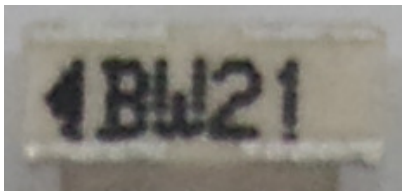
Approval Sheet

Products	Chip Antenna	3D Structure
Supplier CODE	ODBWPTR5020	 Top-Side View  Bottom-Side View
Model	SNH-V6430BN	
SEC CODE		
Revision	Ver1.0 07/08	
Supplier	Partron	

MSL	LEAD FREE	BFRs-Free, Halogen-Free
MSL 1	LEAD-FREE	HF BFRs/CFRs/PVC-Free

By designed	By checked	By approved
김홍기		
Hongki.Kim	Chanik.Jeon	Namsik.Min
07/08	07/08	07/08

– Contents –

1. Revision

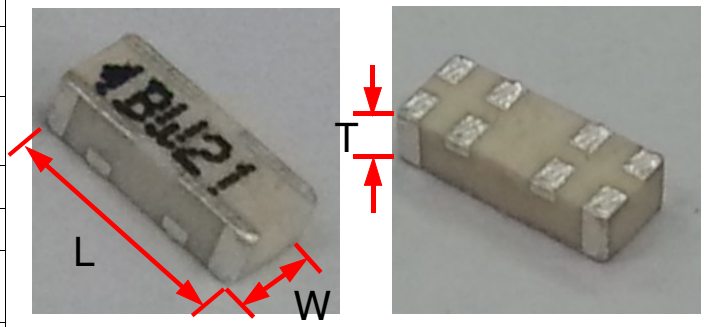
Revision No	Originator	Description of changes	Date of changes
Ver 1.0	Hongki.Kim	Issued	2016.07.08

2. Summary of Parts & Dimension

2.1 Summary of Parts

This product is the internal dielectric chip antenna of radio communication, forms the pattern with Ag paste on the brick of dielectric block and materializes the characteristics.

2.2 Dimension of parts

Type	Only Bulk Ceramic						
Material	Dielectric Block	Mg_2SiO_4(Magnesium Silicate)					
	Electrode Paste	Ag					
Size [mm]	L = 5.0 ± 0.1 (CPK: 2.14)						
	W = 2.0 ± 0.1 (CPK: 2.43)						
	T = 1.2 ± 0.1 (CPK: 2.26)						
Flatness Level	0.04						
MSL LEVEL	MSL LEVEL 1						
ESD LEVEL	More than 15 KV (HBM CLASS 3B)						
Version	Revision 1.0						
Electrical Characteristics (CTF)	Characteristics	VSWR(CTF)	Cycle of management	Q`ty	CPK	Reference	
	2095MHz	1.0 ~ 3.0 :1	all inspection	all	2.36	4,5,8,27 Page	
	2125MHz	1.0 ~ 3.0 :1	all inspection	all	3.33	4,5,8,27 Page	

3. Critical to Quality(CTQ)

- The following list is specified as the emphasis management list and managed.

CTQ Item	SPEC	Cycle of management	measurement System
Plasticity Temperature	1350±15℃	three times a day	Temperature Sensor
Dry Temperature	200±15℃	three times a day	Temperature Sensor
Hot Belt Conveyor Temperature	900±25℃	three times a day	Temperature Sensor

CTF Item	Specification Reason
Single Element Measurement SWR	This item is an important parameter that fixs an electrical characteristic
Single Element Measurement Dimension	Dimension Degree of precision is an important item of characteristic of chip antenna

- require attention for the following list.

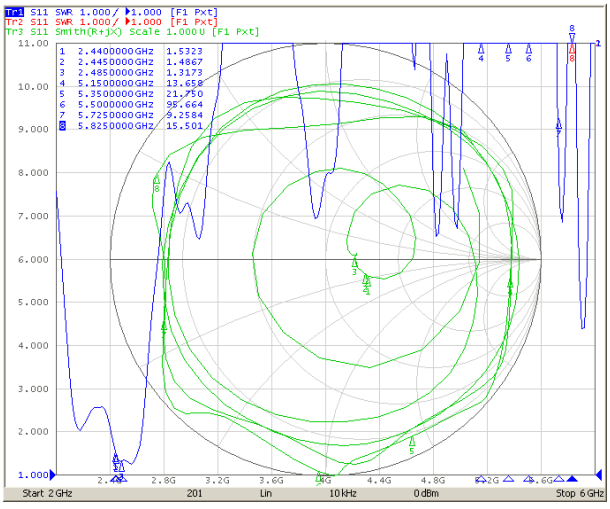
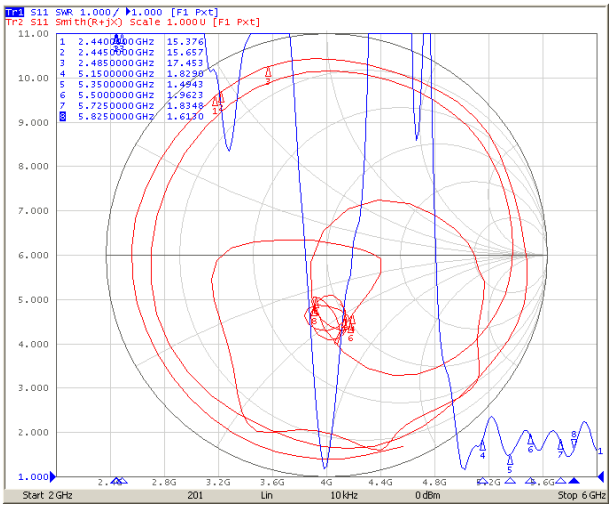
ITEM	Content
Keeping	Sealing tightly when keeping for a long time.
Action	Maybe characteristics changes when changing any design.

4. Electrical Characteristics

4.1 Set Condition

항 목				특 성
Frequency Range [MHz]				WiFi (2.4GHz) : 2400 ~ 2485 WiFi (5GHz) : 5150 ~ 5825
SWR [Max]				2.5 : 1 (Typ 2.0 : 1)
Input Impedance [Ω]				50 Ohm
Polarization				Linear
Gain [dBi] WiFi (2.4GHz)	Total Gain (Peak / Avg) [dBi]			-0.3 / -5.3
	Azimuth	Theta	Peak	-7.99
			Average	-12.39
		Phi	Peak	-0.57
			Average	-4.84
	Elevation 1	Theta	Peak	-0.82
			Average	-5.36
		Phi	Peak	1.77
			Average	-3.56
	Elevation 2	Theta	Peak	1.86
			Average	-2.99
		Phi	Peak	-1.80
			Average	-8.48
Gain [dBi] WiFi (5GHz)	Total Gain (Peak / Avg) [dBi]			-1.8 / -6.7
	Azimuth	Theta	Peak	-7.99
			Average	-13.55
		Phi	Peak	1.88
			Average	-3.30
	Elevation 1	Theta	Peak	-1.44
			Average	-5.27
		Phi	Peak	-1.83
			Average	-7.34
	Elevation 2	Theta	Peak	-2.37
			Average	-7.58
		Phi	Peak	-4.99
			Average	-9.55

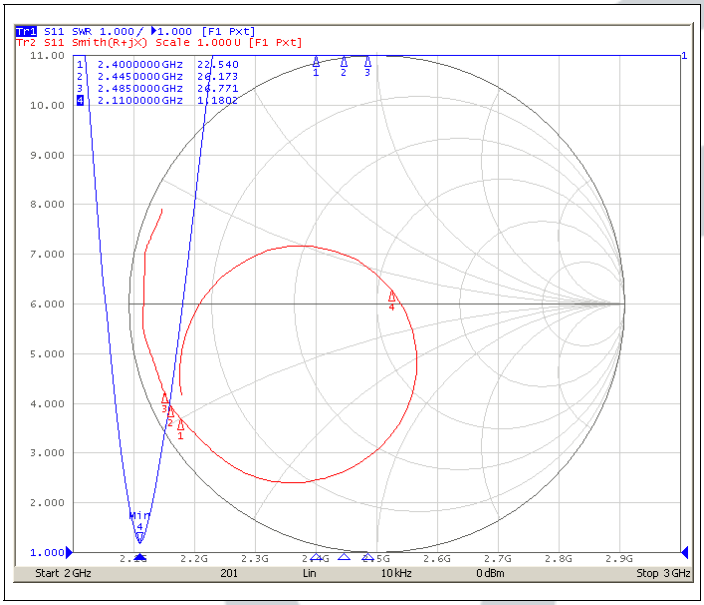
4.2 S11 Graph of Set Condition

2.4 GHz	5 GHz
	

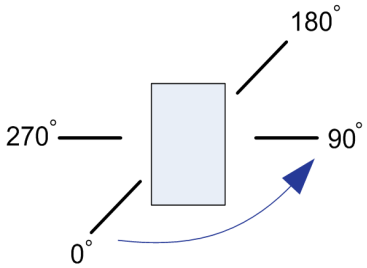
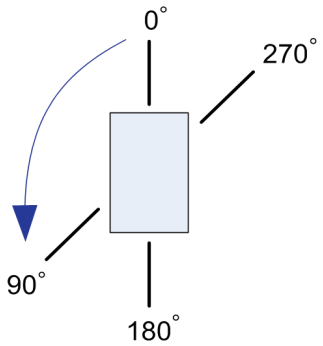
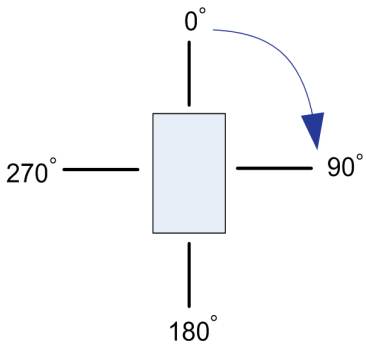
4.3 Test Fixture Condition

ITEM	SPEC
Frequency Range [MHz]	2095 ~ 2125
Lower frequency(2095 MHz) SWR [Min~Max]	1.0 ~ 3.0 : 1 (Typ 2.5 : 1)
Upper frequency(2125 MHz) SWR [Min~Max]	1.0 ~ 3.0 : 1 (Typ 2.5 : 1)

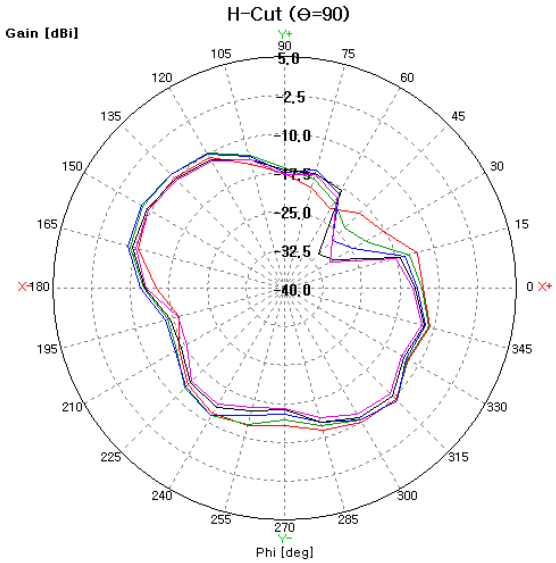
4.4 S11 Graph of Test Fixture Condition CTF



4.5-1 Radiation Pattern (2.4GHz Band)

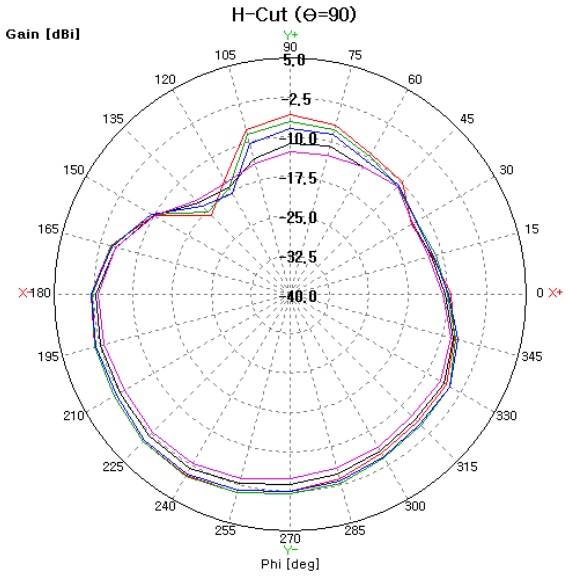
Azimuth Plane	Elevation1 Plane	Elevation2 Plane
		
Theta	Vertical field of measured plane	
Phi	Horizontal field of measured plane	

Azimuth Theta



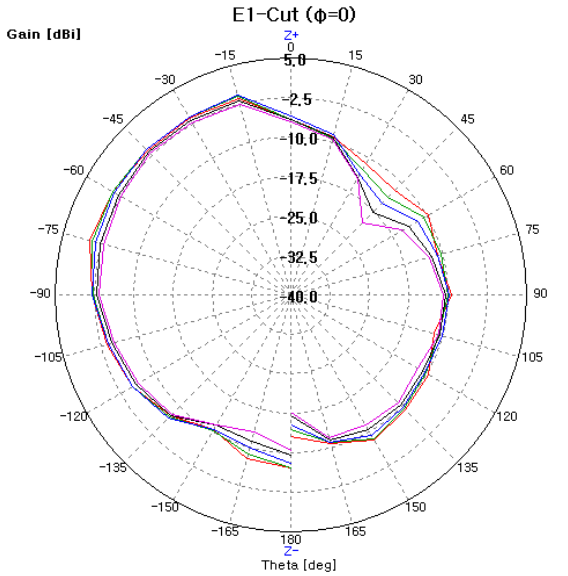
		θ-Pol(H)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	2.400	18.47	-7.33	1.51	0.00	315.00	-12.70	-9.38	150.00	-4.01	1.04	180.00	-8.10	-1.86	-15.00
2	2.425	19.80	-7.03	2.25	0.00	315.00	-12.26	-8.15	150.00	-3.50	1.42	0.00	-8.18	-1.74	-15.00
3	2.445	19.01	-7.21	2.50	0.00	330.00	-12.39	-7.99	150.00	-3.56	1.77	0.00	-8.48	-1.80	-15.00
4	2.465	15.94	-7.98	2.24	0.00	330.00	-13.29	-9.09	150.00	-4.30	1.50	0.00	-9.16	-2.21	-15.00
5	2.485	14.34	-8.43	2.15	0.00	330.00	-13.80	-9.45	150.00	-4.76	1.46	0.00	-9.58	-2.45	-15.00

Azimuth Phi



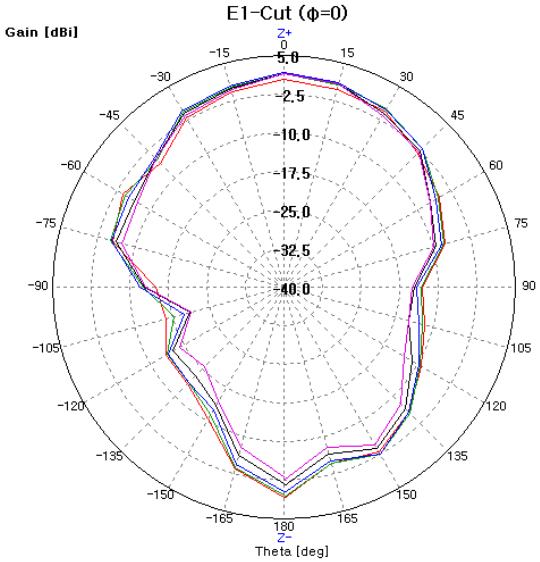
		φ-Pol(V)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	2.400	31.81	-4.97	2.23	15.00	225.00	-4.60	-0.15	240.00	-5.16	-0.26	-75.00	-3.34	0.31	-180.00
2	2.425	32.91	-4.83	2.62	15.00	225.00	-4.49	-0.10	240.00	-5.21	-0.75	-60.00	-2.95	1.19	0.00
3	2.445	31.54	-5.01	2.74	15.00	225.00	-4.84	-0.57	240.00	-5.36	-0.82	-15.00	-2.99	1.86	0.00
4	2.465	25.63	-5.91	2.26	0.00	240.00	-5.95	-1.70	240.00	-6.21	-1.54	-45.00	-3.80	1.63	0.00
5	2.485	22.55	-6.47	2.11	0.00	240.00	-6.72	-2.76	240.00	-6.71	-1.99	-45.00	-4.29	1.59	0.00

