

ZAPO

捷博科技

W24-8821CU

WiFi Dual-band 1X1 11ac +
Bluetooth V4.2

Module Datasheet

Revision History

Date	Revision Content	Revised By	Version
2016/10/10	-Preliminary	Wang Hui	V1.0
2017/12/11	Added module photo	William Pan	V1.1

Contents

1	Revision History.....	1
1.	Introduction.....	2
2.	Features.....	4
3.	General Specification.....	5
3.1	General Specification.....	5
3.1.2	Recommended Operating Rating.....	5
4.	WiFi RF Specification.....	6
4.2	5GHz RF Specification.....	7
5.	Bluetooth Specification.....	10
5.1	Bluetooth Specification.....	10
6.	Pin Assignments.....	11
6.1	Pin Outline.....	11
6.2	Pin Definition.....	11
7.	Dimensions.....	13
7.1	Physical Dimensions.....	13
7.2	Layout Recommendation.....	14
8.	Reference Design.....	15
9.	The Key Material List.....	15
10.	Recommended Reflow Profile.....	16

1. Introduction

ZAPO Technology would like to announce a low-cost and low-power consumption module which has all of the Wi-Fi, Bluetooth functionalities. The highly integrated module makes the possibilities of web browsing, VoIP, Bluetooth headsets applications. With seamless roaming capabilities and advanced security, also could interact with different vendors' 802.11a/b/g/n/ac Access Points in the wireless LAN.

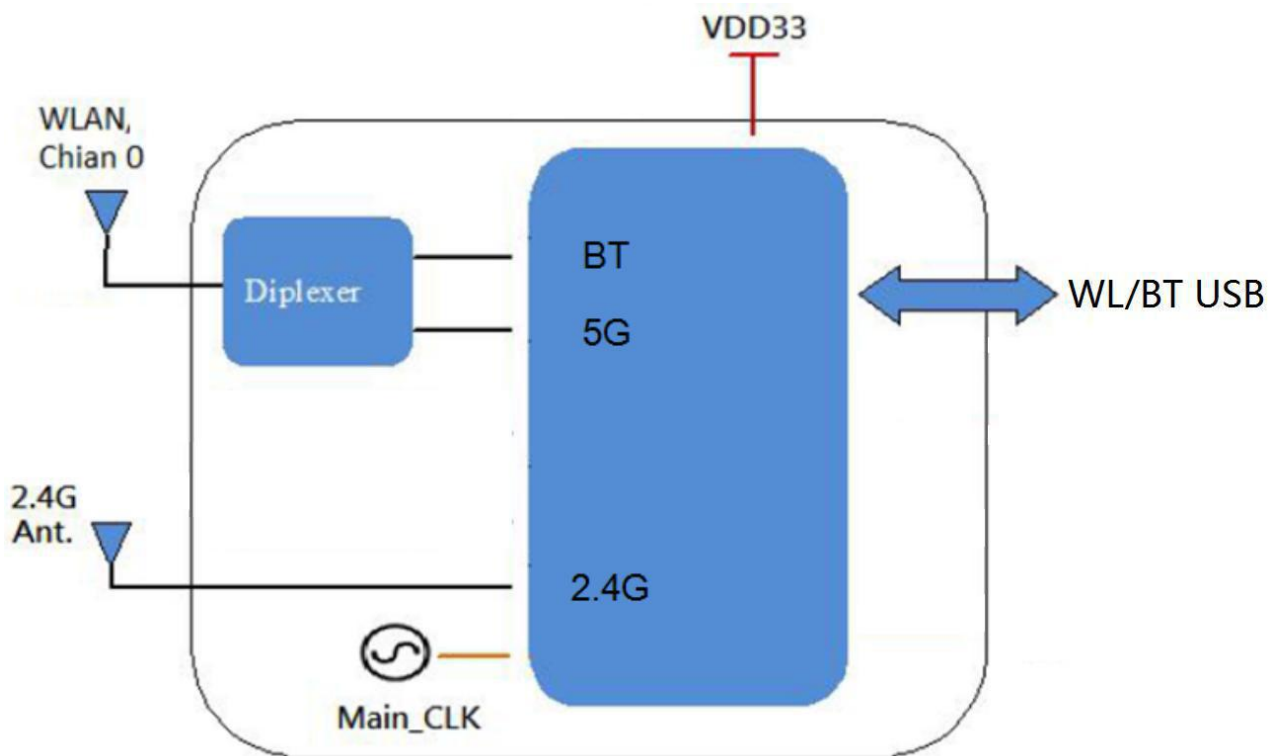
The wireless module complies with IEEE 802.11 a/b/g/n/ac standard and it can achieve up to a speed of 433.3Mbps with single stream in 802.11ac draft to connect to the wireless LAN. The integrated module provides USB interface for Wi-Fi and Bluetooth.

