

**CDW-47822CS-22****WiFi 11ac + BT5.0 Module Spec****Software:**

客 户 Customer	客户承认 Approve (请盖印章)	日 期 Date

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更改记录:

Reversion History:

版本 Version	日期 Date	更改内容 Modification
1.0	2019.01.19	First release
1.1	2019.03.11	增加实物图
1.2	200.02.20	增加屏蔽盖，升级实物图
1.3	200.07.20	升级实物图屏蔽盖镭雕丝印

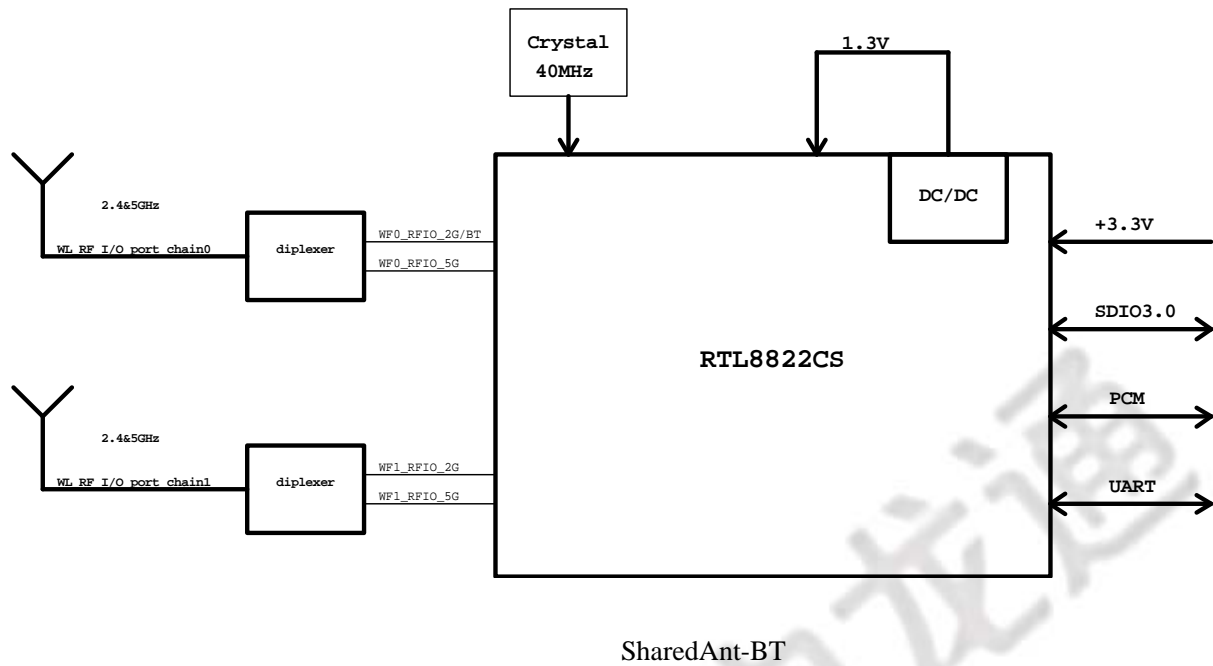
## 1. Overview

The 47822CS-22 is based on RTL8822CS , Complied with IEEE 802.11a/b/g/n/ac 2T2R SDIO3.0 WLAN controller. It combines a WLAN MAC, a 2T2R capable WLAN baseband, BT Protocol Stack (LM, LL, and LE), BT Baseband, modem, and WLAN/BT RF in a single chip. The RTL8822CS provides a complete solution for a high throughput performance intergrated wireless LAN and Bluetooth device.

## 2. Features

- Supports 802.11ac 2x2, Wave-2 compliant with MU-MIMO
- 802.11a/b/g/n/ac Draft 3.0 2T2R WLAN and Bluetooth single module
- Complies with SDIO3.0 for WLAN and UART/PCM interface for BT controller
- Support WLAN 2.4GHz and 5GHz band channels
- Support WLAN 20MHz, 40MHz and 80MHz bandwidth transmission
- WLAN maximum PHY data rate 54Mbps in 802.11a/g; and 300Mbps in 802.11n; and 867Mbps in 802.11ac
- Supports Bluetooth Low Energy
- Supports Bluetooth 5.0 LE Secure Connection by upper layer software upgrade

### 3. Block Diagram



### 4. General Specification

Model	CDW-47822CS-22
Product Name	WLAN 11a/b/g/n/ac SDIO3.0 2T2R + Bluetooth 5.0 module
Major Chipset	RTL8822CS-VS-CG
Standard	802.11a/b/g/n/ac
Modulation Method	BPSK/ QPSK/ 16-QAM/ 64-QAM/256-QAM
Frequency Band	2.4GHz and 5GHz ISM Band
WiFi Interface	SDIO3.0
BT Interface	UART
Operating Temperature	-20° C ~ 70° C
Storage Temperature	-40° C ~ 85° C
Humidity	5% to 90% maximum
Dimension	15x13x1.8 (LxWxH) ±0.3mm