Elevation1 Theta



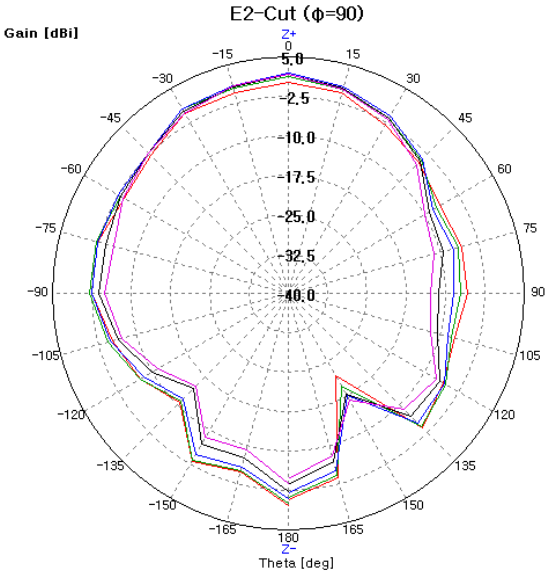
		φ-Pol(V)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	2.400	31.81	-4.97	2.23	15.00	225.00	-4.60	-0.15	240.00	-5.16	-0.26	-75.00	-3.34	0.31	-180.00
2	2.425	32.91	-4.83	2.62	15.00	225.00	-4.49	-0.10	240.00	-5.21	-0.75	-60.00	-2.95	1.19	0.00
3	2.445	31.54	-5.01	2.74	15.00	225.00	-4.84	-0.57	240.00	-5.36	-0.82	-15.00	-2.99	1.86	0.00
4	2.465	25.63	-5.91	2.26	0.00	240.00	-5.95	-1.70	240.00	-6.21	-1.54	-45.00	-3.80	1.63	0.00
5	2.485	22.55	-6.47	2.11	0.00	240.00	-6.72	-2.76	240.00	-6.71	-1.99	-45.00	-4.29	1.59	0.00

Elevation1 Phi



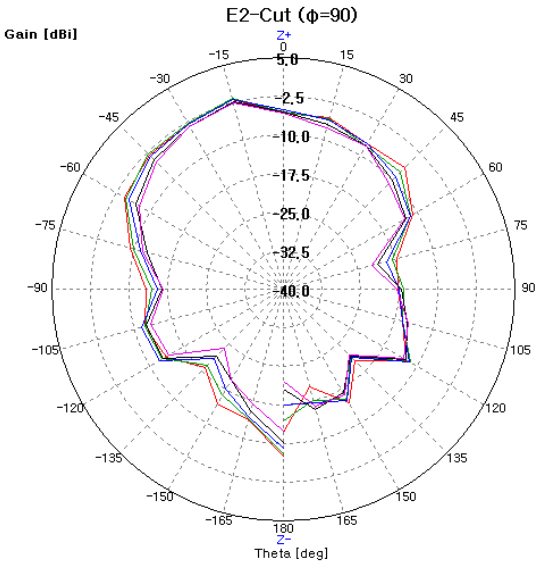
		θ-Pol(H)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	2.400	18.47	-7.33	1.51	0.00	315.00	-12.70	-9.38	150.00	-4.01	1.04	180.00	-8.10	-1.86	-15.00
2	2.425	19.80	-7.03	2.25	0.00	315.00	-12.26	-8.15	150.00	-3.50	1.42	0.00	-8.18	-1.74	-15.00
3	2.445	19.01	-7.21	2.50	0.00	330.00	-12.39	-7.99	150.00	-3.56	1.77	0.00	-8.48	-1.80	-15.00
4	2.465	15.94	-7.98	2.24	0.00	330.00	-13.29	-9.09	150.00	-4.30	1.50	0.00	-9.16	-2.21	-15.00
5	2.485	14.34	-8.43	2.15	0.00	330.00	-13.80	-9.45	150.00	-4.76	1.46	0.00	-9.58	-2.45	-15.00

Elevation2 Theta



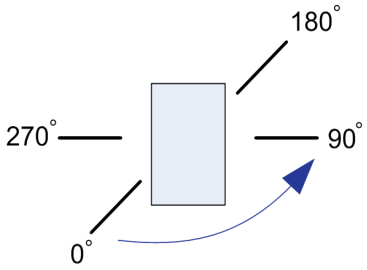
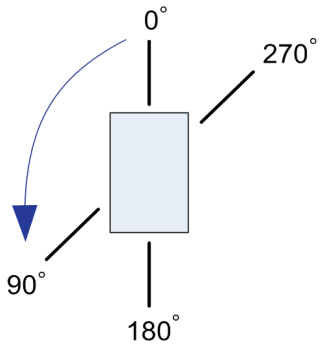
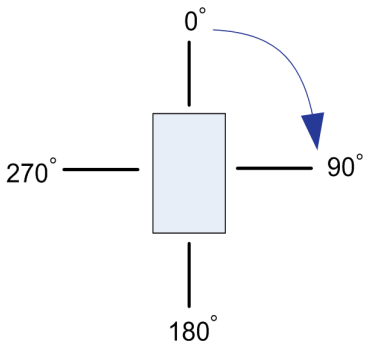
		φ-Pol(V)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	2.400	31.81	-4.97	2.23	15.00	225.00	-4.60	-0.15	240.00	-5.16	-0.26	-75.00	-3.34	0.31	-180.00
2	2.425	32.91	-4.83	2.62	15.00	225.00	-4.49	-0.10	240.00	-5.21	-0.75	-60.00	-2.95	1.19	0.00
3	2.445	31.54	-5.01	2.74	15.00	225.00	-4.84	-0.57	240.00	-5.36	-0.82	-15.00	-2.99	1.86	0.00
4	2.465	25.63	-5.91	2.26	0.00	240.00	-5.95	-1.70	240.00	-6.21	-1.54	-45.00	-3.80	1.63	0.00
5	2.485	22.55	-6.47	2.11	0.00	240.00	-6.72	-2.76	240.00	-6.71	-1.99	-45.00	-4.29	1.59	0.00

Elevation2 Phi

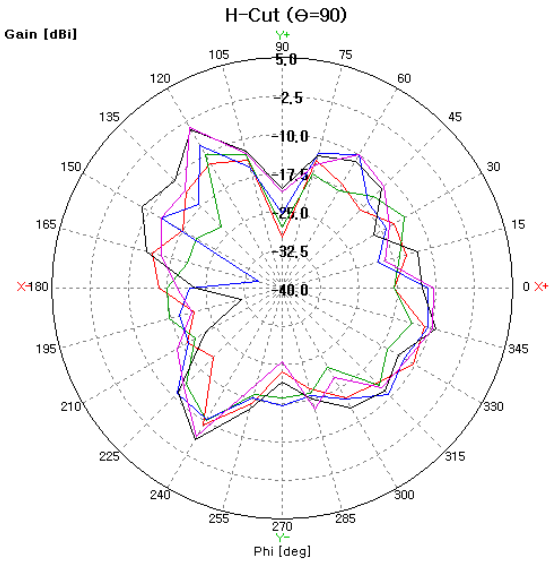


		θ-Pol(H)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	2.400	18.47	-7.33	1.51	0.00	315.00	-12.70	-9.38	150.00	-4.01	1.04	180.00	-8.10	-1.86	-15.00
2	2.425	19.80	-7.03	2.25	0.00	315.00	-12.26	-8.15	150.00	-3.50	1.42	0.00	-8.18	-1.74	-15.00
3	2.445	19.01	-7.21	2.50	0.00	330.00	-12.39	-7.99	150.00	-3.56	1.77	0.00	-8.48	-1.80	-15.00
4	2.465	15.94	-7.98	2.24	0.00	330.00	-13.29	-9.09	150.00	-4.30	1.50	0.00	-9.16	-2.21	-15.00
5	2.485	14.34	-8.43	2.15	0.00	330.00	-13.80	-9.45	150.00	-4.76	1.46	0.00	-9.58	-2.45	-15.00

4.5-2 Radiation Pattern (5GHz Band)

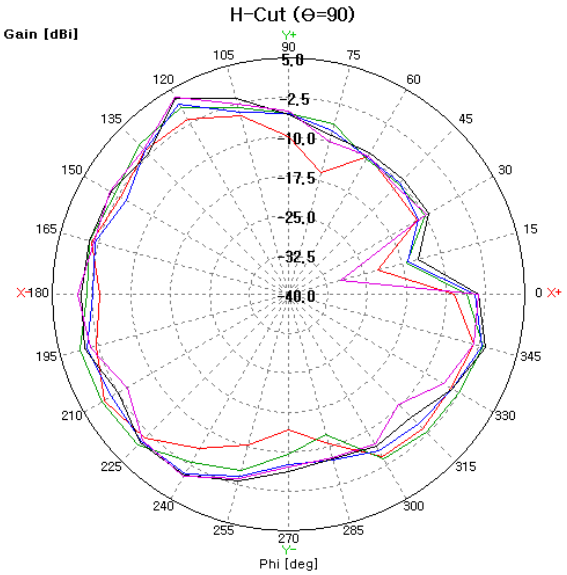
Azimuth Plane	Elevation1 Plane	Elevation2 Plane
		
Theta	Vertical field of measured plane	
Phi	Horizontal field of measured plane	

Azimuth Theta



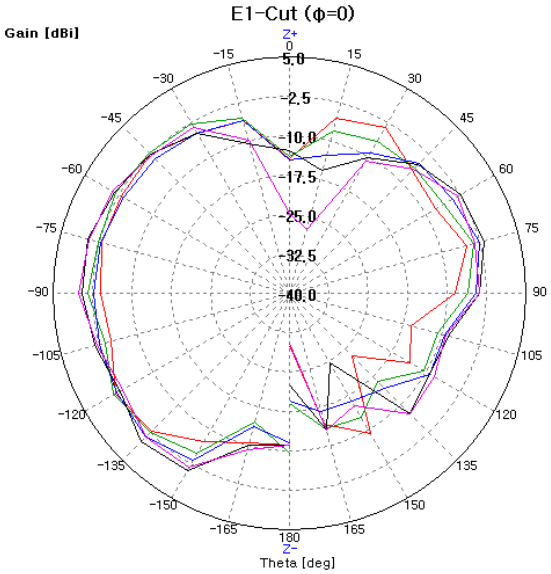
		θ-Pol(H)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	5.150	13.90	-8.57	0.90	30.00	45.00	-14.72	-9.29	240.00	-8.93	-3.75	0.00	-11.34	-6.62	-15.00
2	5.350	15.73	-8.03	1.83	30.00	45.00	-15.43	-9.88	120.00	-7.54	-1.67	0.00	-9.36	-4.44	-15.00
3	5.500	14.93	-8.26	0.51	30.00	45.00	-13.55	-7.99	120.00	-7.34	-1.83	0.00	-9.55	-4.99	135.00
4	5.725	18.58	-7.31	1.48	30.00	45.00	-11.50	-4.39	120.00	-6.93	-1.94	60.00	-7.52	-1.64	135.00
5	5.825	16.54	-7.81	1.26	30.00	105.00	-11.99	-3.90	120.00	-7.96	-1.62	60.00	-8.40	-2.84	120.00

Azimuth Phi



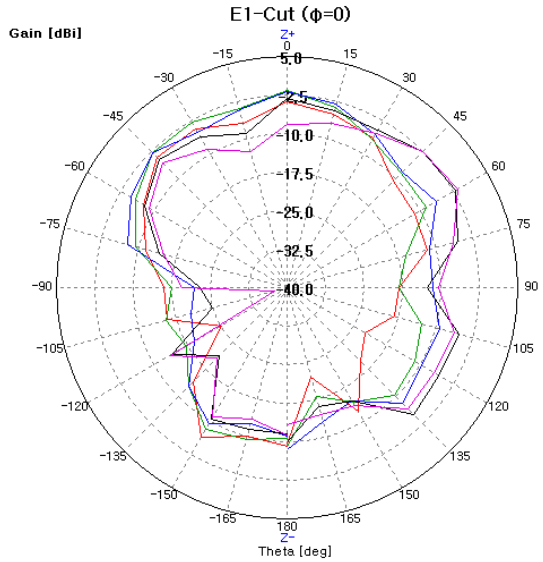
		φ-Pol(V)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	5.150	31.42	-5.03	1.39	75.00	165.00	-4.53	0.45	210.00	-5.87	-1.72	-120.00	-7.90	-2.51	30.00
2	5.350	39.80	-4.00	1.95	60.00	195.00	-2.68	1.11	120.00	-5.08	-1.40	-120.00	-7.62	-3.25	0.00
3	5.500	36.57	-4.37	2.34	120.00	120.00	-3.30	1.88	120.00	-5.27	-1.44	-135.00	-7.58	-2.37	0.00
4	5.725	43.43	-3.62	3.91	120.00	120.00	-2.62	3.17	120.00	-4.11	-0.02	-135.00	-7.36	-2.43	15.00
5	5.825	37.54	-4.26	3.39	90.00	120.00	-2.98	3.39	120.00	-4.42	0.19	-90.00	-8.24	-3.15	15.00

Elevation1 Theta



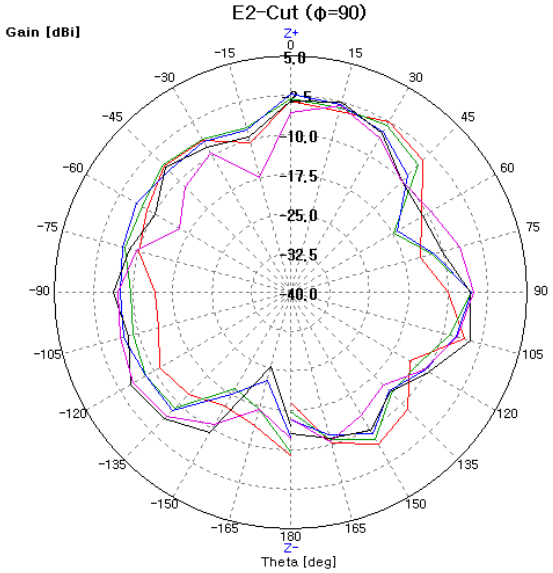
		φ-Pol(V)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	5.150	31.42	-5.03	1.39	75.00	165.00	-4.53	0.45	210.00	-5.87	-1.72	-120.00	-7.90	-2.51	30.00
2	5.350	39.80	-4.00	1.95	60.00	195.00	-2.68	1.11	120.00	-5.08	-1.40	-120.00	-7.62	-3.25	0.00
3	5.500	36.57	-4.37	2.34	120.00	120.00	-3.30	1.88	120.00	-5.27	-1.44	-135.00	-7.58	-2.37	0.00
4	5.725	43.43	-3.62	3.91	120.00	120.00	-2.62	3.17	120.00	-4.11	-0.02	-135.00	-7.36	-2.43	15.00
5	5.825	37.54	-4.26	3.39	90.00	120.00	-2.98	3.39	120.00	-4.42	0.19	-90.00	-8.24	-3.15	15.00

