

Technical Description

The Equipment Under Test (EUT) is a Wi-Fi and BLE enabled monitor which can be paired up with a smartphone and different pictures can be displayed on the monitor based on the operation in a mobile app. The EUT is powered by 100-240VAC 50/60Hz 0.5A adaptor.

BLE Portion

Antenna Type: Internal, integral

Antenna Gain: 3dBi

Nominal Conducted Power: -5.5dBm

Range of Peak Conducted Power: -20dBm to 8dBm

Wi-Fi Portion

Operating Mode	Nominal Power	Range of Peak Conducted Power
802.11b	14.6dBm	0dBm to 19dBm
802.11g	5.7dBm	0dBm to 19dBm
802.11n(HT20)	6.5dBm	0dBm to 19dBm
802.11n(HT40)	6.2dBm	0dBm to 19dBm

The brief circuit description is listed as follows:

1. U1-B (H618) acts as MCU
2. Y1 acts as 24MHz Oscillator for U1-B
3. U14 (GD32F103RBT6) acts as HDMI MCU
4. X2 acts as 8MHz Oscillator for U14
5. U17 (FE1. 1S-SSOP28) acts as USB Hub
6. Y2 acts as 12MHz Oscillator for U17
7. U10-B (TC358870XBG (NOK)) acts as HDMI switch
8. X3 acts as 48MHz Oscillator for U10-B
9. U3 (PS176) provides HDMI to MIPI function
10. Y3 acts as 27MHz Oscillator for U3
11. U1 (RTL8723DS) acts as RF IC
12. X1 acts as 24MHz Oscillator for U1
13. D1, L2, C14 and C15 act as antenna matching circuit.

PRODUCT SPECIFICATION

6223A-SRD

Wi-Fi Single-band 1x1 + Bluetooth 4.2

SDIO/UART Combo Module

Version:v1.7

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

Office: 14th floor, Block B, phoenix zhigu, Xixiang Street, Baoan District, Shenzhen

Factory: NO.8, Litong RD., Liuyang Economic & Technical Development Zone, Changsha, CHINA

TEL:+86-755-2955-8186

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6223A-SRD Module Datasheet

Ordering Information	Part NO.	Description
	FG6223ASRD-W7	RTL8723DS, b/g/n, Wi-Fi BLE4.2, 1T1R, 12X12mm, SDIO/UART, PCB version V2.0, with shielding,LDO type
	FG6223ASRD-W1	RTL8723DS, b/g/n, Wi-Fi+BLE4.2, 1T1R, 12X12mm, SDIO+Uart, PCB Version V2.0, no shielding,LDO type
	FG6223ASRD-W2	RTL8723DS, b/g/n, Wi-Fi+BLE4.2, 1T1R,12X12mm, SDIO+Uart , PCB version V2.0, with shielding,LDO type
	FG6223ASRD-W4	RTL8723DS, b/g/n, Wi-Fi BLE4.2, 1T1R, 12X12mm, SDIO/Uart, PCB version V2.0, with shielding,DC-DC type
	FG6223ASRD-W6	RTL8723DS, Wi-Fi b/g/n + BLE4.2,1T1R, Dual Ant, 12X12mm,SDIO+Uart,with shield cover, LDO type,PCB V5.0

Target power:

2.4G: 17/14/13

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1. General Description

1.1 Introduction

6223A-SRD is a small size and low profile of Wi-Fi + BT Combo module with LGA (Land-Grid Array) footprint, board size is 12*12mm. It can be easily manufactured on SMT process and highly suitable for tablet PC, ultra book, mobile device and consumer products. It provides SDIO interface for Wi-Fi to connect with host processor and high speed UART interface for BT. It also has a PCM interface for audio data transmission with direct link to external audio codec via BT controller. The Wi-Fi throughput can go up to 150Mbps in theory by using 1x1 802.11n b/g/n SISO technology and Bluetooth can support BT2.1 and BT4.2.

6223A-SRD uses highly integrated Wi-Fi/BT single chip based on advanced COMS process. integrates whole Wi-Fi/BT function blocks into a chip, such as SDIO/UART, MAC, BB, AFE, RFE, PA, EEPROM and LDO/SWR, except fewer passive components remained on PCB.

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.

1.2 Description

Model Name	6223A-SRD
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W : 12 x 12 mm
Wi-Fi Interface	Support SDIO V2.0
BT Interface	UART / PCM
OS supported	Android /Linux/ Win CE /iOS /XP/WIN7/WIN10
Operating temperature	-10°C to 70°C
Storage temperature	-40°C to 85°C

2. Features

General

- Compatible with Bluetooth 2.1+EDR and V4.2 systems
- Enterprise level security which can apply WPA/WPA2 certification for Wi-Fi.

PHY Features

- Operate at ISM frequency bands (2.4GHz)
- IEEE standards support: IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i
- Wi-Fi 1 transmitter and 1 receiver allow data rates supporting up to 150 Mbps downstream and 150 Mbps upstream PHY rates

Host Interface

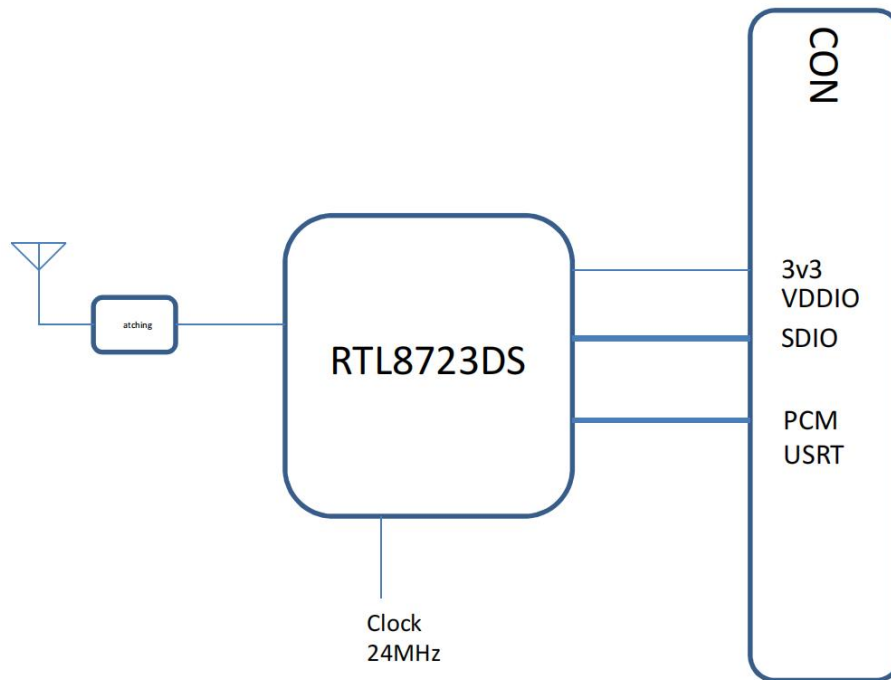
- SDIO for Wi-Fi and UART for Bluetooth
- PCM interface for audio data transmission via BT controller

Bluetooth Features

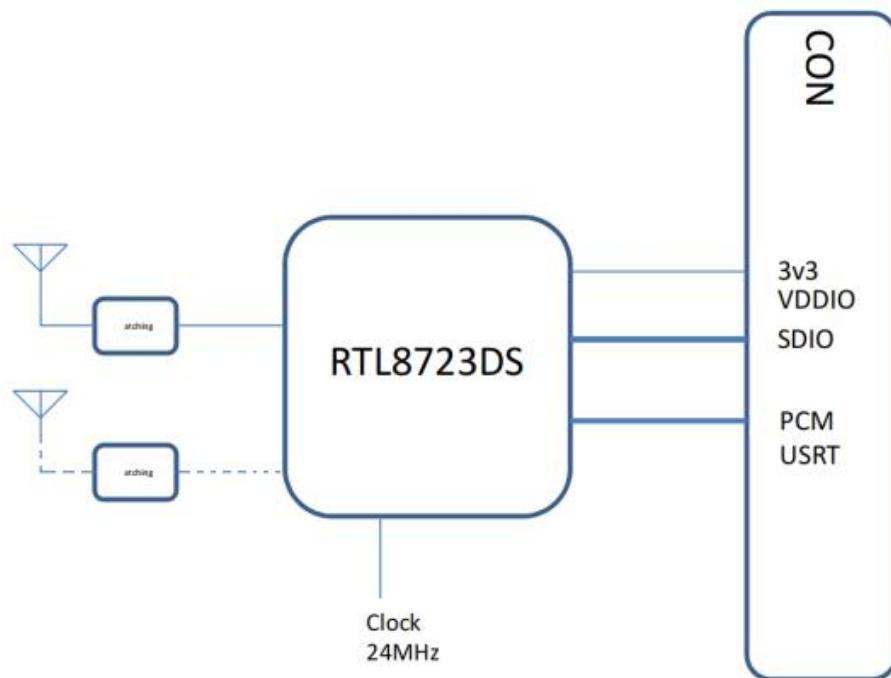
- Support Bluetooth 4.0 Dual mode
- Full-speed Bluetooth operation with Piconet and Scatternet support

