
Antenna specification acknowledgment

Material Name: U02

Sample color: Black

Sample type: FPC

Customer model:

Supplier: Version: R.A

Supplier: Version: R.A

fiction	structure	character	ratify	Date of sample delivery

client :

department	affirm	date	state	sign and seal
electron				
structure				
character				
project				

special clause

1. About performance and structure confirmation section

★ Please confirm the appearance and performance of the product before signing the confirmation letter.

★ Please provide the final trial production machine to our company or take it back to our company for verification before mass production.

★ As the products of this letter of recognition are highly sensitive objects, please be sure to keep the test gold machine for follow-up traceability.

★ As this product is a custom-made item with specific application requirements, customers must return any modified materials or non-designated equipment to our company for RF performance verification when making material changes or using them in unauthorized projects. Failure to comply may result in serious risks of operational discrepancies from design specifications. We will seal and test the prototype devices to confirm their full functionality, thereby preventing potential performance errors caused by improper operation affecting antenna performance.

2. About product storage

★ Due to the surface printing ink, back glue and electroplating objects on the back of this product, please make sure that the temperature is between 23°C and 27°C during storage or transportation, the relative humidity is below 60%, and the environment is free from strong acid, sulfur and oxygen.

★ Because the back glue of this product has strict environmental requirements, customers must assemble the product within the optimal use period after receiving the product to ensure the reliability of the product.

3. Agreement on product use

★ Due to the unique design of this product, ensure full contact with the surface you're adhering to during use. Avoid leaving chemical residues (such as release agents) on the surface, and minimize the use of materials containing release agents. To maintain optimal performance, thoroughly clean the surface before application to ensure it's completely free of any chemical residues.

4. Quality statement of this product

★ Due to the above factors, it is recommended that the optimal use period of this product is 12

months. Over the period, the use effect of the product will be affected. Our company provides lifetime consultation and paid replacement service for this product.

★ This product is a special customized device. Please check the appearance, quantity and performance of the product according to the standards agreed in this "Product Performance and Specifications Acknowledgment Letter" within 7 days after receiving the product. If not, it is deemed that the quality of the product meets the agreed standards of both parties.

★ Verification method: check the engineering seal of the letter of acknowledgment.

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- 1. Frequency band required for customer antenna debugging design**
 - 2. Antenna diagram**
 - 3. Electrical propertie**
 - 3.1 Test method description and data**
 - 3.2 Passive Test Report
 - 3.3 Active Test Report
 - 3.4Active OTA TRP/TIS data**
 - 4. Description of matching circuit**
 - 4. Structural drawings**
 - 5. Environmental treatment**
 - 6.structural drawings**
 - 7.Product test report**
 - 8.Manner of packing**
 - 9.Reliability test report**
 - 10.SGS report**
 - 11.Process Flow Diagram**
 - 12.Quality control flow chart**

1. Bandwidth requirements

frequency	frequency band
3G	W1/5/8
4G	LTE B1/3/5/7/8/20/28/38/40/41
WIFI	WIFI 2.4G

2 antenna diagram

main antenna



WiFi antenna



diversity antenna



3 Electrical properties

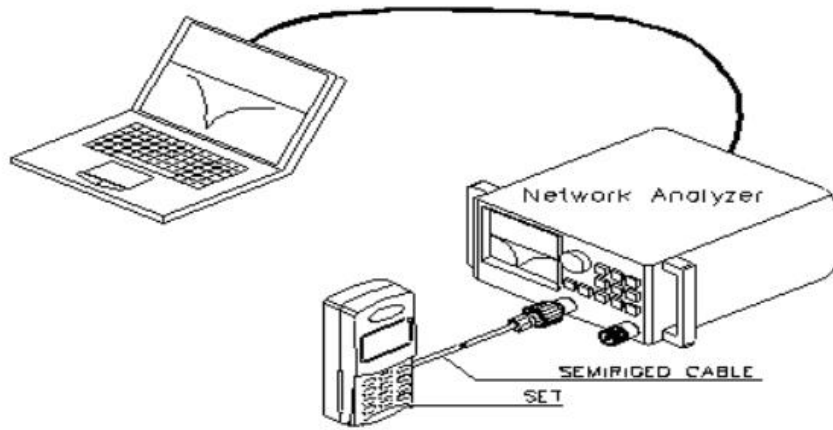
3.1 Test method description and data

frequency	frequency range
3G	W1/5/8
Agilent 8960 SP6010 R&S CMU200	Mobile communication equipment test including GSM, GPRS, EDGE, CDMA2000, 1xEV-DO, TD-SCDMA, WCDMA, HSDPA
R&S CMW500 MT8820C	Including TD-SCDMA, WCDMA, Mobile communication equipment testing for HSDPA, LTE, WIFI and GPS
SP9500E	Including 5G, SA, and NSA
Agilent E4438C	Test active GPS
MVG Chamber	Passive Test / OTA active Test / Efficiency/Gain

3.2 Passive Test Report (passive test report)

Test equipment: network analyzer

Test method: A 50 ohm CABLE cable is exported from the test port of the instrument. After calibration, the SMA connector of the mobile phone fixture is connected with a calibrator, and the data such as return loss or VSWR corresponding to relevant frequency points are recorded.