Elevation1 Phi



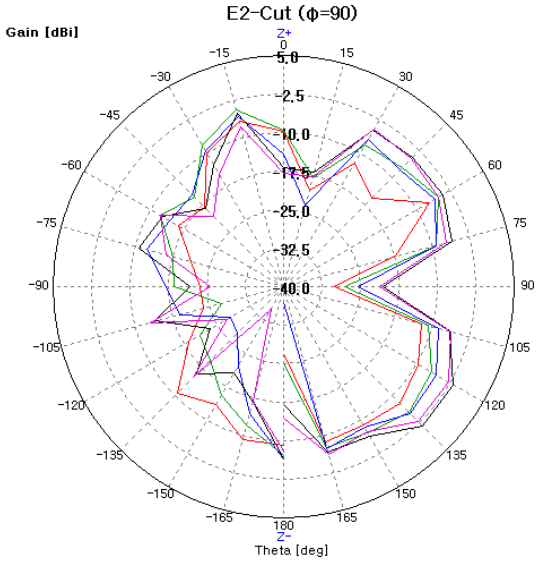
		θ-Pol(H)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	5.150	13.90	-8.57	0.90	30.00	45.00	-14.72	-9.29	240.00	-8.93	-3.75	0.00	-11.34	-6.62	-15.00
2	5.350	15.73	-8.03	1.83	30.00	45.00	-15.43	-9.88	120.00	-7.54	-1.67	0.00	-9.36	-4.44	-15.00
3	5.500	14.93	-8.26	0.51	30.00	45.00	-13.55	-7.99	120.00	-7.34	-1.83	0.00	-9.55	-4.99	135.00
4	5.725	18.58	-7.31	1.48	30.00	45.00	-11.50	-4.39	120.00	-6.93	-1.94	60.00	-7.52	-1.64	135.00
5	5.825	16.54	-7.81	1.26	30.00	105.00	-11.99	-3.90	120.00	-7.96	-1.62	60.00	-8.40	-2.84	120.00

Elevation2 Theta



		φ-Pol(V)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	5.150	31.42	-5.03	1.39	75.00	165.00	-4.53	0.45	210.00	-5.87	-1.72	-120.00	-7.90	-2.51	30.00
2	5.350	39.80	-4.00	1.95	60.00	195.00	-2.68	1.11	120.00	-5.08	-1.40	-120.00	-7.62	-3.25	0.00
3	5.500	36.57	-4.37	2.34	120.00	120.00	-3.30	1.88	120.00	-5.27	-1.44	-135.00	-7.58	-2.37	0.00
4	5.725	43.43	-3.62	3.91	120.00	120.00	-2.62	3.17	120.00	-4.11	-0.02	-135.00	-7.36	-2.43	15.00
5	5.825	37.54	-4.26	3.39	90.00	120.00	-2.98	3.39	120.00	-4.42	0.19	-90.00	-8.24	-3.15	15.00

Elevation2 Phi

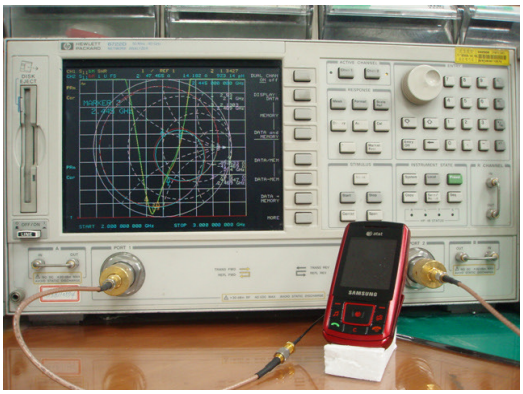
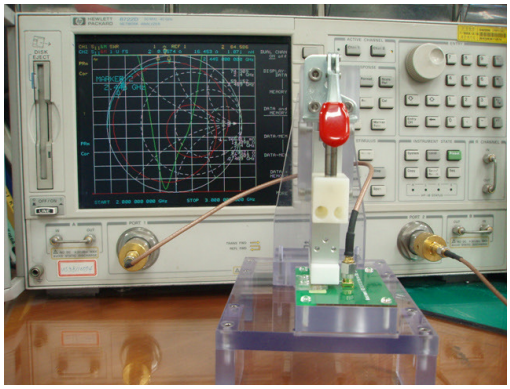


		θ-Pol(H)					H(θ=90)			E1(φ=0)			E2(φ=90)		
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]
1	5.150	13.90	-8.57	0.90	30.00	45.00	-14.72	-9.29	240.00	-8.93	-3.75	0.00	-11.34	-6.62	-15.00
2	5.350	15.73	-8.03	1.83	30.00	45.00	-15.43	-9.88	120.00	-7.54	-1.67	0.00	-9.36	-4.44	-15.00
3	5.500	14.93	-8.26	0.51	30.00	45.00	-13.55	-7.99	120.00	-7.34	-1.83	0.00	-9.55	-4.99	135.00
4	5.725	18.58	-7.31	1.48	30.00	45.00	-11.50	-4.39	120.00	-6.93	-1.94	60.00	-7.52	-1.64	135.00
5	5.825	16.54	-7.81	1.26	30.00	105.00	-11.99	-3.90	120.00	-7.96	-1.62	60.00	-8.40	-2.84	120.00

5. Measurement Process

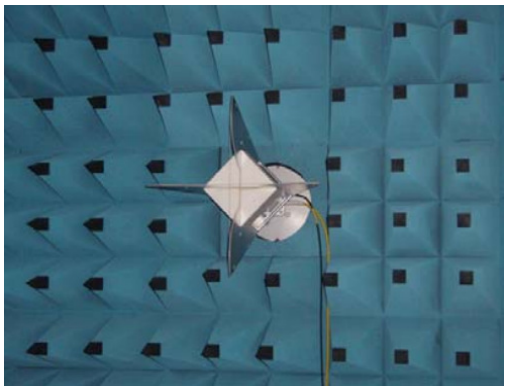
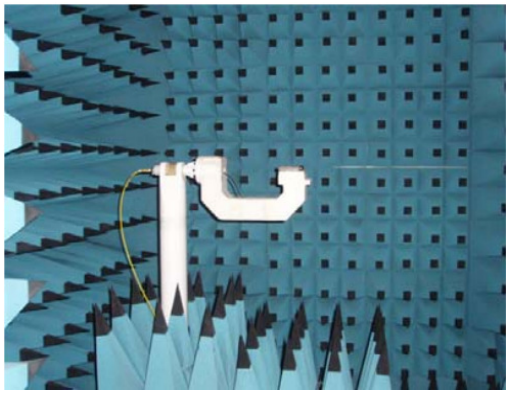
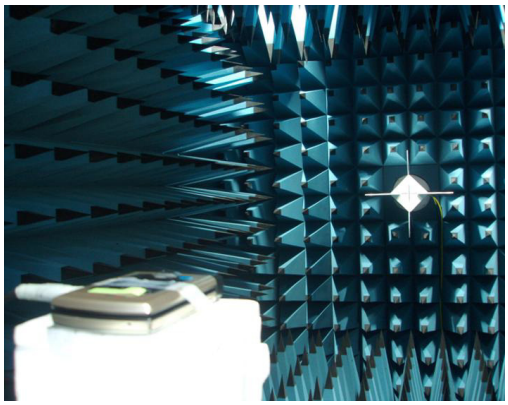
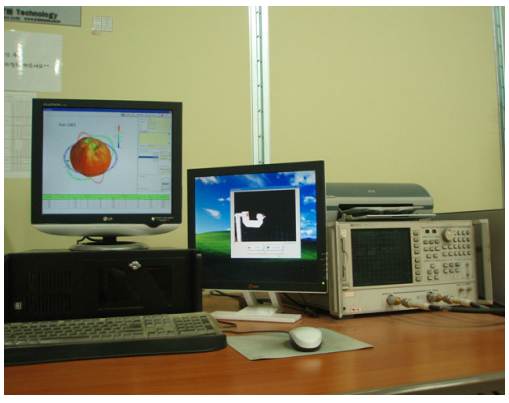
5.1 SWR / Return Loss

Use Network Analyzer when measuring SWR/Return loss and selecting standard SPL,
Use automatic inspection equipment when selecting superior and inferior goods.

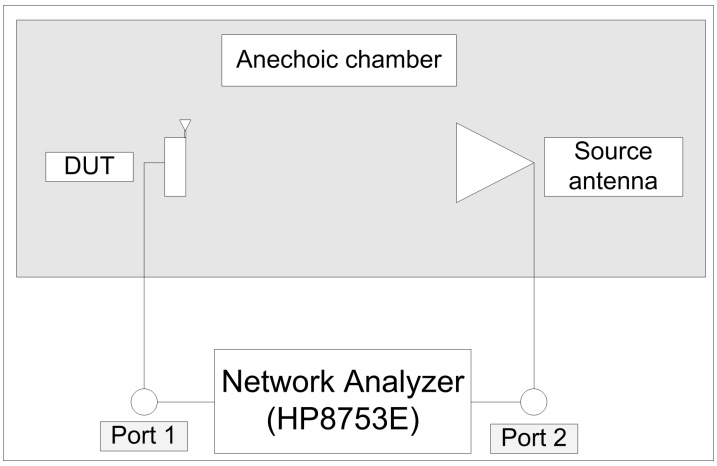
	Set Condition	Test Fixture Condition
Network Analyzer	Agilent HP8753E or Advantest R3765CH	Agilent HP8753E or Advantest R3765CH
Cable	RF cable (300 mm)	RF cable (300 mm)
Test condition		

5.2 Gain

Antenna gain is measured in the Anechoic Chamber of this company, using set above of 4.1 list.

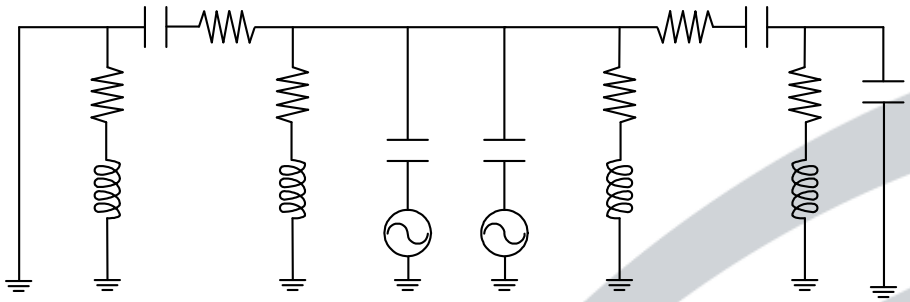
Anechoic Chamber for Antenna Gain Measurement	
	
	

5.3 Gain test block diagram

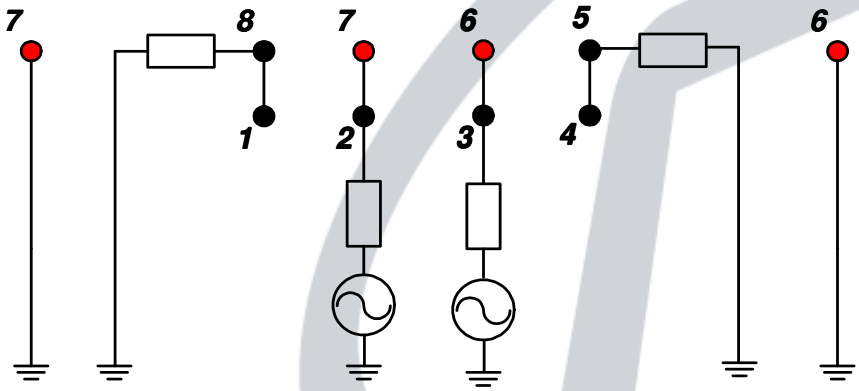


6. Equivalent Circuit

This product is an RF part that realizes the performance of the structure shape of the silver(Ag) pattern on the surface of a rectangular body made of dielectrics by the following structural equivalent circuit configuration.



< Chip Antenna Equivalent Circuit>



< Default Condition Equivalent Circuit>

7. Application Note

This product is an internal dielectric chip antenna that acts to convert guide waves on a transmission structure into free space waves.

This is able to position at anywhere of the PCB that you want. Even if the surround condition of chip antenna alter into the changed electrical characteristic, you can tune the electrical characteristic by designing the another PCB layout. And so far as circumstances permit, using only lumped element, you can adjust the electrical characteristic of antenna without the PCB layout alteration.

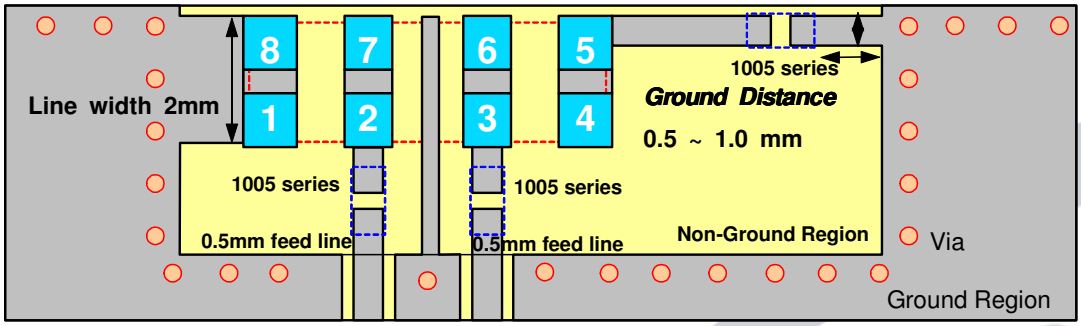
However, You must carefully choose the space for a chip antenna. Because this is only electromagnetic RF device, the electrical characteristic is changed by surrounding condition of antenna.

In case of this product, the four land pads exist and the fixed feeding structure is not, each the No 1, 2, 3 and 4 land pads can become the input pad or the ground short in each another situations. Sometimes, some land pads become just mount pad.

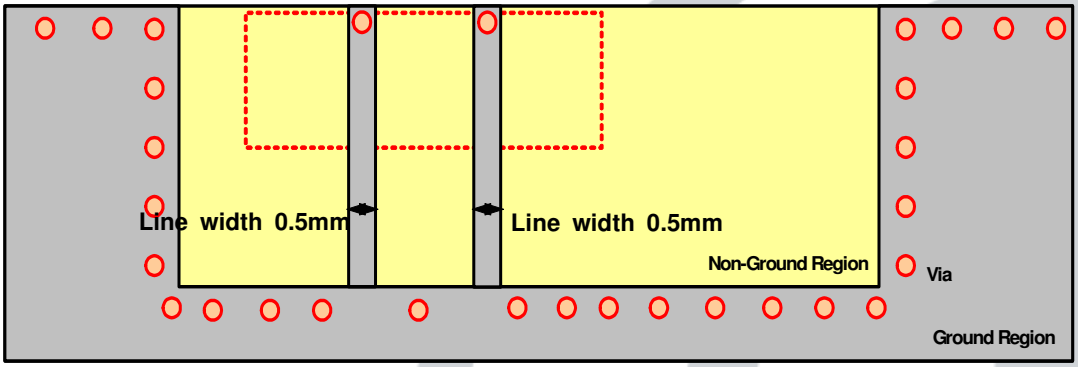
You can obtain the detail informations about the selection of each land pad from PARTRON.

■ PCB Layout Design

- Basic Design



< Chip Antenna The surface to be mounted >



< Chip Antenna The opposite surface to be mounted >

The figure above is a view of the basic PCB drawing for this product as seen from the side opposite to the side on which the chip antenna is mounted.

