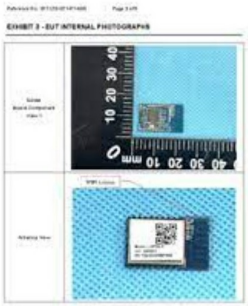


BroadLink LL8720-P Embedded WiFi Module User Manual

Contents

BroadLink LL8720-P Embedded WiFi Module

Product Information

- **Product Name:** LL8720-P
- **Version:** 1.0
- **Date:** December 22, 2022

Features

1. Overview: LL8720-P is an embedded Wi-Fi module designed by BroadLink. It supports both 802.11 b/g/n 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.
2. The module integrates a KM4 micro-processor speed up to 100MHz with 384KB SRAM and 2MB flash.

Product Usage Instructions

Basic Specification

WLAN Parameter:

- **Radio Range:** 2.412 GHz – 2.462GHz
- **Wireless Standards:** IEEE 802.11 b/g/n
- **Radio Output:** Antenna type: Internal (PCB antenna), External: Not supported
- **Receiving Sensitivity:**
  - 802.11b: [Insert receiving sensitivity value]

Please refer to the complete LL8720-P Product Manual v1.0 for detailed information on other specifications, setup

instructions, and troubleshooting guidelines.

LL8720-P Product Manual v1.0

Version	Date	Note
1.0	**December 22, 2022**	**Preliminary version**

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/mDNS protocols
- Support PCB antenna
- 3.3V power supply
- Dimensions (13.3±0.2) mm * (21±0.2) mm * (3.2±0.2)mm (with shielding case)

Overview

LL8720-P is an embedded Wi-Fi module designed by BroadLink, which supports both 802.11 b/g/n 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 a KM4 micro-processor speed up to 100MHz with 384KB SRAM and 2MB flash. Basic Specification

WLAN Parameter

Radio range	2.412 GHz – 2.462GHz
Wireless standards	IEEE 802.11 b/g/n
Radio output	• 802.11b :15.48dBm ± 1.5dBm • 802.11g:13.55dBm±1.5dBm • 802.11n:13.23dBm±1.5dBm
Antenna type	Internal: PCB antenna
	External: Not supported
Receiving sensitivity	• 802.11b<-88dBm@11Mbps • 802.11g<-76dBm@54Mbps • 802.11n<-73dBm@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: Open/WEP-Open/WPA/WPA2 • Encryption algorithm: WEP64/WEP128/TKIP/AES
Network types	STA/AP/STA+AP/WIFI Direct

Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Units
Ts	Storage temperature	-40	125	℃
TA	Ambient operating temperature	-10	85	℃

Vdd	Supply voltage	**3.0**	**3.6**	V
Vio	Voltage on IO pin	0	VDD	V

DC Voltage and Current

Specifications	Min.	Typ.	Max.	Units
VDD	**3.0**	**3.3**	**3.6**	V
VIL(input low voltage)			0.8	V
VIH(input high voltage)	2.0		3.6	V
VOL(output low voltage)			0.4	V
VOH(output high voltage)	2.4		3.6	V
Io (Driving)	4		16	mA
Pull Resistance for IO		75		kΩ
Pull Resistance for SDIO		50		kΩ
RX				mA
11b **11Mbps@17.5dBm**				mA
11g 54Mbps@16dBm				mA
11n **MCS7@15.5dBm**				mA

11b mode

ITEM	**Specification**
Modulation Type	DSSS / CCK
Frequency range	2412 MHz~ 2462 MHz
Channel	CH1 to CH11
Data rate	1, 2, 5.5, 11Mbps

TX Characteristics	Min	Typical	Max.	Unit
Power@11Mbps		**15.48**		dBm
Frequency Error	**–10**		**+10**	ppm
EVM@11Mbps			**–13**	dB
Transmit spectrum mask				
Pass				

RX Characteristics	Min	Typical	Max.	Unit
Minimum Input Level Sensitivity				
11Mbps (FER≦8%)			**-88**	dBm

