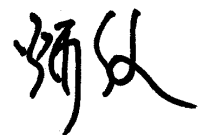




MSL Level 1

ROHS-Y

Approval Sheet

Products	Dielectric Chip Antenna		
Customer	Telian		
Model	K1000		
Customer CODE			
Supplier	PARTRON		
Supplier CODE	ACS2450GBAK1		
Telian	By designed	By checked	By approved
PARTRON	By designed	By checked	By approved
			
	Research 5 Team	Quality Assurance	Laboratory
	Chanik.Jeon	Nam-Sik.Min	Byoung-Jun.Yim
	12/26	12/26	12/26

2007. 12. 26



22-6 Seokwoo-dong, Hwaseong-si, Gyeonggi-do, Korea 455-300

Tel : 82-31-201-7870~6

Fax : 82-31-201-7800

www.partron.co.kr



MSL Level 1

ROHS-Y

SPECIFICATION

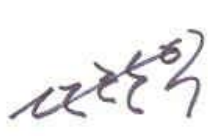
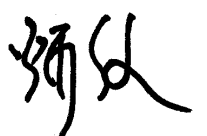
MODEL : ACS2450GBAK1

3D Structure



Top View

Bottom View

By designed	By checked	By approved
		
Research 5 Team	Quality Assurance	Laboratory
Chanik.Jeon	Nam-Sik.Min	Byoung-Jun.Yim
12/26	12/26	12/26

2007. 12. 26

- Contents -

1. Revision History	1 p
2. Summary of Parts	2 p
3. Critical to Quality	2 p
4. Electrical Characteristics	3 p
5. Measurement Process	8 p
6. Internal Block Diagram	10 p
7. Basis Action / Application Note	10 p
8. Measurement Jig SPEC	11 p
9. REFLOW PROFILE	12 p
10. Primary Inspection List	13 p
11. Reliability Condition	14 p
12. Mechanical Characteristics	15 p
13. Structure and Material	17 p
14. Attention	18 p
15. Packing	19 p
16. Process Control	23 p
17. RoHS Data	26 p

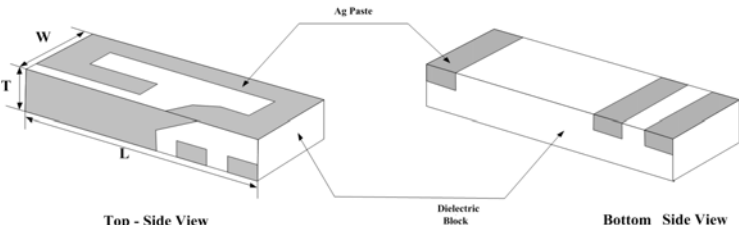
1. Revision

[illegible]

2. 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

Type	Only Bulk Ceramic	
Material	Dielectric Block	Mg_2SiO_4 (Magnesium Silicate)
	Electrode Paste	Ag
Size[mm]	W = 2.0 ± 0.1	
	L = 7.0 ± 0.1	
	T = 1.2 ± 0.1	
Flatness	0.04	
MSL Level	MSL Level 1	
ESD Level	More than 15 KV (HBM CLASS 3B)	
Version	Revision 1.0	

3. Critical to Quality ()

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

CTQ ITEM	Specification Reason
Shape weight, size	Shape weight and size determines the electric block size after plastic and the dielectric block size effects the level of detail for the printing.
Plastic Size	The size after plastic effects the level of detail for the printing.
Printing Size	The level of detail for printing size is an essential list of the BT antenna.

CTF ITEM 	Specification Reason
Single Element measurement SWR	An important Parameter classifying the electrical characteristics.

- require attention for the following list.

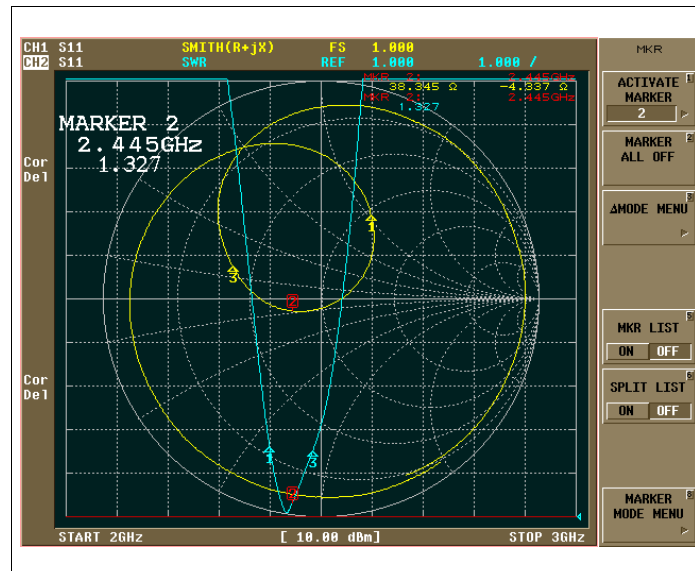
ITEM	Content
Keeping	Sealing tightly when keeping for a long time.
Action	Maybe characteristics changes when changing any design.