This structure adds autocad drawing as an appendix for measuring PCB. Please refer to the detailed dimensions of the figure.

A : The No2 Pad is an input pad and Wi-Fi Band. The No3 Pad is an input pad and BlueTooth Band. Pads 1 and 4 are fixed, and pad 5 is connected to the adjacent ground through a lumped element. At this time, the line width connected to each pad is designed as 0.5 mm. Also, pads 6 and 7 are connected via vias to the opposite side of the antenna mount.

B : A non-grounded area extends to an acceptable area to remove all metal surfaces. This product can not operate with the metal surface area. All layers have the same area and the metal surface is removed. As shown in the figure, the vias are used for the outer surface of the area where there is no metal surface. The non-metallic area of the basic design value of this product is 4.2x12 mm2. (Non-metal areas may change depending on the frequency used.)

C : Pads 6 and 7 are connected to the ground via the vias and the opposite side of the antenna mount. Pads 2 and 3 are connected to the input line as shown in the figure.

D : Pad No. 5 is connected to the adjacent ground by the width of 0.5mm line. As shown in the figure, pad No. 1 and pad No. 8 are connected to the adjacent ground by the width of 2mm line.

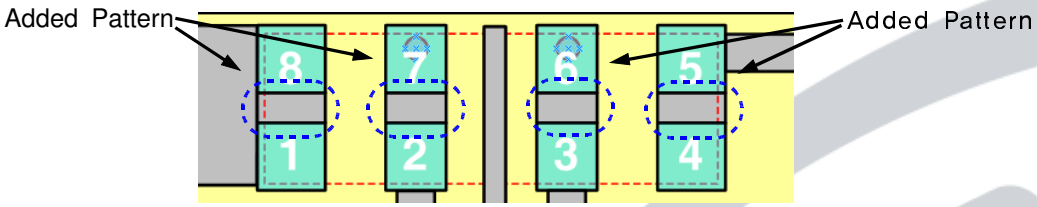
E : Pad No. 5 is connected to the adjacent ground through the 1005 lumped element. At this time, the value of the device used changes according to the frequency band used. (Refer to the Data Sheet for details of the value of lumped element.)

F : As shown in the figure above, insert the vias as many as possible in the corners.

G : Between pad no.2 and pad no.3 there is a Line width of 0.3mm.

- Land Pad Design

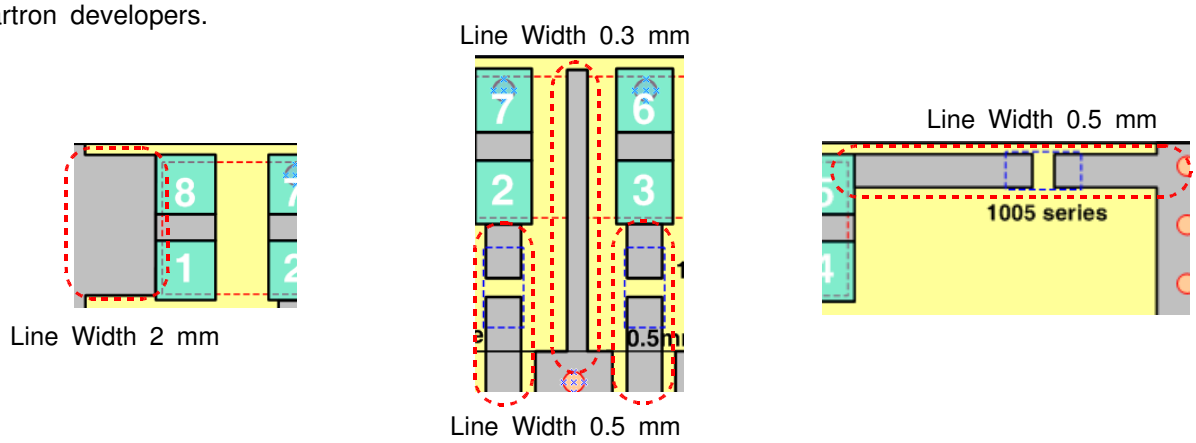
In the case of the first PCB structure, the first and second pads are shorted to the same width, and the second and fourth pads, third and sixth pads and fourth pads The pad 5 is also shorted to the same width, and the actual appearance of the pad is shown as the following four pads only.



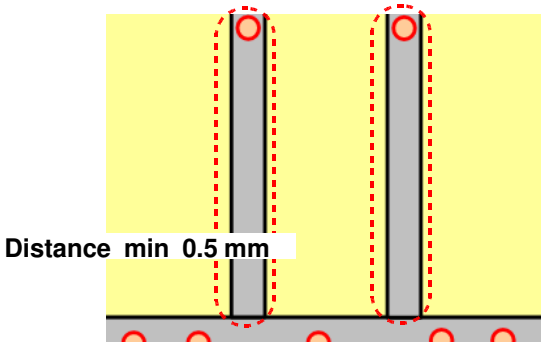
The four pads can be six or eight pads, eliminating the additional connection pads for the short circuit due to changes in the design of the wireless communication system for development applications. This can be changed by the application of Partron developers during the development process. The additional pattern is silk-screened so that lead is not connected and there are eight solder pads as well.

- Line Design

All RF lines configured for this product are designed with a fixed width of 0.5 mm. If you need to change the track width due to unavoidable circumstances, it must be done after consultation with Partron developers.



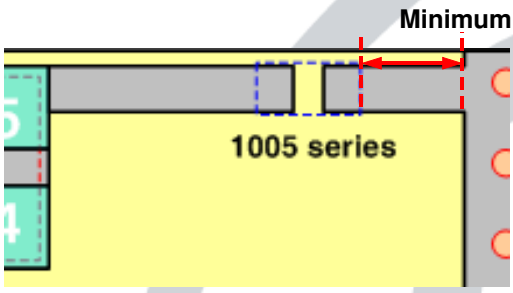
<Figure 1,2,3 Ant track width>



< Figure 4 Line width on the opposite side of the Ant mounting. >

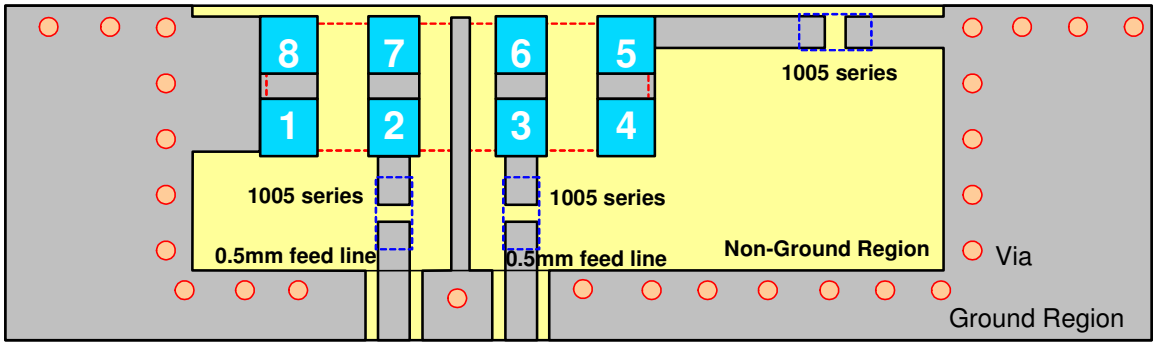
- Inserted Lumped Element

In case of lumped element connected to pad No. 5 for this product, it is based on non-grounded area, and it is located at least 0.5 mm apart from adjacent ground if possible.

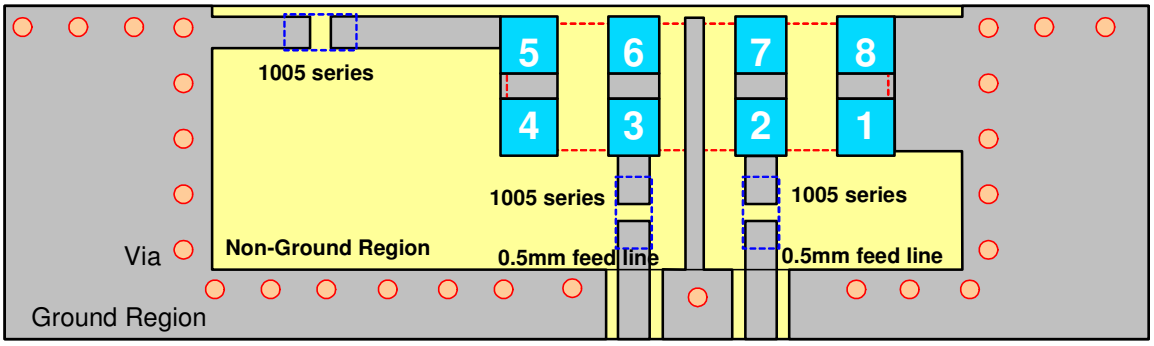


If you don't permit this design, it is possible to change position of lumped element and another design. Have a conference with PARTRON.

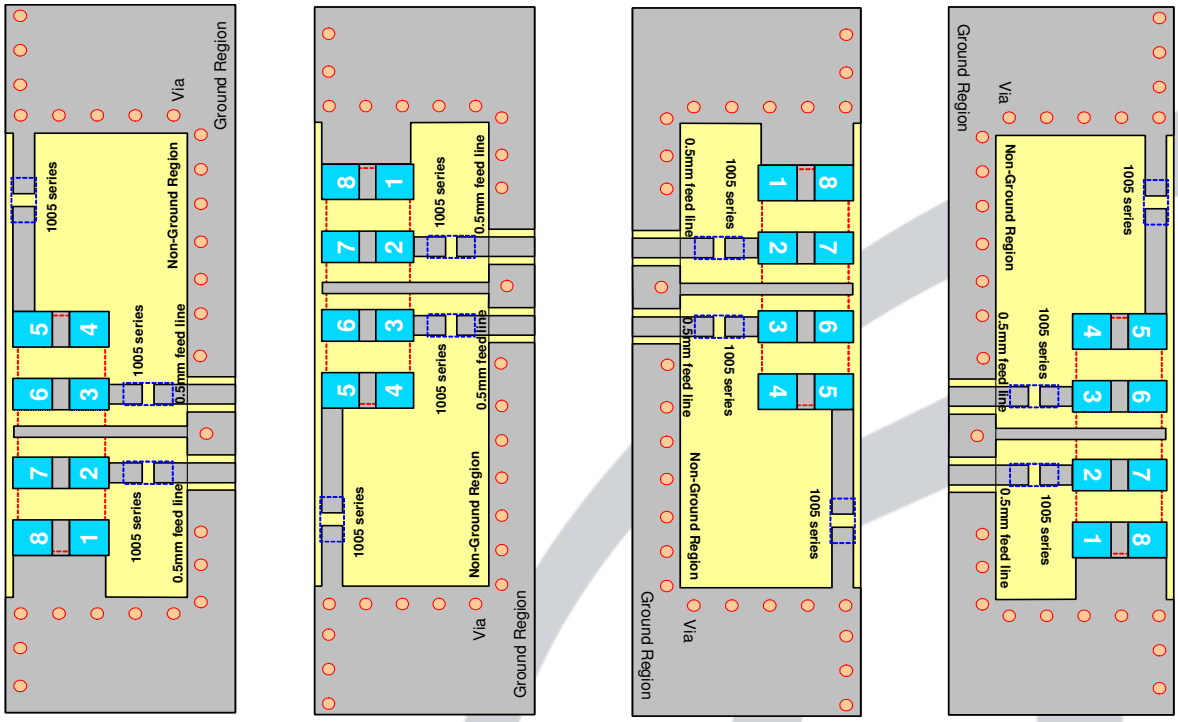
■ Change of Antenna Position



〈Left Position〉



〈Right Position〉

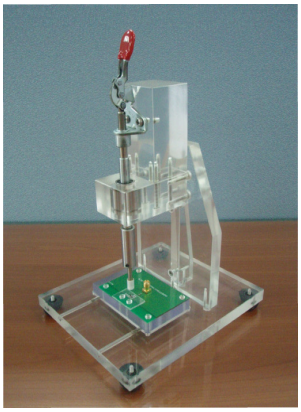


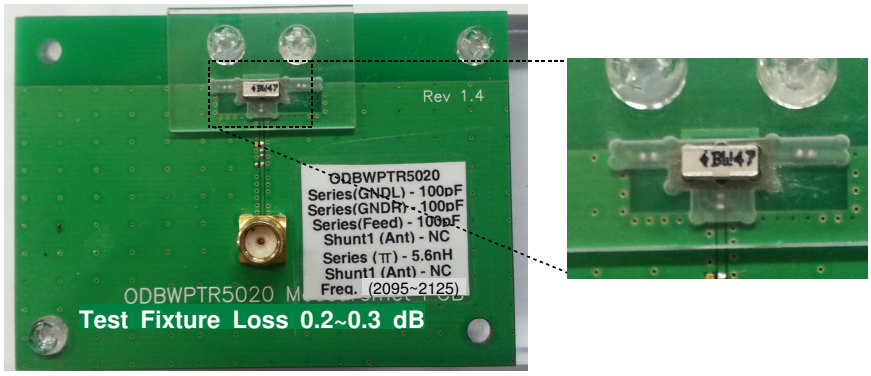
<Right side/up> <Right Side/Down> <Left Side/Up> <Left Side/Down>

As shown in the above figure, even if the position of the product is changed inside the development application wireless communication system, the position of LMS registration pad is changed to symmetrical or horizontally symmetrical, and then the structure is designed according to PCB design guidelines.