This compact module is a total solution for a combination of Wi-Fi + BT technologies. The module is specifically developed for Smart phones and Portable devices.

2. Features

- Highly integrated wireless local area network(WLAN) system-on-chip (SOC) for 5 GHZ 802.11ac, or 2.4G/5G 802.11n WLAN applications.
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Supports Bluetooth V4.2+HS, BLE and be backwards compatible with Bluetooth 1.2, 2.X+ enhance data rate.
- Supports WLAN-Bluetooth coexistence and ISM-LTE coexistence.
- Supports Bluetooth for class1 and class2 power level transmissions without requiring an external PA.

The block diagram of module is depicted in the figure below.



3. General Specification

3.1 General Specification

Model Name	W24-8821CU
Product Description	Support WiFi/Bluetooth functionalities
Dimension	L x W x H: 12(+0.2-0.1) x 13(+0.2-0.1) x 1.6(±0.1) mm
WiFi Interface	USB 2.0
BT Interface	USB 2.0
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 85°C

3.1.2 Recommended Operating Rating

	Min.	Typ.	Max.	Unit
Operating Temperature	0	25	70	deg.C
VCC33	3.15	3.3	3.45	V

4. WiFi RF Specification

4.1 2.4GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11b/g/n/ac, WiFi compliant
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz: Ch1 ~ Ch14
Output Power	802.11b /CCK : 16 dBm \pm 1.5 dB @ EVM \leq -9dB
	802.11g /64-QAM(R=3/4) : 15 dBm \pm 1.5 dB @ EVM \leq -25dB
	802.11n /64-QAM(R=5/6) : 14 dBm \pm 1.5 dB @ EVM \leq -28dB
Receive Sensitivity (11b) @8% PER	- 1Mbps PER @ -88 dBm, typical
	- 2Mbps PER @ -82 dBm, typical
	- 5.5Mbps PER @ -81 dBm, typical
	- 11Mbps PER @ -80 dBm, typical
Receive Sensitivity (11g) @10% PER	- 6Mbps PER @ -80 dBm, typical
	- 9Mbps PER @ -80 dBm, typical
	- 12Mbps PER @ -78 dBm, typical
	- 18Mbps PER @ -76 dBm, typical
	- 24Mbps PER @ -74 dBm, typical
	- 36Mbps PER @ -71 dBm, typical
	- 48Mbps PER @ -69 dBm, typical
	- 54Mbps PER @ -67 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -84 dBm, typical
	- MCS=1 PER @ -80 dBm, typical
	- MCS=2 PER @ -79 dBm, typical
	- MCS=3 PER @ -75 dBm, typical
	- MCS=4 PER @ -72 dBm, typical
	- MCS=5 PER @ -70 dBm, typical
	- MCS=6 PER @ -67 dBm, typical
	- MCS=7 PER @ -66 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -84 dBm, typical
	- MCS=1 PER @ -80 dBm, typical
	- MCS=2 PER @ -79 dBm, typical
	- MCS=3 PER @ -75 dBm, typical
	- MCS=4 PER @ -71 dBm, typical
	- MCS=5 PER @ -67 dBm, typical
	- MCS=6 PER @ -65 dBm, typical