测试示意图

3.3 Active Test Report (Active test report)

TRP/TIS

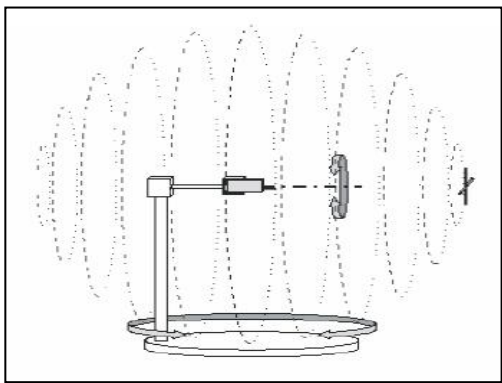
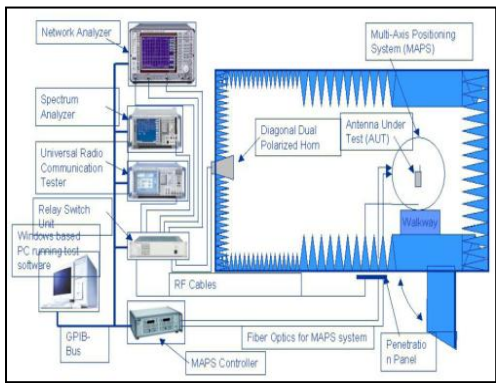
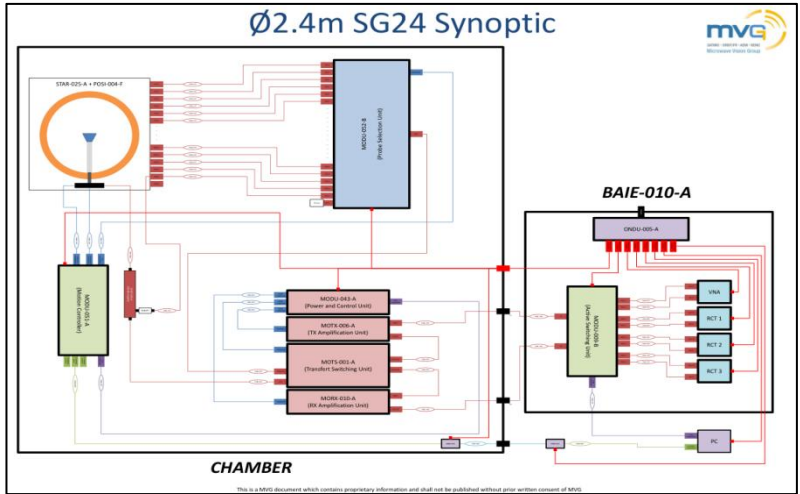
Testing Equipment: Comprehensive tester, network analyzer, full-wave far-field ETS system, French-made Satmio SG24LT near-field 3D microwave anechoic chamber, high-precision positioning system with controller, and computer-based testing environment equipped with automated test programs. Operating conditions: Temperature $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$, humidity $60\% \pm$

15%. Testing Method: Utilize the TRP testing methodology and computational methods from EST or Satmio 24LT system software. During TRP testing, the DUT (Device Under Test) operates at maximum transmission power. Three channels (high, medium, and low) are selected for measurement. The DUT's position is controlled via positioning system, with 15-degree increments applied to measure effective radiated power (EIRP) at various 3D spatial points. The average spherical surface power is calculated through integration using the following formula:

$$TRP \cong \frac{\pi}{2NM} \sum_{i=1}^{N-1} \sum_{j=0}^{M-1} [EiRP_{\theta}(\theta_i, \phi_j) + EiRP(\theta_i, \phi_j)] \sin(\theta_i)$$

During the TIS test, the DUT is in the state of maximum transmission power. Three channels are selected for testing, and the receiving sensitivity of each point in three-dimensional space is measured by controlling the position of DUT with a step of 30 degrees. The average value on the sphere is calculated by integral calculation, and the calculation formula is as follows:

$$TIS \cong \frac{2NM}{\pi \sum_{i=1}^{N-1} \sum_{j=0}^{M-1} \left[\frac{1}{EIS_{\theta}(\theta_i, \phi_j)} + \frac{1}{EIS_{\phi}(\theta_i, \phi_j)} \right]} \sin(\theta_i)$$



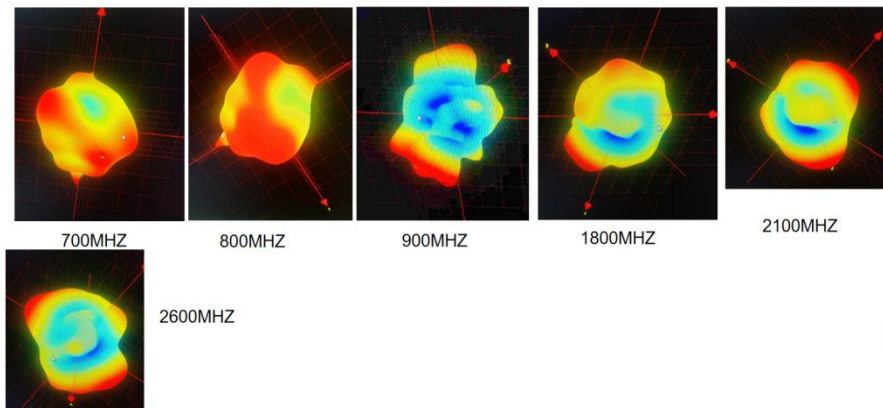
3.4 Active OTA TRP/TIS data

Band	OTA		Band	OTA	
	TRP	TIS		TRP	TIS
LTE B1	19.04		LTE B28	17.6	
	19.25			17.35	
	19.24	-92.01		18.15	-91.57
LTE B3	19.07		LTE B38	19.01	
	19.63			18.83	
	18.77	-93.62		18.47	-91.26
LTE B5	18.32		LTE B40	19.65	
	18.73			20.82	
	18.62	-91.4		21.25	-90.66
LTE B7	19.66		LTE B41	18.85	
	18.93			19.24	
	18.25	-92.27		19.58	-90.25
LTE B8	19.21		W1	19.24	
	18.37			19.35	
	18.53	-89.29		19.08	-104.72
LTE B20	20.06		W5	18.53	
	19.16			19.63	
	19.72	-91.36		19.18	-103.68
			W8	19.20	
				18.97	
				18.67	-100.12

