

# RTL8822CE

802.11ac 867Mbps WLAN + BT5.0

M.2 Module Specification



Module Name::RTL8822CE	
Module Type: 802.11a/b/g/n/ac 867Mbps WLAN + Bluetooth 5.0 Combo M.2 Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
Title:	
Signature:	
	Date:

## Revision History

Revision	Summary	Release Date
1.0	Official release	2022-06-10

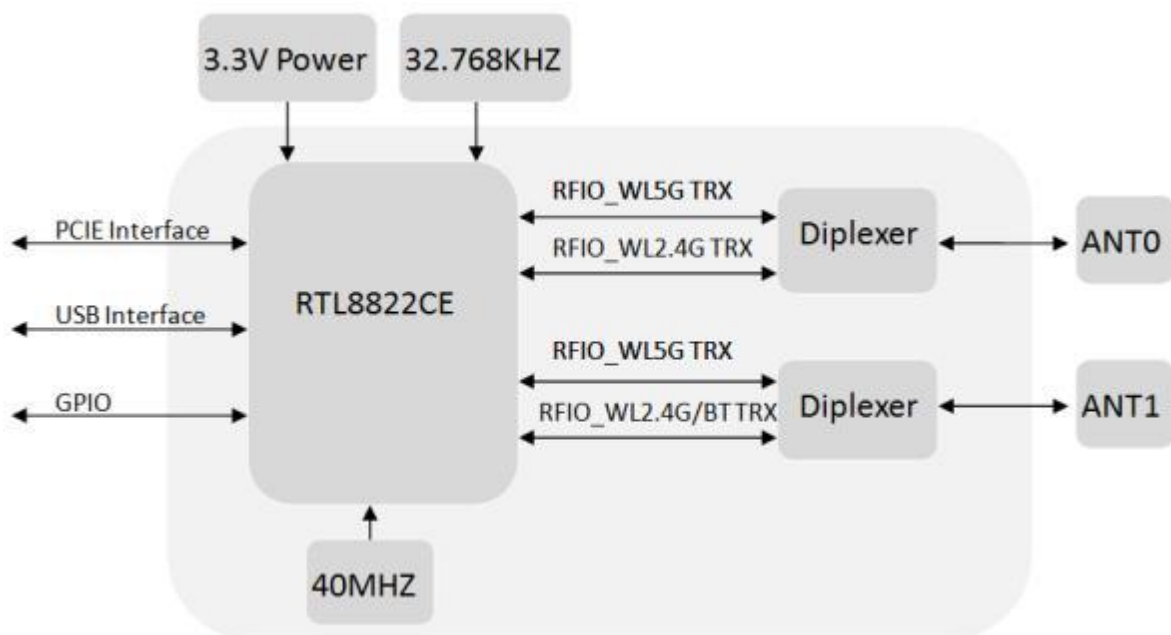
# 1. Introduction

RTL8822CE is a highly integrated Dual-band WLAN + bluetooth5.0 2T2R M.2 (key A and E) module designed base on Realtek RTL8822CE chipset. This module supports IEEE 802.11a/b/g/n/ac standard and provides the maximum PHY data rate up to 867Mbps, and supports 802.11ac Wave-2 MU-MIMO and 802.11n MIMO for 2.4/5G band, it can offer feature-rich wireless connectivity and reliable throughput from an extended distance. BL-M8822CP1 is designed by M.2 2230 A-E key slot type form factor, the interface complies with PCI Express Base Specification Revision 2.1, and USB2.0 FS-mode for Bluetooth.

## 1.1 Features

- Operating Frequencies: 2.4~2.4835GHz or 5.15~5.85GHz
- Interface: PCIe for WLAN, USB for Bluetooth
- IEEE Standards: IEEE 802.11a/b/g/n/ac
- Wireless data rate can reach up to 876Mbps
- Connect to external antenna through MHF4 connector
- Power Supply: VDD3.3V±0.2V main power supply

