



## **BL-WN650BT**

**802.11ac 433Mbps WiFi+BT4.2**

**USB Dongle Specification**

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Top View

Dongle Name: BL-WN650BT	
Module Type: 802.11a/b/g/n/ac 433Mbps 1T1R WiFi + BT4.2 Combo USB Dongle	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

## Revision History

Revision	Summary	Release Date
0.1	Internal release	2020-07-29
1.0	Official release	2021-10-11

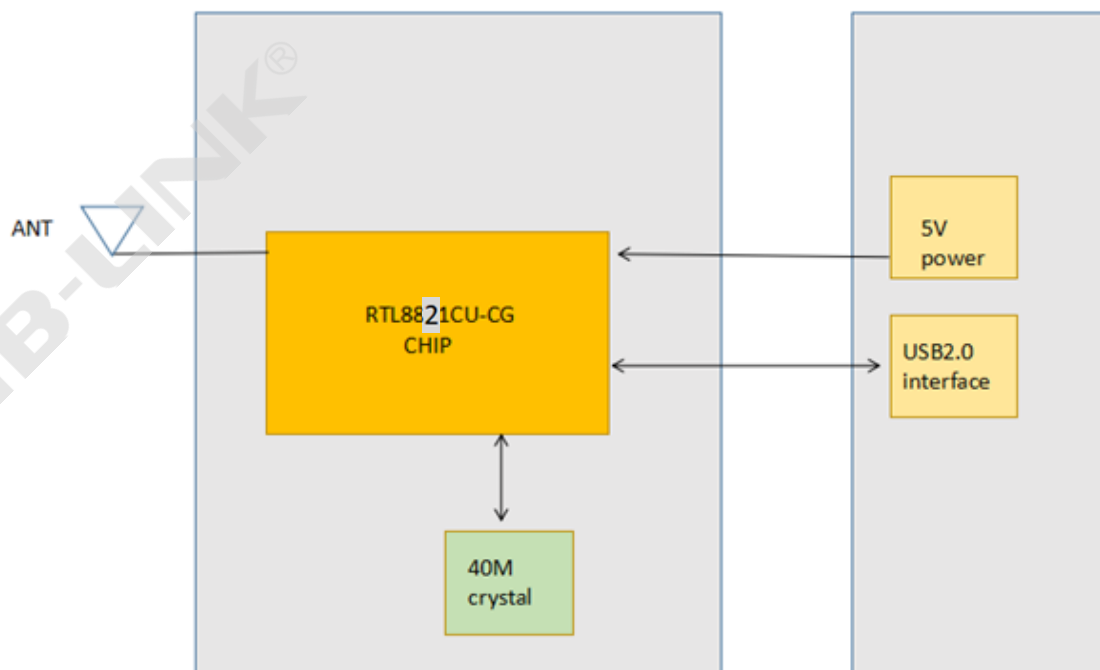
## 1. Introduction

The BL-WN650BT is designed base on RTL8821CU-CG. It supports IEEE 802.11a/b/g/n/ac 1T1R with high throughput data rate for WLAN products and provides the highest PHY rate up to 433.3Mbps. This Dongle includes Bluetooth 2.1+EDR and supports BT 4.2 system. It combines a WLAN MAC, a 1T1R capable WLAN baseband, modem and offers stable, high rate, long distance wireless connectivity through external antenna. It can be used on the IP Camera/Smart TV and other wireless devices easily.

### 1.1 Features

- Operating Frequencies: 2.4~2.4835GHz and 5.15~5.85GHz
- Host Interface is USB2.0
- IEEE Standards: IEEE 802.11a/b/g/n/ac
- BT4.2
- Wireless data rate can reach up to 433Mbps
- Internal steel PIFA antenna
- Power Supply: VDD5 5V±0.3V main power supply
- 

### 1.2 Block Diagram



## 1.3 General Specifications

Dongle Name	BL-WN650BT, WiFi +BT4.2 USB2.0 Dongle
Chipset	RTL8821CU-CG
WiFi Standards	IEEE802.11a/b/g/n/ac, 1T1R SISO, 2.4G/5GHz, 433Mbps (Max)
Host Interface	USB2.0
Antenna	Internal steel PIFA antenna
Dimension	20.4*14.6*6.28mm (L*W*H), Tolerance: +/-0.2mm
Power Supply	DC 5V±0.3V @ 420 mA (Max)
Operation Temperature	-10°C to +60°C
Operation Humidity	10% to 95% RH (Non-Condensing)

## 2. Electrical and Thermal Specifications

### 2.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-10	25	60	°C
Internal Antenna Voltage Standing Wave Ratio		1.5	2	3	/
Supply Voltage	VDD5	4.7	5.0	5.3	V

### 2.2 Digital I/O DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	2.0	3.3	3.6	V
VIL	Input Low Voltage	--	0	0.9	V
VOH	Output High Voltage	2.97	--	3.3	V
VOL	Output Low Voltage	0	--	0.33	V

