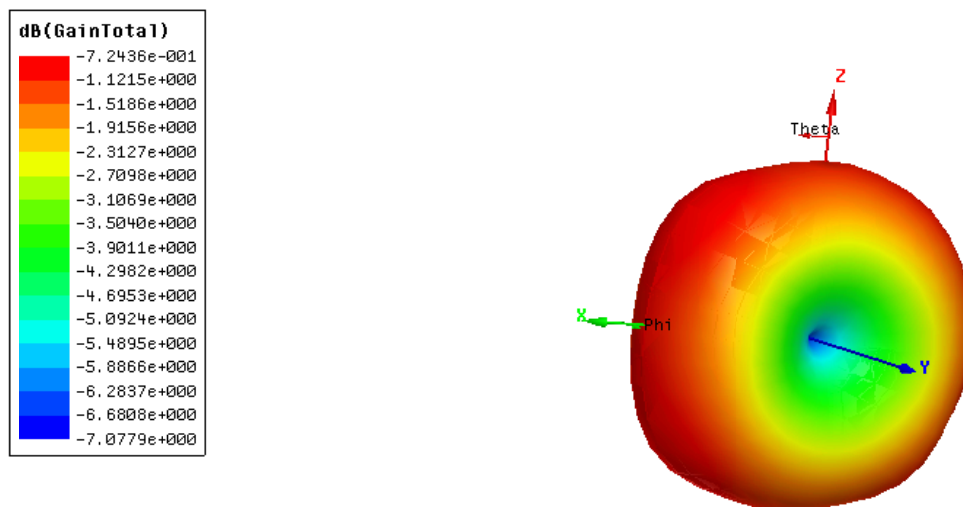The gain of PCB antenna on this module is about -0.7dB, as shown in Fig 3.

Fig 3 Simulated radiation pattern of antenna gain

The following precautions should be considered during designing with PCB antenna:

1. Do not place any electrical components or grounding in antenna area on main board and it's better to leave this area blank on PCB.

2. It is recommended to not place any electrical components within 30mm range of module antenna and not design any circuit or bond copper on main board under this area.

3. Do not use the module inside any metal case or containers with metal painting.

## 4.4. Mechanical Dimensions

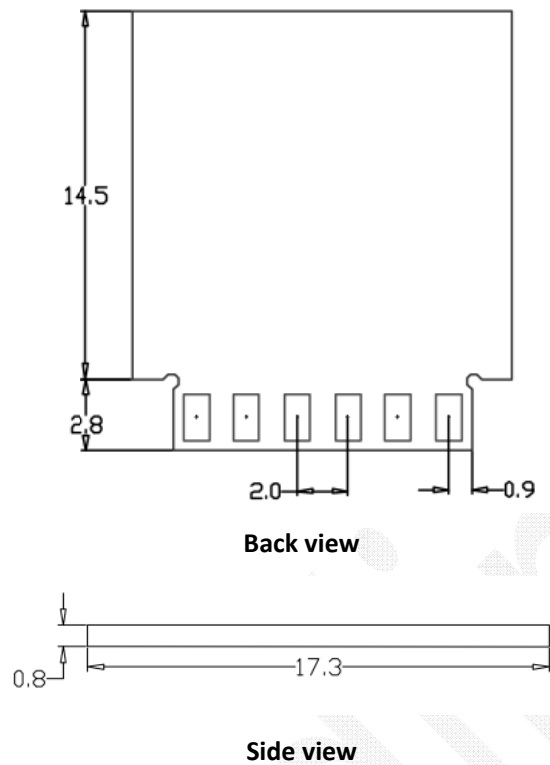Please refer to Fig 4 for the dimensions of BL3351-P module.



**Front view**

**Back view**
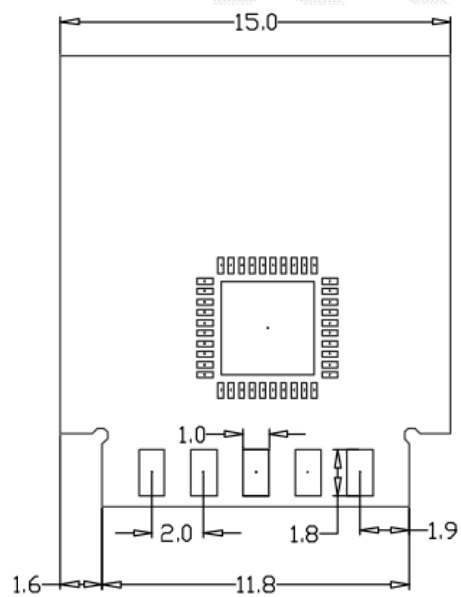


**Side view**

Fig 4 BL3351-P Dimensions

a．Note: Dimensions (15±0.2) mm * (17.3±0.2) mm * (2.4±0.2)mm (with shielding case)

# 5. Reference Design

## 5.1. Power Supply Requirement

If an LDO is used to supply the module with 3.3V power, C1 capacitor can be considered to be used with 10u-22u; If a DCDC is used to supply 3.3V power, C1 capacitor can be considered to be used with 22uF.

It is recommended to supply the module with power higher than 400mA to ensure enough power supply to the module and avoid power down during data transmission.

## Revision History

| Date | Version | Updated Content |
|------|---------|-----------------|
| Jun 06, 2018 | 1.0 | Preliminary version |
| Jun 21, 2018 | 1.1 | Updated PIN definitions |
| | | |
| | | |

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

www.broadlink.com.cn

**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:** Additional testing and certification may be necessary when multiple modules are used.

**Note 4:** 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 5:** 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 Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the 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, LM Technologies Ltd. shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

**Note 6:** FCC ID label on the final system must be labeled with "Contains FCC ID: 2ACDZ-BL3351-P" or "Contains transmitter module FCC ID: 2ACDZ-BL3351-P".

## IC WARNING

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:
(1) This device may not cause interference; and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.