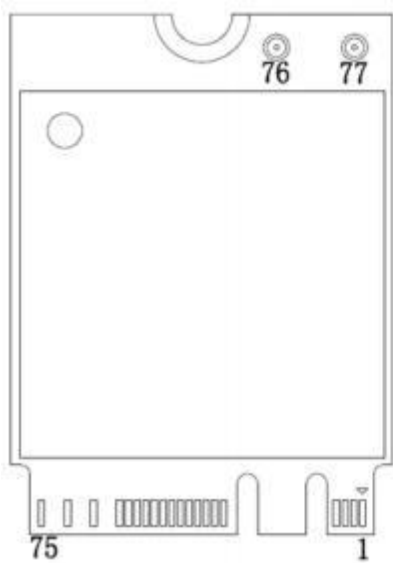
## 1.2 Block Diagram



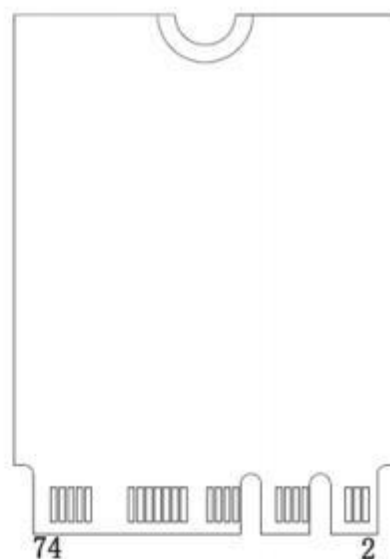
## 1.3 General Specifications

Module Name	RTL8822CE 867Mbps WLAN + BT5.0 M.2 Module
Chipset	RTL8822CE-CG
WLAN Standards	IEEE802.11a/b/g/n/ac
Host Interface	PCIe for WLAN; USB for Bluetooth
Antenna	Connect to the external antenna through MHF4 connector
Dimension	M.2, 30*22*2.15mm (L*W*H)
Power Supply	DC 3.3V±0.2V @ 655 mA (Max)
Operation Temperature	-40°C to +85°C
Operation Humidity	10% to 95% RH (Non-Condensing)

## 2. Pin Assignments



Top View



Bottom View

## 2.1 Pin Definition

No	Pin Name Platform Pinout	Pin Name Module Pinout	Voltage	WLAN or BT	Module Pin Description
1	GND	GND			
2	3.3V	3.3V	3.3V	ALL	
3	USB_D+	USB_D+	3.3V	BT	USB Transmitter/Receiver Differential Pair for BT
4	3.3V	3.3V	3.3V	ALL	
5	USB_D-	USB_D-	3.3V	BT	USB Transmitter/Receiver Differential Pair for BT
6	LED_WLAN	LED_WLAN	3.3V	WLAN	Status indicators via LED devices that will be provided by the system
7	GND	GND			
8	Connector Key	Connector Key			
9	Connector Key	Connector Key			
10	Connector Key	Connector Key			
11	Connector Key	Connector Key			
12	Connector Key	Connector Key			
13	Connector Key	Connector Key			
14	Connector Key	Connector Key			
15	Connector Key	Connector Key			
16	LED_BT	LED_BT	3.3V	BT	Status indicators via LED devices that will be provided by the system
17	NC	NC			
18	GND	GND			
19	NC	NC			
20	HOST_WAKE_BT	BT_WAKE_HOST	3.3V	BT	Bluetooth device to wake up HOST
21	NC	NC			
22	NC	NC			
23	NC	NC			
24	Connector Key	Connector Key			
25	Connector Key	Connector Key			
26	Connector Key	Connector Key			
27	Connector Key	Connector Key			

28	Connector Key	Connector Key			
29	Connector Key	Connector Key			
30	Connector Key	Connector Key			
31	Connector Key	Connector Key			
32	NC	NC			
33	GND	GND			
34	NC	NC			
35	PETp0+	PERp0+	PCIe PHY	WLAN	PCIe x1 differential receive pair
36	NC	NC			
37	PETn0-	PERn0-	PCIe PHY	WLAN	PCIe x1 differential receive pair
38	BT_WAKE_HOST	HOST_WAKE_BT	3.3V	BT	HOST to wake up BT
39	GND	GND			
40	NC	NC			
41	PERp0+	PETp0+	PCIe PHY	WLAN	PCIe x1 differential transmit pair
42	NC	NC			
43	PERn0-	PETn0-	PCIe PHY	WLAN	PCIe x1 differential transmit pair
44	NC	NC			
45	GND	GND			
46	NC	NC			
47	REFCLKP+	REFCLKP+	PCIe PHY	WLAN	Input signal for PCIe differential reference clock (100MHz)
48	NC	NC			
49	REFCLKN-	REFCLKN-	PCIe PHY	WLAN	Input signal for PCIe differential reference clock (100MHz)
50	SUSCLK (32KHz) (O) (0/3.3V)	SUSCLK (32KHz) (I) (0/3.3V)	3.3V	WLAN+ BT	32.768KHz clock supply input that is provided to reduce power and cost for the module. SUSCLK will have a duty cycle that can be as low as 30% or as high as 70% 200ppm
51	GND	GND			
52	PERST# (O) (0/3.3V)	PERST# (I) (0/3.3V)	3.3V	WLAN	Input signal for functional reset to the card, active low
53	CLKREQ# (I) (0/3.3V)	CLKREQ# (O) (0/3.3V)	3.3V	WLAN	Output for reference clock request signal
54	BT_DISABLE#	BT_DISABLE#	3.3V	BT	Reserved for definition with future