IEEE802.11g mode

ITEM	**Specification**
Modulation Type	OFDM
Frequency range	2412 MHz~ 2462 MHz
Channel	CH1 to CH11
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps

TX Characteristics	Min	Typical	Max.	Unit
Power@54Mbps		**13.55**		dBm
Frequency Error	**–10**		**+10**	ppm
EVM@54Mbps			**–29**	dB
Transmit spectrum mask				
Pass				

RX Characteristics	Min	Typical	Max.	Unit
Minimum Input Level Sensitivity				
54Mbps			**-76**	dBm

IEEE802.11n 20MHz bandwidth mode

ITEM	**Specification**
Modulation Type	OFDM
Frequency range	2412 MHz~ 2462 MHz
Channel	CH1 to CH11
Data rate	MCS0/1/2/3/4/5/6/7

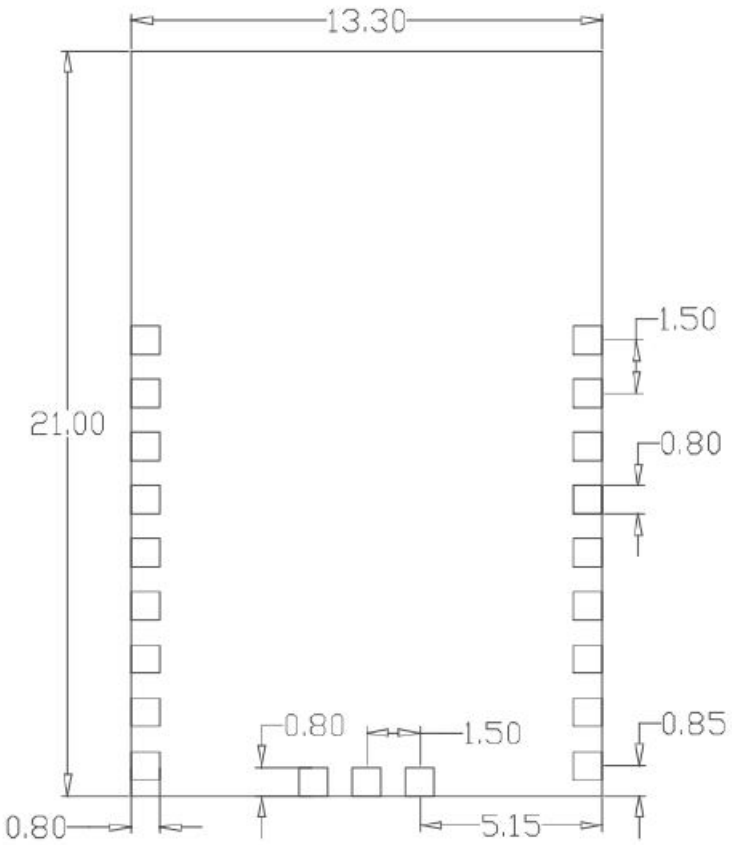
TX Characteristics	Min	Typical	Max.	Unit
Power@HT20, MCS7		**13.23**		dBm
Frequency Error	**–10**		**+10**	ppm
EVM@HT20, MCS7			**–30**	dB
Transmit spectrum mask				
Pass				