	- MCS=7 PER @ -64 dBm, typical
Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0 PER @ -86 dBm, typical
	- MCS=1 PER @ -83 dBm, typical
	- MCS=2 PER @ -82 dBm, typical
	- MCS=3 PER @ -78 dBm, typical
	- MCS=4 PER @ -75 dBm, typical
	- MCS=5 PER @ -71 dBm, typical
	- MCS=6 PER @ -69 dBm, typical
	- MCS=7 PER @ -68 dBm, typical
	- MCS=8 PER @ -63 dBm, typical
Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0 PER @ -84 dBm, typical
	- MCS=1 PER @ -81 dBm, typical
	- MCS=2 PER @ -79 dBm, typical
	- MCS=3 PER @ -76 dBm, typical
	- MCS=4 PER @ -73 dBm, typical
	- MCS=5 PER @ -68 dBm, typical
	- MCS=6 PER @ -67 dBm, typical
	- MCS=7 PER @ -65 dBm, typical
	- MCS=8 PER @ -61 dBm, typical
	- MCS=9 PER @ -60 dBm, typical

4.2 5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/b/g/n/ac, Wi-Fi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz: Please see the table ¹
Modulation	802.11a/n : 64-QAM, 16-QAM, QPSK, BPSK 802.11ac : 256-QAM, 64-QAM, 16-QAM, QPSK, BPSK
Output Power	802.11a /64-QAM(R=3/4) : 14 dBm ± 1.5 dB @ EVM ≤ -25dB
	802.11n /64-QAM(R=5/6) : 13 dBm ± 1.5 dB @ EVM ≤ -28dB
	802.11ac/256-QAM(R=3/4) : 12 dBm ± 1.5 dB @ EVM ≤ -30dB
	802.11ac/256-QAM(R=5/6) : 11 dBm ± 1.5 dB @ EVM ≤ -32dB
Receive Sensitivity (11a, 20MHz) @10% PER	- 6Mbps PER @ -85 dBm, typical
	- 9Mbps PER @ -83 dBm, typical
	- 12Mbps PER @ -82 dBm, typical

	- 18Mbps PER @ -80 dBm, typical
	- 24Mbps PER @ -76 dBm, typical
	- 36Mbps PER @ -73 dBm, typical
	- 48Mbps PER @ -68 dBm, typical
	- 54Mbps PER @ -67 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -85 dBm, typical
	- MCS=1 PER @ -83 dBm, typical
	- MCS=2 PER @ -80 dBm, typical
	- MCS=3 PER @ -77 dBm, typical
	- MCS=4 PER @ -73 dBm, typical
	- MCS=5 PER @ -69 dBm, typical
	- MCS=6 PER @ -67 dBm, typical
	- MCS=7 PER @ -66 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -83 dBm, typical
	- MCS=1 PER @ -80 dBm, typical
	- MCS=2 PER @ -78 dBm, typical
	- MCS=3 PER @ -75 dBm, typical
	- MCS=4 PER @ -72 dBm, typical
	- MCS=5 PER @ -67 dBm, typical
	- MCS=6 PER @ -66 dBm, typical
	- MCS=7 PER @ -64 dBm, typical
Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0 PER @ -86 dBm, typical
	- MCS=1 PER @ -84 dBm, typical
	- MCS=2 PER @ -81 dBm, typical
	- MCS=3 PER @ -77 dBm, typical
	- MCS=4 PER @ -74 dBm, typical
	- MCS=5 PER @ -70 dBm, typical
	- MCS=6 PER @ -68 dBm, typical
	- MCS=7 PER @ -67 dBm, typical
	- MCS=8 PER @ -63 dBm, typical
Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0 PER @ -83 dBm, typical
	- MCS=1 PER @ -79 dBm, typical
	- MCS=2 PER @ -77 dBm, typical
	- MCS=3 PER @ -74 dBm, typical
	- MCS=4 PER @ -71 dBm, typical
	- MCS=5 PER @ -66 dBm, typical
	- MCS=6 PER @ -64 dBm, typical

Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=7 PER @ -62 dBm, typical
	- MCS=8 PER @ -60 dBm, typical
	- MCS=9 PER @ -59 dBm, typical
	- MCS=0 PER @ -80 dBm, typical
	- MCS=1 PER @ -77 dBm, typical
	- MCS=2 PER @ -75 dBm, typical
	- MCS=3 PER @ -71 dBm, typical
	- MCS=4 PER @ -68 dBm, typical
	- MCS=5 PER @ -66 dBm, typical
	- MCS=6 PER @ -62 dBm, typical
	- MCS=7 PER @ -60 dBm, typical
	- MCS=8 PER @ -57 dBm, typical
	- MCS=9 PER @ -56 dBm, typical

¹5GHz Channel table

Band (GHz)	Operating Channel Numbers	Channel center frequencies(MHz)
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320
5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5.725GHz~5.825GHz	140	5700
	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

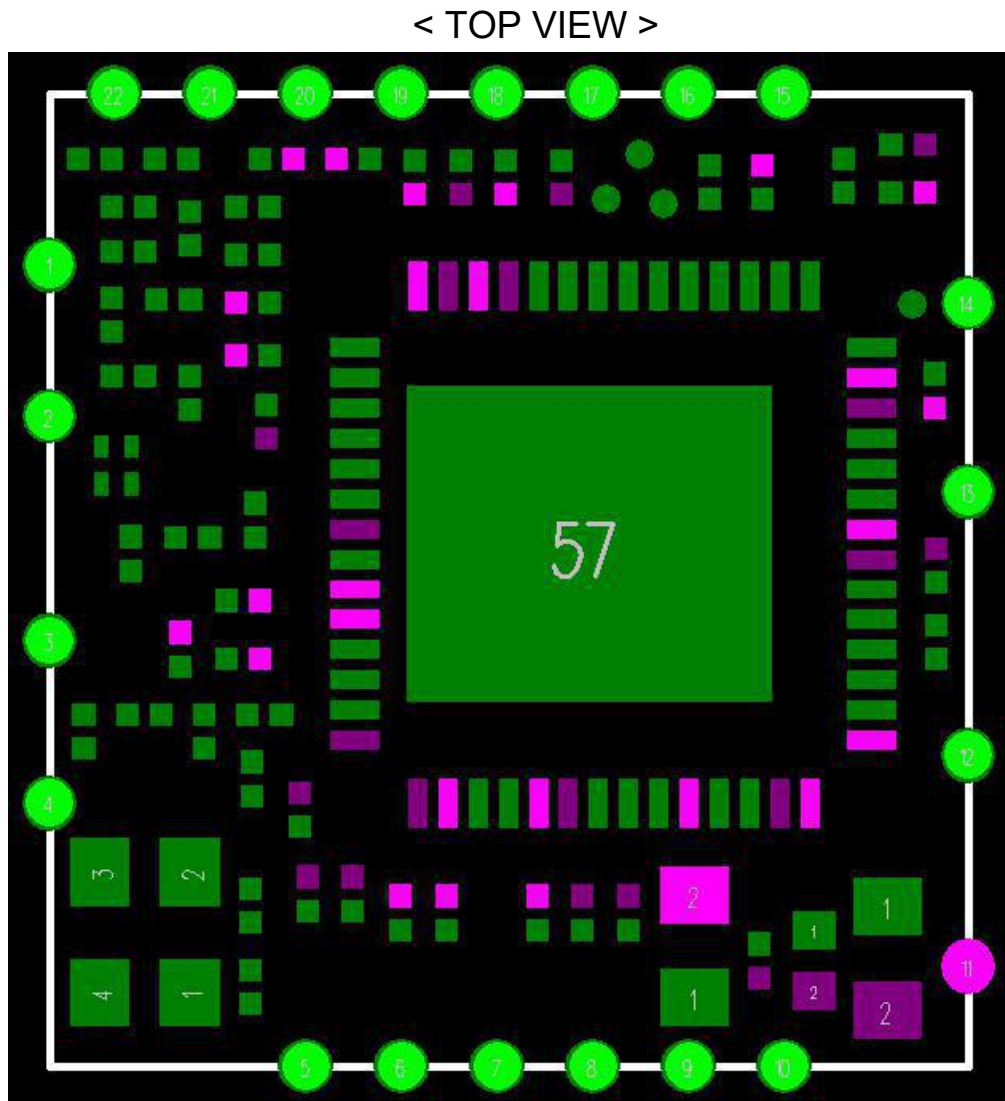
5. Bluetooth Specification

5.1 Bluetooth Specification

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V4.2 of 1, 2 and 3 Mbps.		
Host Interface	USB		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	79 channels		
Modulation	FHSS, GFSK, DPSK, DQPSK		
RF Specification			
	Min.	Typical.	Max.
Output Power (Class 1.5)		8 dBm	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-88 dBm	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-88 dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-81 dBm	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