	(O) (0/3.3V)	(I) (0/3.3V)			revisions of this specification.
55	WAKE (I) (0/3.3V)	WAKE (O) (0/3.3V)	3.3V	WLAN	This signal is used to request the system from a sleep/suspended state to service a function initiated wake event
56	W_DISABLE# (O) (0/3.3V)	W_DISABLE# (I) (0/3.3V)	3.3V	WLAN	Input and active low signal. This signal is used by the system to disable radio operation. When implemented, this signal requires a pull-up resistor on the card
57	GND	GND			
58	NC	NC			
59	NC	NC			
60	NC	NC			
61	NC	NC			
62	NC	NC			
63	GND	GND			
64	NC	NC			
65	NC	NC			
66	NC	NC			
67	NC	NC			
68	NC	NC			
69	GND	GND			
70	NC	NC			
71	NC	NC			
72	3.3V	3.3V			
73	NC	NC			
74	3.3V	3.3V			
75	GND	GND			
76		ANT0		WLAN	2.4/5G ANT0
77		ANT1		WLAN + BT	2.4/5G/BT ANT1

## 3. Electrical and Thermal Specifications

### 3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-40	25	85	°C
External Antenna VSWR			1.7	2	/
Supply Voltage	VDD	3.1	3.3	3.5	V

### 3.2 Current Consumption

Conditions : VDD=3.3V ; Ta:25°C			
Use Case	VDD Current (average)		
	Typ	Max	Units
WIFI Unassociated (Linux Driver, BT disable)	195	210	mA
2.4G HT40 RX Listen (Linux Driver, BT disable)	180	200	mA
5G VHT80 RX Listen (Linux Driver, BT disable)	202	214	mA
2.4G HT20 MCS8 TX@17dBm (RF test)	648	655	mA
2.4G HT40 MCS15 TX@14dBm (RF test)	380	390	mA
5G VHT80 MCS0 TX@16dBm (RF test)	490	500	mA
5G VHT80 MCS9 TX@13dBm (RF test)	339	347	mA
2.4G HT40 MCS15 RX Active (RF test)	232	240	mA
5G VHT80 MCS9 RX Active (RF test)	237	246	mA
Bluetooth Unassociated (Linux Driver, WIFI disable)	33	35	mA
BT BR_1M DH5 TX@6dBm (RF test)	305	310	mA
BT EDR_3M DH5 TX@6dBm (RF test)	303	309	mA
BT LE_1M TX@6dBm (RF test)	296	312	mA
BT LE_2M TX@6dBm (RF test)	278	285	mA
BT BR_1M DH5 RX Active (RF test)	258	265	mA



BT EDR_3M DH5 RX Active (RF test)	257	265	mA
BT LE_1M RX Active (RF test)	257	265	mA
BT LE_2M RX Active (RF test)	258	264	mA