Main antenna efficiency and gain

Frequency	Efficiency	Gain . dB	Frequency	Efficiency	Gain . dB
691000000.0	26.14%	-0.82	1700000000.0	45.19%	1.25
700962962.0	27.36%	-0.68	1730303030.0	44.94%	1.38
710925925.0	28.24%	-0.35	1760606060.0	45.83%	1.56
720888888.0	29.08%	-0.10	1790909090.0	49.36%	1.69
730851851.0	31.76%	-0.08	1821212121.0	50.65%	2.02
740814814.0	42.41%	0.57	1851515151.0	52.88%	2.25
750777777.0	52.90%	1.39	1881818181.0	52.79%	2.15
760740740.0	65.66%	2.15	1912121212.0	54.23%	2.45
770703703.0	71.69%	2.62	1942424242.0	57.99%	2.56
780666666.0	66.46%	1.69	1972727272.0	58.54%	2.65
790629629.0	39.79%	-0.81	2003030303.0	57.98%	2.47
800592592.0	23.08%	-2.32	2033333333.0	59.56%	2.62
810555555.0	24.63%	-1.71	2063636363.0	63.33%	3.10
820518518.0	33.89%	0.15	2093939393.0	63.45%	3.40
830481481.0	43.58%	1.51	2124242424.0	64.35%	3.27
840444444.0	48.67%	2.23	2154545454.0	63.94%	3.23
850407407.0	53.91%	2.68	2184848484.0	62.63%	3.15
860370370.0	57.68%	3.08	2215151515.0	61.29%	3.02
870333333.0	58.07%	3.07	2245454545.0	59.03%	2.65
880296296.0	57.65%	2.76	2275757575.0	54.54%	2.58
890259259.0	56.44%	2.30	2306060606.0	51.91%	2.45
900222222.0	57.10%	2.20	2336363636.0	48.64%	2.37
910185185.0	53.86%	1.95	2366666666.0	45.96%	2.25
920148148.0	51.59%	1.85	2396969696.0	45.96%	2.21
930111111.0	50.64%	1.80	2427272727.0	46.48%	2.36
940074074.0	49.88%	1.63	2457575757.0	49.19%	2.51
950037037.0	49.23%	1.54	2487878787.0	49.77%	2.55
960000000.0	48.08%	1.45	2518181818.0	48.78%	2.48
			2548484848.0	49.53%	2.61
			2578787878.0	48.56%	2.45
			2609090909.0	47.38%	2.31
			2639393939.0	48.77%	2.48
			2669696969.0	48.61%	2.44
			2700000000.0	50.65%	2.62

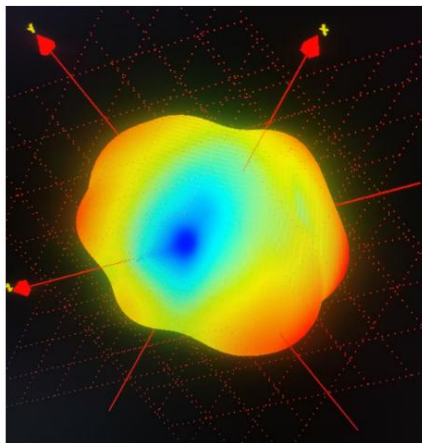
Main antenna Apple diagram



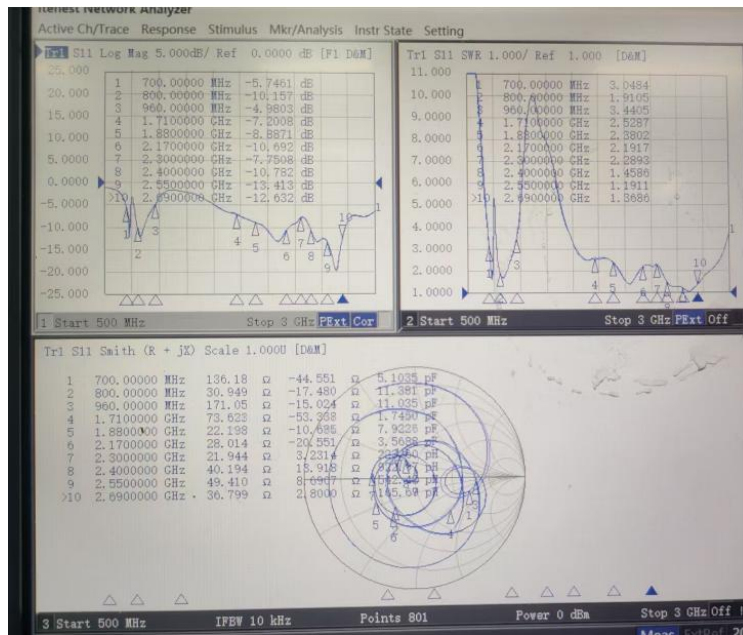
WIFI antenna and gain

Frequency	Efficiency	Gain . dB
2400000000.0	41.09%	-0.54735
2405000000.0	40.19%	-0.57185
2410000000.0	40.78%	-0.53725
2415000000.0	40.84%	-0.51251
2420000000.0	42.00%	-0.37489
2425000000.0	41.50%	-0.38049
2430000000.0	42.49%	-0.18982
2435000000.0	42.54%	-0.1289
2440000000.0	43.01%	-0.17829
2445000000.0	43.11%	-0.22012
2450000000.0	44.74%	-0.00846
2455000000.0	45.47%	0.163339
2460000000.0	47.01%	0.316503
2465000000.0	47.11%	0.404714
2470000000.0	47.94%	0.487268
2475000000.0	47.34%	0.597463
2480000000.0	47.81%	0.575986
2485000000.0	47.56%	0.79984
2490000000.0	47.80%	0.732298
2495000000.0	47.49%	0.941863
2500000000.0	47.43%	0.839968