## 2.3 Current Consumption

Conditions : VDD5=5V ; Ta:25°C			
Use Case	VBAT Current (average)		
	Typ	Max	Units
2.4G 11Mbps TX @17dBm (RF test)	331	381	mA
2.4G HT40 MCS0 TX @14dBm (RF test)	286	352	mA
2.4G HT40 MCS7 TX @14dBm (RF test)	215	360	mA
5G VHT80MCS0TX @12dBm (RF test)	281	352	mA
5G VHT80 MCS9 TX @12dBm (RF test)	254	384	mA
2.4G RX Active (RF test)	91	124	mA
5G RX Active (RF test)	111	150	mA

## 3. WiFi RF Specifications

### 3.1 2.4G WiFi RF Specification

Conditions: VDD5=5V; Ta:25°C				
Features		Description		
WLAN Standard		IEEE 802.11b/g/n		
Frequency Range		2.4~2.4835GHz (2.4GHz ISM Band)		
Channels		Ch1~Ch13 (For 20MHz Channels)		
Modulation		802.11b (DSSS): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM;		
Data Rate		802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps;		
Frequency Tolerance		≤ ±15ppm		
2.4G Transmitter Specifications				
TX Rate		TX Power	TX Power Tolerance	EVM
802.11b@1~11Mbps		17dBm	±2dBm	≤-10dB

802.11g@6Mbps	17dBm	±2dBm	≤-10dB
802.11g@54Mbps	14dBm	±2dBm	≤-25dB
802.11n@HT20_MCS0	17dBm	±2dBm	≤-10dB
802.11n@HT20_MCS7	14dBm	±2dBm	≤-28dB
802.11n@HT40_MCS0	17dBm	±2dBm	≤-10dB
802.11n@HT40_MCS7	14dBm	±2dBm	≤-28dB

#### 2.4G Receiver Specifications

RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11b@1Mbps	-94dBm	-10dBm	< 8%
802.11b@11Mbps	-85dBm	-10dBm	< 8%
802.11g@6Mbps	-90dBm	-15dBm	< 10%
802.11g@54Mbps	-72dBm	-15dBm	< 10%
802.11n@HT20_MCS0	-88dBm	-15dBm	< 10%
802.11n@HT20_MCS7	-69dBm	-15dBm	< 10%
802.11n@HT40_MCS0	-85dBm	-15dBm	< 10%
802.11n@HT40_MCS7	-65dBm	-15dBm	< 10%

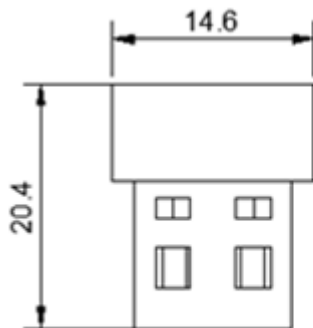
## 3.2 5G WiFi RF Specification

Conditions: VDD5=5V; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac
Frequency Range	5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.73GHz; 5.735~5.835GHz (5GHz ISM Band);
Channels	Ch36, Ch40, Ch44, Ch48; Ch52~Ch64; Ch100~Ch140; Ch149~Ch165 (For 20MHz Channels)
Modulation	802.11a (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11ac (OFDM): BPSK, QPSK, 16QAM, 64QAM, 256QAM;
Date Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R_SISO) 6.5~86.7Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R_SISO)13.5~200Mbps;

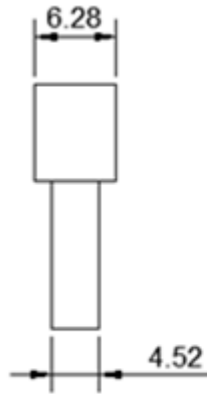
	802.11ac (VHT80): MCS0~MCS9(1T1R_SISO)29.3~433.3Mbps;		
Frequency Tolerance	≤ ±15ppm		
5G Transmitter Specifications			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11a@6Mbps	15dBm	±2dBm	≤-10dB
802.11a@54Mbps	13dBm	±2dBm	≤-25dB
802.11n@HT20_MCS0 802.11ac@VHT20_MCS0	15dBm	±2dBm	≤-10dB
802.11n@HT20_MCS7 802.11ac@VHT20_MCS7	13dBm	±2dBm	≤-28dB
802.11n@HT40_MCS0 802.11ac@VHT40_MCS0	15dBm	±2dBm	≤-10dB
802.11n@HT40_MCS7 802.11ac@VHT40_MCS7	13dBm	±2dBm	≤-28dB
802.11ac@VHT20_MCS8	12dBm	±2dBm	≤-30dB
802.11ac@VHT40_MCS8 802.11ac@VHT40_MCS9	13dBm	±2dBm	≤-32dB
802.11ac@VHT80_MCS0	14dBm	±2dBm	≤-10dB
802.11ac@VHT80_MCS9	11dBm	±2dBm	≤-32dB
5G Receiver Specifications			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11a@6Mbps	-90dBm	-20dBm	< 10%
802.11a@54Mbps	-72dBm	-20dBm	< 10%
802.11n@HT20_MCS0	-88dBm	-20dBm	< 10%
802.11n@HT20_MCS7	-69dBm	-20dBm	< 10%
802.11n@HT40_MCS0	-86dBm	-20dBm	< 10%
802.11n@HT40_MCS7	-66dBm	-20dBm	< 10%
802.11ac@VHT20_MCS8	-71dBm	-20dBm	< 10%
802.11ac@VHT40_MCS9	-65dBm	-20dBm	< 10%
802.11ac@VHT80_MCS0	-84dBm	-20dBm	< 10%
802.11ac@VHT80_MCS9	-55dBm	-20dBm	< 10%