6. Pin Assignments

6.1 Pin Outline



6.2 Pin Definition

NO	Name	Description
1	GND	Ground connections
2	WL_BT_ANT	5G WIFI AND BT ANT
3	WL_ANT	2.4G WIFI ANT
4	GND	Ground connections

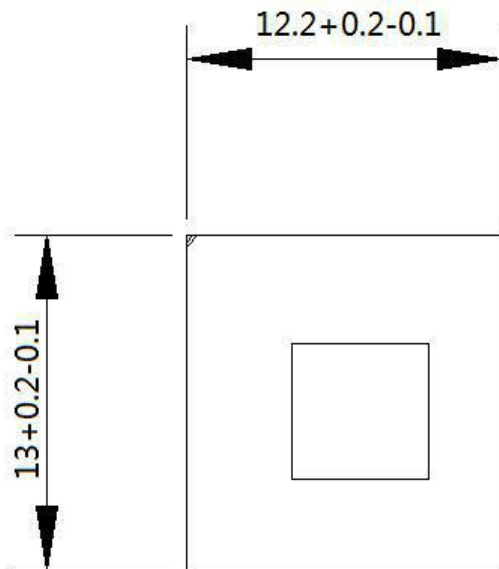
5	NC	Floating (Don't connected to ground)
6	NC	Floating (Don't connected to ground)
7	NC	Floating (Don't connected to ground)
8	NC	Floating (Don't connected to ground)
9	BT_WAKE_HOST	Bluetooth device to wake-up HOST
10	HOST_WAKE_BT	HOST to wake-up Bluetooth device
11	VDD33	3.3V POWER INPUT
12	D-	USB DATA DM
13	D+	USB DATA DP
14	GND	Ground connections
15	GPIO1	3DD_SYNC GPIO
16	WL_DIS	WIFI DISABLE
17	BT_DIS	Bluetooth DISABLE
18	CHIP_EN	CHIP ENABLE
19	HOST_WAKE_WL	HOST to wake-up WIFI device
20	WL_WAKE_HOST	WIFI device to wake-up HOST
21	GPIO2	WPS GPIO
22	GPIO8	LED GPIO

7. Dimensions

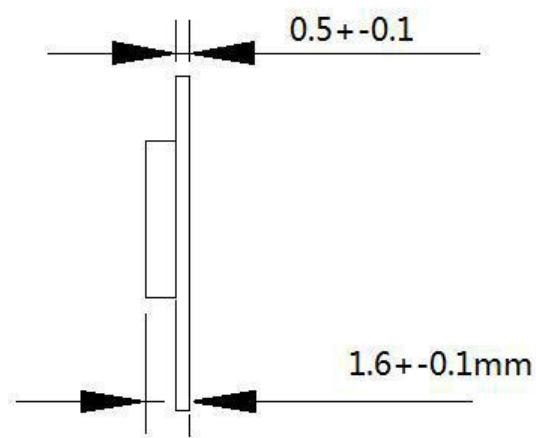
7.1 Physical Dimensions

(Unit: mm)