## 5. Electrical Characteristics

### 5.1 WiFi Section:

#### A. 2.4GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/b/g/n/ac WiFi compliant
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz : Ch1 ~ Ch14
Modulation	802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM, 16-QAM, QPSK, BPSK
Output Power	802.11b /1Mbps : 18dBm ± 1.5 dB @ EVM ≤ -15dB 802.11b /11Mbps : 17dBm ± 1.5 dB @ EVM ≤ -15dB
	802.11g /6Mbps : 17 dBm ± 1.5 dB @ EVM ≤ -5dB 802.11g /54Mbps : 15 dBm ± 1.5 dB @ EVM ≤ -28dB
	802.11n HT20 /MCS0 : 17 dBm ± 1.5 dB @ EVM ≤ -5dB 802.11n HT20/MCS7 : 14 dBm ± 1.5 dB @ EVM ≤ -30dB
	802.11n HT40 /MCS0 : 17 dBm ± 1.5 dB @ EVM ≤ -5dB 802.11n HT40/MCS7 : 14 dBm ± 1.5 dB @ EVM ≤ -30dB
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -93 dBm, typical
	- 2Mbps PER @ -91 dBm, typical
	- 5.5Mbps PER @ -88 dBm, typical
	- 11Mbps PER @ -86 dBm, typical
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -90 dBm, typical
	- 9Mbps PER @ -89 dBm, typical
	- 12Mbps PER @ -88 dBm, typical
	- 18Mbps PER @ -85 dBm, typical
	- 24Mbps PER @ -82 dBm, typical
	- 36Mbps PER @ -79 dBm, typical
	- 48Mbps PER @ -74 dBm, typical
- 54Mbps PER @ -72 dBm, typical	
Receive Sensitivity	- MCS=0 PER @ -90 dBm, typical
	- MCS=1 PER @ -87 dBm, typical
	- MCS=2 PER @ -85 dBm, typical
	- MCS=3 PER @ -81 dBm, typical
	- MCS=4 PER @ -78 dBm, typical

(11n,20MHz) @10% PER	- MCS=5 PER @ -73 dBm, typical
	- MCS=6 PER @ -72 dBm, typical
	- MCS=7 PER @ -70 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -87 dBm, typical
	- MCS=1 PER @ -84 dBm, typical
	- MCS=2 PER @ -82 dBm, typical
	- MCS=3 PER @ -79 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	
Maximum Input Level	802.11b : -10 dBm
	802.11g/n : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

## B. 5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac 2x2, WiFi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz : Please see the table
Modulation	802.11a : OFDM /64-QAM, 16-QAM, QPSK, BPSK 802.11n : OFDM /64-QAM, 16-QAM, QPSK, BPSK 802.11ac : OFDM /256-QAM
Output Power	802.11a /6Mbps : 17 dBm ± 1.5dB @ EVM ≤ -5dB 802.11a /54Mbps : 15 dBm ± 1.5dB @ EVM ≤ -25dB 802.11n HT20 /MCS0 : 17 dBm ± 1.5 dB @ EVM ≤ -5dB 802.11n HT20 /MCS7 : 14 dBm ± 1.5 dB @ EVM ≤ -28dB 802.11n HT40 /MCS0 : 17 dBm ± 1.5 dB @ EVM ≤ -5dB 802.11n HT40 /MCS7 : 14 dBm ± 1.5 dB @ EVM ≤ -28dB 802.11ac VHT20 /MCS0 : 17 dBm ± 1.5 dB @ EVM ≤ -5dB 802.11ac VHT20 /MCS8 : 14 dBm ± 1.5 dB @ EVM ≤ -30dB 802.11ac VHT40 /MCS0 : 16dBm ± 1.5 dB @ EVM ≤ -5dB 802.11ac VHT40 /MCS9 : 13dBm ± 1.5 dB @ EVM ≤ -32dB 802.11ac VHT80 /MCS0 : 16 dBm ± 1.5 dB @ EVM ≤ -32dB 802.11ac VHT80 /MCS9 : 13 dBm ± 1.5 dB @ EVM ≤ -32dB

Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -89 dBm, typical
	- 9Mbps PER @ -88 dBm, typical
	- 12Mbps PER @ -87 dBm, typical
	- 18Mbps PER @ -84 dBm, typical
	- 24Mbps PER @ -81 dBm, typical
	- 36Mbps PER @ -78 dBm, typical
	- 48Mbps PER @ -73 dBm, typical
	- 54Mbps PER @ -72 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -89 dBm, typical
	- MCS=1 PER @ -86 dBm, typical
	- MCS=2 PER @ -84 dBm, typical
	- MCS=3 PER @ -81 dBm, typical
	- MCS=4 PER @ -77 dBm, typical
	- MCS=5 PER @ -72 dBm, typical
	- MCS=6 PER @ -71 dBm, typical
	- MCS=7 PER @ -68 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -86 dBm, typical
	- MCS=1 PER @ -83 dBm, typical
	- MCS=2 PER @ -81 dBm, typical
	- MCS=3 PER @ -78 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
Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0, NSS1 PER @ -87 dBm, typical
	- MCS=1, NSS1 PER @ -85 dBm, typical
	- MCS=2, NSS1 PER @ -83 dBm, typical
	- MCS=3, NSS1 PER @ -80 dBm, typical
	- MCS=4, NSS1 PER @ -76 dBm, typical
	- MCS=5, NSS1 PER @ -71 dBm, typical
	- MCS=6, NSS1 PER @ -70 dBm, typical
	- MCS=7, NSS1 PER @ -69 dBm, typical
	- MCS=8, NSS1 PER @ -65 dBm, typical
	- MCS=0, NSS1 PER @ -85 dBm, typical
- MCS=1, NSS1 PER @ -82 dBm, typical	
- MCS=2, NSS1 PER @ -80 dBm, typical	

Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=3, NSS1 PER @ -77 dBm, typical
	- MCS=4, NSS1 PER @ -74 dBm, typical
	- MCS=5, NSS1 PER @ -69 dBm, typical
	- MCS=6, NSS1 PER @ -68 dBm, typical
	- MCS=7, NSS1 PER @ -67 dBm, typical
	- MCS=8, NSS1 PER @ -62 dBm, typical
	- MCS=9, NSS1 PER @ -58 dBm, typical
Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=0, NSS1 PER @ -82 dBm, typical
	- MCS=1, NSS1 PER @ -79 dBm, typical
	- MCS=2, NSS1 PER @ -77 dBm, typical
	- MCS=3, NSS1 PER @ -73 dBm, typical
	- MCS=4, NSS1 PER @ -70 dBm, typical
	- MCS=5, NSS1 PER @ -67 dBm, typical
	- MCS=6, NSS1 PER @ -65 dBm, typical
	- MCS=7, NSS1 PER @ -63 dBm, typical
	- MCS=8, NSS1 PER @ -59 dBm, typical
	- MCS=9, NSS1 PER @ -55 dBm, typical
Maximum Input Level	802.11a/n/ac : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain



## 5.2 5GHz(20MHz) 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
	140	5700
5.725GHz~5.825GHz	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

## 5.3 Bluetooth Section:

Feature	Description		
<b>General Specification</b>			
Bluetooth Standard	Bluetooth V5.0 of 1, 2 and 3 Mbps.		
Host Interface	UART		
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		
<b>RF Specification</b>			
	<b>Min.</b>	<b>Typical.</b>	<b>Max.</b>
Output Power (Class 1.5)		10 dBm	
Output Power (Class 2)		2 dBm	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-89 dBm	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-86 dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-83 dBm	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

## 6. Electrical Characteristics

### A. Power requirements

symbol	Parameter	Minimum	Typical	Maximum	Units
VCC	3.3V supply voltage	3.135	3.3	3.465	V
VDDIO	I/O supply voltage	1.71	1.8 or 3.3	3.46	V
Current	3.3V rating current	--	--	1000	mA

### B. Power Consumption

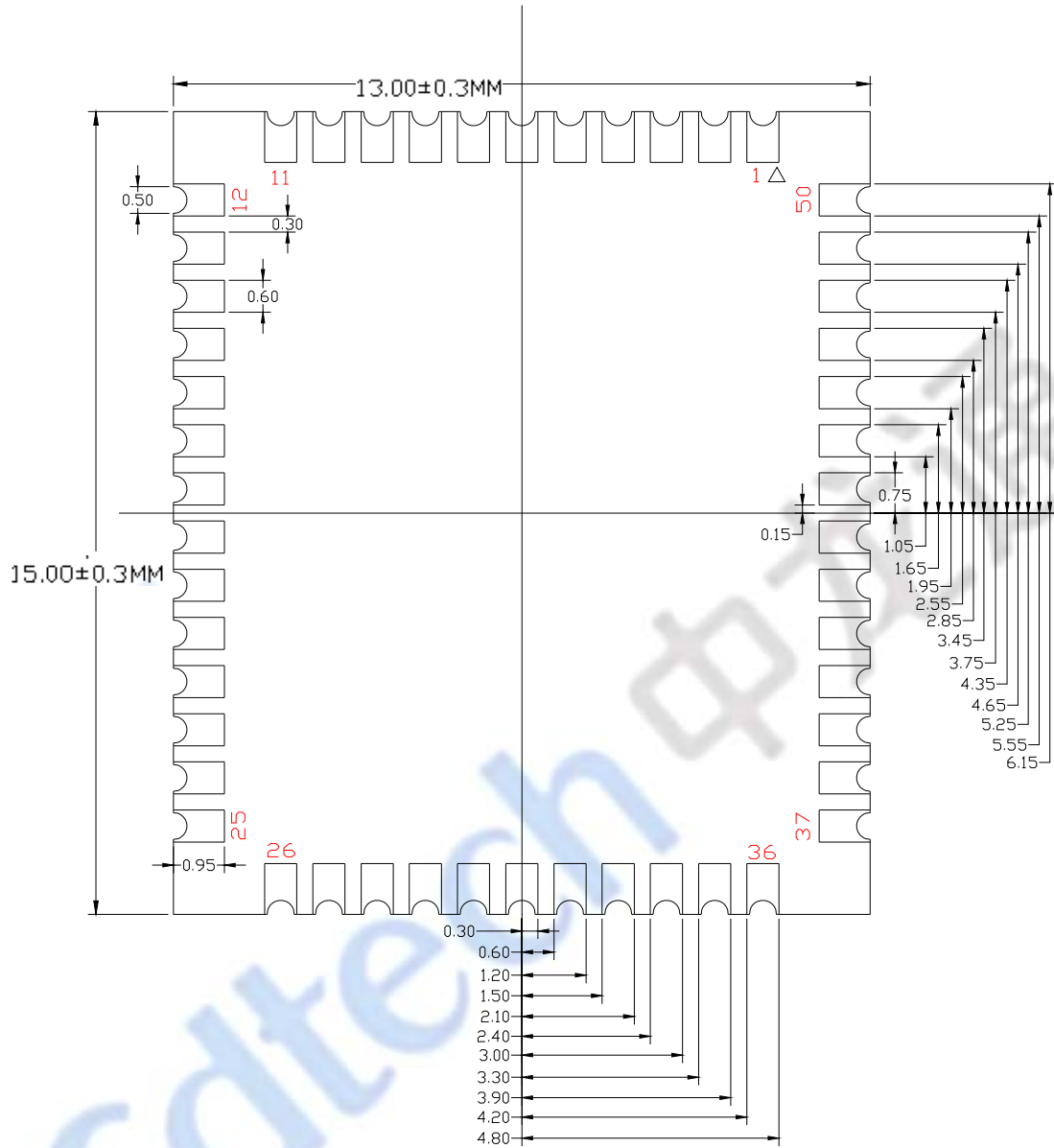
\*Note1 : Measurement duration condition by 10 sec