4. Electrical Characteristics

4.1 Set Condition

ITEM				SPEC
Frequency Range [MHz]				2400 ~ 2485
SWR [Max]				3 : 1 (Typ 2.5 : 1)
Input Impedance [Ω]				50 Ohm
Polarization				Linear
Gain[dBi]	Total Gain (Peak / Avg) [dBi]			-5.2 / -11.6
	Azimuth	Theta	Peak	-7.85
			Average	-11.90
		Phi	Peak	-7.57
			Average	-11.00
	Elevation 1	Theta	Peak	-6.86
			Average	-10.40
		Phi	Peak	-8.58
			Average	-14.14
	Elevation 2	Theta	Peak	-10.02
			Average	-16.66
		Phi	Peak	-5.15
			Average	-9.36

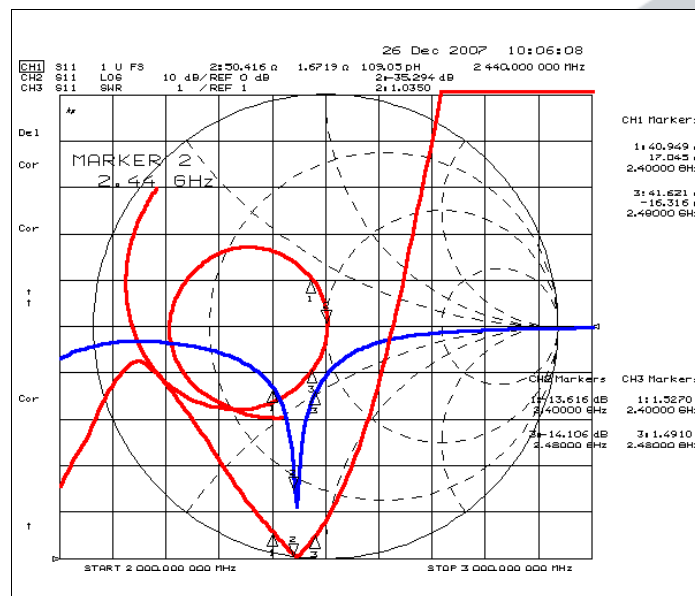
4.2 S11 Graph of Set Condition



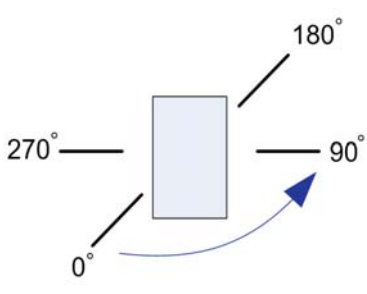
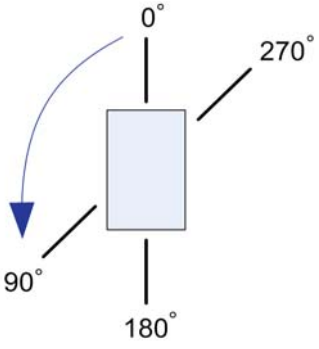
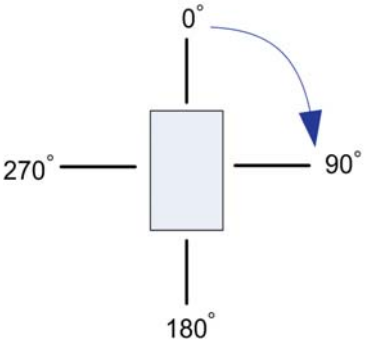
4.3 Test Fixture Condition

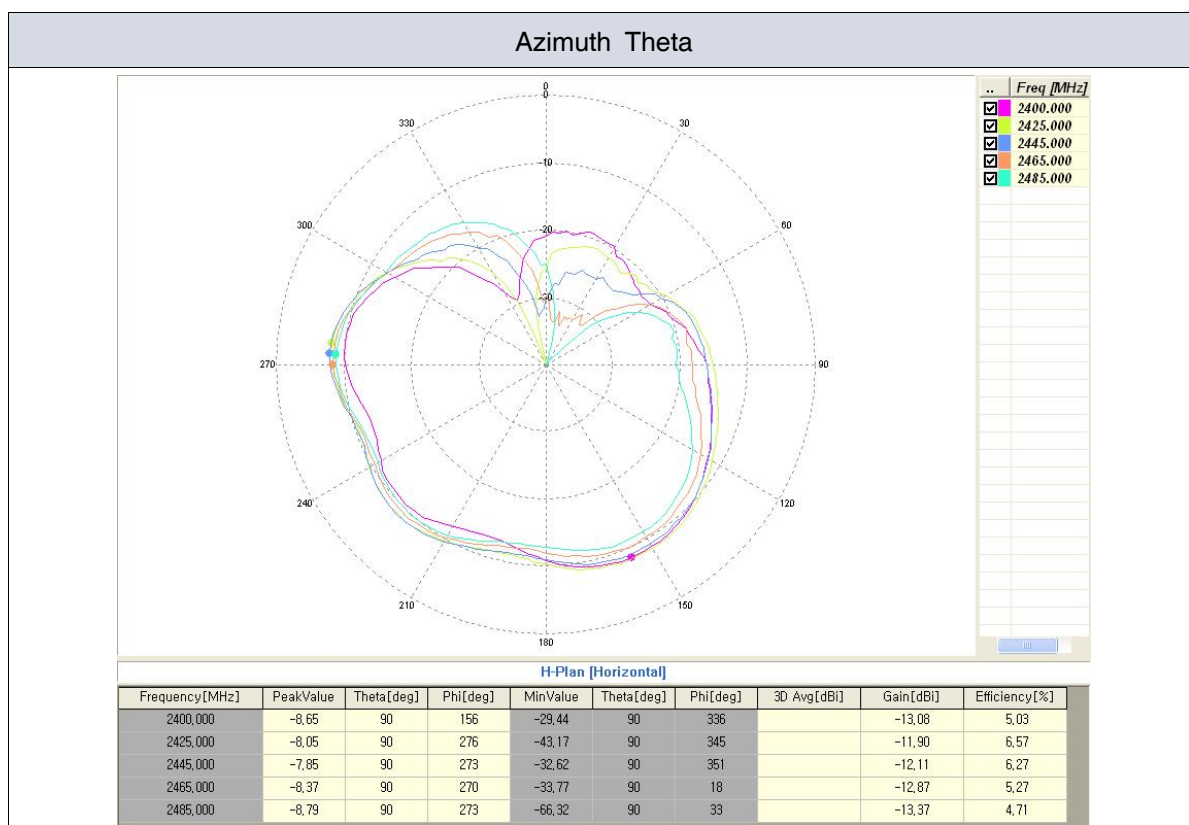
ITEM	SPEC
Frequency Range [MHz]	2400 ~ 2480
Lower frequency(2400MHz) SWR [Min~Max]	1.0 ~ 2.0 : 1 (Typ 1.5 : 1)
Upper frequency(2480MHz) SWR [Min~Max]	1.0 ~ 2.0 : 1 (Typ 1.5 : 1)