3. Block Diagram

Single antenna type



Dual antenna type



4. General Specification

4.1 WI-FI Specification

Feature	Description		
WLAN Standard	IEEE 802.11 b/g/n Wi-Fi compliant		
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)		
Number of Channels	2.4GHz: Ch1 ~ Ch14		
Test Items	Typical Value		EVM
Output Power	802.11b /11Mbps : 17dBm $\pm$ 2 dB		EVM $\leq$ -10dB
	802.11g /54Mbps : 14dBm $\pm$ 2 dB		EVM $\leq$ -25dB
	802.11n /MCS7 : 13dBm $\pm$ 2 dB		EVM $\leq$ -28dB
Spectrum Mask	Meet with IEEE standard		
Freq. Tolerance	$\pm$ 20ppm		
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -91 dBm		$\leq$ -83
	- 2Mbps PER @ -89 dBm		$\leq$ -80
	- 5.5Mbps PER @ -86 dBm		$\leq$ -79
	- 11Mbps PER @ -84 dBm		$\leq$ -76
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -87 dBm		$\leq$ -85
	- 9Mbps PER @ -86 dBm		$\leq$ -84
	- 12Mbps PER @ -84 dBm		$\leq$ -82
	- 18Mbps PER @ -82 dBm		$\leq$ -80
	- 24Mbps PER @ -79 dBm		$\leq$ -77
	- 36Mbps PER @ -75 dBm		$\leq$ -73
	- 48Mbps PER @ -71 dBm		$\leq$ -69
	- 54Mbps PER @ -70 dBm		$\leq$ -68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -87 dBm		$\leq$ -85
	- MCS=1 PER @ -84 dBm		$\leq$ -82
	- MCS=2 PER @ -82 dBm		$\leq$ -80
	- MCS=3 PER @ -79 dBm		$\leq$ -77
	- MCS=4 PER @ -75 dBm		$\leq$ -73
	- MCS=5 PER @ -71 dBm		$\leq$ -69
	- MCS=6 PER @ -70 dBm		$\leq$ -68
	- MCS=7 PER @ -69 dBm		$\leq$ -67
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0, PER @ -84 dBm		$\leq$ -82
	- MCS=1, PER @ -81 dBm		$\leq$ -79
	- MCS=2, PER @ -79 dBm		$\leq$ -77

	- MCS=3, PER @ -76 dBm	≤ -74
	- MCS=4, PER @ -72 dBm	≤ -70
	- MCS=5, PER @ -68 dBm	≤ -66
	- MCS=6, PER @ -67 dBm	≤ -65
	- MCS=7, PER @ -66 dBm	≤ -64
Maximum Input Level	802.11b : -8 dBm	
	802.11g/n : -20 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

4.2 Bluetooth Specification

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V4.2 of 1, 2 and 3 Mbps.		
Host Interface	UART		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2400 MHz ~ 2483.5 MHz		
Number of Channels	79 channels		
Modulation	GFSK, π /4-DQPSK, 8-DPSK		
RF Specification			
	Min(dBm)	Typical(dBm)	Max(dBm)
Output Power (Class 1)	2	5	8
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-89	
Sensitivity @ BER=0.01% for π /4-DQPSK (2Mbps)		-86	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-83	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	π /4-DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

5. ID setting information

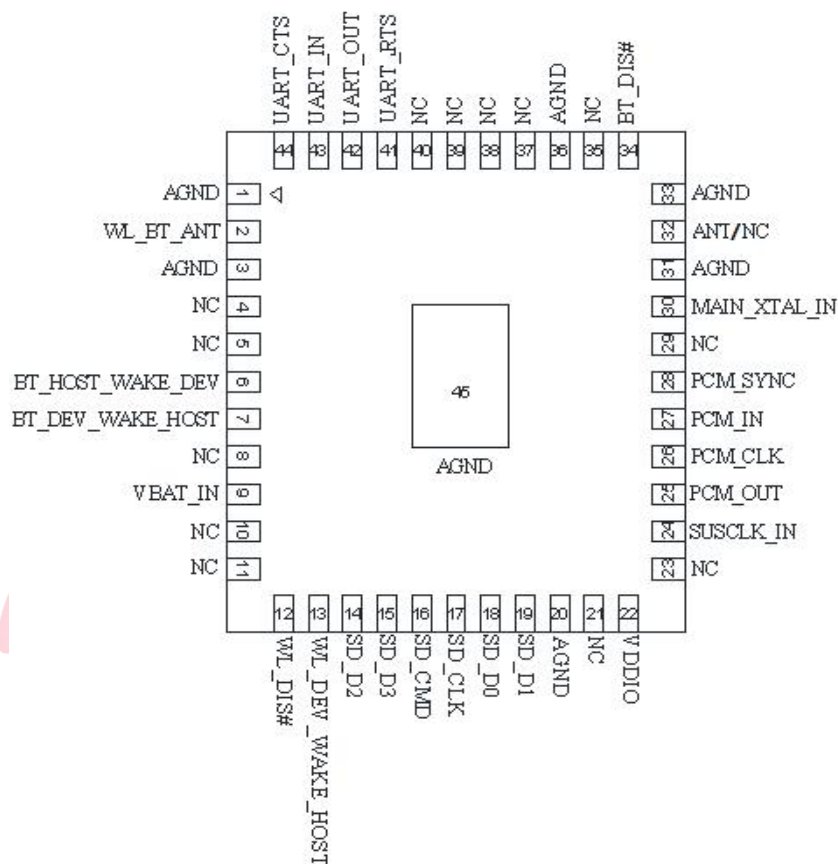
WI-FI

Vendor ID	024C
Product ID	D723

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	AGND		Ground connections	
2	WL_BT_ANT	I/O	RF I/O port	
3	AGND		Ground connections	
4	NC		Floating (NC)	
5	NC		Floating (NC)	
6	HOST_WAKE_BT	I	Host to wake up Bluetooth device	VDDIO

7	BT_WAKE_HOST	O	Bluetooth device to wake up host. (muti function for Test mode configuration. pull high to test mode ; pull low to normal mode .when wifi power on this pin must keep low)	VDDIO
8	NC		Floating (NC)	
9	VBAT_IN	P	3.3±10% V Main power voltage source input	3.3V
10	NC		Floating (NC)	
11	NC		Floating (NC)	
12	WL_DIS#	I	Pull high: ON , Pull low: OFF External pull low can disable WL	3.3V
13	WL_HOST_WAKE	O	WLAN to wake up HOST	VDDIO
14	SD_D2	I/O	SDIO data line 2	
15	SD_D3	I/O	SDIO data line 3	
16	SD_CMD	I/O	SDIO command line	
17	SD_CLK	I	SDIO clock line	
18	SD_D0	I/O	SDIO data line 0	
19	SD_D1	I/O	SDIO data line 1	
20	AGND		Ground connections	
21	NC		Floating(NC)	
22	VDDIO	P	I/O Voltage supply input	VDDIO
23	NC		Floating (NC)	
24	SUSCLK_IN	I	External Clock input(32.768kHz). Can keep NC.	
25	PCM_OUT	O	PCM Output	VDDIO
26	PCM_CLK	I/O	PCM Clock	VDDIO
27	PCM_IN	I	PCM Input	VDDIO
28	PCM_SYNC	O	PCM Sync	VDDIO
29	NC		Floating (NC)	
30	MAIN_XTAL_IN	O	Floating (NC)	
31	AGND		Ground connections	
32	ANT/NC		FG6223ASRD-W6 DUAL-ANTENNA RF Port Single antenna type can Floating (NC)	
33	AGND		Ground connections	
34	BT_DIS#	I	Pull high: ON , Pull low: OFF External pull low can disable BT	3.3V
35	NC		Floating (NC)	
36	AGND		Ground connections	
37	NC		Floating (NC)	