\*Note2: SD\_CLK=200Mhz

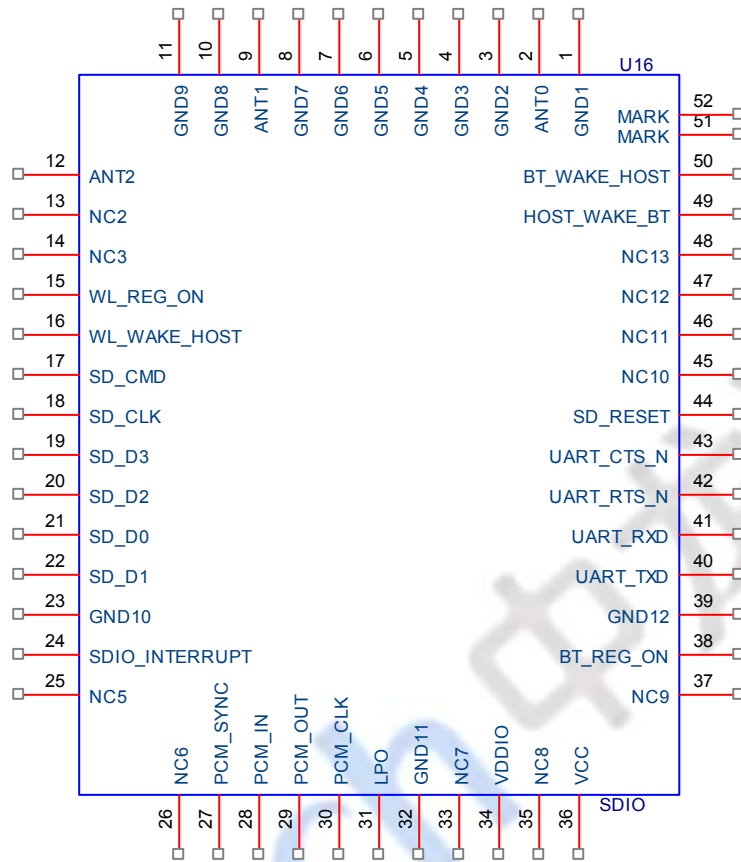
\*Note3: Non-Associated idle Scan Period=1 min

(Unit : mA @ 3.3V)			BT			
WLAN <sup>*Note1</sup>			Disable	Idle	FTP TX	FTP RX
Non-Associated idle			13.8			
Associated idle	DTIM=1	5GHz	4		--	--
		2.4GHz	6		--	--
WoWLAN	DTIM=1	5GHz	2.7			
		2.4GHz	4.8			
Radio off			NA		--	--
Disable			1.1		--	--
		Throughput (Mbps)				
Transmit@VHT80,11ac		514	562		--	--
Receive@VHT80,11ac		550	312		--	--
Transmit@VHT40,11ac		270	570		--	--
Receive@VHT40,11ac		250	248		--	--
Transmit@VHT20,11ac		129	589		--	--
Receive@VHT20,11ac		127	210		--	--
Transmit@HT40,11n		214	615		--	--
Receive@HT40,11n		220	235		--	--
Transmit@HT20,11n		110	578		--	--
Receive@HT20,11n		107	187		--	--
Transmit@54M (g mode)		29	322		--	--
Receive@54M,11n (g mode)		26	192		--	--
Transmit@11M,11n (b mode)		5	328		--	--
Receive@11M,11n (b mode)		5	220		--	--

## 7. Footprint Dimension



## 8. Pin Description

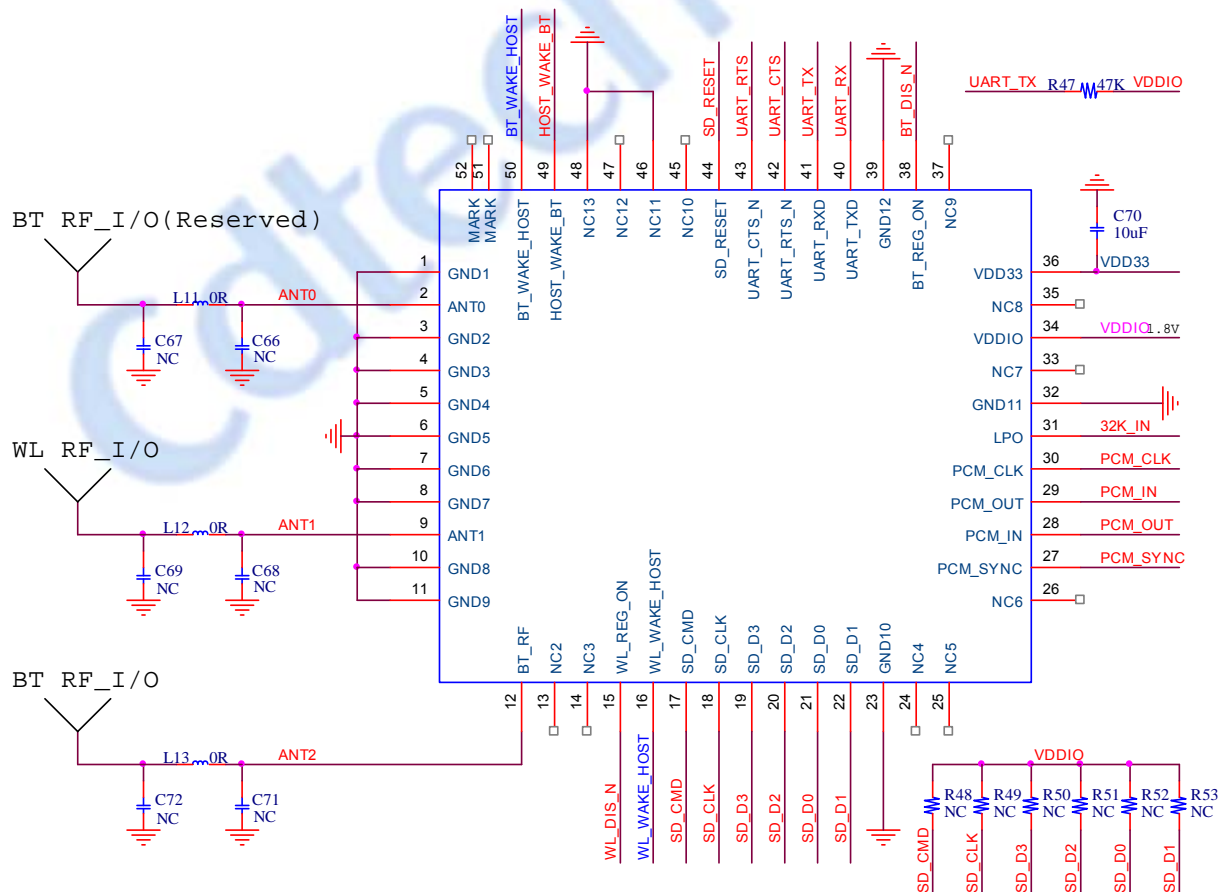


NO.	Name	Type	Description
1	GND	—	Ground connections
2	ANT0	I/O	WL_RF I/O port chain0
3	GND	—	Ground connections
4	GND	—	Ground connections
5	GND	—	Ground connections
6	GND	—	Ground connections
7	GND	—	Ground connections
8	GND	—	Ground connections
9	ANT1	I/O	WL_RF I/O port chain1