8. Test Fixture Specification

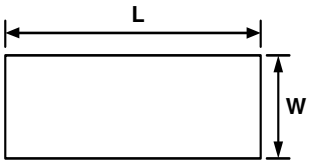
8.1 Test Fixture and Test PCB



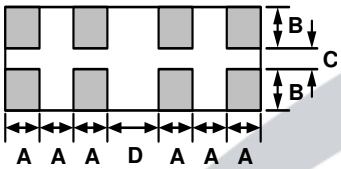


※ Ev B'd is the same as the manual measuring jig (Ev B'd is soldered to the contact type and manual measuring jig is the same for the eastern contact type)

Chip Antenna Dimension



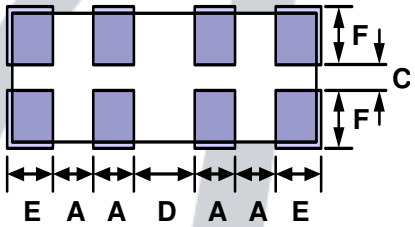
Chip Antenna
Soldering Pad Dimension



Parameter	L	W	T	A	B	C	D
Value[mm]	5.0 ± 0.1	2.0 ± 0.1	1.2 ± 0.1	0.6	0.8	0.4	1.4

8.2 Soldering Pad Dimension and PCB layout Dimension

PCB
Soldering Land Dimension

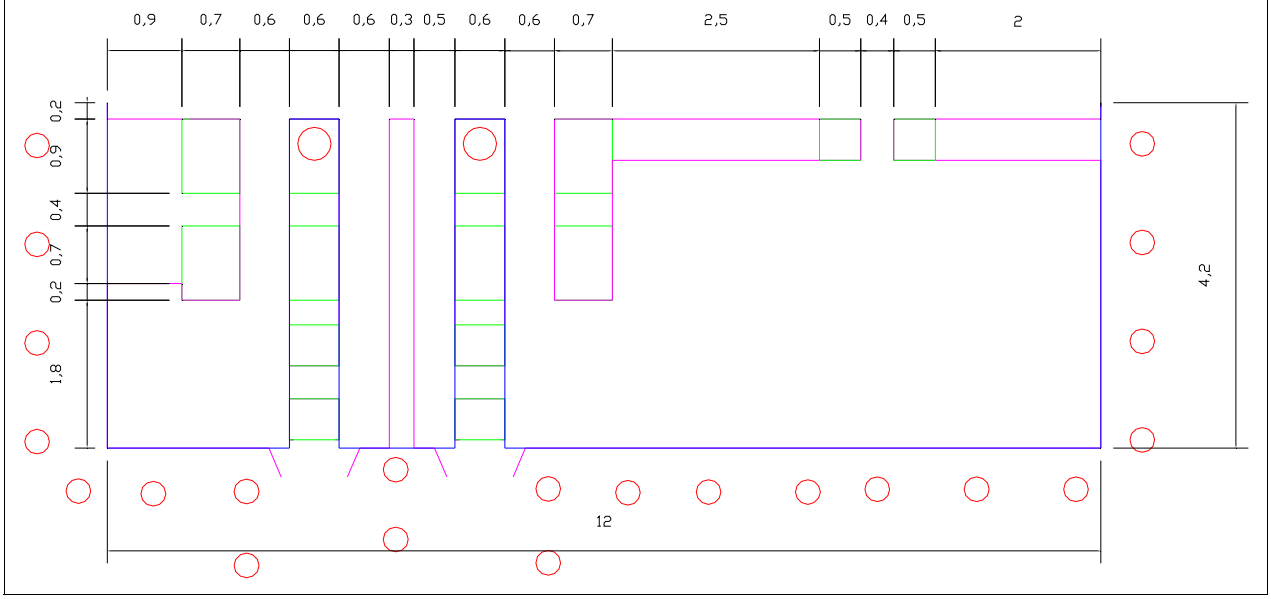


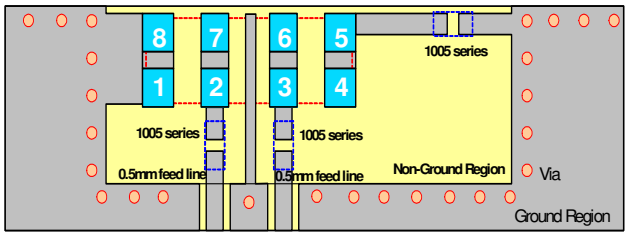
Parameter	A	C	D	E	F
Value[mm]	0.6	0.4	1.4	0.7	0.9

Unless Specified tolerances are ± 0.05 mm

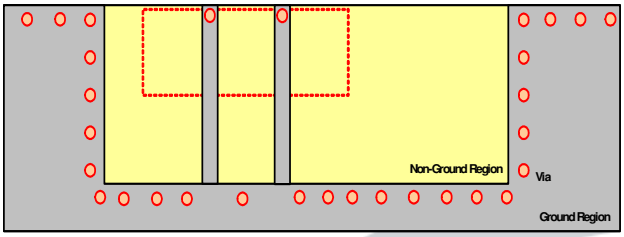
■ PCB Drawing(Auto CAD Design)

- WiFi (2.4GHz, 5GHz)



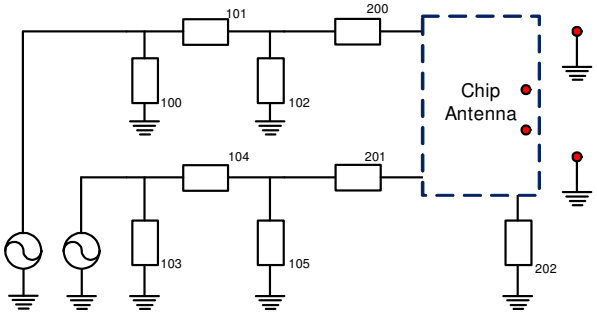


< Top View >

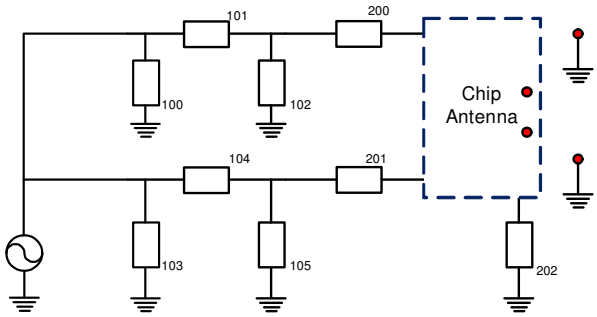


< Bottom View >

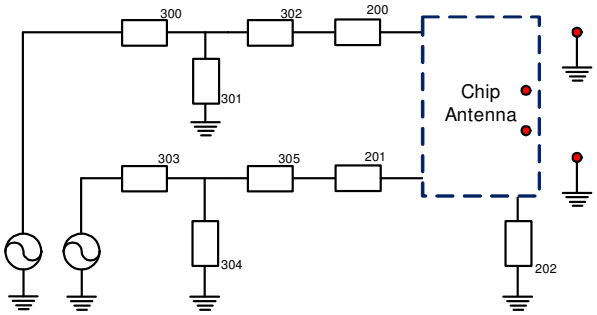
8.3 Matching Cicuit and Default



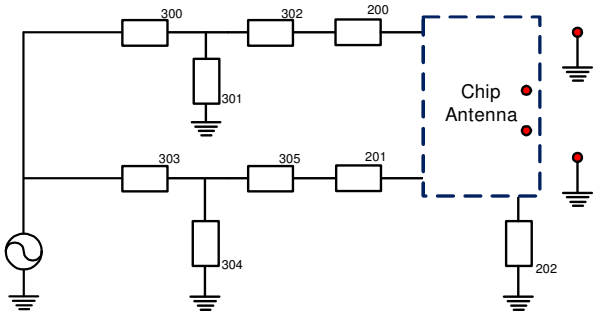
Two Feeding



One Feeding



Two Feeding

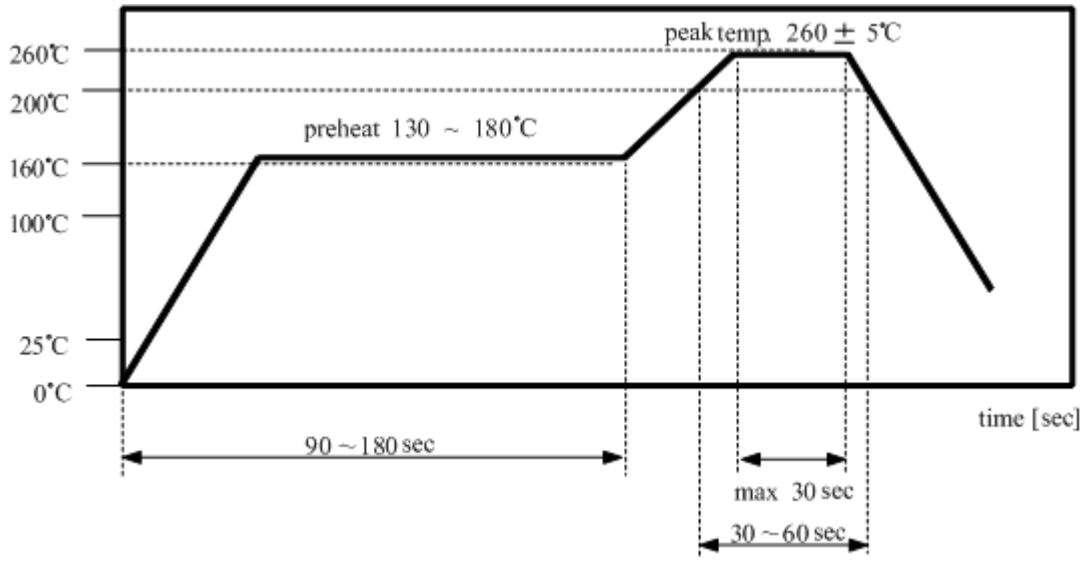


One Feeding

No		100	101	102	103	104	105	200	201	202	300	301	302	303	304	305
Default Value	One Feeding	N/C	4 pF	N/C	N/C	12 pF	1 pF	100 pF	100 pF	1.2 nH	100 pF	N/C	4 pF	100 pF	1 pF	12 pF
	Two Feeding	N/C	4 pF	N/C	N/C	12 pF	1 pF	100 pF	100 pF	1.2 nH	100 pF	N/C	4 pF	100 pF	1 pF	12 pF

9. REFLOW PROFILE

9.1 Reflow Soldering



9.2 Manual Soldering

Pre-heating Temperature : 120℃ , 60 ~ 300 sec.

Soldering Temperature : 340℃±5℃ , 5sec max per each terminal.

9.3 Applied PCB Pattern Design

7. Basic Operation and Application and 8.2 PCB Structure and Solder Pad Dimensions Reference

10. Primary Inspection List

Item	Frequency [MHz]		Size [mm]		
Standard	SWR 3.0 Max		L = 5.0±0.1	W = 2.0±0.1	T = 1.2±0.1
	2095 MHz	2125 MHz			
1	1.81	1.62	5.02	2.01	1.20
2	1.74	1.60	4.99	1.99	1.21
3	1.68	1.69	5.01	2.00	1.22
4	1.70	1.63	4.98	2.02	1.20
5	1.59	1.74	5.02	1.98	1.20
6	1.64	1.69	5.00	2.00	1.19
7	1.76	1.60	4.98	1.99	1.21
8	1.67	1.62	5.00	2.00	1.18
9	1.53	1.58	5.01	2.01	1.20
10	1.52	1.63	5.03	2.00	1.17
11	1.61	1.51	4.99	2.02	1.20
12	1.64	1.50	5.00	1.98	1.19
13	1.83	1.64	4.99	2.01	1.21
14	1.58	1.63	5.01	1.99	1.23
15	1.55	1.62	4.99	2.00	1.20
16	1.68	1.51	5.02	1.98	1.19
17	1.59	1.58	5.00	2.02	1.22
18	1.67	1.62	4.99	1.98	1.18
19	1.68	1.69	5.02	2.00	1.19
20	1.83	1.64	4.98	1.99	1.20
X	1.52	1.51	5.10	2.10	1.30
σ	1.83	1.74	4.90	1.90	1.10
Cpk	1.67	1.62	5	2	1.2
Decision	OK	OK	OK	OK	OK

11. Reliability Condition

11.1 Environment Test

ITEM	TEST CONDITION	LIMIT
PCT	+121±5 ℃, RH=100%, 96 hr	After test, Must meet the characteristics spec of 4.3 list
Low Temperature Resistance	-40℃±3℃, 120hr	
Humidity Action	+85±3℃, RH85%	

11.2 Thermal shock test , Reflow test

ITEM	TEST CONDITION	LIMIT
Thermal shock	condition : -40℃±3℃/1min ↔ +85℃±3℃/1min Test Cycle : 20 cycle Temperature change time : within 5 min	After test, Must meet the characteristics spec of 4.3 list
Reflow	Pre Heating : 200±5℃, 30～60 sec Peak Heating : 260℃±5℃, 30sec Max	

11.3 Mechanical Test

ITEM	TEST CONDITION	LIMIT
Vibration	Freq : 10~500Hz , Acceleration : 10 ×9.8㎨(G) Sweep time : 15 min , X.Y.Z each 5 times	After test, Must meet the characteristics spec of 4.3 list
Drop	18 times free fall Using the drop jig 152cm high Jig : 120g±20g Plastic Jig Bottom : Concrete or Iron	

11.4 MSL LEVEL Test

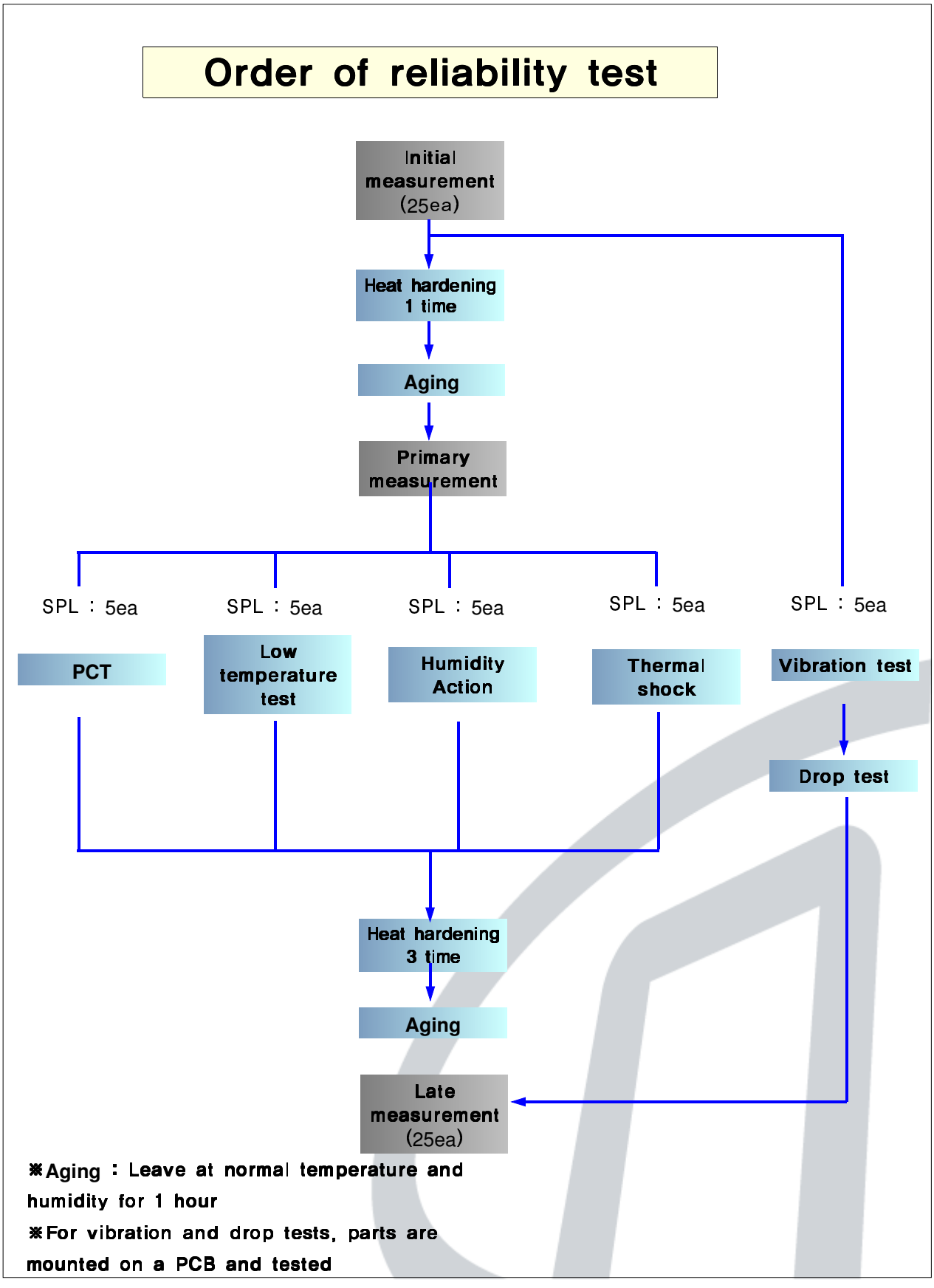
1) JEDEC J-STD-020C Test

	Floor Life		Soak Requirements	
	Time	Conditions	Time	Conditions
1	Unlimited	= < 30℃ / RH 85%	168+5 / -0	= < 85℃ / RH 85%

2) Test Condition

ITEM	Conditon	LIMIT
Soak Requirements	After leaving +85±3℃, RH85% 168hr±2hr 3 times Reflow without aging	After test, Must meet the characteristics spec of 4.3 list