## 4. Mechanical Specifications

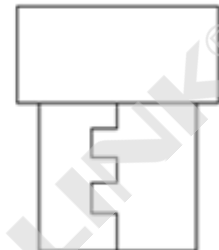
### 4.1 Module Outline Drawing



Top View



Side View

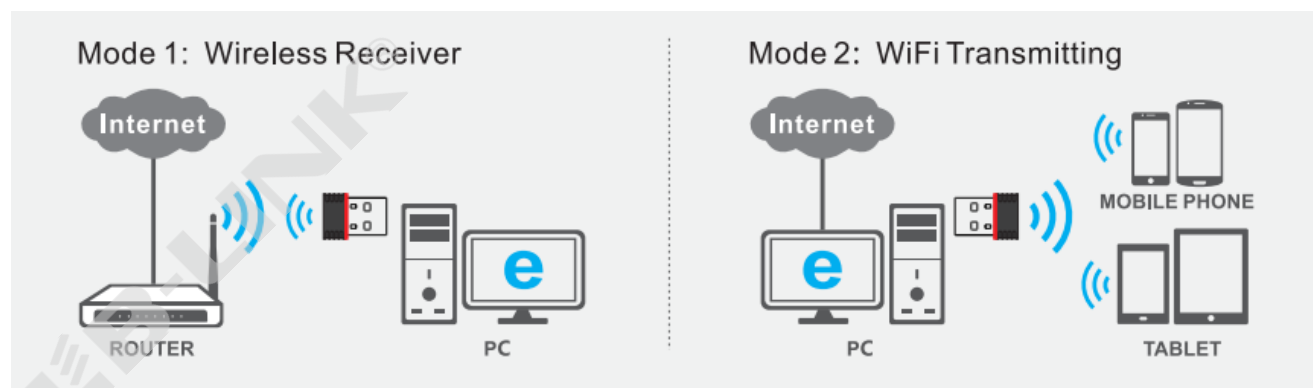


Bottom View

Module dimension: 20.4mm\*14.6mm\*6.28mm (L\*W\*H; Tolerance:  $\pm 0.2$ mm)

## 5. Application Information

### 5.1 Typical Application



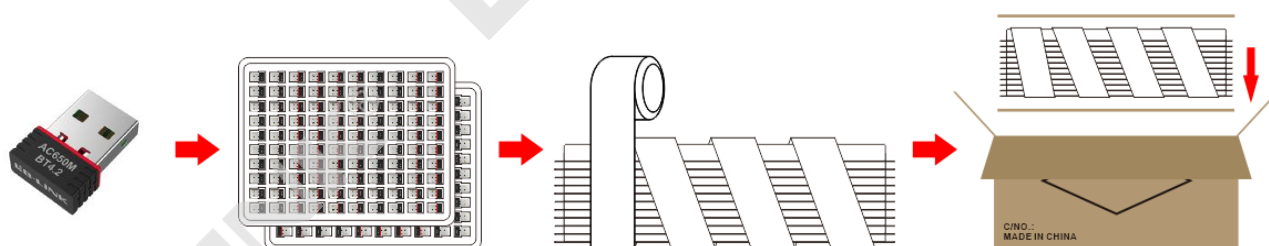


## 6. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8821CU-CG	REALTEK	
2	PCB	BL-W8821CU6	Guangdong KING SHINE Technology	8821CU & 8811CU P2P
			MILLION SOURCE PRINTED CIRCUIT BOARD CO., LTD	
			Quzhou Sunlord Electronics Co., Ltd	
3	Crystal	40MHz-10pF-10ppm-2520	HOSONIC ELECTRONIC CO., LTD.	
			HUBEI TKD ELECTRONICS TECHNOLOGY CO., LTD.	
			LUCKI CM ELECTRONICS CO., LTD	
4	Diplexer	DP1005-E2455FB-ACX	ACX	
			TDK China Co., Ltd.	

## 7. Package and Storage Information

### 7.1 Package Dimensions



Package specification:

1. Put the product into the blister tray, and each tray must be folded 180°.
2. A total of 11 blister trays are stacked in each box. The top tray is empty and used as the lid.
3. after stacking and tying with wire film, put a flat card on top and bottom, and then put into the carton.
4. 100 products per blister plate, 1000 products per box.