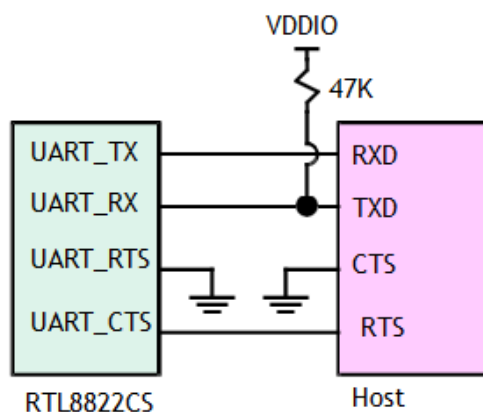
10	GND	—	Ground connections
11	GND	—	Ground connections
12	ANT2	I/O	NC
13	GND	—	Ground connections
14	NC	—	No connect
15	WL_REG_ON	I	WL_EN(GPIO15)
16	WL_WAKE_HOST	O	WLAN wake host (GPIO10)
17	SDIO_CMD	I/O	SDIO command line
18	SDIO_CLK	I/O	SDIO CLK
19	SDIO_DATA_3	I/O	SDIO DATA3
20	SDIO_DATA_2	I/O	SDIO DATA2
21	SDIO_DATA_0	I/O	SDIO DATA0
22	SDIO_DATA_1	I/O	SDIO DATA1
23	GND	—	Ground connections
24	SDIO_INTERRUPT	I	SDIO interrupt signal (GPIO10)
25	NC	—	No connect
26	NC	—	No connect
27	PCM_SYNC	I/O	PCM sync signal
28	PCM_IN	I	PCM DATA INPUT
29	PCM_OUT	I	PCM DATA OUTPUT
30	PCM_CLK	I/O	PCM CLK
31	LPO	—	No connect
32	GND	—	Ground connections
33	NC	—	No connect
34	VDDIO	P	I/O Voltage supply input 1.8V or 3.3V
35	NC	—	No connect
36	VCC	P	3.3V INPUT
37	NC	—	No connect
38	BT_REG_ON	—	BT_EN(GPIO11)

39	GND	—	Ground connections
40	UART_TXD	O	Bluetooth UART interface
41	UART_RXD	I	Bluetooth UART interface
42	UART_RTS_N	O	Bluetooth UART interface
43	UART_CTS_N	I	Bluetooth UART interface
44	SD_RESET	—	No connect
45	NC	—	No connect
46	GND	—	Ground connections
47	NC	—	No connect
48	GND	—	Ground connections
49	HOST_WAKE_BT	—	HOST_WAKE_BT(GPIO13)
50	BT_WAKE_HOST	O	BT_WAKE_HOST (GPIO14)

## 9. Schematic design guide

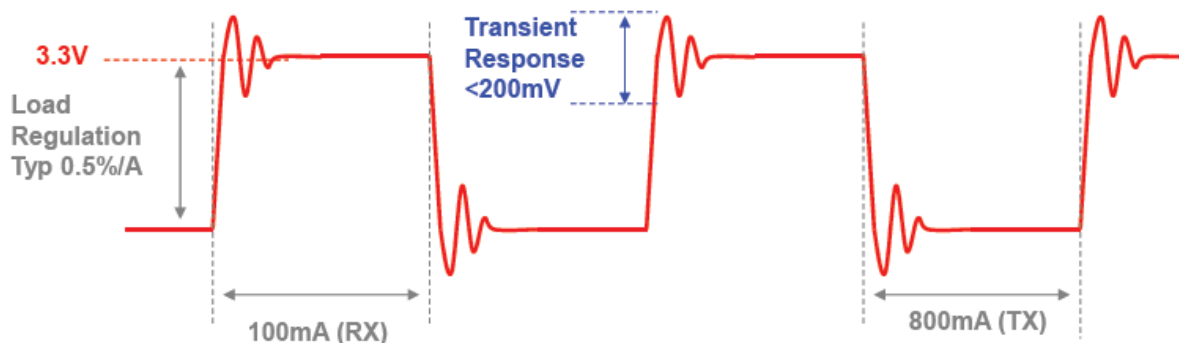


1. RF reserves C-L-C components for impedance matching fine tuning.
2. SDIO 3.0: VDDIO connects 1.8V.
3. Pull high resistance is reserved for SDIO signal line.
4. BT HCI is the UART interface, the connection is as follows, UART\_RX is recommended to add Pull High resistor.



### SCH - 3.3V Source Transient Requirements

- Module 3.3V power supply requires a dedicated voltage regulator and cannot be shared with other circuits.
- Line regulation: 0.05%, Load Regulation: 0.5%
- Transient response: Transient chopping amplitude of 100/800mA step load variation should be less than 200mVpp, and transient chopping should be stable within 3 natural frequency response periods.
- Regulator noise and stability: It is necessary to confirm that the regulator has no abnormal noise or low frequency oscillation that is difficult to observe.



