

## **802.11ac WiFi Module**

**Model Number: 802R8822**

### **PRODUCT SPECIFICATION**

## Document revision history

Revision	Date	Approved by	Remarks
Version 1.0	2019-03-04		

## FCC Warning

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.

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

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) This device and its antenna(s) must not be co - located with any other transmitters except in accordance with FCC multi - transmitter product procedures. Referring to the multi - transmitter policy, multiple - transmitter(s) and module(s) can be operated simultaneously without C2P.
- 3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band & CH36 to CH165 for 5G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end - user regarding to Regulatory Domain change.

**USERS MANUAL OF THE END PRODUCT:**

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio - frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

**LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following " Contains FCCID:LNQ802R8822". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.

## 1. General Description

This document is to specify the product requirements for 802.11a/b/g/n/ac PCI-e Module. This Card is based on Realtek RTL8822BEH chipset that is a highly integrated single-chip that supports 2-stream 802.11ac solutions with Multi-user MIMO (Multiple-Input, Multiple-Output) with Wireless LAN (WLAN) PCI Express network interface controller and HS-UART mixed interface.

The RTL8822BE provides a complete solution for a high-performance integrated wireless and Bluetooth device.

The RTL8822BEH-VR-CG baseband implements Multi-user Multiple Input, Multiple Output (MU-MIMO) Orthogonal Frequency Division Multiplexing (OFDM) with two transmit and two receive paths (2T2R). Features include two spatial stream transmissions, short Guard Interval (GI) of 400ns, spatial spreading, and support for variant channel bandwidth. Moreover, RTL8822BEH-VR-CG provides one spatial stream space-time block code (STBC), Transmit Beamforming (TxBF) and Low Density Parity Check (LDPC) to extend the range of transmission. At the receiver, extended range and good minimum sensitivity is achieved by having receiver diversity up to 2 antennas. As the recipient, the RTL8822BE also supports explicit sounding packet feedback that helps senders with beamforming capability.

For legacy compatibility, Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying (CCK) and OFDM baseband processing are included to support all IEEE 802.11b, 802.11g and 802.11a data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK with data scrambling capability are available, and CCK provides support for legacy data rates, with long or short preamble. The high speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, 64QAM and 256QAM modulation of the individual subcarriers, and rate compatible coding rate of 1/2, 2/3, 3/4, and 5/6, provide up to 866.7Mbps for IEEE 802.11ac MIMO OFDM.

## 2. Features

- Compatible with IEEE 802.11a standard to provide wireless 54Mbps data rate.
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps data rate.
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps data rate.
- Compatible with IEEE 802.11n standard to provide wireless 300Mbps data rate.
- Compatible with IEEE 802.11ac standard to provide wireless 866.7Mbps data rate.
- Operation at 2.4~2.5GHz and 5.15~5.825GHz frequency band to meet worldwide regulations
- Provides simple legacy and 20MHz/40MHz/80MHz co-existence mechanisms to ensure backward and network compatibility.
- Supports infrastructure networks via Access Point and ad-hoc network via peer-to-peer communication
- Supports IEEE 802.11i (WPA and WPA2), WAPI, enhanced security
- Friendly user configuration and diagnostic utilities
- PCIe 2.0 interface, Mini PCIe
- ROHS compliant

### 3. General Requirements

#### 3.1 IEEE 802.11b Section

	<b>Feature</b>	<b>Detailed Description</b>
3.2.1.1	Standard	<ul style="list-style-type: none"> <li>• IEEE 802.11b</li> </ul>
3.2.1.2	Radio and Modulation Schemes	<ul style="list-style-type: none"> <li>• DQPSK, DBPSK, DSSS, and CCK</li> </ul>
3.2.1.3	Operating Frequency	<ul style="list-style-type: none"> <li>• 2400~2483.5 MHz ISM band</li> </ul>
3.2.1.4	Channel Numbers	<ul style="list-style-type: none"> <li>• 11 channels for United States</li> <li>• 13 channels for Europe Countries</li> </ul>
3.2.1.5	Data Rate	<ul style="list-style-type: none"> <li>• 11, 5.5, 2, and 1 Mbps</li> </ul>
3.2.1.6	Media Access Protocol	<ul style="list-style-type: none"> <li>• CSMA/CA with ACK</li> </ul>

#### 3.2 IEEE 802.11g Section

	<b>Feature</b>	<b>Detailed Description</b>
3.2.2.1	Standard	<ul style="list-style-type: none"> <li>• IEEE 802.11g</li> </ul>
3.2.2.2	Radio and Modulation Type	<ul style="list-style-type: none"> <li>• QPSK , BPSK , 16QAM , 64QAM with OFDM</li> </ul>
3.2.2.3	Operating Frequency	<ul style="list-style-type: none"> <li>• 2400~2483.5MHz ISM band</li> </ul>
3.2.2.4	Channel Numbers	<ul style="list-style-type: none"> <li>• 11 channels for United States</li> <li>• 13 channels for Europe Countries</li> </ul>
3.2.2.5	Data Rate	<ul style="list-style-type: none"> <li>• 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> </ul>
3.2.2.6	Media Access Protocol	<ul style="list-style-type: none"> <li>• CSMA/CA with ACK</li> </ul>