38	NC		Floating (NC)	
39	NC		Floating (NC)	
40	NC		Floating (NC)	
41	UART_RTS		UART RTS, module side is Ground connections	
42	UART_OUT	O	UART Output	VDDIO
43	UART_IN	I	UART Input	VDDIO
44	UART_CTS	I	UART CTS,	VDDIO
45	AGND		Floating (NC)	

P:POWER I:INPUT O:OUTPUT VDDIO:3.3V

7. Electrical Specifications

7.1 Power Supply DC Characteristics

The digital IO supports VDD33 or VDD18 application.

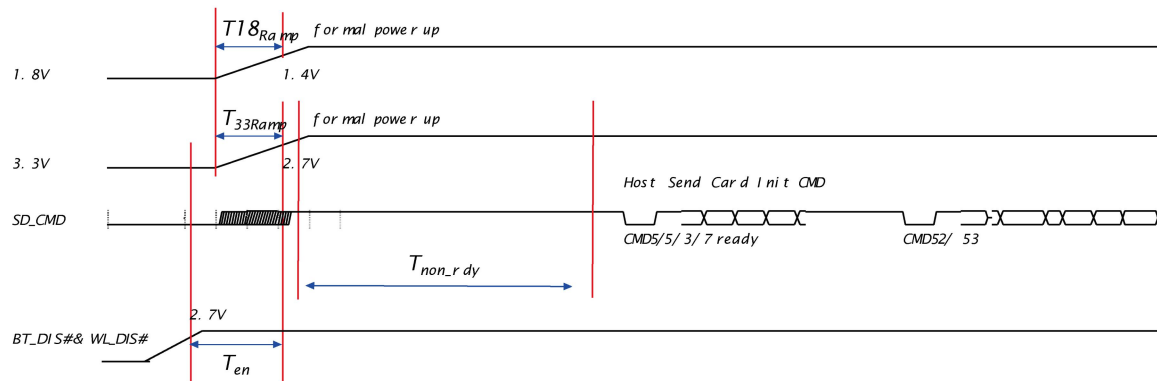
	MIN	TYP	MAX	Unit
Operating Temperature	-10	25	70	deg.C
VCC33	3.0	3.3	3.6	V
VDDIO	1.62	1.8 or 3.3	3.6	V
ESD		3.5		KV

7.2 Power Consumption

Power Consumption (Typical by using SWR)	Wi-Fi only: TX b mode 20MHz: 335 mA (max) RX b mode 20MHz: 80 mA (max) TX n mode 40MHz: 133 mA (max) RX n mode 40MHz: 53 mA (max) TX n mode 20MHz: 137 mA (max) RX n mode 20MHz: 47 mA (max) BT: TX: 101.8 mA (max) RX: 75.8 mA (max) IDEL: 50.5 mA (max)
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7.3 SDIO Power-on sequence

After power-on, the SDIO interface is selected by the RTL8723DS automatically when a valid SDIO command is received. To attain better SDIO host compatibility, the following power-on sequence is recommended.



Symbol	Description
T _{33ramp}	The 3.3V main power ramp up duration.
T _{18ramp}	The 1.8V main power ramp up duration.
T _{non_rdy}	SDIO Not Ready Duration. In this state, the RTL8723DS may respond to commands without the ready bit being set. After the ready bit is set, the host will initiate complete card detection procedure.
T _{en}	Interval between the rising point of 3.3V and WL_DIS#& BT_DIS# pull up with WL_DIS#& BT_DIS function enabled.

After main 3.3V ramp up and 1.8V ramp up, the power management unit is enabled by the power ready detection circuit. The power management unit enables the SDIO block. eFUSE is then autoloading to SDIO circuits during the T_{non_rdy} duration. After CMD5/5/3/7 procedures, card detection is executed. When the driver has loaded, normal CMD52 and CMD53 are used.

	Min	Typical	Max	Unit
T _{33ramp}	0.2	0.5	2.5	ms
T _{18ramp}	0.2	0.5	2.5	ms
T _{non-rdy}	1	2	10	ms
T _{en}	-	0	-	ms

7.4 Interface Circuit time series

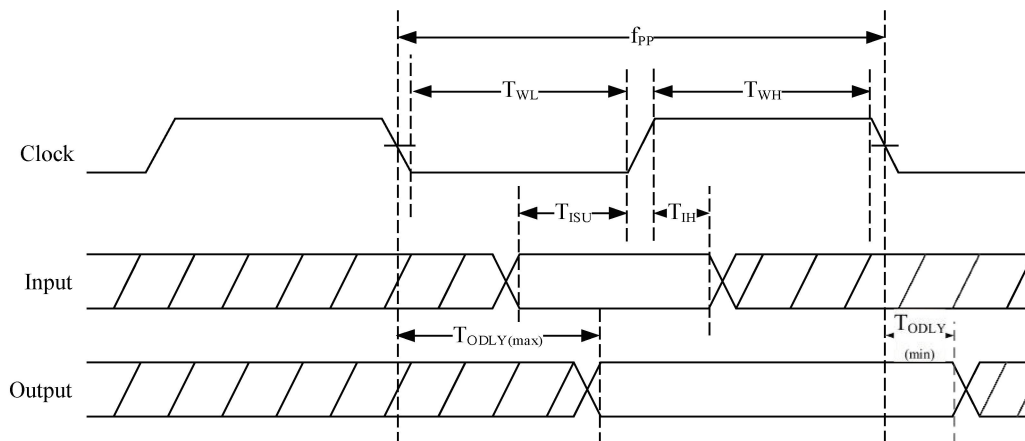
7.4.1 SDIO Pin Description

The module supports SDIO v2.0 signal level ranges form 1.8V to 3.3V.

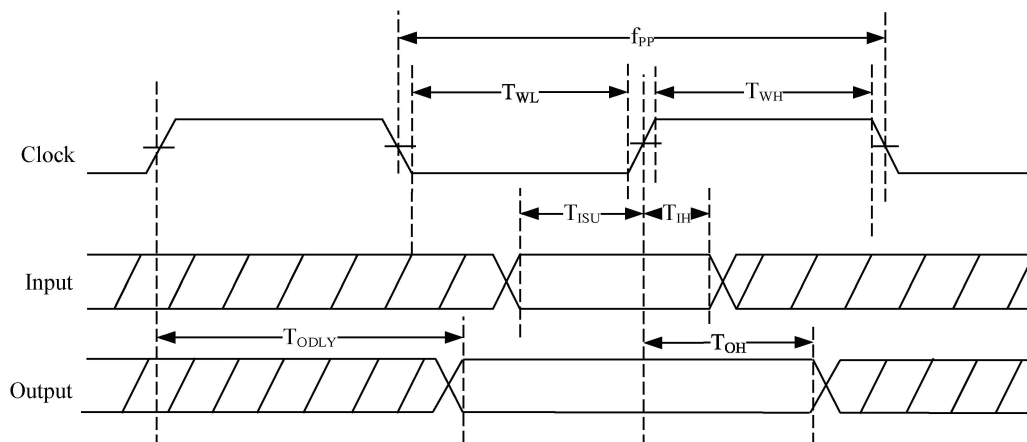
SDIO Pin Description

SD 4-Bit Mode	
DATA0	Data Line 0
DATA1	Data Line 1 or Interrupt
DATA2	Data Line 2 or Read Wait
DATA3	Data Line 3
CLK	Clock
CMD	Command Line