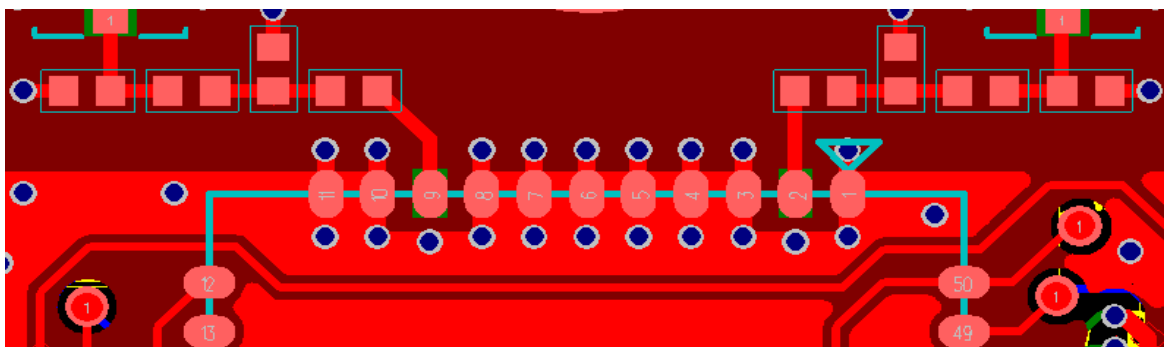


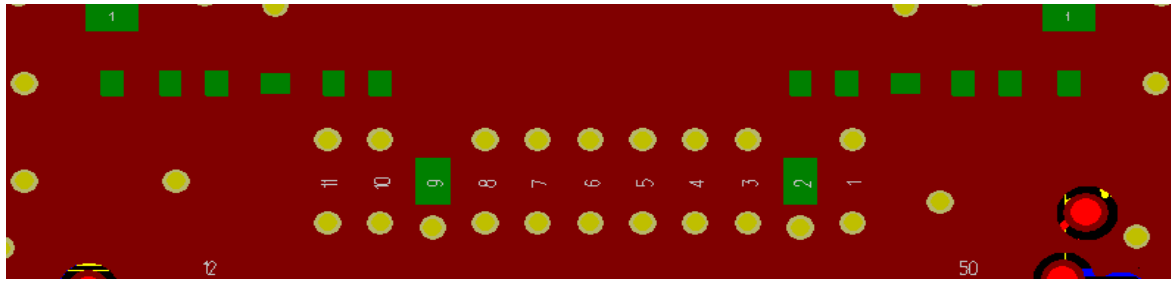
## 10.PCB design guide

- The following table provides recommendations for the layout of the 2-layer, 4-layer, and 6-layer PCBs.
- Except the 2-layer board, Layer 2 must be a full GND, providing a complete reference ground for the RF trace of Layer 1 and isolating noise from other layers.
- The characteristic impedance of the RF trace must be 50 +/- 10% ohms. Please ask the board supplier to provide a dicing report to confirm compliance.

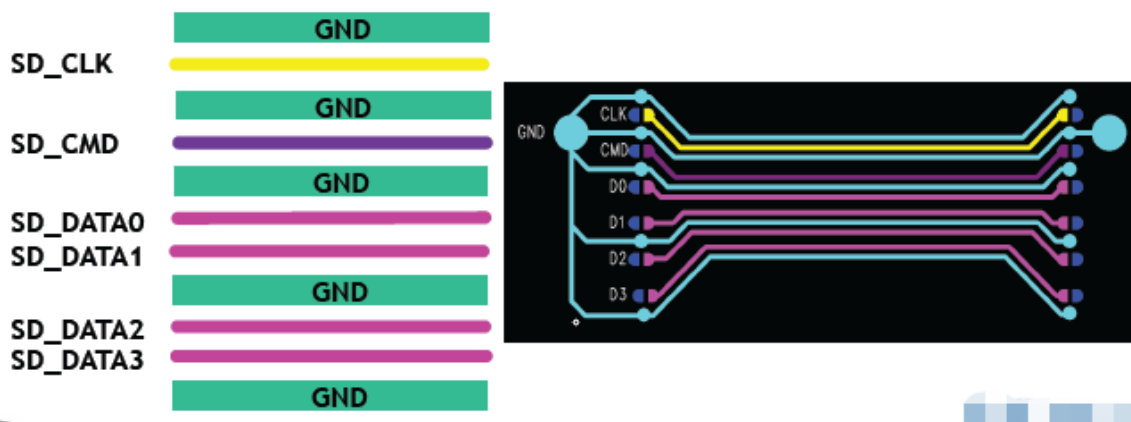
Layer	Layer 2 Design Advice	Layer 4 Design Advice	Layer 6 Design Advice
Layer 1	Component placement / RF signal routing	Component placement / RF signal routing	Component placement / RF signal routing
Layer 2	GND/Power supply	GND	GND
Layer 3	X	Power supply/signal routing	Analogy power supply/signal routing
Layer 4	X	Power supply/signal routing/GND	GND
Layer 5	X	X	Digital power supply/signal routing
Layer 6	X	X	GND

- The characteristic impedance of the RF signal traces must be 50 ohm.
- 4L PCB RF foot Pad must keep out  $\geq 10$ mil in the TOP layer, and for Pad with larger width ( $\geq 1.3$  times line width), the GND of L2 just under it must be hollowed out with equal area, as shown below.
- 2L PCB RF wire must be covered with copper foil, and the copper spacing is recommended to be 4mil or 5mil.