## 4. WIFI & Bluetooth RF Specifications

### 4.1 2.4G WIFI RF Specification

Conditions : VDD=3.3V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11b/g/n, CSMA/CA		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Ch1~Ch13 (For 20MHz Channels)		
Modulation	802.11b (DSSS): CCK, DQPSK, DBPSK; 802.11g (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;		
Date 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 (HT20): MCS8~MCS15(2T2R_MIMO) 13~144.4Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R_MIMO) 27~300Mbps;		
Frequency Tolerance	≤±15ppm		
2.4 G Transmitter Specifications			
TX Rate	TX Power (dBm)	TX Power Tolerance (dB)	EVM (dB)
802.11b@1~11Mbps	18	±1.5	≤ -15
802.11g@6Mbps	17	±1.5	≤ -15
802.11g@54Mbps	17	±1.5	≤ -25
802.11n@HT20_MCS0	16	±1.5	≤ -10
802.11n@HT20_MCS7	16	±1.5	≤ -28
802.11n@HT40_MCS0	16	±1.5	≤ -10
802.11n@HT40_MCS7	16	±1.5	≤ -28
2.4 G Receiver Specifications			
RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER
802.11b@1Mbps	-95	0	< 8%

802.11b@11Mbps	-87	0	< 8%
802.11g@6Mbps	-92	0	< 10%
802.11g@54Mbps	-74	0	< 10%
802.11n@HT20_MCS0	-91	0	< 10%
802.11n@HT20_MCS7	-71	0	< 10%
802.11n@HT40_MCS0	-87	0	< 10%
802.11n@HT40_MCS7	-69	0	< 10%

## 4.2 5G WIFI RF Specification

Conditions : VDD=3.3V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11a/n/ac, CSMA/CA		
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, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256;		
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 (HT20): MCS8~MCS15(2T2R_MIMO) 13~144.4Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R_MIMO) 27~300Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R_SISO) 6.5~86.7Mbps; 802.11ac (VHT20): MCS0~MCS8(2T2R_MIMO) 13~173.3Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R_SISO)13.5~200Mbps; 802.11ac (VHT40): MCS0~MCS9(2T2R_MIMO)27~400Mbps; 802.11ac (VHT80): MCS0~MCS9(1T1R_SISO)29.3~433.3Mbps; 802.11ac (VHT80): MCS0~MCS9(2T2R_MIMO)58.5~866.7Mbps;		
Frequency Tolerance	$\leq \pm 15\text{ppm}$		
5 G Transmitter Specifications			
TX Rate	TX Power (dBm)	TX Power Tolerance (dB)	EVM (dB)

802.11a@6Mbps	17	±2	≤ -10
802.11a@54Mbps	17	±2	≤ -25
802.11n@HT20_MCS0	16	±2	≤ -10
802.11n@HT20_MCS7	16	±2	≤ -28
802.11n@HT40_MCS0	16	±2	≤ -10
802.11n@HT40_MCS7	16	±2	≤ -28
802.11ac@VHT80_MCS0	14	±2	≤ -10
802.11ac@VHT80_MCS9	14	±2	≤ -32
5 G Receiver Specifications			
RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER
802.11a@6Mbps	-91	0	< 10%
802.11a@54Mbps	-73	0	< 10%
802.11n@HT20_MCS0	-91	0	< 10%
802.11n@HT20_MCS7	-70	0	< 10%
802.11n@HT40_MCS0	-88	0	< 10%
802.11n@HT40_MCS7	-67	0	< 10%
802.11ac@VHT80_MCS0	-85	0	< 10%
802.11ac@VHT80_MCS9	-59	0	< 10%