4.4 S11 Graph of Test Fixture Condition

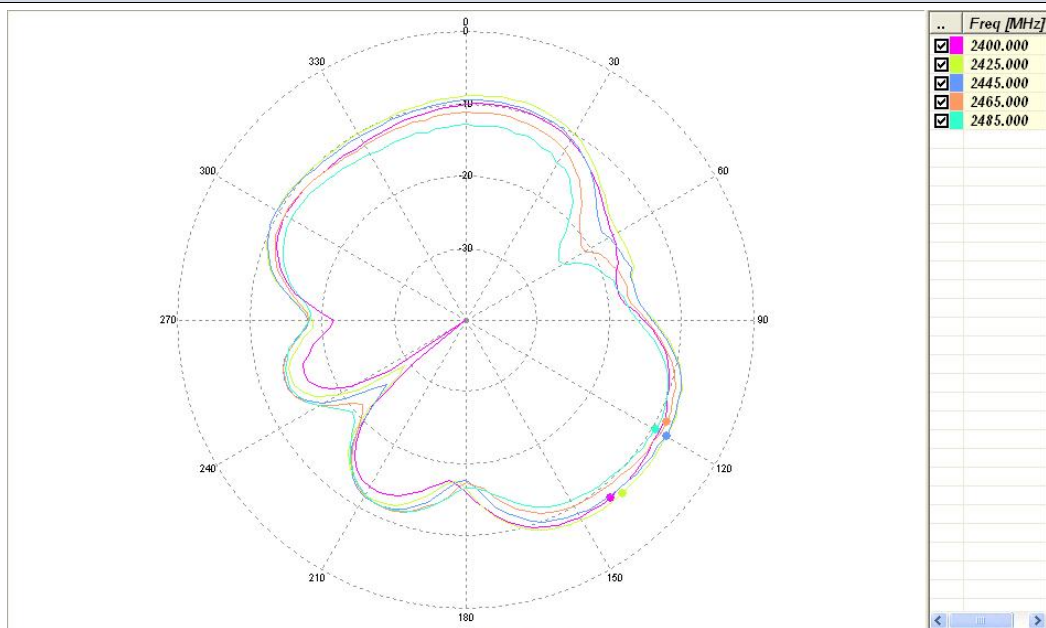


4.5 Radiation Pattern

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



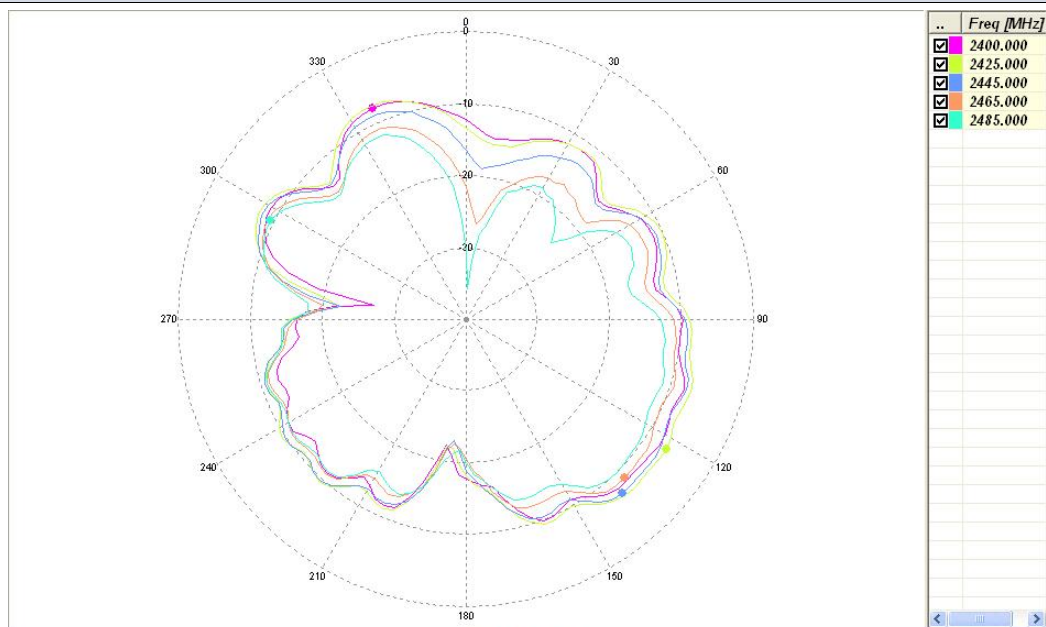
Azimuth Phi



H-Plan [Vertical]

Frequency[MHz]	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	Gain[dBi]	Efficiency[%]
2400,000	-8,19	90	141	-39,79	90	234		-12,12	6,24
2425,000	-7,57	90	138	-29,28	90	234		-11,00	8,06
2445,000	-7,88	90	120	-25,79	90	231		-11,43	7,30
2465,000	-8,73	90	117	-21,53	90	231		-12,53	5,70
2485,000	-9,52	90	120	-24,61	90	57		-13,46	4,62

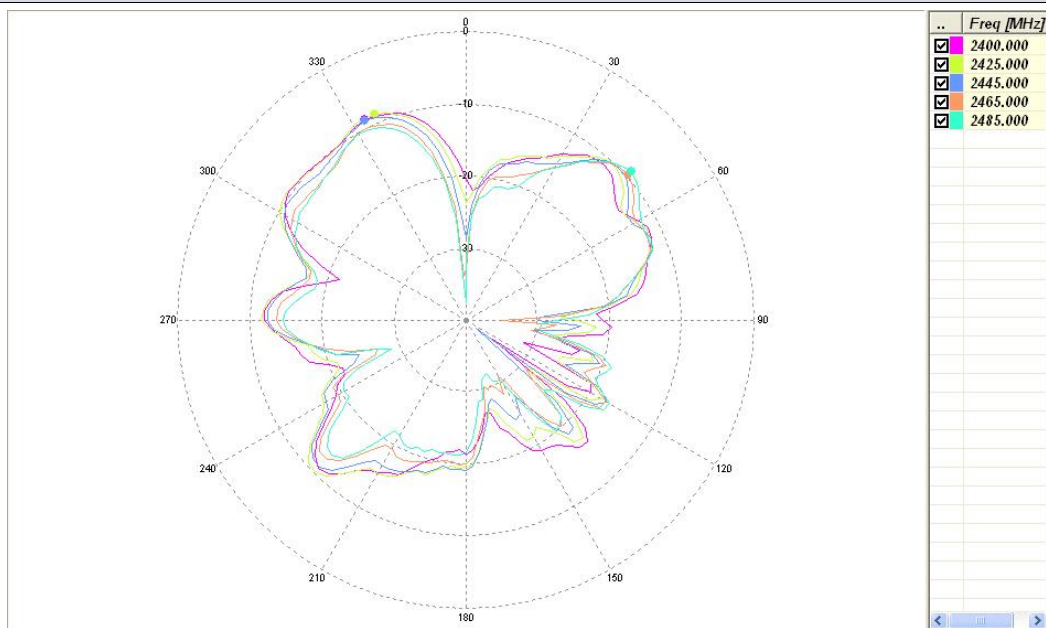
Elevation1 Theta



E1-Plan [Vertical]

Frequency[MHz]	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	Gain[dBi]	Efficiency[%]
2400,000	-7,79	336	0	-26,93	279	0		-11,30	7,53
2425,000	-6,86	123	0	-22,25	276	0		-10,40	9,24
2445,000	-7,44	138	0	-22,99	186	0		-11,14	7,80
2465,000	-8,82	135	0	-26,57	6	0		-12,69	5,50
2485,000	-9,47	297	0	-35,59	3	0		-13,60	4,48