7.4.2 SDIO Timing table



SDIO Interface Timing

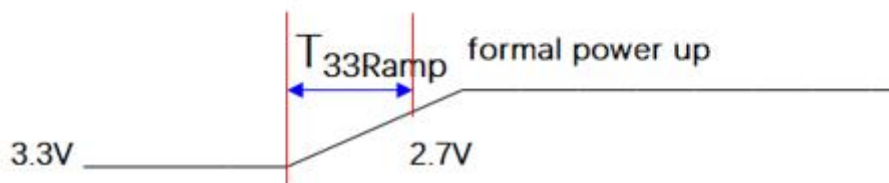


SDIO High Speed Interface Timing

NO	Parameter	Mode		MIN	MAX	Unit
f _{pp}	Clock Frequency	DEF		0	25	MHz
		HS		0	50	MHz
T _{WL}	Clock Low Time	DEF		10	-	ns
		HS		7	-	ns
T _{WH}	Clock High Time	DEF		10	-	ns
		HS		7	-	ns
T _{ISU}	Input Setup Time	DEF		5	-	ns
		HS		6	-	ns
T _{IH}	Input Hold Time	DEF		5	-	ns
		HS		2	-	ns
T _{ODLY}	Output Delay Time	DEF	During Data Transfer Mode	-	14	ns
			During Identification Mode	-	50	
		HS		-	14	ns
NO	Parameter	Mode		MIN	MAX	Unit
T _{OH}	Output Hold Time	HS		2.5	-	ns

7.4.3 module power-on&off time sequence

	Min	Typical	Max	Unit
T33 power on ramp	0.2	0.5	2.5	ms
T33 power off ramp	0.2	5	10	ms



Note:

1.上下电时序请满足表格要求；

The power up ramp and power down ramp must meet the following table.

2.上下电过程如有较长时间中间电压停留都会有几率导致 efuse 被窜写；

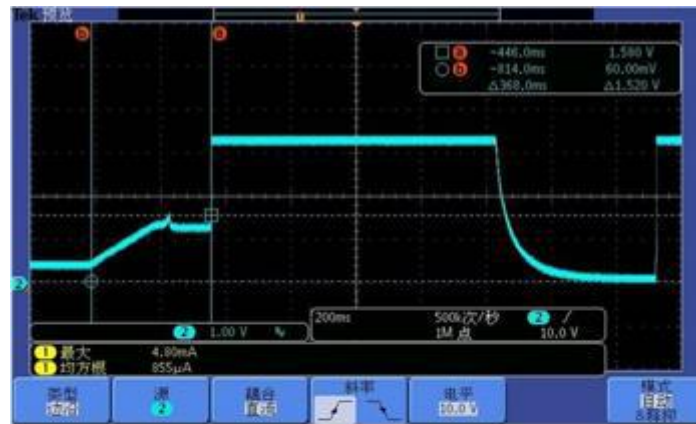
If climbing process for a long time during power-on and power-off , It may cause efuse to be overwritten.

3.建议主芯片上电完成后，再给模组上电；

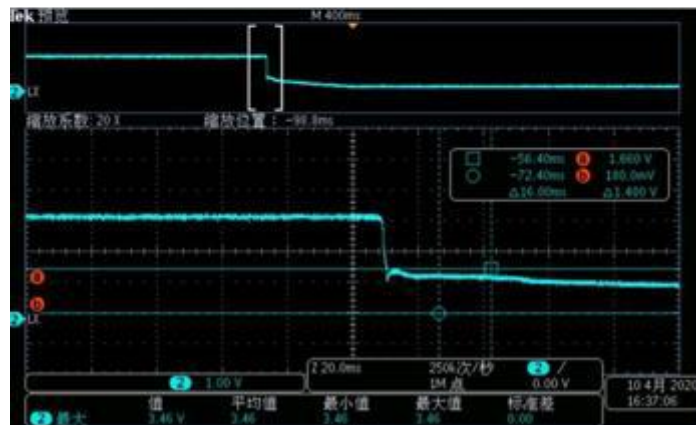
it is recommended to power on the module after platform side.

4.如有下图所示异常上下电时序，务必做相应调整符合时序规格；

If power on/off timing as below shown, must modify to meet the timing specification.



异常上电时序



异常下电时序

7.4.4 PCM interface

Symbol	Type	Pin NO	Description
PCM IN	I	27	PCM data input
PCM OUT	O	25	PCM data output
PCM SYNC	O	28	PCM synchronization control
PCM CLK	IO	26	PCM Clock

Module supports a PCM digital audio interface that is used for transmitting digital audio/voice data to /from the audio codec.Features are supported as below:

- . Support Master and slave mode
- . Programmable long/short Frame sync

- . Support 8-bit A-law/u-law, and 13/16-bit linear PCM format
- . Support sign-extension and zero-padding for 8-bit and 13-bit samples
- . Support padding of audio gain to 13-bit samples
- . PCM master clock output: 64, 128, 256, or 512 KHz
- . Supports SCO/ESCO link

7.4.5 UART interface

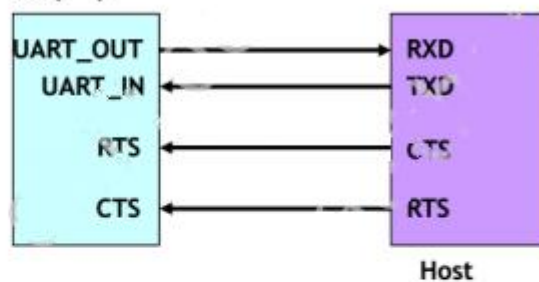
Below shown the UART hci interface connection guide.

Uart signal level ranges from 1.8V to 3.3V. must meet with the VDDIO voltage level.

HCI 硬件流程控制管脚连接

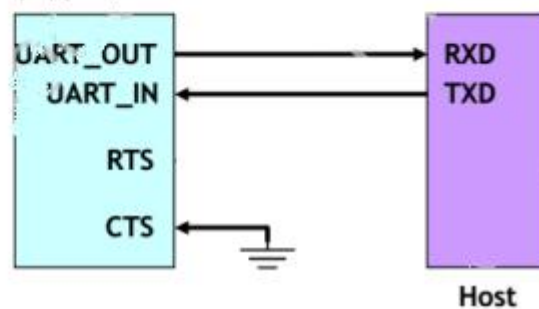
- Host 有支持硬件流程控制的接法

圖(一)



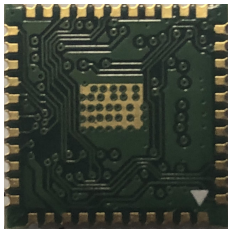
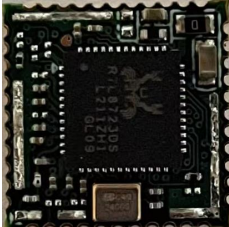
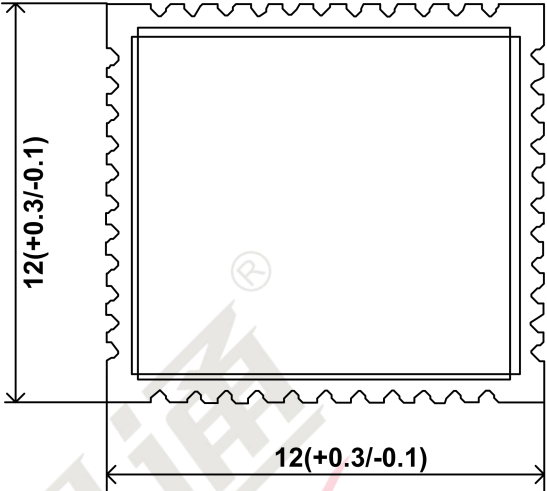
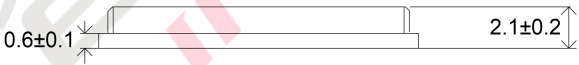
- Host 不支持硬件流程控制的接法

圖(二)