### 4.3 Bluetooth RF Specification

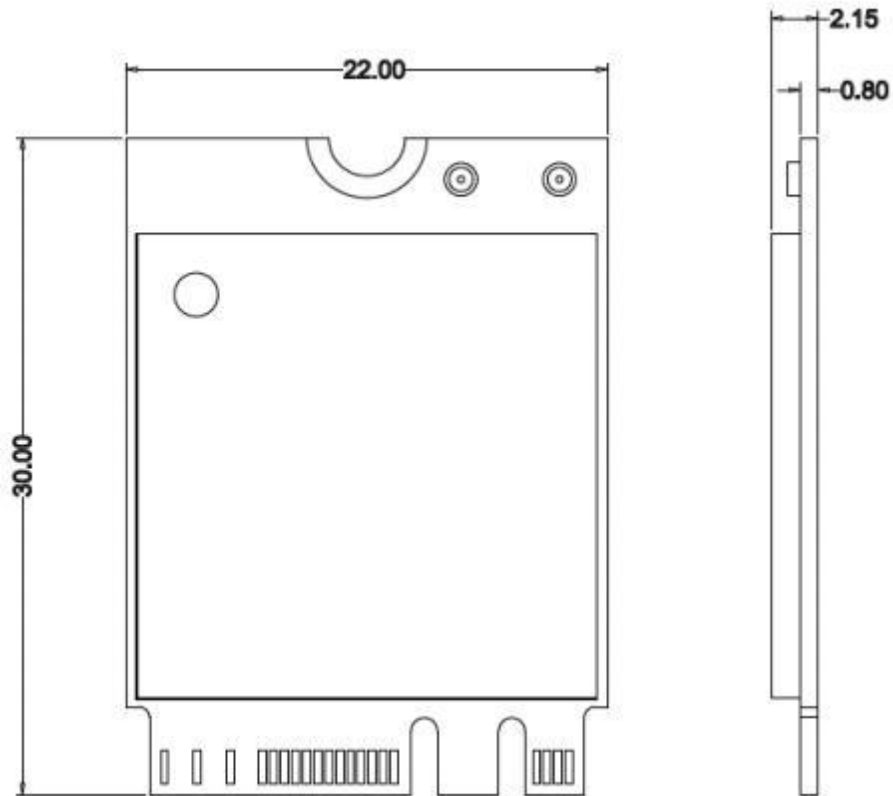
Conditions: VDD33=3.3V; Ta:25°C	
Features	Description
Bluetooth Specification	Bluetooth v2.1+EDR/3.0+HS/4.2/5.0
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;

Date Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: $\pi/4$ -DQPSK; EDR_3Mbps: 8DPSK; LE_125Kbps: GFSK (Coded_S=8); LE_500Kbps: GFSK (Coded_S=2); LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);			
Bluetooth Transmitter Specifications				
Items	Min (dBm)	Typ (dBm)	Max (dBm)	
TX Power				
BR_1M	2	5	8	
EDR_2M	2	5	8	
EDR_3M	2	5	8	
LE_125/500K	2	5	8	
LE_1M	2	5	8	
LE_2M	2	5	8	
Bluetooth Receiver Specifications				
Items	Sensitivity		Maximum Input Level	
	Input Level (Typ: dBm)	BER	Input Level (Typ: dBm)	BER
BR_1M	-90	$\leq 0.1\%$	-5	$\leq 0.1\%$
EDR_2M	-80	$\leq 0.01\%$	-5	$\leq 0.1\%$
EDR_3M	-70	$\leq 0.01\%$	-5	$\leq 0.1\%$
	Input Level	PER	Input Level	PER
LE_125K	-90	$\leq 30.8\%$	-5	$\leq 30.8\%$
LE_500K	-90	$\leq 30.8\%$	-5	$\leq 30.8\%$
LE_1M	-90	$\leq 30.8\%$	-5	$\leq 30.8\%$
LE_2M	-90	$\leq 30.8\%$	-5	$\leq 30.8\%$

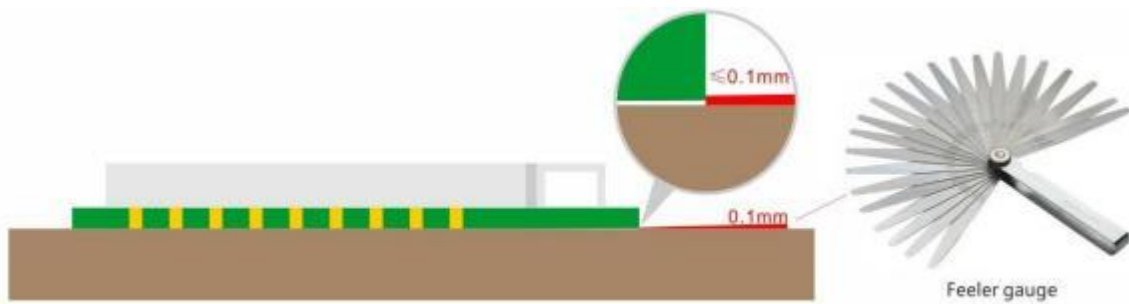
**Note:** For BER receiver sensitivity test, bit error rate (BER) better than 0.1% for a minimum of 1600000 bits transmitted by the tester; For EDR receiver sensitivity test, bit error rate (BER) better than 0.01% for a minimum of 16000000 bits transmitted by the tester; For LE receiver sensitivity test, packet error rate (PER) better than 30.8% for a minimum of 1500 packets transmitted by the tester.