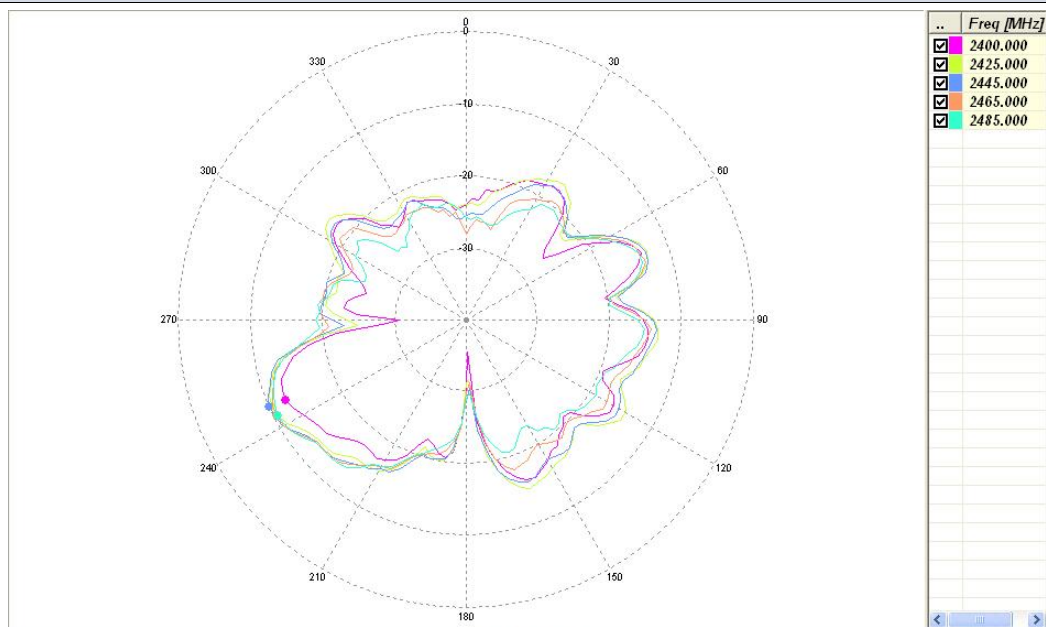
Elevation1 Phi



E1-Plan [Horizontal]

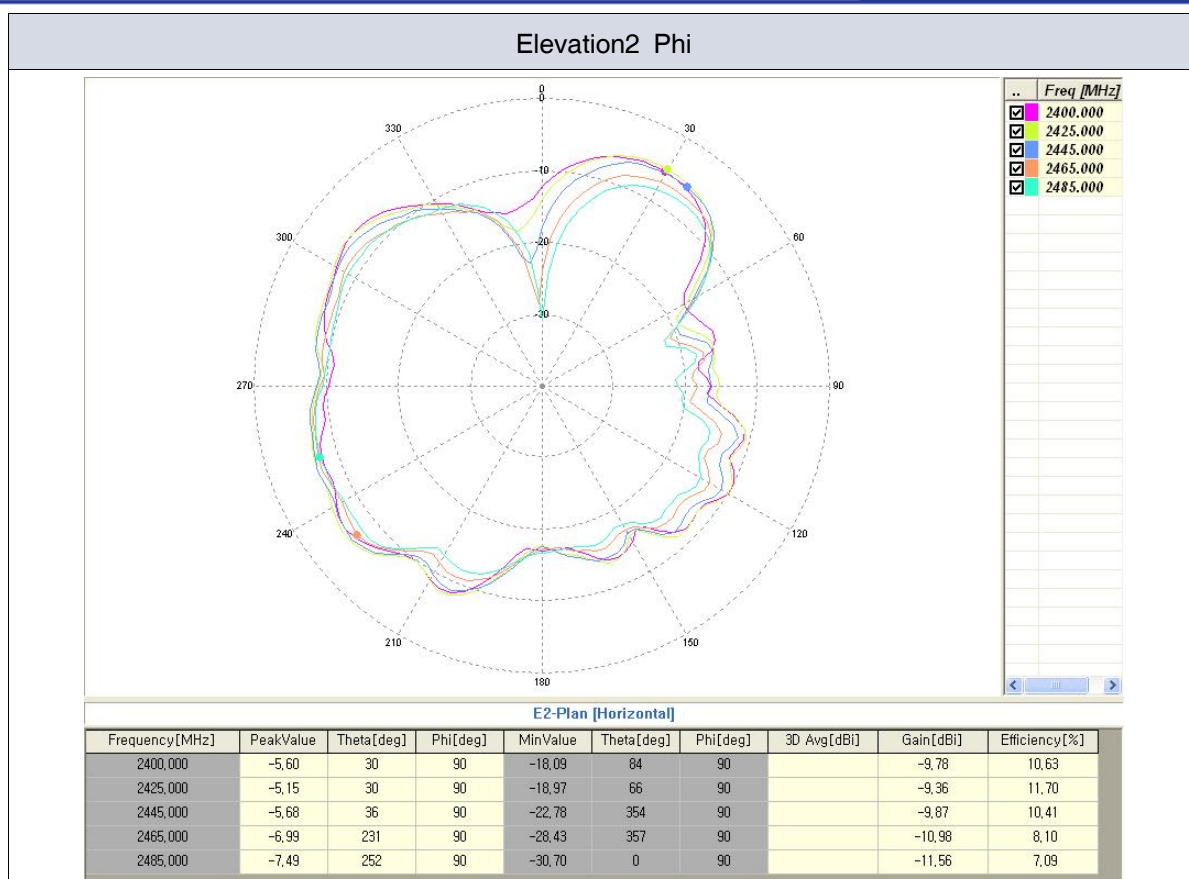
Frequency[MHz]	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	Gain[dBi]	Efficiency[%]
2400,000	-8,79	333	0	-35,37	126	0		-14,35	3,78
2425,000	-8,58	336	0	-28,90	126	0		-14,14	3,97
2445,000	-8,97	333	0	-38,12	129	0		-14,68	3,52
2465,000	-9,73	48	0	-35,05	90	0		-15,51	2,92
2485,000	-9,13	48	0	-37,54	357	0		-15,72	2,79

Elevation2 Theta



E2-Plan [Vertical]