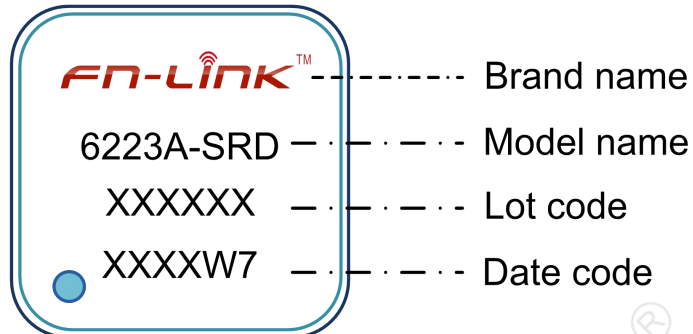
8. Size reference

8.1 Module Picture

L x W : 12 x 12 (+0.3/-0.1) mm    (-W1 type)	
FG6223ASRD-W7/W4 H: 2.1 (±0.2) mm FG6223ASRD-W1 H: 1.6 (±0.2) mm FG6223ASRD-W2 H: 1.9 (±0.2) mm FG6223ASRD-W6 H: 2.3 (±0.2) mm	
Weight	FG6223ASRD-W7/W4: 0.54g FG6223ASRD-W1: 0.39g FG6223ASRD-W2: 0.53g FG6223ASRD-W6: 0.59g

8.2 Marking Description

< TOP VIEW >



Date code:

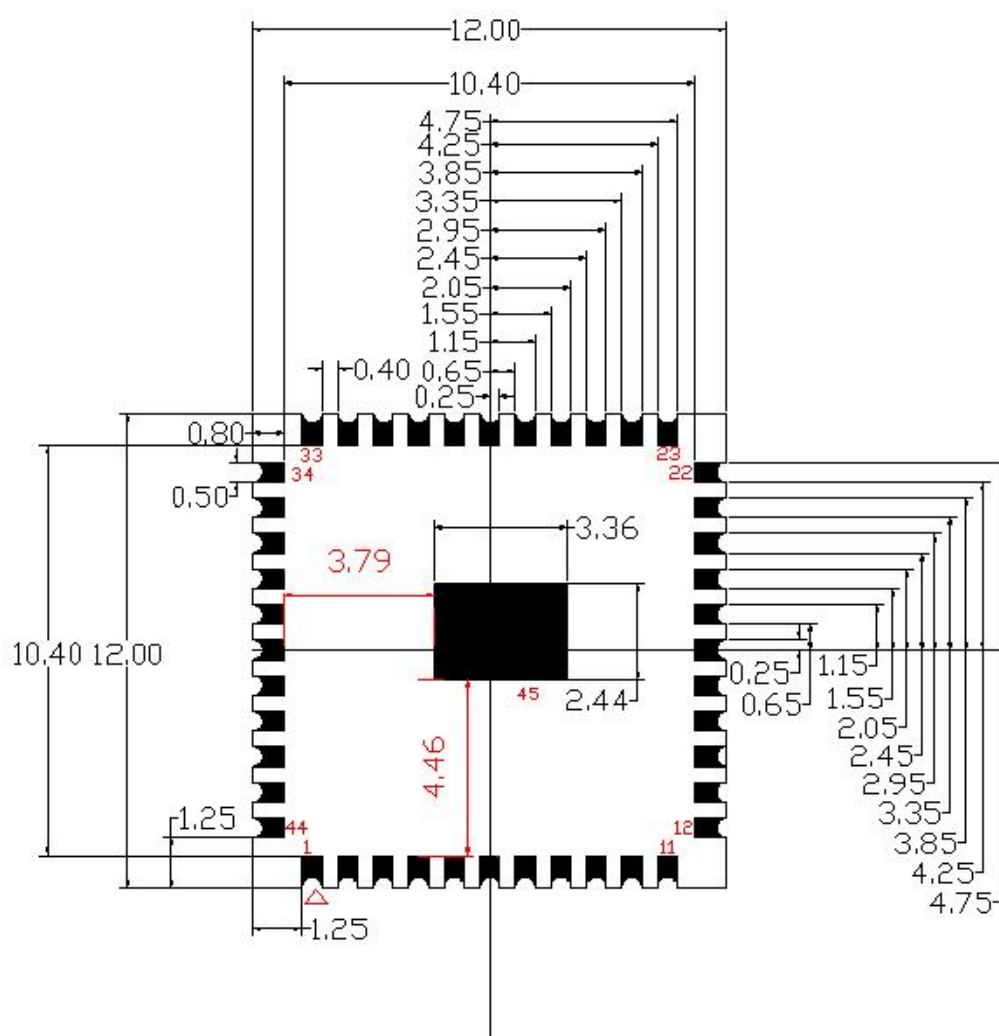
XXXXW2 -----FG6223ASRD-W2

XXXXW4 -----FG6223ASRD-W4

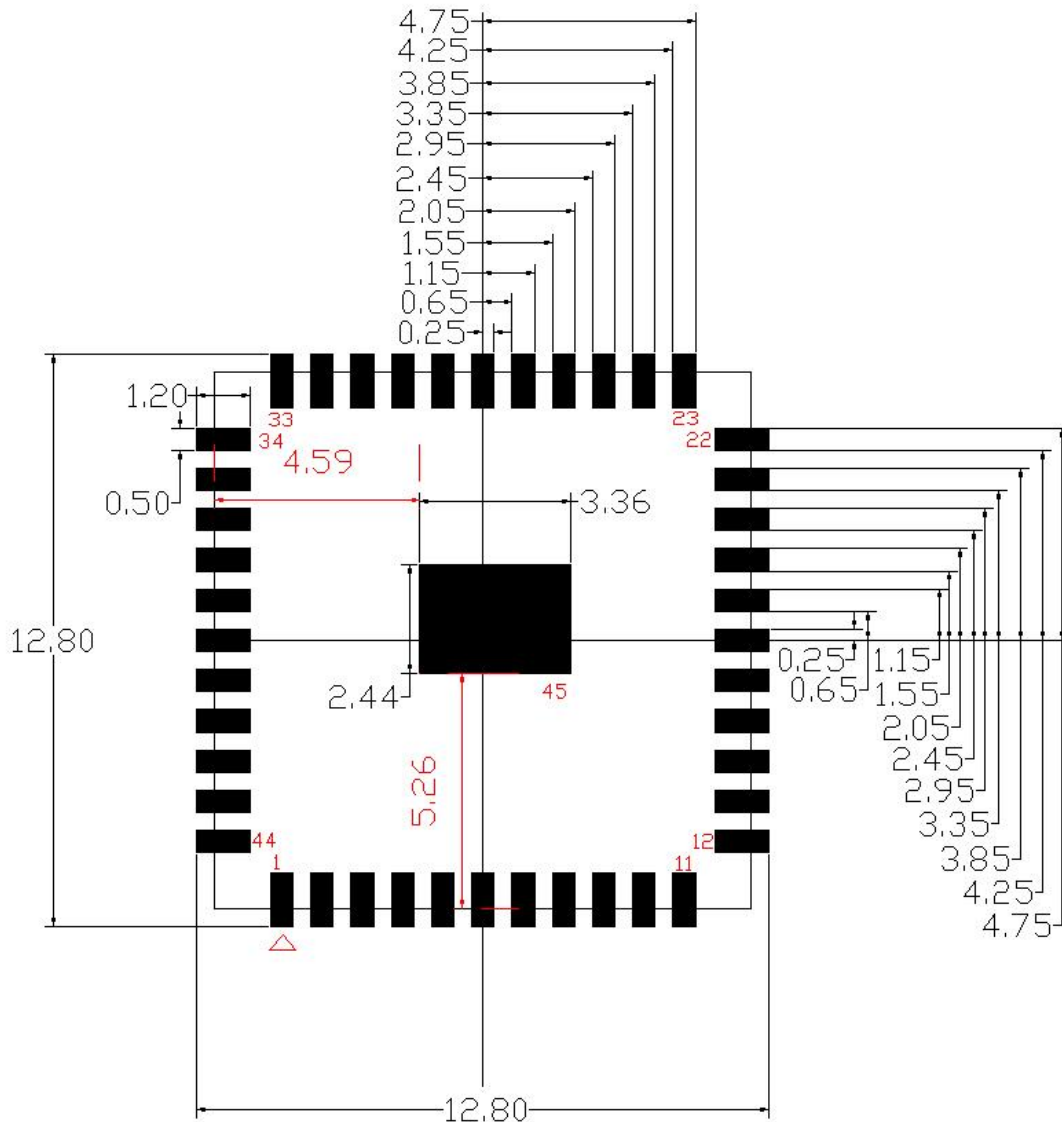
XXXXW6 -----FG6223ASRD-W6

8.3 Physical Dimensions

<TOP View>



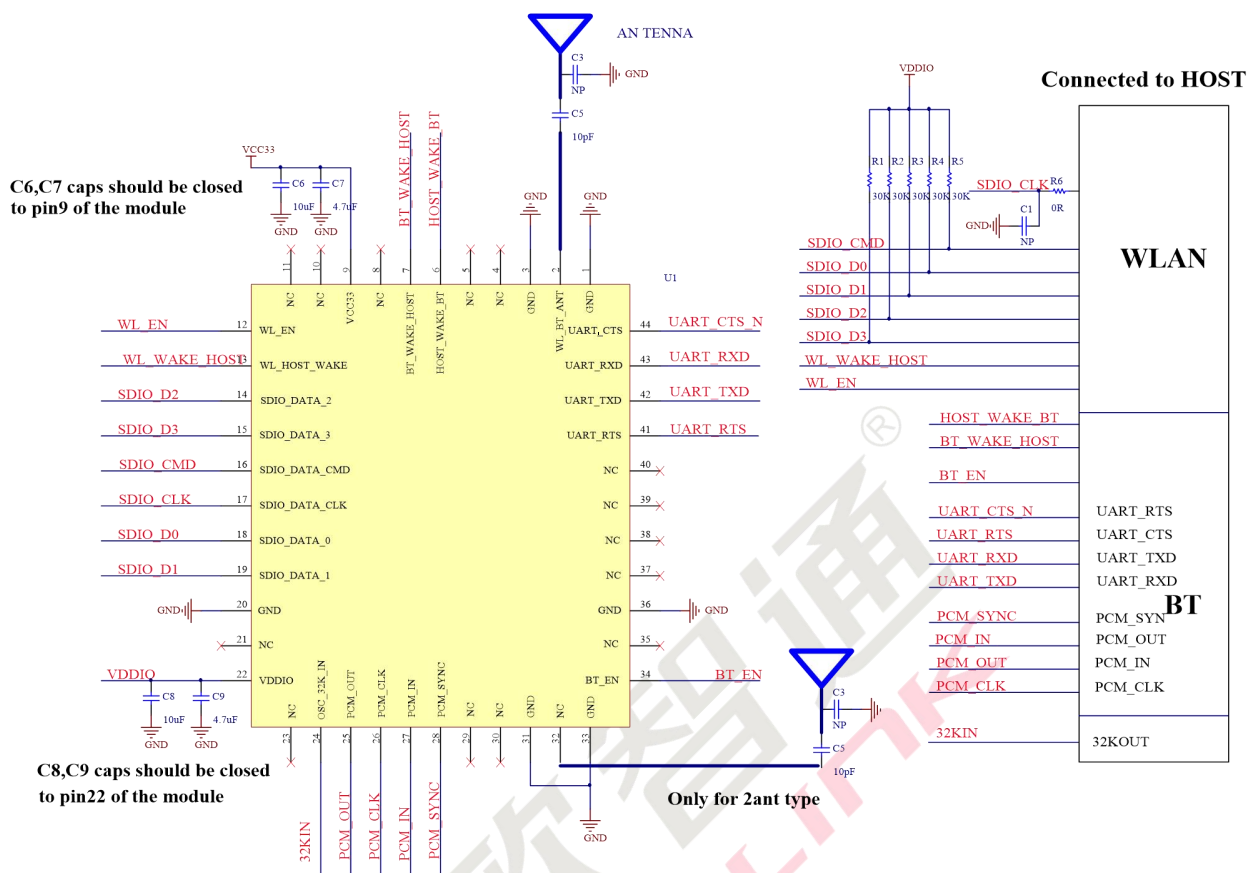
8.4 Layout Recommendation



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Chipset	RTL8723DS-CG QFN48 4.4X4.4mm	Realtek
2	PCB	6223A-SRD 12X12mm 4L	XY-PCB,KX-PCB,SL-PCB,Sunlord, Truly
3	Crystal	2520 24MHz 12pF 10ppm	TST,HOSONIC,TKD,ECEC,JWT
4	Inductor	0603 4.7uH , $\pm 20\%$, >500mA	Microgate,sunlord,cenke,ceaiya
5	Shielding	6223A-SRD shielding	信太,精力通,卓益

10. Reference Design

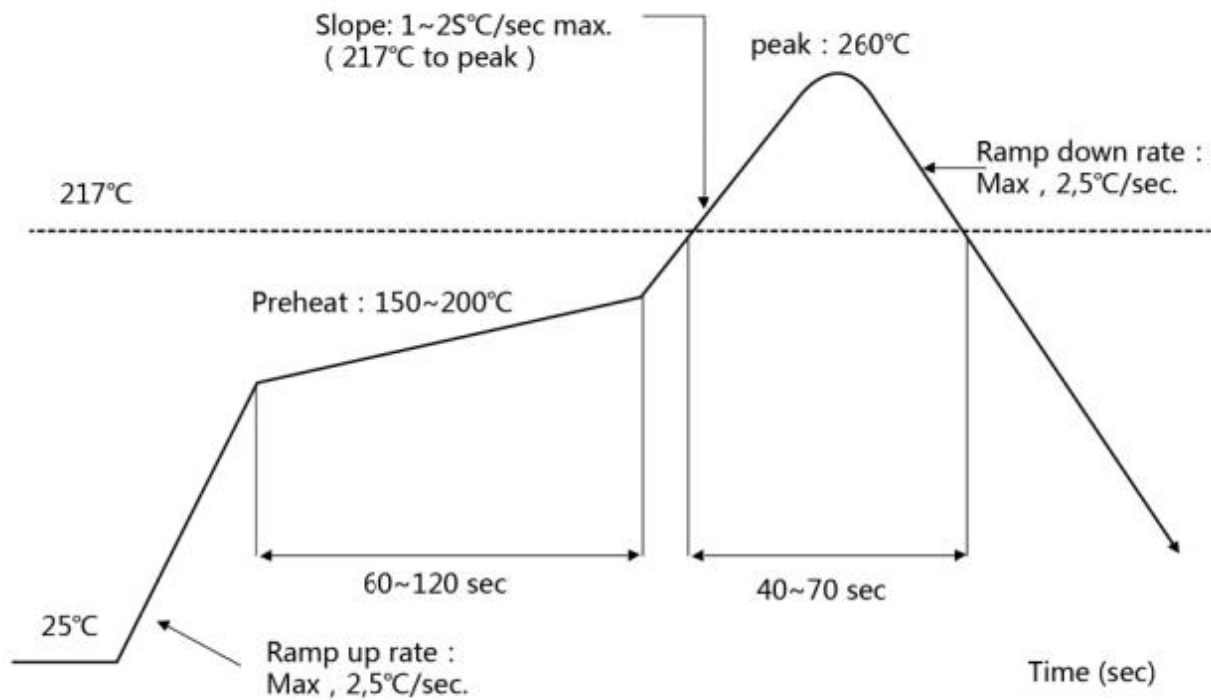


11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <260°C

Number of Times : ≤2 times



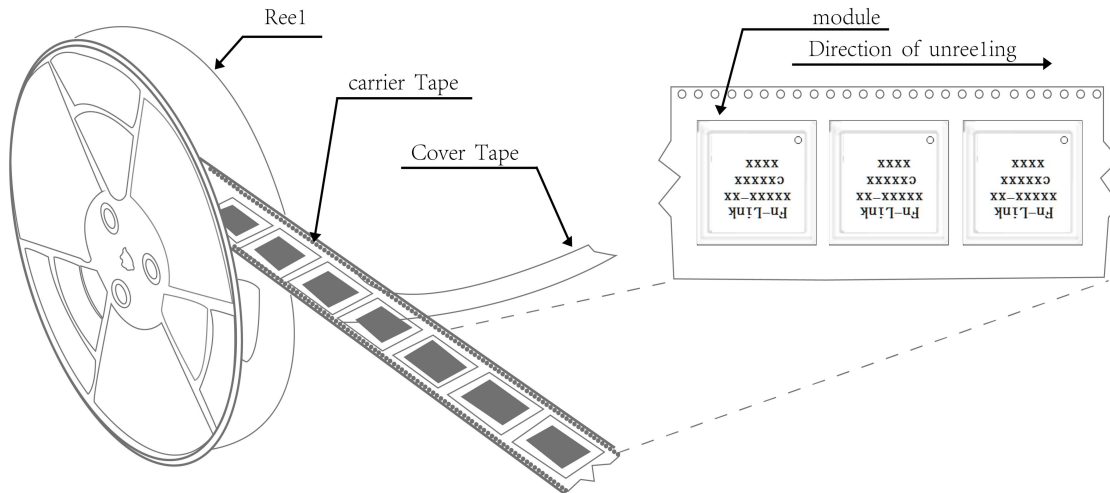
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