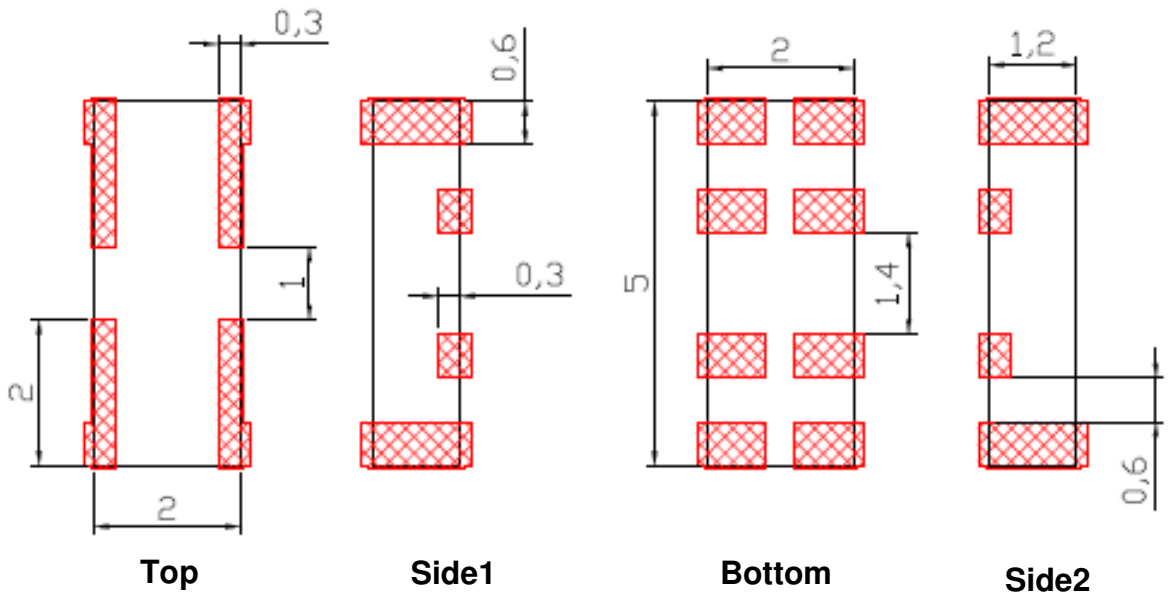
11.5 Order of reliability test



12. Mechanical Characteristics

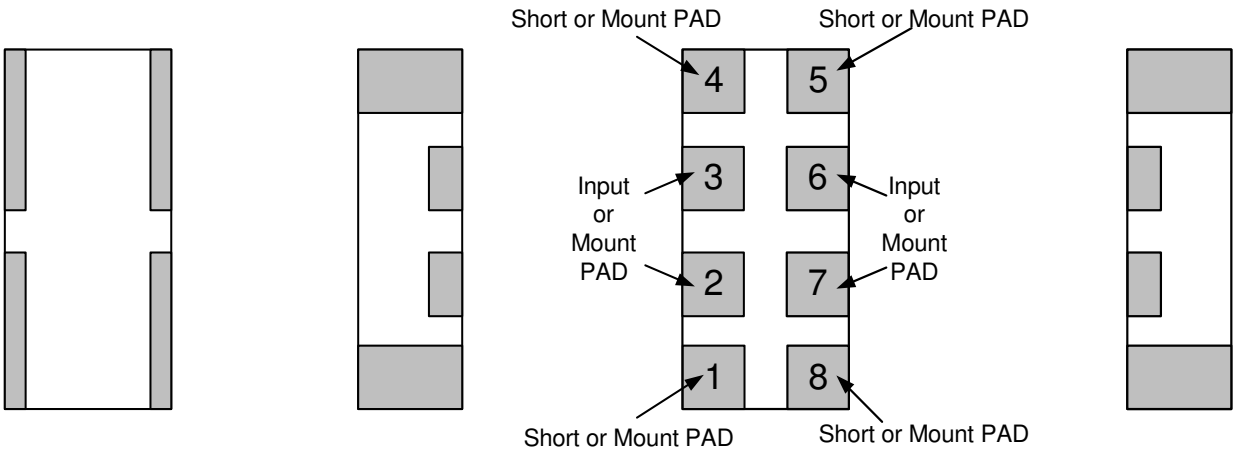
12.1 Antenna Pattern Dimension

Antenna Pattern View



Dimension : mm
Tolerance : ± 0.05mm

12.2 Pin name

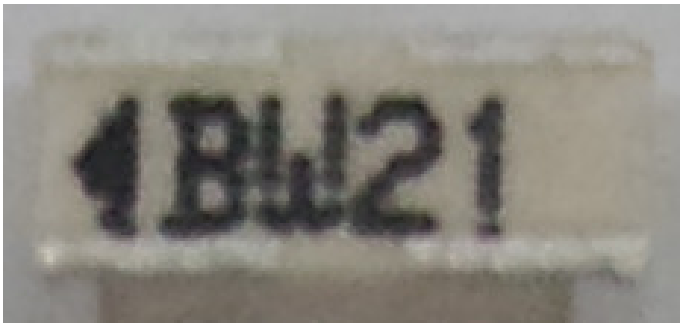


12.3 LOT number notation

21
①

① Week : 1 - 1 Week, 2 - 2 Week, 3 - 3 Week, ····, 20 - 20 Week, 21 - 20 Week ····

12.4 Marking

Marking View


◀	BW	21
①	②	③

① Input Signal
② Bluetooth, WiFi
③ Week : 1 - 1 Week, 2 - 2 Week, 3 - 3 Week, ····, 20 - 20 Week, 21 - 20 Week ····

12.5 Marking type

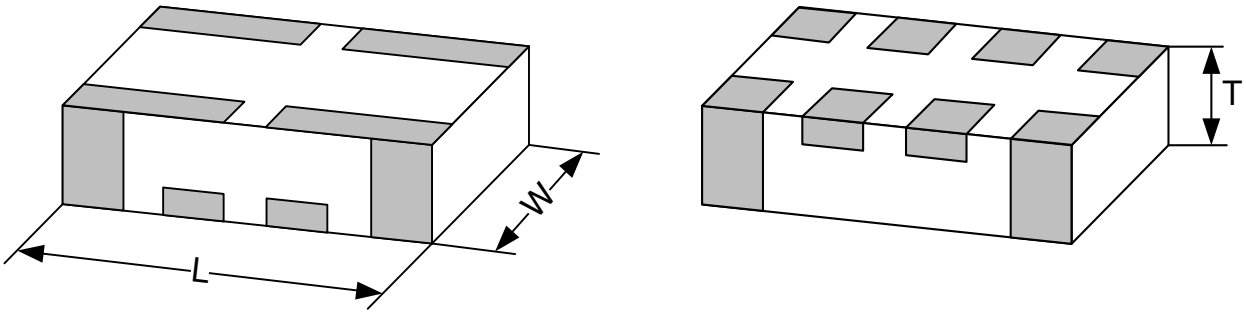
Ink marking - Using Black Ink

13. Structure and Material

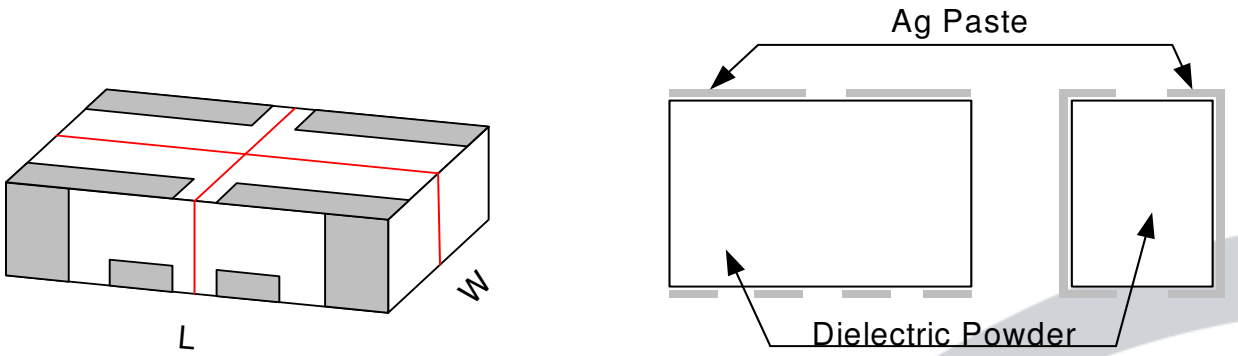
13.1 materialization method

Chip antenna forms the pattern with Ag paste on the brick of dielectric block and materializes the characteristics

13.2 Struture



13.3 Internal cross section



13.4 Material

ITEM	Material	Maker	Printing pattern SPEC
Dielectric Block	Powder	INanoTech	
PATTERN	Ag Paste	DeaJoo	Thickness : Min10㎛(TYP 16~20㎛)

14. Attention

14.1 Temperature Condition

	Range of Temperature	Unit
Application Temperature	-40 ~ +100	℃
Keeping Temperature	-40 ~ + 70	℃

14.2 Temperature Test Condition

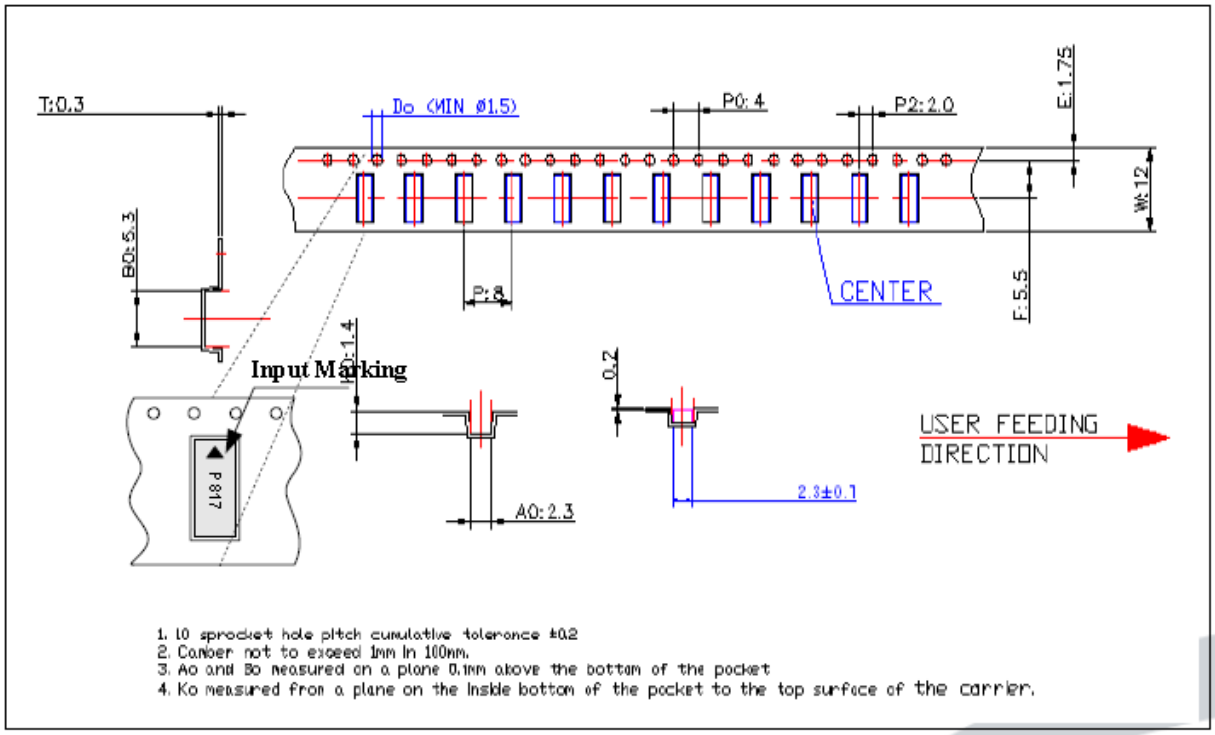
	Condition	Range of Temperature
Application temperature	Low	24hr normal action at -75℃
	High	24hr normal action at +150℃
Keeping temperature	Low	normal action when left for 1000hr at -75℃
	High	normal action when left for 1000hr at +85℃

* Because of the keeping temperature problem, no admission when left over +85℃

15. Packing

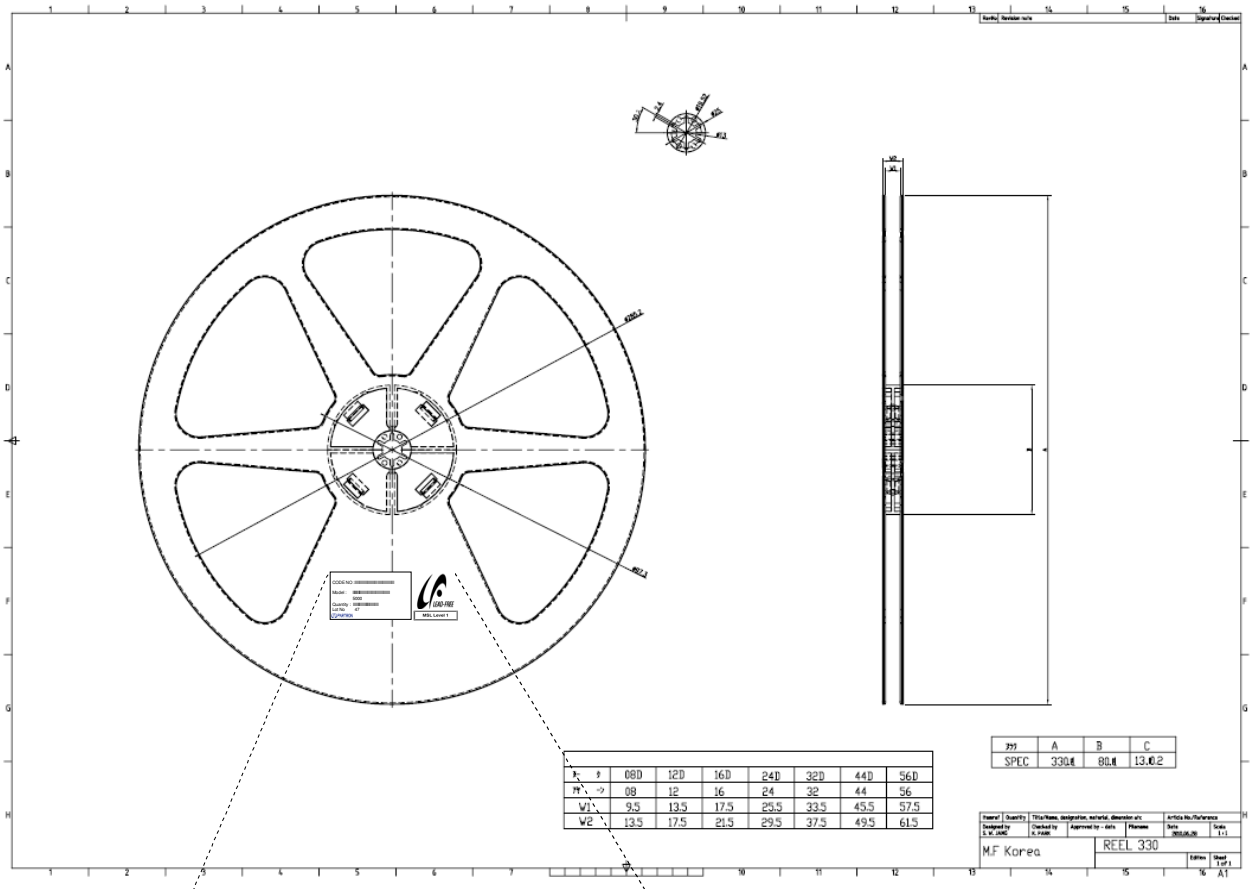
15.1 Carrier/Reel

Item	Material	Surface Resistance	Electricity	Method
Carrier tape	A-PET	Typical $10^8\Omega$	10V MAX	Heat Press
Cover tape	PET	Typical $10^8\Omega$	30V MAX	
Reel	PS	Typical $10^8\Omega$	30V MAX	-