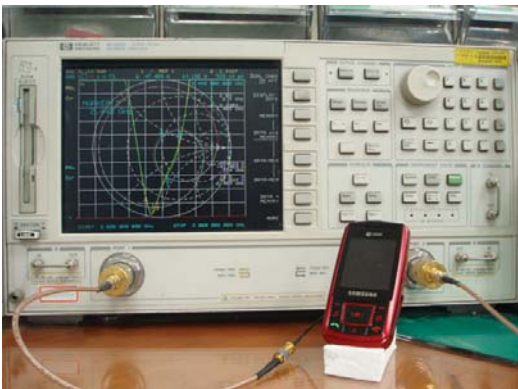
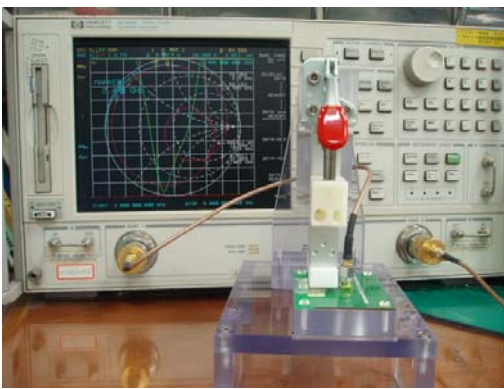
Frequency[MHz]	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	Gain[dBi]	Efficiency[%]
2400,000	-12,46	246	90	-35,45	177	90		-18,26	1,60
2425,000	-10,30	246	90	-31,61	177	90		-16,66	2,27
2445,000	-10,02	246	90	-30,40	177	90		-16,72	2,24
2465,000	-10,42	243	90	-31,15	177	90		-17,48	1,90
2485,000	-10,62	243	90	-29,61	177	90		-17,93	1,72