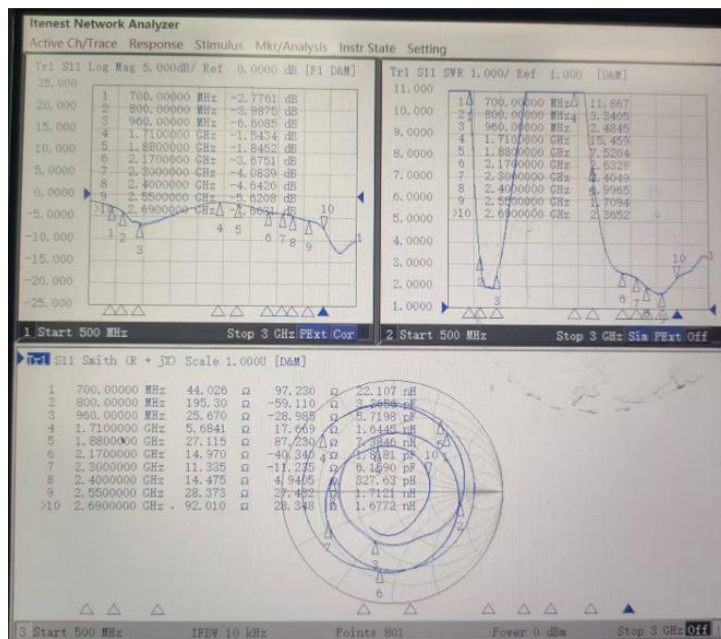
WIFI antenna Apple diagram



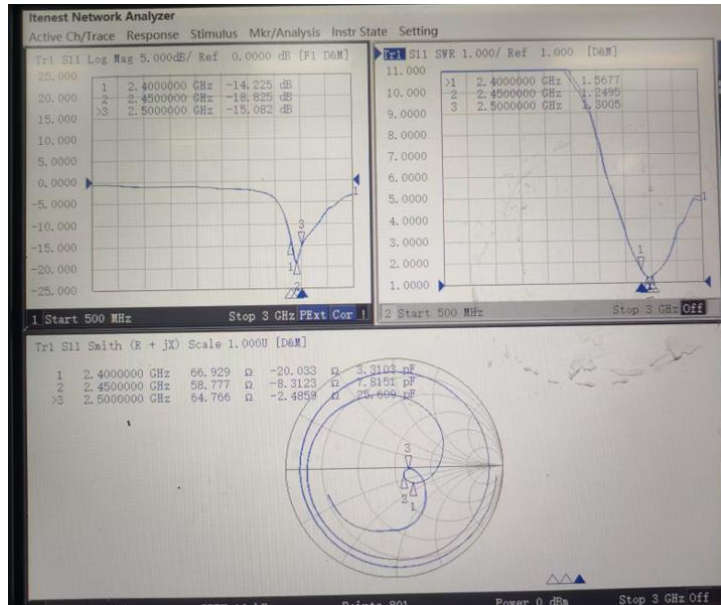
Main antenna S11



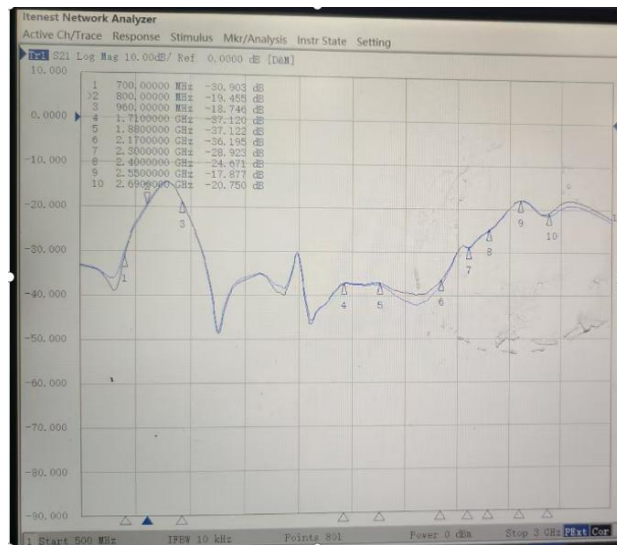
Subdivided antenna S11



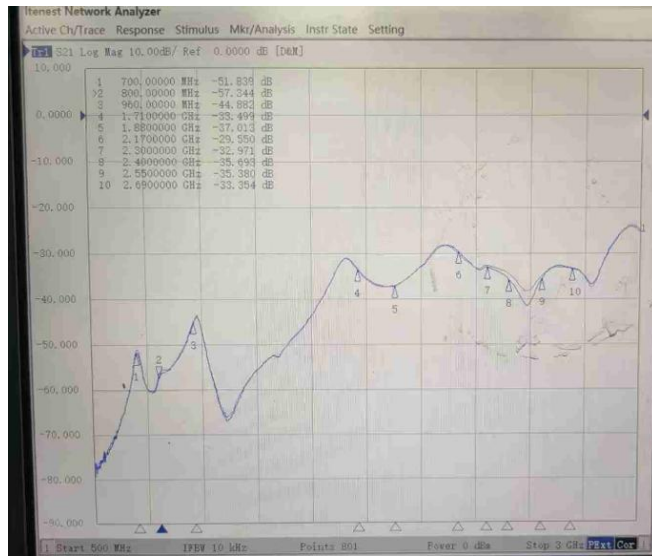
WiFi antenna S11



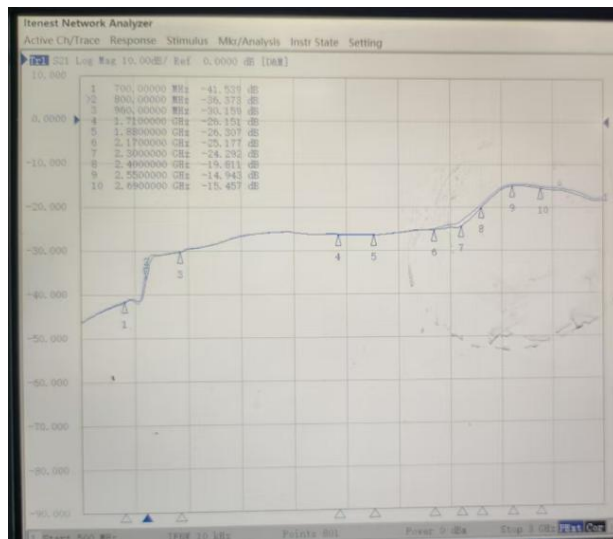
Isolation between main antenna and diversity antenna



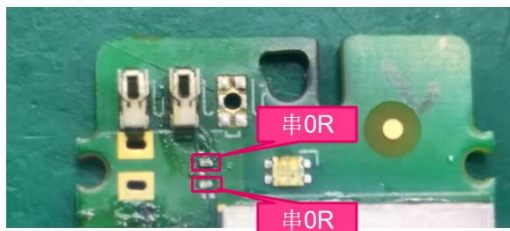
Main antenna and WIFI antenna Isolation



Divergent antenna and WIFI antenna Isolation



4. Match circuit description



主天线匹配:



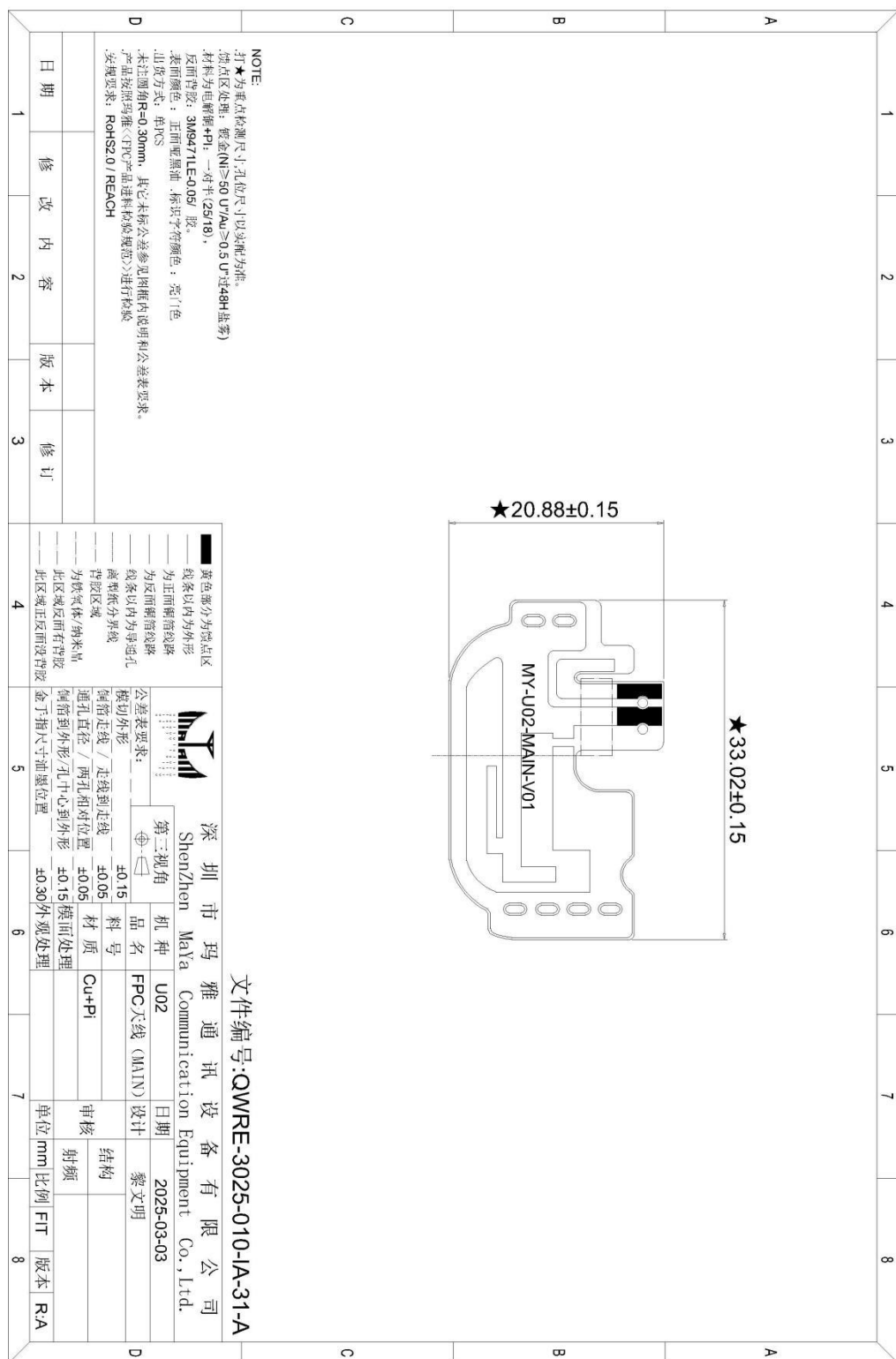
分集天线匹配:

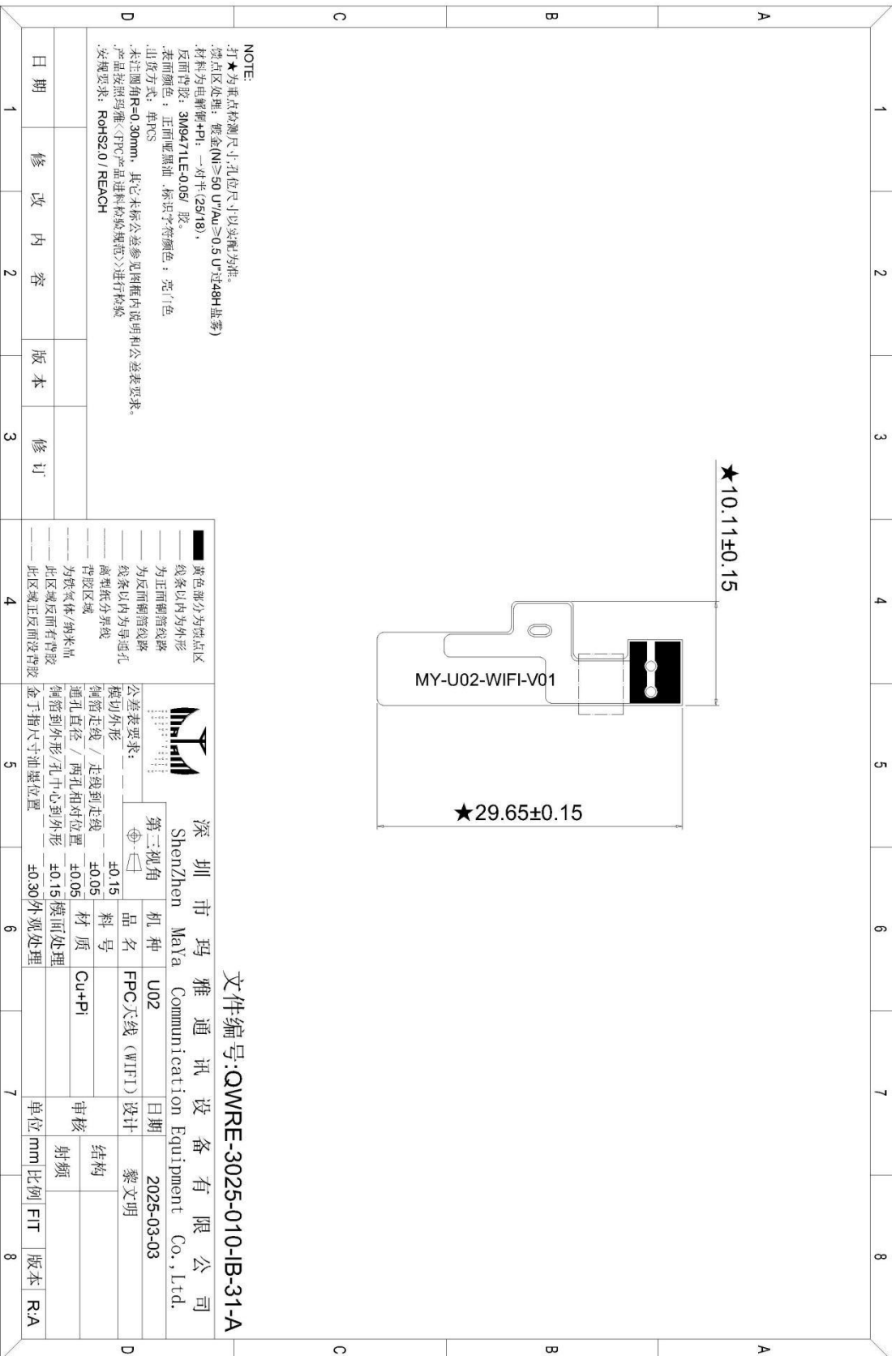
WiFi天线未改动匹配

5. Environmental treatment

No environmental treatment

6. structural drawings





★10.11±0.15

★29.65±0.15

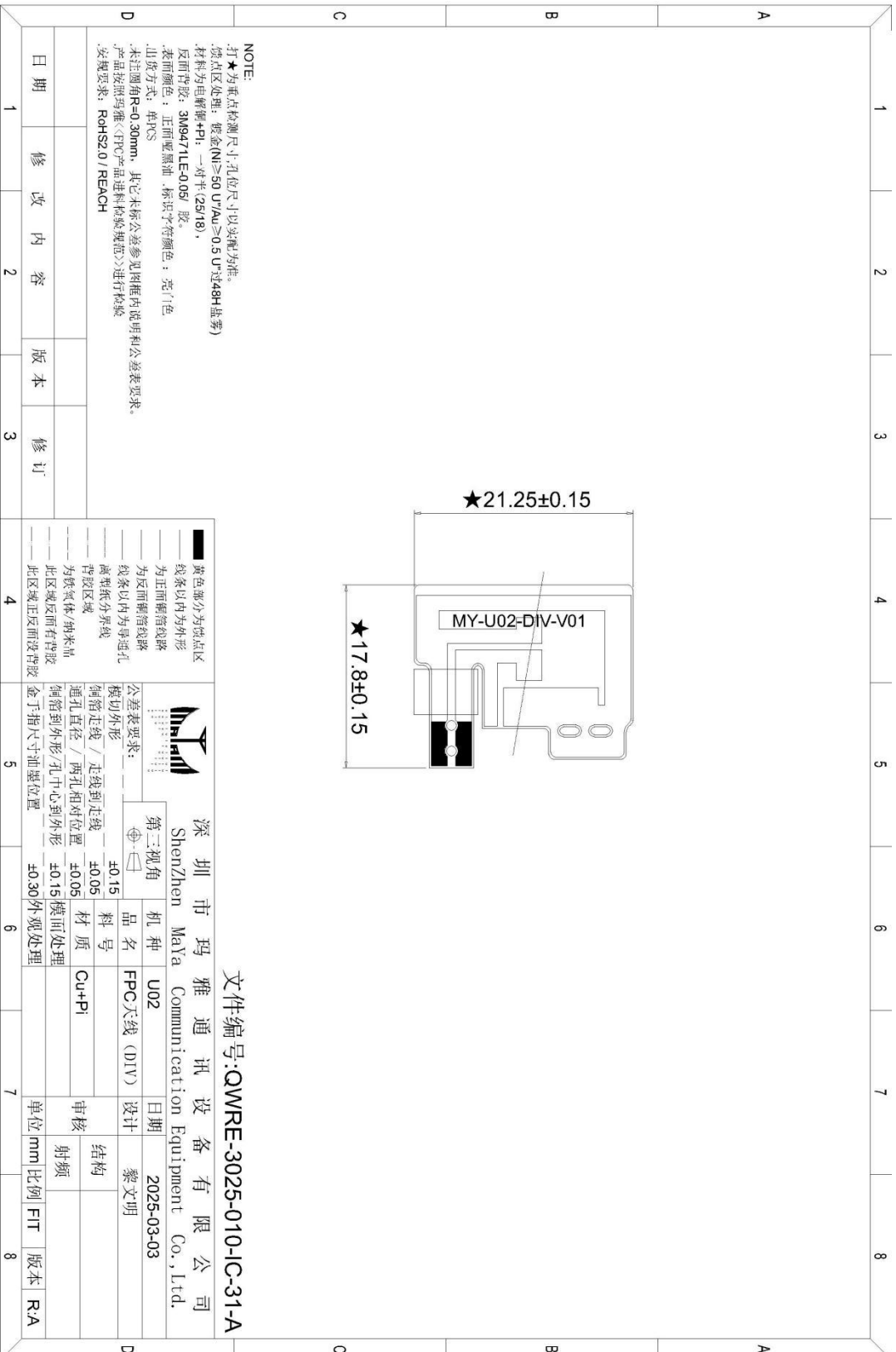
MY-U02-WIFI-V01

文件编号:QWRE-3025-010-IB-31-A

NOTE:
 .打★为重点检测尺寸,孔位尺寸以实型为准。
 .德点区处理:镀金(NI≥50 U/7Au≤0.5 U/过48H盐雾)
 .材料为电鍍铜+PI,一対半(25/18),
 .反面背胶:3M9471LE-0.05/胶。
 .表面颜色:正而哑黑油,标识字符颜色:亮白色
 .出货方式:单PCS
 .未注圆角R=0.30mm,其它未标公差参见图框内说明和公差表要求。
 .产品按照玛雅<PPC产品进料检验规范>进行检验。
 .安规要求:RoHS2.0/REACH

日期	修改内容	版本	修订
1	2	3	

<ul style="list-style-type: none"> 黄色部分为焊点区 线条以内为外形 为正面铜箔线路 为反面铜箔线路 线条以内为穿透孔 虚线纸分界线 背胶区域 为铁氟体/纳米晶 此区域反面有背胶 此区域正反面有背胶 	<p>深圳市玛雅通讯设备有限公司 Shenzhen MaYa Communication Equipment Co., Ltd.</p>	公差表要求: 模切外形 铜箔走线 / 走线到走线 通孔直径 / 两孔相对位置 铜箔到外形/孔中心到外形 金手指尺寸冲塞位置	第三视角 ±0.15 ±0.05 ±0.05 ±0.15膜面处理 ±0.30外观处理	机种 U02	品名 FPC天线 (WIFI)	日期 2025-03-03	设计 黎文明	审核 射频	单位 mm	比例 FIT	版本 R.A
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NOTE:
 打★为重点检测尺寸,孔径尺寸以实际为准。
 .热点区处理: 镀金(NI)≥50 U"/AU≥0.5 U"过48H(盐雾)
 .材料为电镀锌+PI, -对半(25/18),
 反面背胶: 3M9471LE-0.09/ 胶。
 .表面颜色: 正面无黑油, 标识字颜色: 亮白色
 .出货方式: 单PCS
 .未注通孔R=0.30mm, 其它公差参考参照框架点说明和公差表要求。
 .产品按照罗雅《FPC产品进料检验规范》进行检验
 .外观要求: RoHS2.0/REACH