DKC DWG. No.	D-1208-058
DIMENSIONAL UNIT	MM
UNTOLERANCED DIMENSION	±0.1
CAD FILE NAME	051010
DESIGNED BY	K. M. C
SCALE	1/1
TITLE	CARRIER TAPE 2.0*5.0*1.2P
PART.	CARRIER TAPE
MATERIAL	A-PET
LENGTH	50.4M
COUNT	6300P

NAME	SPEC.
W	12.0±0.2
E	1.75±0.1
F	5.5±0.1
Do	1.5+0.1
P	8.0±0.1
Po	4.0±0.1
P2	2.0±0.1
Ao	2.3±0.1
Bo	5.3±0.1
Ko	1.4±0.1
T	0.3±0.05



CODE NO :IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

Model : IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
5000

Quantity : IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

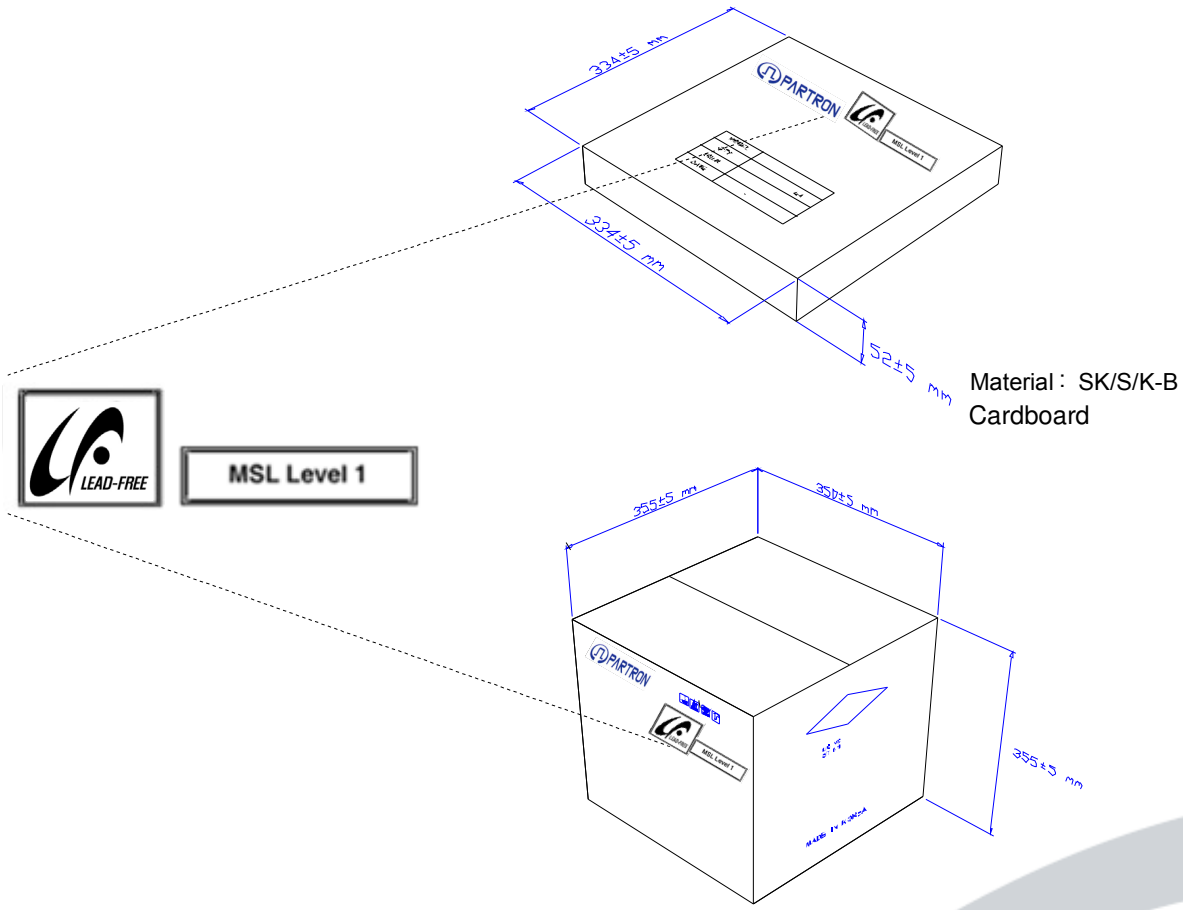
Lot No 21

PARTRON

LEAD-FREE

MSL Level 1

15.2 Box

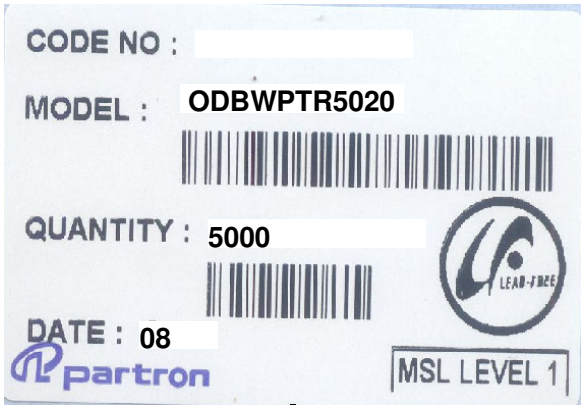


Material : SK/S/K-B Cardboard

15.3 Actual packing picture

Reel

Internal Box



Reel / Inner Box label

Outer Box label

16. Process Control

Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

Input Materials	FLOW CHART		Process name	Management of Factors					Management of quality					
	preparation	Main Process		Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Margin	Method of Inspection	Cycle of management	Record	Action
Ceramic POWDER		◇	Import Inspection						shrinking rate permittivity	refer to Guide Sheet	Micrometer Network	10ea/LOT	C/sheet	Return
POWDER lubricant	○		powder	Mixer					mixing	POWDER lubricant	Scale	PER MIXING	-	Exhaust
		○	Shaping	Press	pressure Mold Condition	refer to Guide Sheet	Per LOT 1/day	parameter C/SHEET	dimension weight density aspect	refer to Guide Sheet	Micrometer scale Calculated Visual	5/100EA 10ea/lot	LOT CARD	Exhaust
		○	Plasticity	Plasticity Hole	SETTER Outside Temperature PROFILE	refer to Guide Sheet	all 2/day 1/month	C/sheet						
		◇	Block						wide length shape	refer to Guide Sheet	Micrometer Calipers Visual Inspection	20ea/LOT 20ea/LOT all	C/sheet	Exhaust
AG PASTE		○	SIDE1 PAD Printing	Printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN Dimension aspect	refer to Guide Sheet	Microscope	10ea/3Jig	c/sheet	Rework
		○	Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework

Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

Input Materials	FLOW CHART		Process name	Management of Factors					Management of quality					
	preparation	Main Process		Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Margin	Method of Inspection	Cycle of management	Record	Action
AG PASTE		◯	SIDE 2 PAD Printing	Printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN Dimension aspect	refer to Guide Sheet	Microscope	10ea/3Jig	c/sheet	Rework
		◯	Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework
		◯	Baking	Baking Hole mesh net	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter C/Sheet	Breakage Pollution	refer to Guide Sheet	Visual Inspection	all	Lot card	Exhaust Rework
AG PASTE		◯	TOP printing	Printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN dimension	refer to Guide Sheet	measure	10ea/3Jig	c/sheet	Rework
		◯	Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework
AG PASTE		◯	BOTTOM PAD Printing CTQ	printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN dimension aspect	refer to Guide Sheet	measure Microscope	10ea/3Jig	c/sheet	Rework

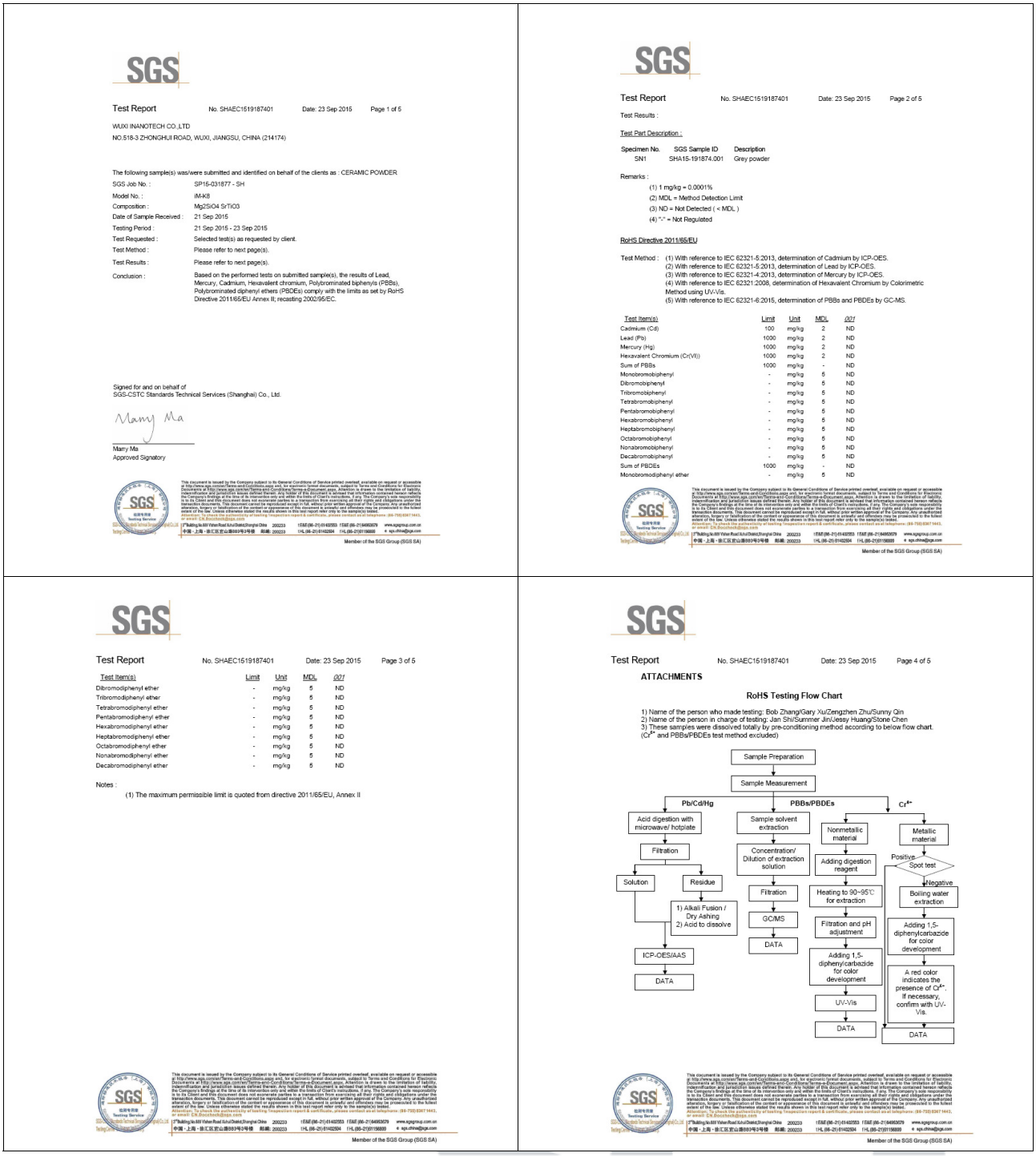
Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

Input Materials	FLOW CHART		Process name	Management of Factors					Management of quality					
	preparation	Main Process		Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Margin	Method of Inspection	Cycle of management	Record	Action
	○		Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework
		○	Baking	Baking Hole mesh net	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter C/Sheet	Breakage Pollution	refer to Guide Sheet	Visual Inspection	all	Lot card	Exhaust Rework
		◇	aspect inspection						aspect	Reference SPL refer to Guide Sheet	Visual Inspection microscope	all	Lot card production diary	Exhaust repair
		○	MARKING	Marking Machine					marking	Reference SPL	Visual Inspection	all	Lot card production diary	Rework Exhaust
		◇	Electrical Characteristic	NETWORK Inspection Jig	proofreading Condition	refer to Guide Sheet	1/2hour	C/sheet	Electrical Characteristic	refer to Guide Sheet	Network	all	Lot card production diary	Exhaust repair
		◇	aspect inspection						aspect dimension	Reference SPL refer to Guide Sheet	Visual Inspection microscope	all	Lot card production diary	Exhaust repair
Carrier cover reel		○	Taping						Quantity Direction aspect	refer to Guide Sheet	Manual	all	Lot card production diary	Rework
		◇	shipper inspection	NETWORK Inspection Jig	proofreading Condition	refer to Guide Sheet	1/person	C/sheet	Electrical Characteristic aspect packing	refer to Guide Sheet	Network microscope Visual Inspection	refer to Guide Sheet	Result Paper	return Exhaust
packing box label		○	packing	bar code printer					packing P/N Quantity	refer to Guide Sheet	Visual Inspection	all	-	Rework
		◇	packing inspection						packing P/N Quantity	refer to Guide Sheet	Visual Inspection	all	-	return

17. RoHS Data

1) Ceramic Powder

Parts Name	iM-K8
Tester Organization	SGS Testing KOREA co. Ltd.
Measurement Tester	Please see the 'method' in the test report
Measurement Data	Please see the report under the table



SGS

Test Report No. SHAEC1519187401 Date: 23 Sep 2015 Page 1 of 5

WUXI INANOTECH CO.,LTD
NO.518-3 ZHONGHUI ROAD, WUXI, JIANGSU, CHINA (214174)

The following sample(s) was/were submitted and identified on behalf of the clients as : CERAMIC POWDER

SGS Job No. :	SP15-031877 - SH
Model No. :	iM-K8
Composition :	Mg2SiO4 SrTiO3
Date of Sample Received :	21 Sep 2015
Testing Period :	21 Sep 2015 - 23 Sep 2015
Test Requested :	Selected test(s) as requested by client.
Test Method :	Please refer to next page(s).
Test Results :	Please refer to next page(s).
Conclusion :	Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) comply with the limits as set by RoHS Directive 2011/65/EU Annex II; recasting 2002/95/EC.

Signed for and on behalf of
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

Marry Ma
Approved Signatory

SGS

Test Report No. SHAEC1519187401 Date: 23 Sep 2015 Page 2 of 5

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	SHA15-191874.001	Grey powder

Remarks :
(1) 1 mg/kg = 0.0001%
(2) MDL = Method Detection Limit
(3) ND = Not Detected (< MDL)
(4) "-" = Not Regulated

RoHS Directive 2011/65/EU

Test Method : (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
(2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
(3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
(4) With reference to IEC 62321:2008, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
(5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.