RX Characteristics	Min	Typical	Max.	Unit

	.			
Minimum Input Level Sensitivity				
MCS7			**-73**	dBm

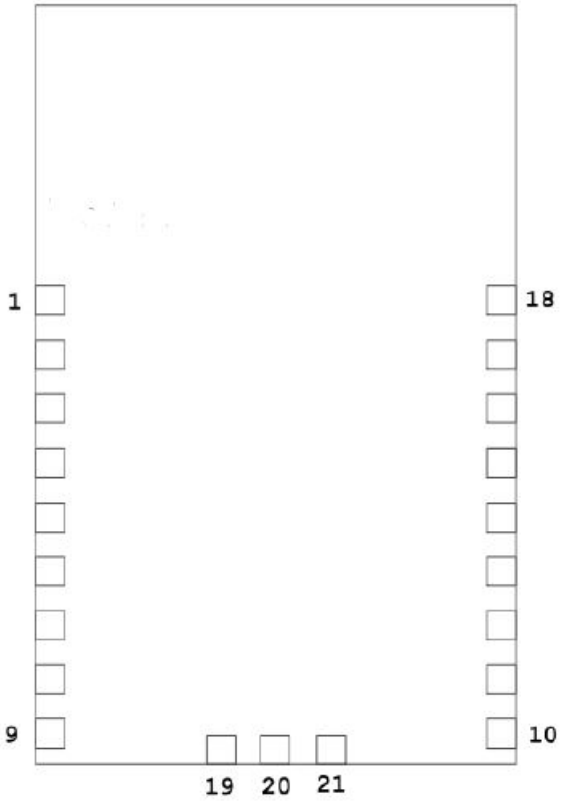
Hardware

Mechanical Dimensions



Stamp bonding pad diameter: 0.6mm

Pin Definitions


1
18
9
10
19
20
21

PINs	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
1	GPIOA2	U1_RX	I2C0_SCL	PWM2		
2	GPIOA3	U1_TX	I2C0_SDA	PWM3		
3	GPIOA4			PWM4		
4	GPIOA8					
5	GPIOA11	U0_TX	I2C0_SCL	PWM0		
6	GPIOA12	U0_RX	I2C0_SDA	PWM1		
7	GPIOA13			PWM7		
8	VD33					
9	GND					
10	CHIP_EN					
11	GPIOA7					
12	GPIOA17			PWM5		SD_CMD
13	GPIOA18			PWM6		SD_CLK
14	GPIOA19		I2C0_SCL	PWM7	SPI_MOSI	SD_D0
15	GPIOA20		I2C0_SDA	PWM0	SPI_MISO	SD_D1
16	GPIOA15	U2_RX	I2C0_SCL	PWM3	SPI_CS	SD_D2
17	GPIOA16	U2_TX	I2C0_SDA	PWM4	SPI_SCL	SD_D3
18	GND					
19	VD33					
20	GPIOA14			PWM2		SD_INT
21	GPIOA0					

Note:

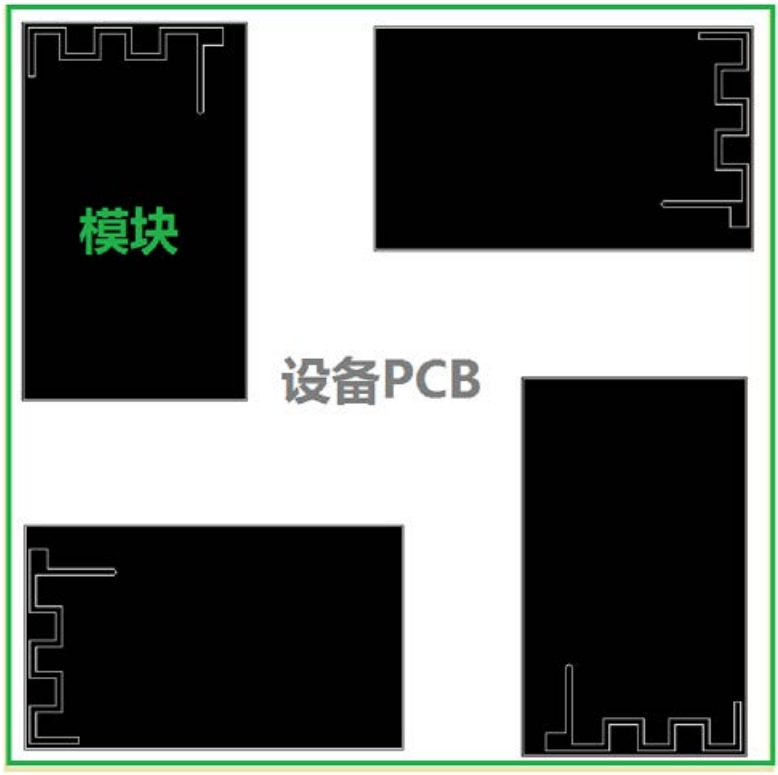
1. In default, UART2 (pin1 and pin2) are used for transparent communication and UART_log (pin16 and pin17) are used for output of debugging information and burning firmware.
2. Please refer to the description in DC Characteristics for UART output current level.
3. CHIP_EN hardware reset pin and will be effective with VIL. Configuration information will be remained after module reset. The module has pull-up process for CHIP_EN designed internally.
4. The pins for reset button and LED indication should be defined according to actual firmware and circuit
5. GPIO0 is designed for specific hardware function