#### 3.3 IEEE 802.11a Section

	<b>Feature</b>	<b>Detailed Description</b>
3.2.3.1	Standard	<ul style="list-style-type: none"> <li>• IEEE 802.11a</li> </ul>
3.2.3.2	Radio and Modulation Type	<ul style="list-style-type: none"> <li>• QPSK , BPSK , 16QAM , 64QAM with OFDM</li> </ul>
3.2.3.3	Operating Frequency	<ul style="list-style-type: none"> <li>• 5.15~5.35GHz and 5.47~5.825GHz for US</li> <li>• 5.15~5.35GHz and 5.47~5.725GHz for Europe</li> </ul>
3.2.3.4	Channel Numbers	<ul style="list-style-type: none"> <li>• 24 non-overlapping channels for US and Canada</li> <li>• 19 non-overlapping channels for Europe</li> </ul>
3.2.3.5	Data Rate	<ul style="list-style-type: none"> <li>• 6, 9, 12, 18, 24, 36, 48, 54 Mbps</li> </ul>
3.2.3.6	Media Access Protocol	<ul style="list-style-type: none"> <li>• CSMA/CA with ACK</li> </ul>

**3.2.4 IEEE 802.11n Section**

	Feature	Detailed Description																								
3.2.4.1	Standard	• IEEE 802.11n																								
3.2.4.2	Radio and Modulation Type	• QPSK , BPSK , 16QAM ,64QAM with OFDM																								
3.2.4.3	OperatingFrequency	•2.4GHz band:2400 ~ 2483.5MHz • 5GHz and:5150 ~ 5850MHZ																								
3.2.4.4	Data Rate (Mbps)	<table border="1"> <thead> <tr> <th rowspan="2">MCS</th> <th colspan="2">GI=800ns</th> <th colspan="2">GI=400ns</th> </tr> <tr> <th>20MHz</th> <th>40MHz</th> <th>20MHz</th> <th>40MHz</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>6.5</td> <td>13.5</td> <td>7.2</td> <td>15</td> </tr> <tr> <td>7</td> <td>65</td> <td>135</td> <td>72.2</td> <td>150</td> </tr> <tr> <td>15</td> <td>130</td> <td>270</td> <td>144.4</td> <td>300</td> </tr> </tbody> </table>	MCS	GI=800ns		GI=400ns		20MHz	40MHz	20MHz	40MHz	0	6.5	13.5	7.2	15	7	65	135	72.2	150	15	130	270	144.4	300
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3.2.4.5	Media Access Protocol	• CSMA/CA with ACK																								

**3.2.5 IEEE 802.11ac Section**

	Feature	Detailed Description																																																							
3.2.5.1	Standard	• IEEE 802.11ac																																																							
3.2.5.2	Radio and Modulation Type	• QPSK , BPSK , 16QAM ,64QAM,256QAM with OFDM																																																							
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3.2.4.5	Media Access Protocol	• CSMA/CA with ACK																																																							

## 4. Electrical and Thermal Characteristics

### 4.1 Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-55	+125	°C
Ambient Operating Temperature	0	70	°C
Junction Temperature	0	125	°C

### 4.2 General Section

	Feature	Detailed Description
5.2.1	Antenna Type	<ul style="list-style-type: none"> <li>• PCB PIFA Antenna</li> <li>• Dipole Antenna</li> </ul>
5.2.2	Operating Voltage	<ul style="list-style-type: none"> <li>• DC3.3V±10%</li> </ul>
5.2.3	Current Consumption	<ul style="list-style-type: none"> <li>• &lt;1000mA</li> </ul>
5.2.4	Form Factor and Interface	<ul style="list-style-type: none"> <li>• <b>PCIe interface</b></li> </ul>

### 4.3 Software

**Driver:** Linux, Android

### 4.4 Antenna Information

	PCB PIFA ANTENNA		DIAPOLE ANTENNA	
	2.4G	5G	2.4G	5G
Ant A	4.9dBi	5.6dBi	1.8dBi	2dBi
Ant B	3.6dBi	4.4dBi	1.8dBi	2dBi

## 4.5 Mechanical Dimensions

Pin	Definition	Pin	Definition
1	WAKE <sub>n</sub>	22	PCIE_RESET <sub>n</sub>
2, 24, 39, 41, 52	VD33	23	PET <sub>n</sub> 0
3, 5, 6, 8, 17, 19, 28, 30, 44, 46, 48	NC	25	PET <sub>p</sub> 0
4, 9, 15, 18, 21, 26, 27, 29, 34, 35, 37, 40, 43, 50	GND	31	HSIN
7	CLKREQ <sub>n</sub>	32	UART_TX
10, 12, 14, 16, 45, 47, 49, 51	VDDA5_PA	33	HSIP
11	REFCLK-	36	UART_CTS
13	REFCLK+	38	UART_RX
20	WL_DIS_N	42	5GL_EN_1295