Test Item(s)	Limit	Unit	MDL	001
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	2	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

SGS

Test Report No. SHAEC1519187401 Date: 23 Sep 2015 Page 3 of 5

Test Item(s)	Limit	Unit	MDL	001
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

Notes :
(1) The maximum permissible limit is quoted from directive 2011/65/EU, Annex II

SGS

Test Report No. SHAEC1519187401 Date: 23 Sep 2015 Page 4 of 5

ATTACHMENTS

RoHS Testing Flow Chart

1) Name of the person who made testing: Bob Zhang/Gary Xu/Zengzhen Zhu/Sunny Qin
2) Name of the person in charge of testing: Jan Shi/Summer Jin/Jessy Huang/Stone Chen
3) These samples were dissolved totally by pre-conditioning method according to below flow chart.
(Cr^{6+} and PBBs/PBDEs test method excluded)

SGS

Test Report No. SHAEC1519187401 Date: 23 Sep 2015 Page 5 of 5

Sample photo:

SHA15-191874.001

SGS authenticate the photo on original report only

*** End of Report ***

3/Building 3a,889 Yishan Road Xuhui District,Shanghai China 200233 t (86-21) 61402553 f (86-21)64953679 www.sgsgroup.com.cn
中国·上海·徐汇区宜山路889号3号楼 邮编: 200233 t (86-21) 61402594 f (86-21)61156899 e sgs.china@sgs.com

2) Ag Paste

Parts Name	DNF2010C
Tester Organization	SGS Testing KOREA co. Ltd.
Measurement Tester	Please see the 'method' in the test report
Measurement Data	Please see the report under the table

SGS

Test Report No. F690101/LF-CTSAYAA15-23789 Issued Date : 2015. 05. 18 Page 1 of 7

DAEJOO ELECTRONICS MATERIALS CO., LTD.
148,Seohaean-ro
Siheung-si,Gyeonggi-do
Korea

The following sample(s) was/were submitted and identified by/on behalf of the client as:-

SGS File No.	: AYAA15-23789
Product Name	: Ag Paste
Item No./Part No.	: N/A
Client Reference Data	: DNF8010C(Y150310), DNF8510(Y150326), DNF8510(Y150305)
Received Date	: 2015. 05. 08
Test Period	: 2015. 05. 08 to 2015. 05. 18
Report Comments	: By the applicant's request, item No.s/part No.s & client reference information are stated/added on report.
Test Results	: For further details, please refer to following page(s)

SGS Korea Co., Ltd.

Jeff Jang / Chemical Lab Mgr

SGS

Test Report No. F690101/LF-CTSAYAA15-23789 Issued Date : 2015. 05. 18 Page 2 of 7

Sample No. : AYAA15-23789.001
Sample Description : Ag Paste
Item No./Part No. : N/A
Materials : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Lead (Pb)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Lead by ICP-OES)	5	N.D.
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cadmium by ICP-OES)	0.5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013 (Determination of Mercury by ICP-OES)	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	With reference to IEC 62321:2008 (Determination of Hexavalent Chromium by spot test/Colorimetric Method using UV-Vis)	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.

SGS

Test Report No. F690101/LF-CTSAYAA15-23789 Issued Date : 2015. 05. 18 Page 3 of 7

Sample No. : AYAA15-23789.001
Sample Description : Ag Paste
Item No./Part No. : N/A
Materials : N/A

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.

Halogen Content

Test Items	Unit	Test Method	MDL	Results
Chlorine(Cl)	mg/kg	With reference to EN 14582, IC	30	N.D.
Bromine(Br)	mg/kg	With reference to EN 14582, IC	30	N.D.

NOTE:
(1) N.D. = Not detected,(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) Negative = Undetectable / Positive = Detectable
(6) ** = Qualitative analysis (No Unit)
(7) * = Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

SGS

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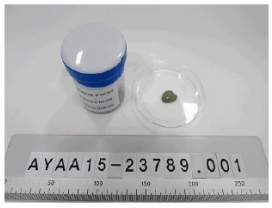
Picture of Sample as Received:



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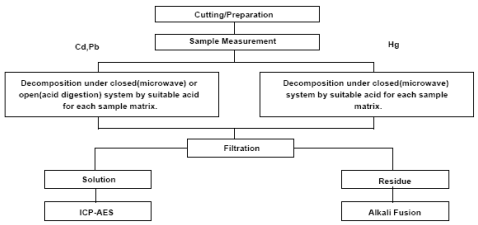
Flow Chart of Digestion



Sample material	Digestion Acid
Metal:Fe, Cu, Al, etc.	Aqua regia , HCl, HNO_3
Plastic	HNO_3, HCl, HF, $HClO_4$
Silver	HNO_3, H_2SO_4
Solder, Au, Pt, Pd, Sb, Sn	Aqua regia
Glass	HNO_3, HF
Ti, Zr, W, Mo, Si , Hf, Nb,Ta	HNO_3, HCl, HF
Sn(as IEC 62321)	HNO_3, HCl, H_2SO_4, HBr
Others	Any acid

The samples were dissolved totally by pre-conditioning method according to above flow chart.
Section Chief : Gilsae Yi

F401 Version2

SGS

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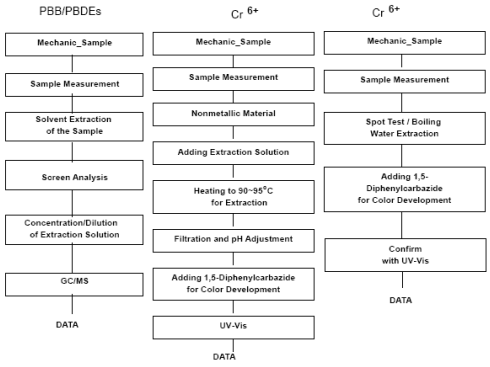
Flow Chart of Cr^{6+},PBB/PBDEs Testing



F401 Version2

SGS

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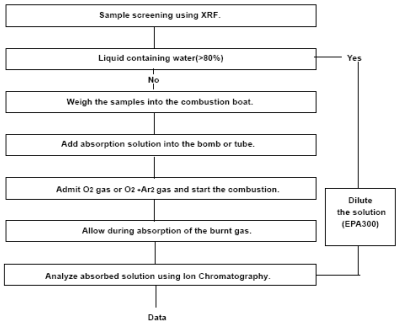
Flow Chart for Halogen Test



*** End of Report ***

F401 Version2

3) Marking Ink

Parts Name	IR/IC-270BK INK
Tester Organization	SGS Testing KOREA co. Ltd.
Measurement Tester	Please see the 'method' in the test report
Measurement Data	Please see the report under the table

SGS

测试报告 No. SHAEC1510713104 日期: 2015年06月09日 第1页,共6页

多米诺标识科技有限公司
中国上海市浦东金桥出口加工区云桥路1150号

以下测试之样品是由申请者所提供及确认：IR-299BK/IC-299BK 印刷油墨

SGS工作编号：	SP15-018441 - SH
料号：	IR-299BK/IC-299BK
批号：	AC000132A
样品接收日期：	2015年06月05日
测试周期：	2015年06月05日 - 2015年06月09日
测试要求：	根据客户要求测试
测试方法：	请参见下一页
测试结果：	请参见下一页
结论：	基于所送样品进行的测试，镉、铅、汞、六价铬、多溴联苯(PBBs)、多溴二苯醚(PBDEs)的测试结果符合欧盟RoHS指令2002/95/EC的重订指令2011/65/EU附录II的限值要求.

通标标准技术服务（上海）有限公司
授权签名

Helen Liu 刘海鹏
批准签署人

本报告是编号为SHAEC1510713103报告的中文版本.

SGS

测试报告 No. SHAEC1510713104 日期: 2015年06月09日 第2页,共6页

测试结果：

测试样品描述：

样品编号	SGS样品ID	描述
SN1	SHA15-107131.002	黑色液体

备注：
(1) 1 mg/kg = 0.0001%
(2) MDL = 方法检测限
(3) ND = 未检出 (< MDL)
(4) "-" = 未规定

RoHS指令2011/65/EU

测试方法： (1) 参考IEC 62321-5:2013, 用ICP-OES测定镉的含量
(2) 参考IEC 62321-5:2013, 用AAS测定铅的含量
(3) 参考IEC 62321-4:2013, 用ICP-OES测定汞的含量
(4) 参考IEC 62321:2008, 用紫外-可见分光光度计比色法测定六价铬的含量
(5) 参考IEC 62321:2008, 用GC-MS测定PBBs(多溴联苯)和PBDEs(多溴二苯醚) 的含量

测试项目	限值	单位	MDL	002
镉(Cd)	100	mg/kg	2	ND
铅(Pb)	1000	mg/kg	2	ND
汞(Hg)	1000	mg/kg	2	ND
六价铬(Cr(VI))	1000	mg/kg	2	93
多溴联苯之和(PBBs)	1000	mg/kg	-	ND
一溴联苯	-	mg/kg	5	ND
二溴联苯	-	mg/kg	5	ND
三溴联苯	-	mg/kg	5	ND
四溴联苯	-	mg/kg	5	ND
五溴联苯	-	mg/kg	5	ND
六溴联苯	-	mg/kg	5	ND
七溴联苯	-	mg/kg	5	ND
八溴联苯	-	mg/kg	5	ND
九溴联苯	-	mg/kg	5	ND
十溴联苯	-	mg/kg	5	ND
多溴二苯醚之和(PBDEs)	1000	mg/kg	-	ND
一溴二苯醚	-	mg/kg	5	ND
二溴二苯醚	-	mg/kg	5	ND

SGS

测试报告 No. SHAEC1510713104 日期: 2015年06月09日 第3页,共6页

测试项目	限值	单位	MDL	002
三溴二苯醚	-	mg/kg	5	ND
四溴二苯醚	-	mg/kg	5	ND
五溴二苯醚	-	mg/kg	5	ND
六溴二苯醚	-	mg/kg	5	ND
七溴二苯醚	-	mg/kg	5	ND
八溴二苯醚	-	mg/kg	5	ND
九溴二苯醚	-	mg/kg	5	ND
十溴二苯醚	-	mg/kg	5	ND

备注：
(1) 最大允许极限值引用自指令2011/65/EU附录II.

卤素

测试方法： 参照EN 14582:2007 方法测定, 采用IC进行分析.

测试项目	单位	MDL	002
氟(F)	mg/kg	50	ND
氯(Cl)	mg/kg	50	ND
溴(Br)	mg/kg	50	ND
碘(I)	mg/kg	50	ND

备注：所示结果为僵样品总重量中的含量

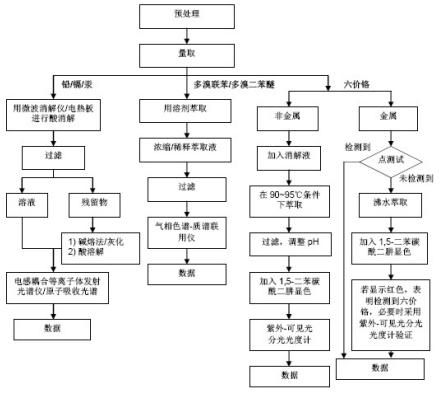
SGS

测试报告 No. SHAEC1510713104 日期: 2015年06月09日 第4页,共6页

附件

RoHS 测试流程图

1) 分析人员：张小波/徐潮/朱增标/秦兴章
2) 项目负责人：施青/金黎霞/黄婷/陈抒磊
3) 样品按照下述流程被完全消解（六价铬和多溴联苯/多溴二苯醚测试除外）。



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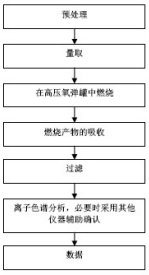
测试报告 No. SHAEC1510713104 日期: 2015年06月09日 第5页,共6页

附件

Halogen(氧弹法)测试流程图

1) 分析人员: 印宇
2) 项目负责人: 李丹



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测试报告 No. SHAEC1510713104 日期: 2015年06月09日 第6页,共6页

样品照片:

SHA15-107131.002

此照片仅限于随SGS正本报告使用

*** 报告完 ***

18. Reliability test report - an annexed paper

19. Shipment Inspection Report

파트론	담 당	확 인	승 인

검 사 성 적 서

업체	입 안	심 사	결 정

협력회사명	㈜ 파 트 론	부품명	CHIP Antenna(ODBWPTR6020)	출고수량	
적용모델	ODBWPTR6020	C O D E N O		L O T - N O		Ver(버전)	1.0

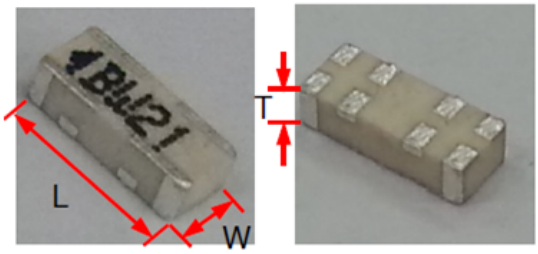
검사일	파트론	20 . . .	검사원	파트론	안선주	종 합 판 정	파트론	합 격	재 질
	업체			업체			업체		Powder+Ag paste

검 사 항 목	검 사 방 식		검사 조건	시료수		불량수	
	파 트 론	업체		파트론	업체	파트론	업체
외 관	KS Q ISO 2859-1 G-2		0.65 (c=0)	n=		Pn= 0	
치 수	체 크 검 사		c=0	n= 20		Pn= 0	
전기적특성	KS Q ISO 2859-1 G-2		0.65 (c=0)	n=		Pn= 0	
유해물질	체 크 검 사		c=0	n=1		Pn= 0	

측 정 D A T A ※ 검사항목별 검사 수준에 일치된 수량을 검사하고 시료가 20개 이상일 경우 측정DATA는 20개만 지정한다.

검 사 항 목	특성검사				치 수(mm)						외관검사				유해물질			
규 격	2096MHz 1.0 ~ 3.0		2125MHz 1.0 ~ 3.0		L ① 6.00 ±0.10		W ② 2.00 ±0.10		T ③ 1.20 ±0.10		파손,미인쇄 인쇄번짐,변색등				판정기준에 준할 것			
구 분	파트론	업체	파트론	업체	파트론	업체	파트론	업체	파트론	업체	파트론	업체				파트론	업체	
1	1.81		1.62		6.02		2.01		1.20		OK				Cd	0		
2	1.74		1.60		4.99		1.99		1.21		OK				Pb	1097	세라믹 함유Pb	
3	1.68		1.69		6.01		2.00		1.22		OK				Hg	117		
4	1.70		1.63		4.98		2.02		1.20		OK				Cr	0		
5	1.69		1.74		6.02		1.98		1.20		OK				Br	8		
6	1.64		1.69		6.00		2.00		1.19		OK				Cl	0		
7	1.76		1.60		4.98		1.99		1.21		OK				Sb	0		
8	1.67		1.62		6.00		2.00		1.18		OK				Sn	0		
9	1.63		1.68		6.01		2.01		1.20		OK				S	0		
10	1.62		1.63		6.03		2.00		1.17		OK							
11	1.61		1.61		4.99		2.02		1.20		OK							
12	1.64		1.60		6.00		1.98		1.19		OK							
13	1.83		1.64		4.99		2.01		1.21		OK							
14	1.68		1.63		6.01		1.99		1.23		OK							
15	1.65		1.62		4.99		2.00		1.20		OK							
16	1.68		1.61		6.02		1.98		1.19		OK							
17	1.69		1.68		6.00		2.02		1.22		OK							
18	1.67		1.62		4.99		1.98		1.18		OK							
19	1.68		1.69		6.02		2.00		1.19		OK							
20	1.83		1.64		4.98		1.99		1.20		OK							
X	1.67		1.62		6.00		2.00		1.20									
σ	0.09		0.06		0.02		0.01		0.01									
Cpk	2.36		3.33		2.14		2.43		2.26									
판 정	OK		OK		OK		OK		OK		OK					OK		

도 면



RoHS

Sb-F Antimony - Free

유기물 (단위:ppm)

물질구분	RoHS-Free				Halogen-free		안티몬	유기주석	TVOC
	Cd	Pb	Hg	Cr	Br	Cl	Sb	Sn	TVOC
판정기준	50	200	700	700	900	900	700	900	16

· 본검사 LOT는 당사 출하검사 규정에 만족하며 품질을 보증함

· 대 표 이 사 김 종 구 (인)