5. Measurement Process

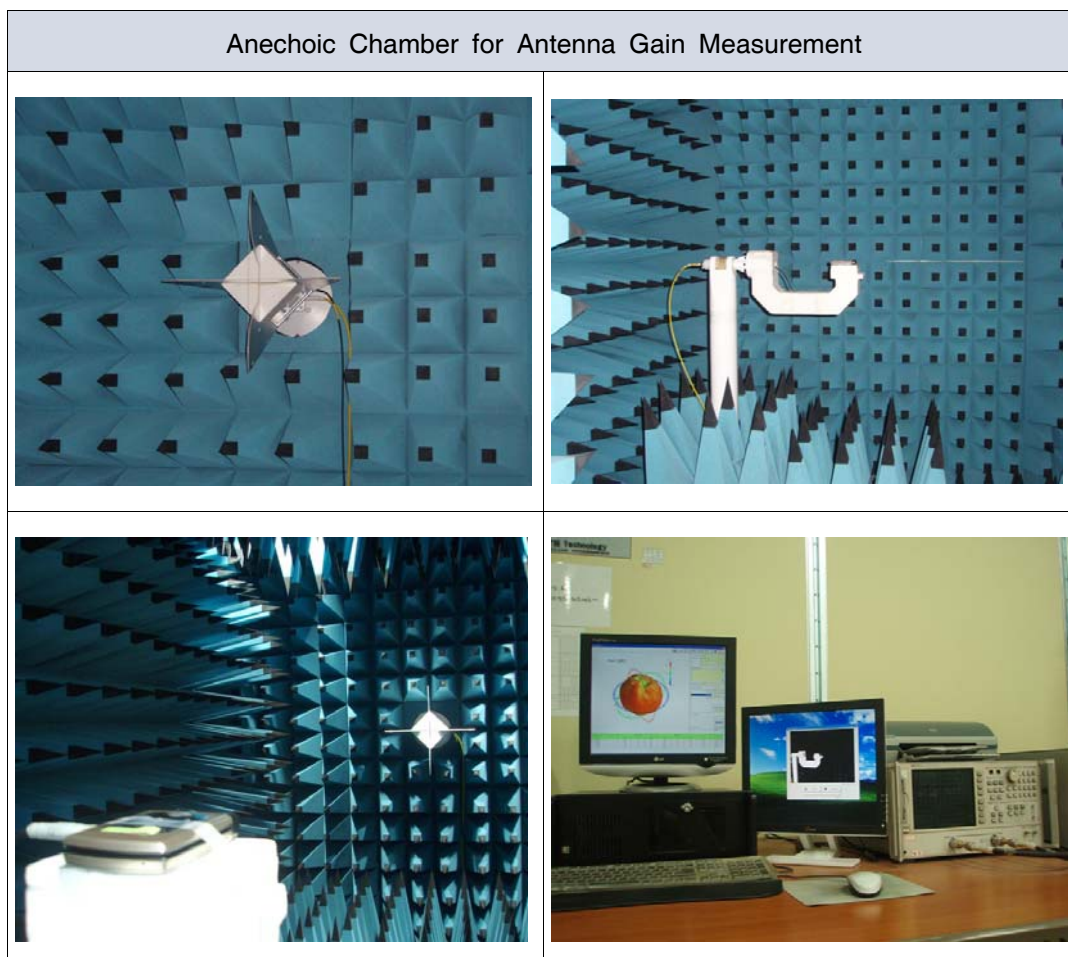
5.1 SWR/Return loss

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

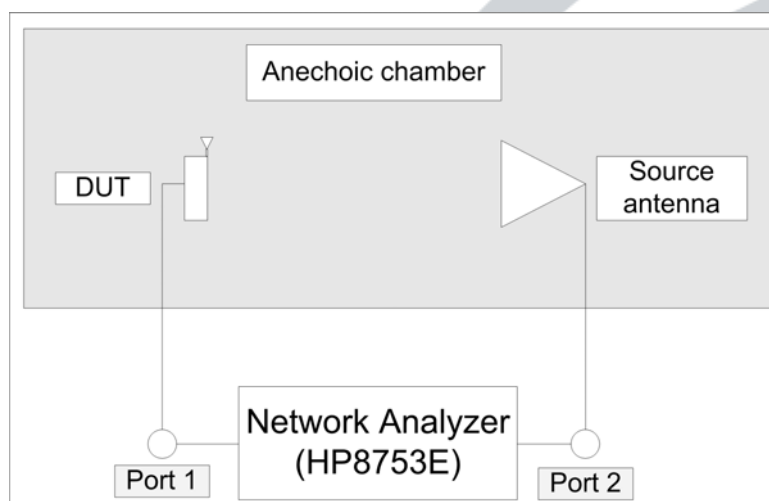
	Set Condition	Test Fixture Condition
Network Analyzer	Agilent HP8753D	Agilent HP8753D or Advantest R3765CH
Cable	RF cable(300mm)	RF cable(300mm)
Test condition		

5.2 Gain

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

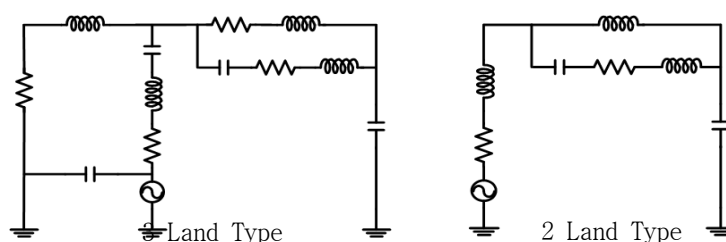


5.3 Gain test block diagram



6. Internal Block Diagram