13. Package

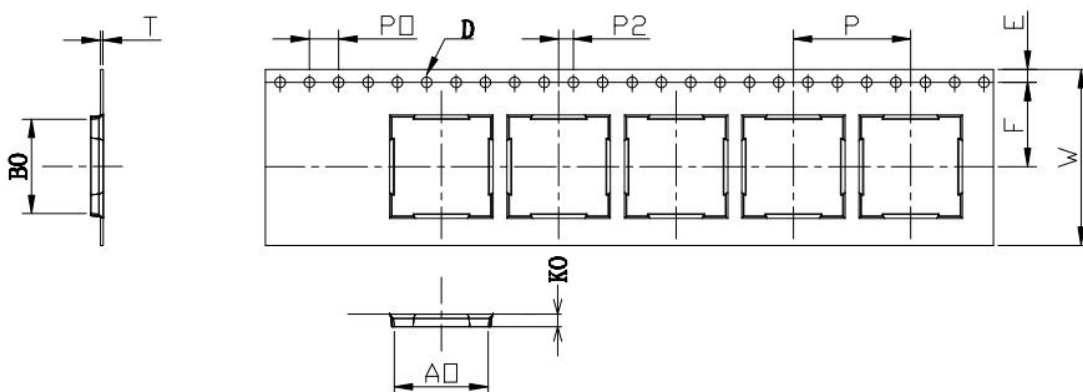
13.1 Reel

A roll of 1500pcs



13.2 Carrier Tape Detail

ITEM	W	A0	B0	D	F	E	K0	P0	P2	P	T
DIM	24	12.45	12.45	1.50	11.5	1.75	2.60	4.0	2.0	16.0	0.30
TOLE	$\begin{smallmatrix} +0.3 \\ -0.3 \end{smallmatrix}$	± 0.10	± 0.10	$\begin{smallmatrix} +0.1 \\ -0.0 \end{smallmatrix}$	$\begin{smallmatrix} +0.1 \\ -0.1 \end{smallmatrix}$	± 0.1	± 0.10	± 0.1	± 0.1	± 0.1	± 0.05



13.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*32.6m the cover tape :21.3mm*32.6m

Color of plastic disc: blue



NY bag size:450mm*415mm



size : 350*350*35mm



The packing case size:360*210*370mm

14. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care

all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition
- d) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected
- e) Baking is required if conditions b) or c) are not respected
- f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

Appendix 1

Certification information

KC No

R-R-Ozt-6223A-SRD

TELEC



CE

RE-17121503

HUNA66

FCC

2AATL-6223A-SRD

IC

24844-6223ASRD

SRRC

CMIIT ID:2017DP6668(M)

承认书项目表

NO.	内 容 (Contents)	页数 (Number of Page)	页码 (Page Code)
1	承认书封面 (Spec Cover)	1	1
2	承认书项目表 (Spec Item)	1	2
3	工程成品图 (Drawing)	1	3
4	电性测试报告 (Test Reports)	1	4
5	S 参数测试 (S Parameter)	1	5
6	增益测试 (Gain Test)	1	6
7			
8			
9			
10	-	-	-
11	-	-	-
12	-	-	-

ADD：东莞市虎门镇大宁麒麟东路6号

Tel:15818375487

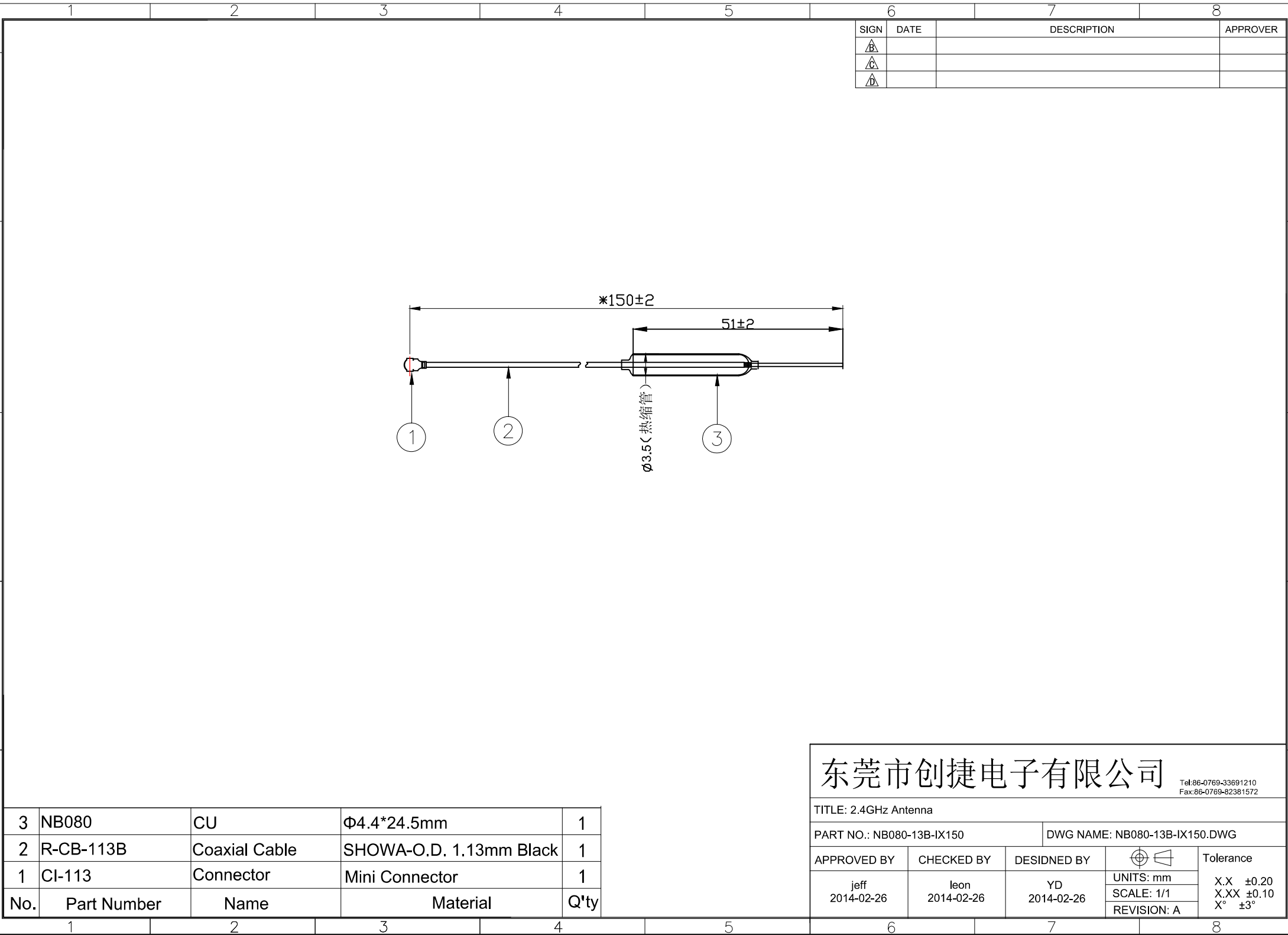
电性测试报告

Test Reports

Electrical Properties	
Frequency	2.4 - 2.5 GHz
Impedance	50 Ohm Nominal
V.S.W.R	<= 2.0 Max
Return Loss	-10 dB Max
Radiation	Omni-directional
Gain (Peak)	3.0dBi
Cable Loss	3.2 dB / m Max @ 2450 MHz
Polarization	Linear, Vertical
Admitted Power	1 W
Connector	ipex
Physical Properties	
Antenna Material	CU
Cable Type	O.D. 1.13mm // 150 mm
Operating Temp.	-10 ~ +60 °C
Storage Temp.	-10 ~ +70 °C
Cable Color	Black