## 5. Mechanical Specifications

### 5.1 Module Outline Drawing

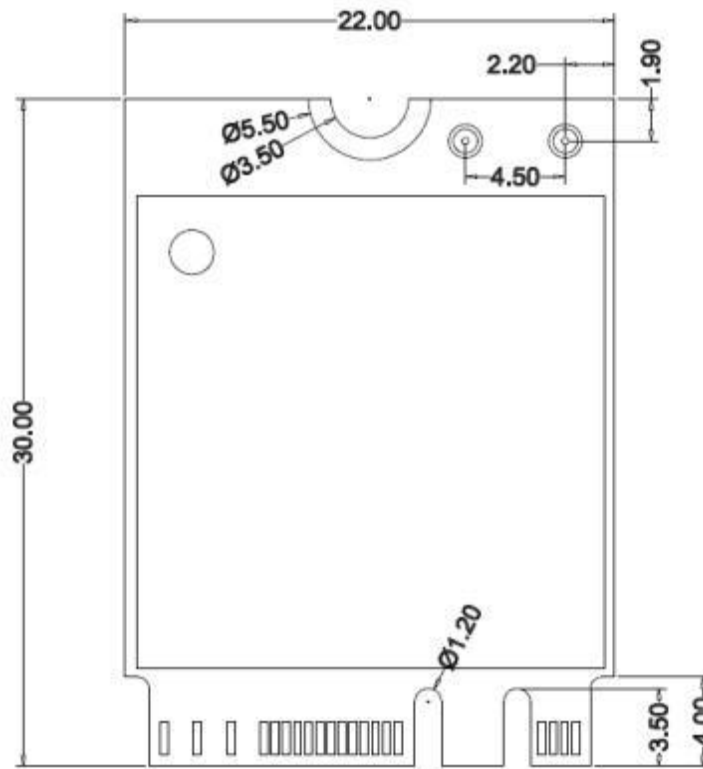


Module dimension: 30.0\*22.0\*2.15mm(L\*W\*H; Tolerance:  $\pm 0.15$ mm)



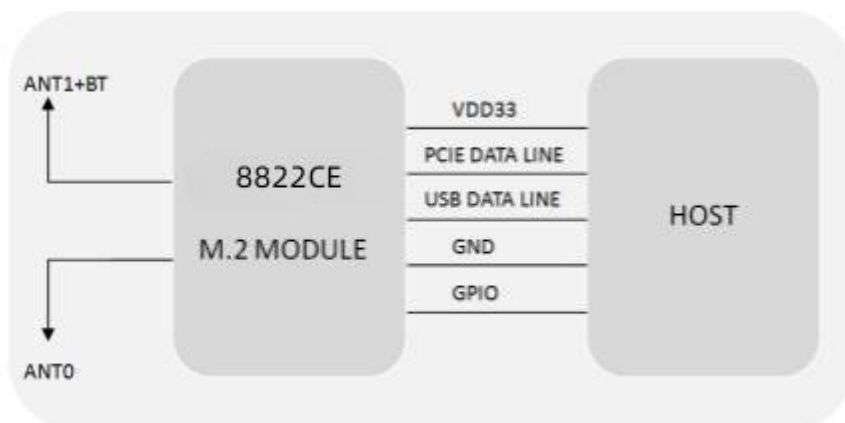
Module Bow and Twist:  $\leq 0.1$ mm

## 5.2 Mechanical Dimensions



## 6. Application Information

### 6.1 Typical Application Circuit



## 6.2 Recommend PCB Layout Footprint

Please use NGFF socket (M.2 connector) A key or E key.

## 7. Package and Storage Information

### 7.1 Package Dimensions



Package specification:

1. 60 modules per blister plate and 600 modules per box.
2. The blister is bound with wire membrane
3. The outer box size is 46\*29\*13.5cm.

### 7.2 Storage Conditions

Absolute Maximum Ratings:

- Storage temperature: -40°C to +85°C,
- Storage humidity: 10% to 95 (Non-Condensing)

Recommended Storage Conditions:

- Storage temperature: 5°C to +40°C,
- Storage humidity: 20% to 90% RH

ESD Sensitivity:

The Module is a static-sensitive electronic device.  
Do not operate or store near strong electrostatic fields.  
Take proper ESD precautions!