日期	修改内容	版本	修订
1	2	3	

<ul style="list-style-type: none"> ■ 黄色部分为热点区 —— 线条以内为外形 —— 为反面铜箔线路 —— 为反面铜箔线路 —— 线条以内为导通孔 —— 导板纸分界线 —— 导板区域 —— 为纸/气体/纳米品 —— 此区域反面有背胶 —— 此区域正反面没背胶 	4
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		深圳市玛雅通讯设备有限公司 ShenZhen Maya Communication Equipment Co., Ltd.	
公差表要求:	第三视角	机种	品名
模切外形	±0.15	U02	FPC天线 (DIV)
铜箔走线 / 走线到走线	±0.05	料号	Cu+Pi
通孔直径 / 两孔相对位置	±0.15	材质	
铜箔到外形 / 孔中心到外形	±0.30	表面处理	
金手指尺寸加垫位置		外观处理	

日期	设计	日期	审核
2025-03-03	黎文明		
结构	射频	单位	mm
比例	FTT	版本	R/A
8			

文件编号:QWRE-3025-010-IC-31-A

7. Product test report

Product inspection report							
material quality	FPC						
project	U02						
quantity	5PCS						
date	2025. 03. 07						
— appearance:							
Check list	check	result					
1. Surface impurity and dirt	5PCS	OK					
2. glue overflow		OK					
3. waste		OK					
4. tear		OK					
5. Gold surface oxidation		OK					
6. ink		OK					
二、 Reliability test (randomly select 5 PCS):							
test project	standard	1	2	3	4	5	Test results
1. Adhesion test	The ink does not fall off	NO	NO	NO	NO	NO	OK
2. Salt Spray Test	Gold has no corrosive face	NO	NO	NO	NO	NO	OK
3. Wear resistance test	No substrate leakage						OK
4. Foil stamping content	MY-U02-MAIN-V01						OK
三、 Size measurement (randomly selected 5PCS):							

Size measurement (randomly selected 5PCS)	reference value (mm)	Tolerance + (mm)	Tolerance - (mm)	1	2	3	4	5	Test results
1	33.02	0.15	0.15	33.05	33.03	33	33.07	33	OK
2	20.88	0.15	0.15	20.85	20.90	20.85	20.88	20.90	OK
3									
4									
5									
6									

Product inspection report

material quality	FPC								
project	U02								
quantity	5PCS								
date	2025. 03. 07								
appearance:									
Check list	check	result							
1. Surface impurity and dirt	5PCS	OK							
2. glue overflow		OK							
3. waste		OK							
4. tear		OK							
5. Gold surface oxidation		OK							
6. ink		OK							
二、Reliability test (randomly select 5 PCS):									
test project	standard	1	2	3	4	5	Test results		
1. Adhesion test	The ink does not fall off	NO	NO	NO	NO	NO	OK		
2. Salt Spray Test	Gold has no corrosive face	NO	NO	NO	NO	NO	OK		
3. Wear resistance test	No substrate leakage						OK		

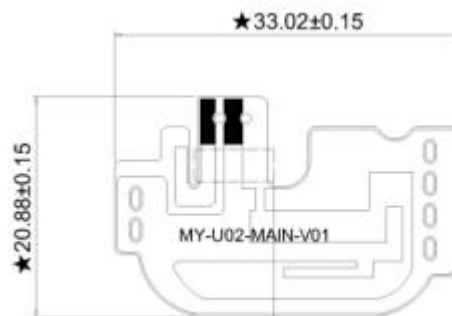
4. Foil stamping content	MY-U02-MAIN-V01	OK
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三、 Size measurement (randomly selected 5PCS):

Size measurement (randomly selected 5PCS)	reference value (mm)	Tolerance + (mm)	Tolerance - (mm)	1	2	3	4	5	Test results
1	10.11	0.15	0.15	10.15	10.12	10.08	10.07	10.15	OK
2	29.65	0.15	0.15	29.60	29.66	29.70	29.63	29.61	OK
3									
4									
5									
6									

Product inspection report

material quality	FPC		
project	U02		
quantity	5PCS		
date	2025. 03. 07		
— appearance:			
Check list	check	result	
1. Surface impurity and dirt	5PCS	OK	
2. glue overflow		OK	
3. waste		OK	
4. tear		OK	
5. Gold surface oxidation		OK	
6. ink		OK	
二、 Reliability test (randomly select 5 PCS):			



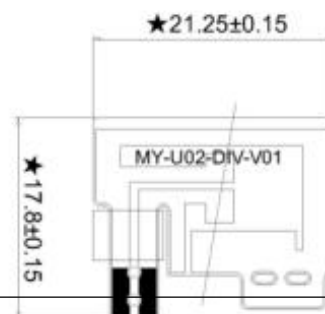
test project	standard	1	2	3	4	5	Test results
1. Adhesion test	The ink does not fall off	NO	NO	NO	NO	NO	OK
2. Salt Spray Test	Gold has no corrosive face	NO	NO	NO	NO	NO	OK
3. Wear resistance test	No substrate leakage						OK
4. Foil stamping content	MY-U02-MAIN-V01						OK

三、Size measurement (randomly selected 5PCS):

Size measurement (randomly selected 5PCS)	reference value (mm)	Tolerance + (mm)	Tolerance - (mm)	1	2	3	4	5	Test results
1	33.02	0.15	0.15	33.05	33.03	33	33.07	33	OK
2	20.88	0.15	0.15	20.85	20.90	20.85	20.88	20.90	OK
3									
4									
5									
6									

Product inspection report

material quality	FPC		
project	U02		
quantity	5PCS		
date	2025.03.07		
appearance:			
Check list	check	result	
1. Surface impurity and	5PCS	OK	



dirt									
2. glue overflow		OK							
3. waste		OK							
4. tear		OK							
5. Gold surface oxidation		OK							
6. ink		OK							
二、Reliability test (randomly select 5 PCS):									
test project	standard	1	2	3	4	5	Test results		
1. Adhesion test	The ink does not fall off	NO	NO	NO	NO	NO	OK		
2. Salt Spray Test	Gold has no corrosive face	NO	NO	NO	NO	NO	OK		
3. Wear resistance test	No substrate leakage						OK		
4. Foil stamping content	MY-U02-MAIN-V01						OK		
三、Size measurement (randomly selected 5PCS):									
Size measurement (randomly selected 5PCS)	reference value (mm)	Tolerance + (mm)	Tolerance - (mm)	1	2	3	4	5	Test results
1	21.25	0.15	0.15	21.25	21.22	21.21	21.28	21.27	OK
2	17.8	0.15	0.15	17.85	17.88	17.83	17.78	17.75	OK
3									
4									