This product is made of the dielectric block and RF part materialized the characteristics by structural change of Ag pattern on the brick of dielectric block and conditioning value of the structural equivalent circuit.

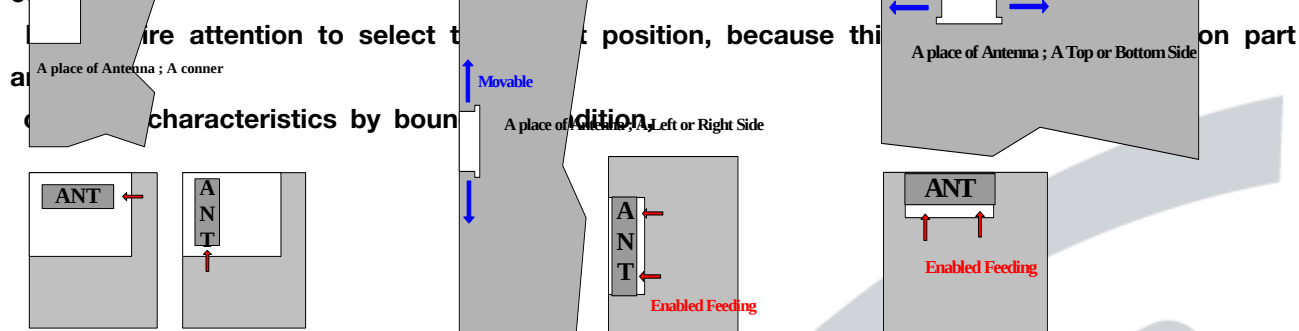


7. Basis Action / Application Note

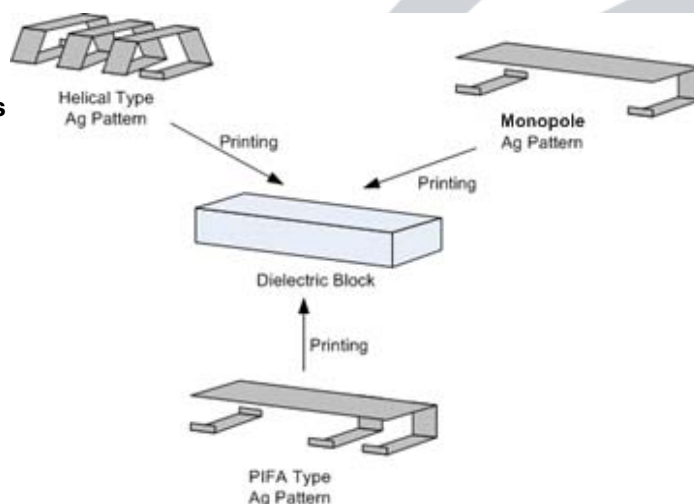
This product is the internal dielectric chip antenna of radio communication, converts the electric signal

advanced along by transmission line into free space wave.

This product will be mounted wherever you want and the design is revised by mount condition



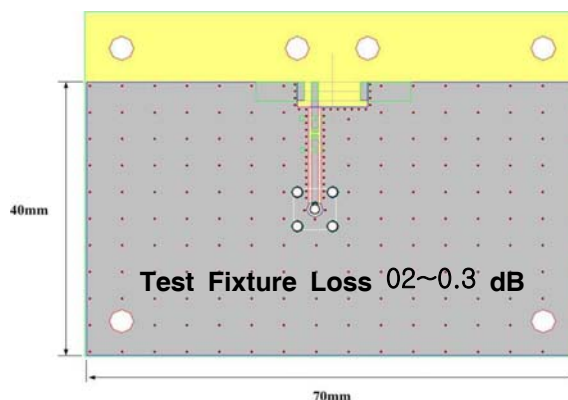
As the following, this



boundary condition.