ADD: 东莞市虎门镇大宁麒麟东路6号

Tel:15818375487



SIGN	DATE	DESCRIPTION	APPROVER

3	NB080	CU	Φ4.4*24.5mm	1
2	R-CB-113B	Coaxial Cable	SHOWA-O.D. 1.13mm Black	1
1	CI-113	Connector	Mini Connector	1
No.	Part Number	Name	Material	Q'ty

东莞市创捷电子有限公司

Tel:86-0769-33691210
Fax:86-0769-82381572

TITLE: 2.4GHz Antenna

PART NO.: NB080-13B-IX150

DWG NAME: NB080-13B-IX150.DWG

APPROVED BY

CHECKED BY

DESIDNED BY



Tolerance

jeff
2014-02-26

leon
2014-02-26

YD
2014-02-26

UNITS: mm

SCALE: 1/1

REVISION: A

X.X ±0.20

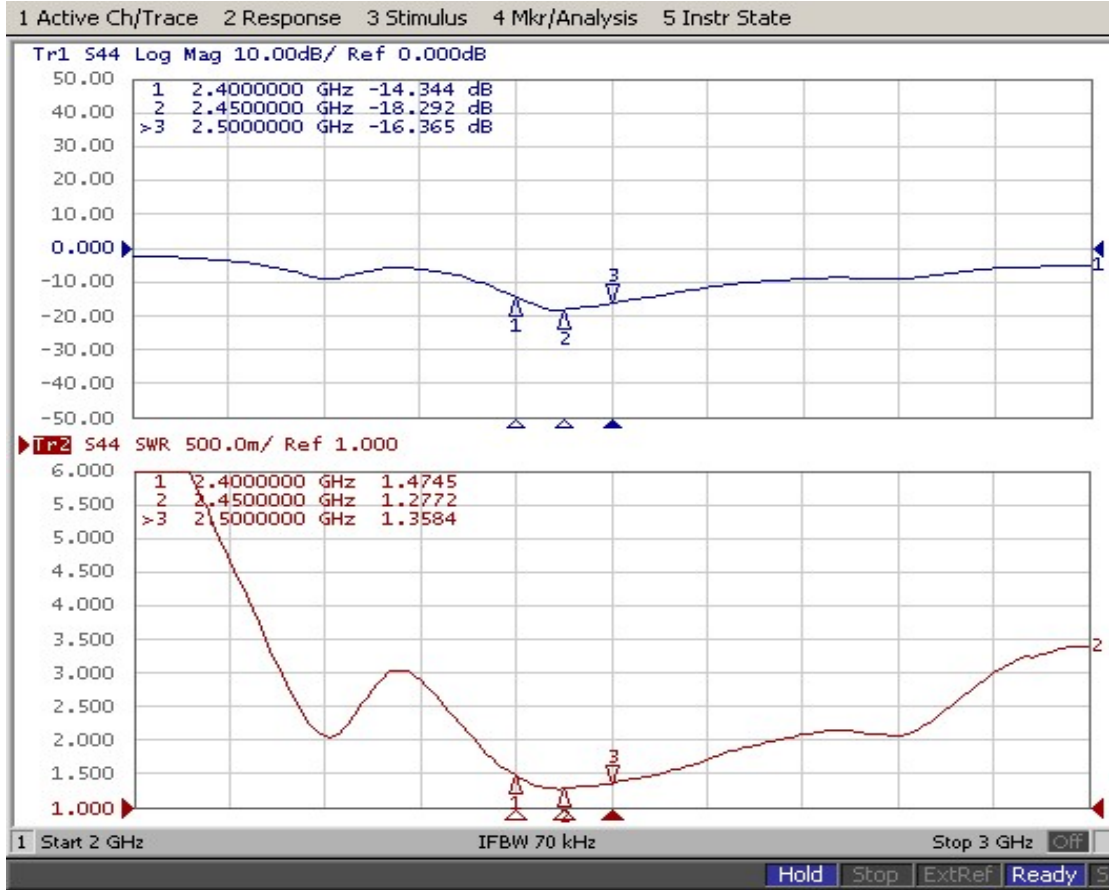
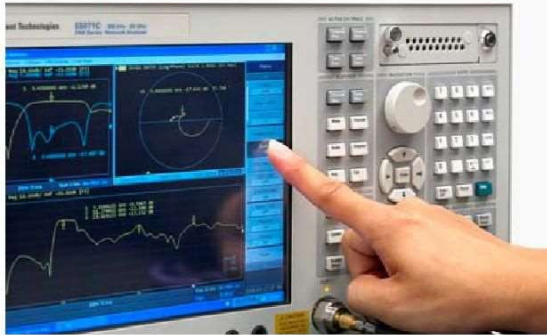
X.XX ±0.10

X° ±3°

S 参数测试

S Parameter Test

Agilent E5071C



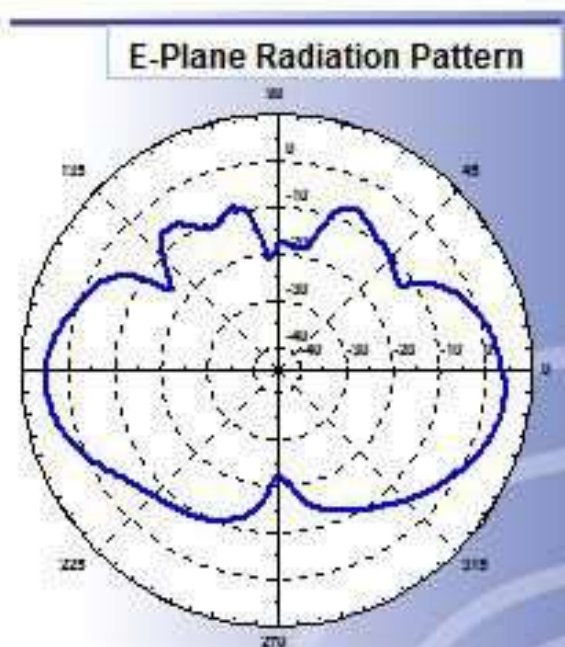
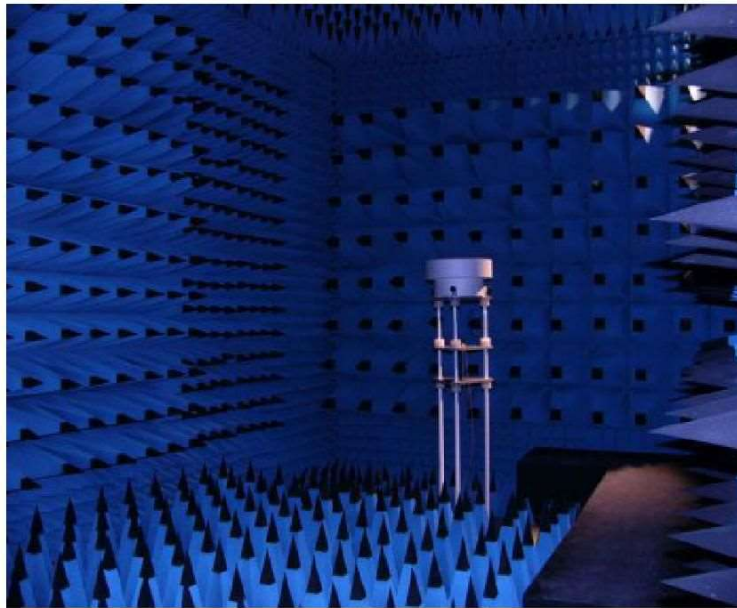
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增益测试

Gain Test

*Antenna
Radiation
Pattern
VS
Gain*



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