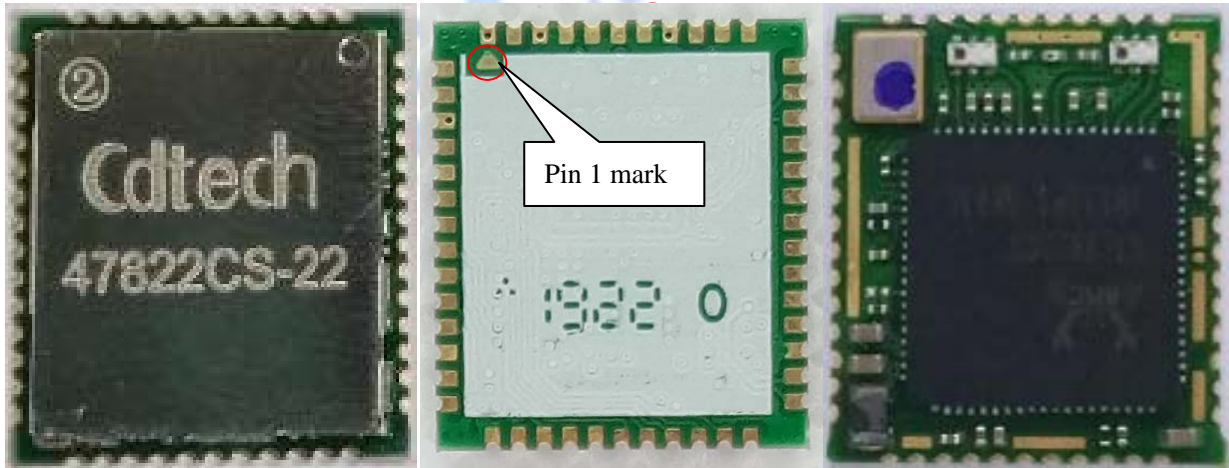
- 3.3V voltage regulator supply to the module, power supply pin routing should be as thick as possible and short circuit resistance should be as much as possible <math><0.05\text{ ohm}</math>.
- 10uF power supply capacitance must be placed close to the module pin.
- SDIO traces:
  1. Keep the characteristic impedance of SDIO traces ~50 ohm.
  2. The traces(CLK, CMD, D0~D3)difference shall be kept +/-100 mil, the total length shall be <math><2.5\text{ inches}</math>.
  3. All traces shall go along with the reference GND, and there must be no shunt stubs on those traces.
  4. There must be less than 4 via on each signal trace(CLK, CMD, D0~D3).
  5. Keep the CLK trace away from CMD and DATA traces and have it go along (better shielded) with GND track.
  6. For 2L PCB, it is better to have GND traces. The end points of both ends of this GND line must be connected directly to the GND of the module and Host.



**11. Suplier**

Secondary supplier list	
Material name	Supplier brand
Wifi IC	Realtek
Crystal	FK , TKD , JWT, TXC
PCBA	A, O, S, I
Diplexer	TDK, ACX, Walsin, GLEAD, Sunlord
Power inductance	Sunlord, CHILISIN, SAMWHA
Capacitance	SAMSUNG /EYANG
Resistance	UniOhm /YAGEO/Walsin

**12. Module Photo**

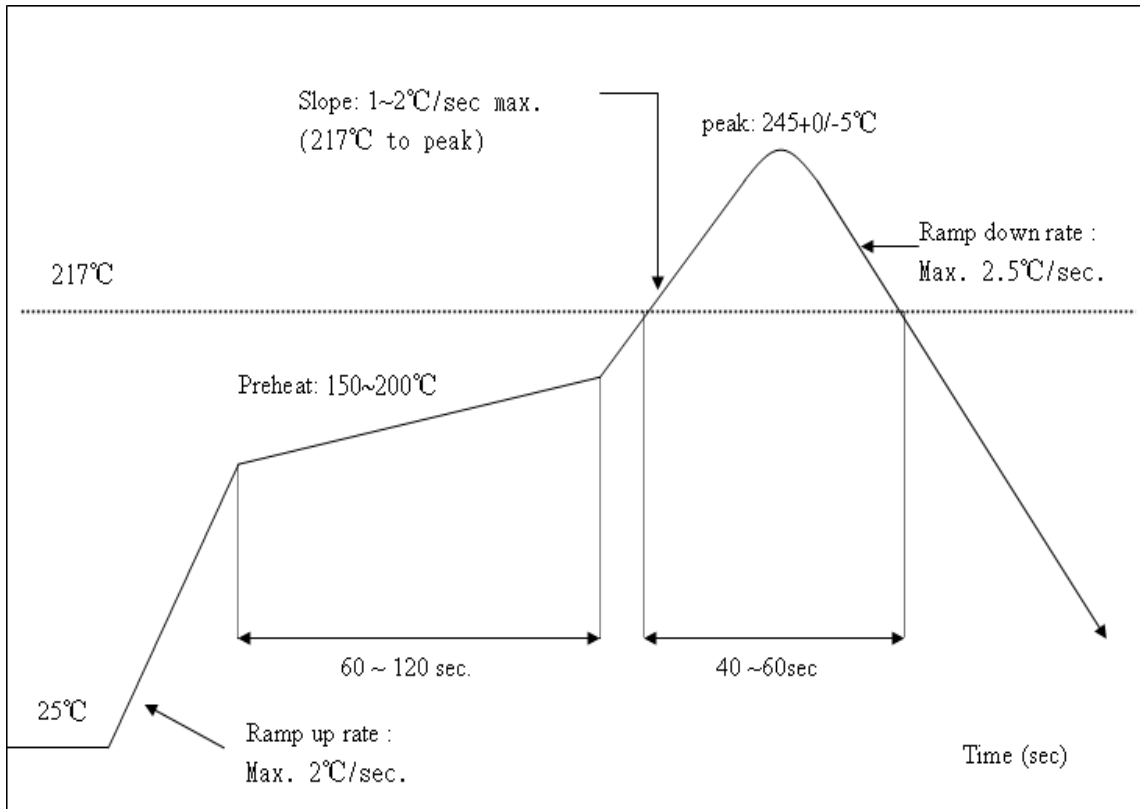


### 13. Recommended Reflow Profile

Referred IPC/JEDEC standard.