8. Packaging

使用材料		
序号	名称	规格
1	封口胶袋	
2	纸箱	

每个封口胶袋内天线按标签数量，外用纸箱包装



包装示意图



9. Reliability test report

盐雾测试报告							
							编号: 202501011
客户名称	上德		生产批次		1		
产品名称	FPC		测试数量		3		
产品料号	3025-010		测试标准		GB. 24. 23. 17		
检验时间	2025. 03. 07		货品素材		FPC		
测试时间: 2025. 03. 07 8:00 2025. 03. 07 8:00							
测试项目	要求标准	实际数值	判定	测试项目	要求标准	实际数值	判定
测试仪器规格	PS-60	PS-60	OK	测试时间	48H	48H	OK
盐雾测试类别	NSS 中性	NSS 中性	OK	盐雾箱温度	35±1	35±	OK
盐水 PH 值	6.5-7.0	6.9	OK	盐雾沉降量 (H. 80C)	1-2ML	1-2ML	OK
喷雾方式	连续喷雾	连续喷雾	OK	货品材质	电解铜+PI	电解铜+PI	OK
盐水成份	5±1%	5%	OK	压缩空气节压力	1.00±0.01	1	OK
饱和温度	47℃	47℃	OK	试样放置角度	90℃	90℃	OK
测试观察时间	观察现象						
4H	无异常						
8H	无异常						
12H	无异常						
16H	无异常						
24H	无异常						
28H	无异常						
32H	无异常						
36H	无异常						
40H	无异常						
44H	无异常						
48H	无异常						
判定标准: 依国标 5944-86 评级方法判定, 9 级以上为合格							
最终判定结果	合格 <input checked="" type="checkbox"/>			不合格 <input type="checkbox"/>			
测试人员	高月兰	审核	夏兵	审批			
备注: 常用的盐雾试验方法有: NSS 中性盐雾试验, AASS 乙酸盐雾试验, CASS 铜乙酸加速试验。							

10.SGS Report



检测报告

编号: SHAEC24000428806

日期: 2024年01月12日

第1页, 共9页

客户名称: 苏州蔡伦格蒂电子材料有限公司
客户地址: 江苏省太仓市太平北路168号

样品名称: 电解柔性覆铜箔基材
以上样品及信息由客户提供。

SGS工作编号: SHP24-000434
样品接收时间: 2024年01月08日
检测周期: 2024年01月08日~2024年01月12日
检测要求: 根据客户要求检测。
检测方法: 见后续页。
检测结果: 见后续页。

检测要求	结论
欧盟 RoHS 指令 2011/65/EU 附录 II 的修正指令(EU) 2015/863-铅、汞、镉、六价铬、多溴联苯 (PBB)、多溴二苯醚 (PBDE)、邻苯二甲酸二(2-乙基己基)酯 (DEHP)、邻苯二甲酸丁苄酯 (BBP)、邻苯二甲酸二丁酯 (DBP)和邻苯二甲酸二异丁酯 (DIBP)	符合
卤素	见检测结果

通标标准技术服务(上海)有限公司
授权签名

盛雯舒

Sue Sheng 盛雯舒
批准签署人



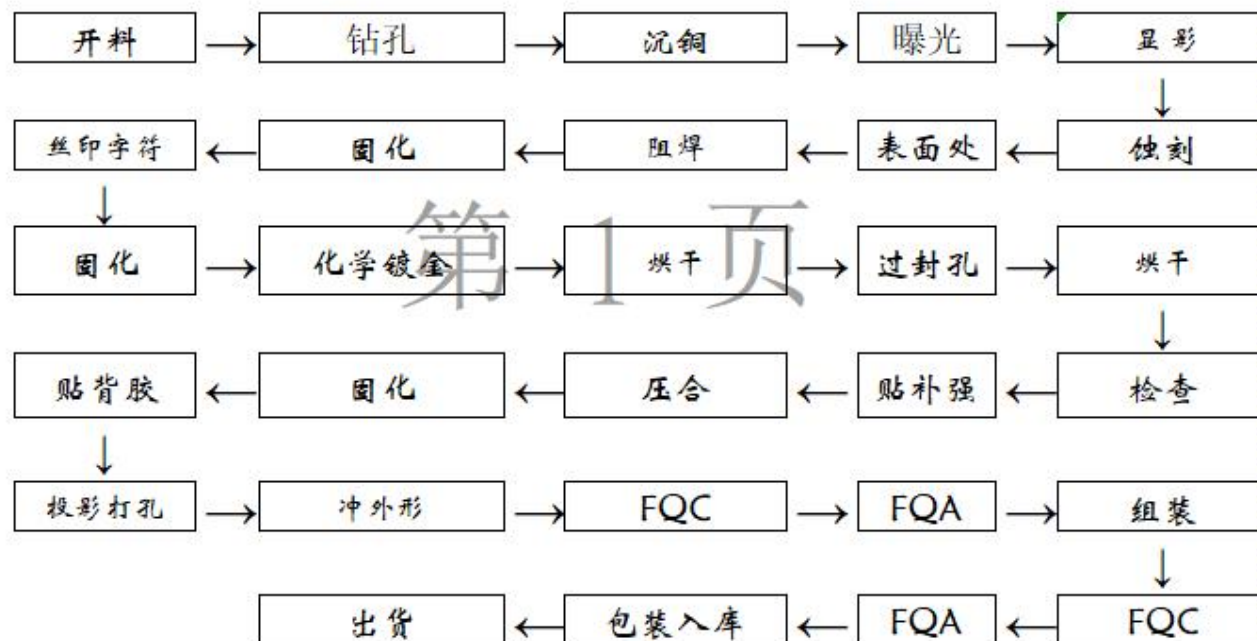
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Attention: To check the authenticity of testing (inspection report & certificate, please contact us at telephone: (86-755) 8307 1443, or email: CN.Doccheck@sgs.com

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Member of the SGS Group (SGS SA)

11. Process flow chart

工艺流程



12. Quality control flow chart