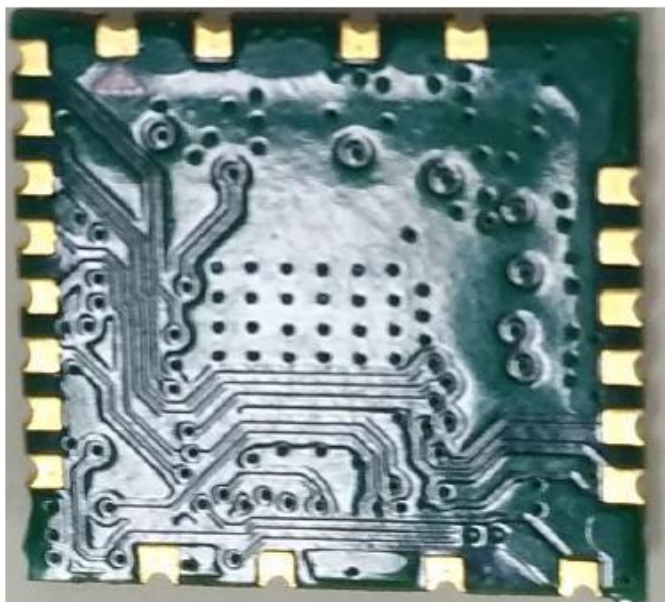
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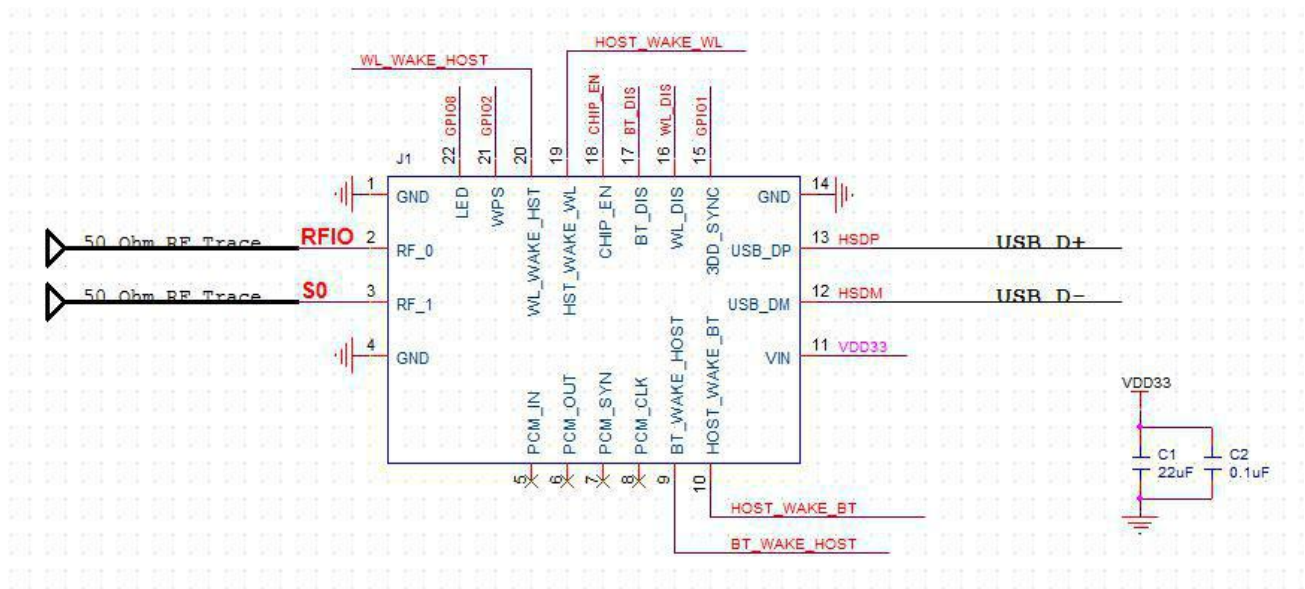
< Side View >



Module Photo



8. Reference Design



9.The Key Material List

1	DPX	Diplexer 2G&5GHz 50 OHM (Murata)
2	主 IC	IC RF SOC RTL8821CU MQFN56 (Realtek)
3	SMD 晶振	2520,40MHZ,15PF,10ppm (希华, TXC, 晶宝)
4	PCB	6221E-UUC V1.0 (顺络, 博敏, 利尔)
5	SMD 电感	2.2 uH, L0603 (顺络, murata, 麦捷微)

10. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<250^{\circ}\text{C}$

Number of Times : ≤ 2 times