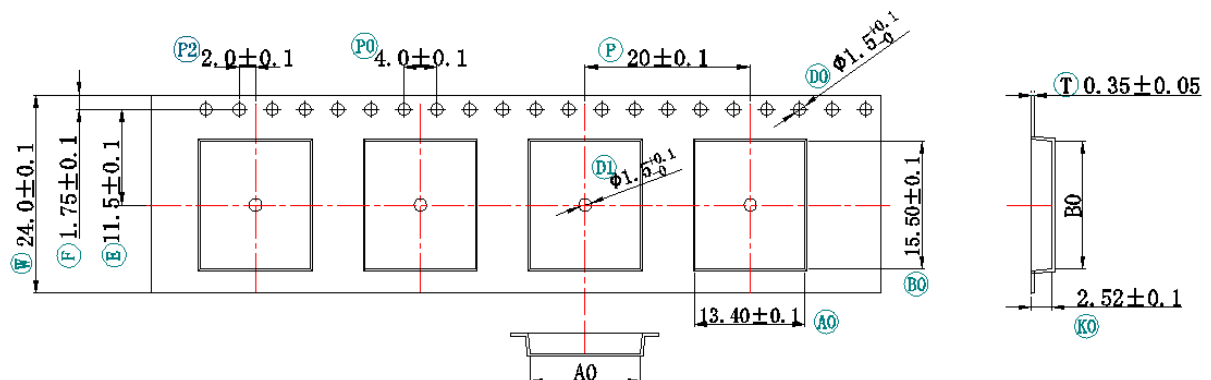
Peak Temperature : <math> < 250^{\circ}\text{C}</math>

Number of Times : 2 times

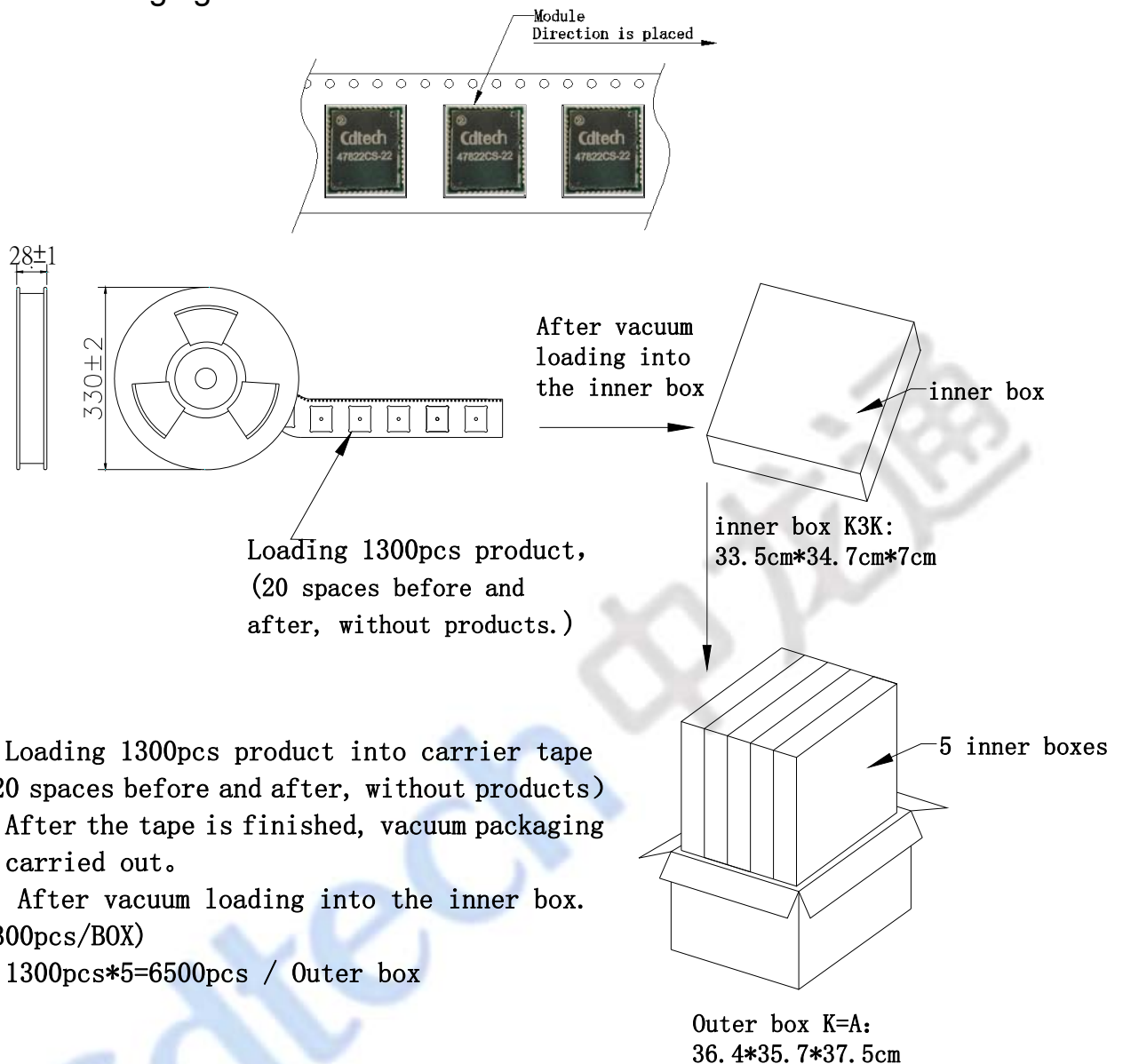


### 14. Packing information

#### 14.1 Carrier size Detail:



14.2 Packaging Detail:



- 1、 Loading 1300pcs product into carrier tape (20 spaces before and after, without products)
- 2、 After the tape is finished, vacuum packaging is carried out.
- 3、 After vacuum loading into the inner box. (1300pcs/BOX)
- 4、 1300pcs\*5=6500pcs / Outer box



**ESD CAUTION**

The 47822CS-22 is ESD (electrostatic discharge) sensitive device and may be damaged with ESD or spike voltage. Although 47822CS-22 is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.