GPIO0	1	Test Mode
	0	Normal

PCB Antenna

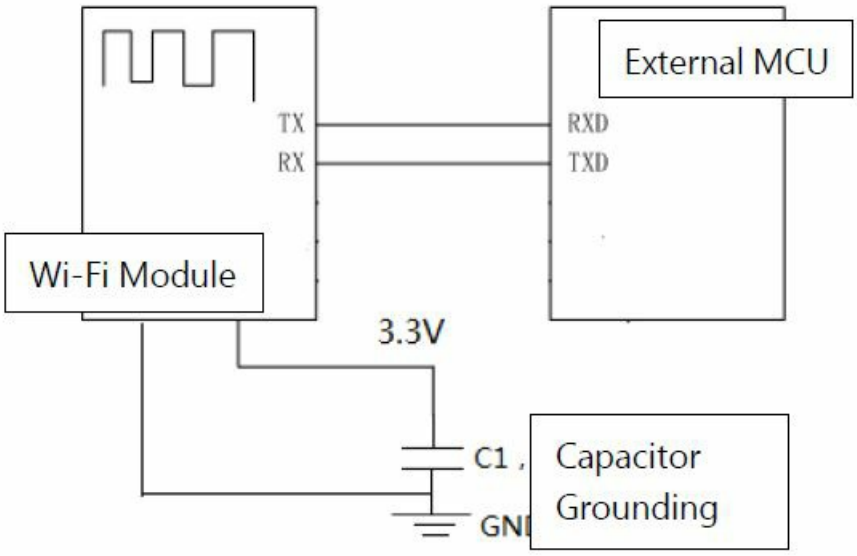
The following precautions should be considered during designing with PCB antenna:

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 10mm 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. Keep the antenna of wifi module next to the edge of main board during design of PCB to ensure better performance of antenna, as illustrated below



Reference Design

1. **UART Interface Design**
   For devices with 3.3V power supply, you can directly connect the device UART port with module UART port according to the illustration.



If your device is powered by 5V, you can refer to the circuit shown in the figure below or design your own circuit for power conversion. The value of resistor can be adjusted according to actual circuit design.

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 10uF-22uF; 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.

List of applicable FCC rules FCC Part 15.247

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

- **Label and compliance information**
  FCC ID label on the final system must be labeled with “Contains FCC ID: 2A9BE-LL8720-P” or “Contains transmitter module FCC ID: 2A9BE-LL8720-P”.
- **Information on test modes and additional testing requirements**
  Contact Hangzhou LinknLink 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 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, Hangzhou LinknLink 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
2. this device must accept any interference received, including interference that may cause undesired operation.

NOTE: 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:

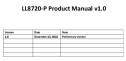
- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.
- These limits are designed to provide reasonable protection against harmful interference in a residential installation.
- This equipment generates, uses and can radiate 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.

1. **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.
2. **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.

3. **Note 3:** Additional testing and certification may be necessary when multiple modules are used.
4. **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.
5. **Note 5**: 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.

Documents / Resources

	**BroadLink LL8720-P Embedded WiFi Module** [pdf] User Manual 2A9BE-LL8720-P, 2A9BELL8720P, ll8720 p, LL8720-P, Embedded WiFi Module, LL8720-P Embedded WiFi Module, WiFi Module, Module