8. Measurement Jig SPEC

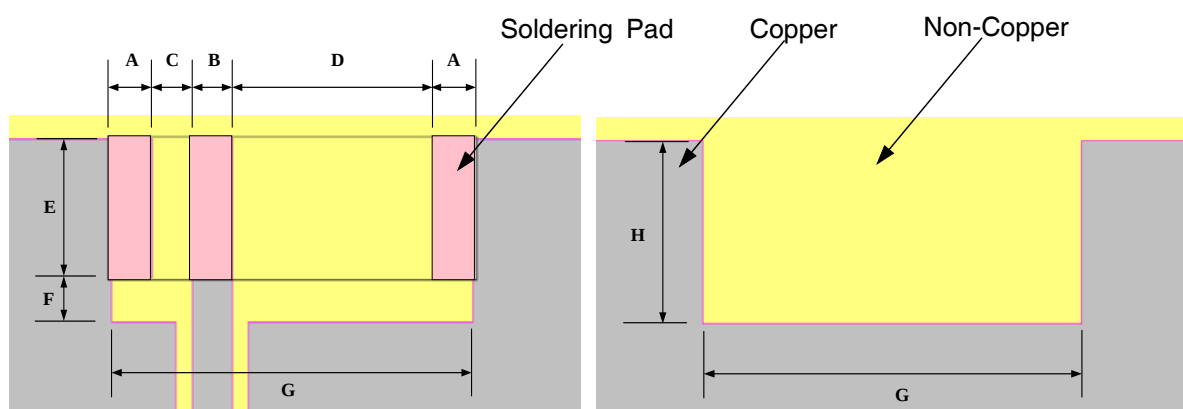
8.1 Test Fixture And GROUND Condition



※ Ev B'd and Test Fixture Jig is the same

(Contact way of Ev B'd is soldering, Test Fixture is copper contact way)

8.2 PCB Layout & Soldering Pad Dimension



Top Layout

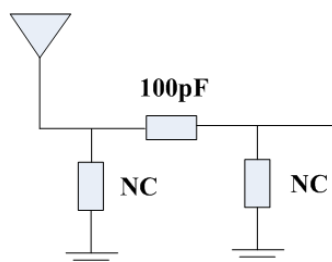
Bottom Pattern

Parameter	A	B	C	D	E	F	G	H
Value[mm]	1.1	1.0	0.5	3.5	2.2	1.0	7.0	3.2

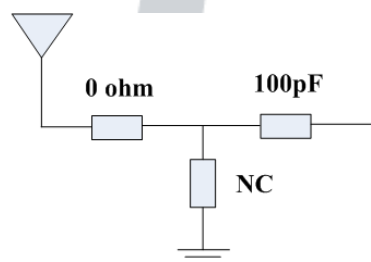
Unit ; mm

Unless specified tolerances are ± 0.1

8.3 Matching Circuit And Reference Value



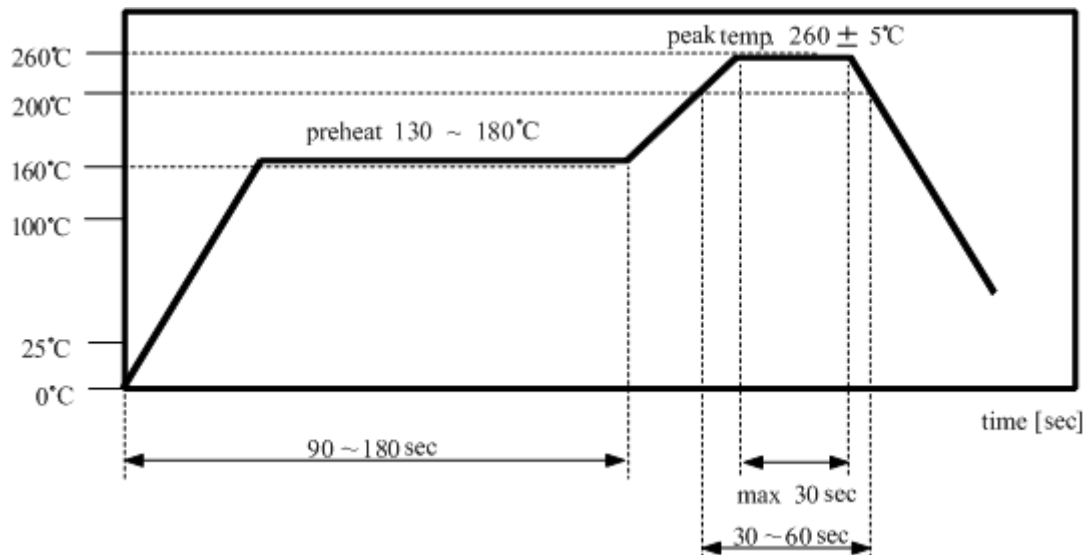
π Matching



T Matching

9. REFLOW PROFILE

9.1 Reflow Soldering



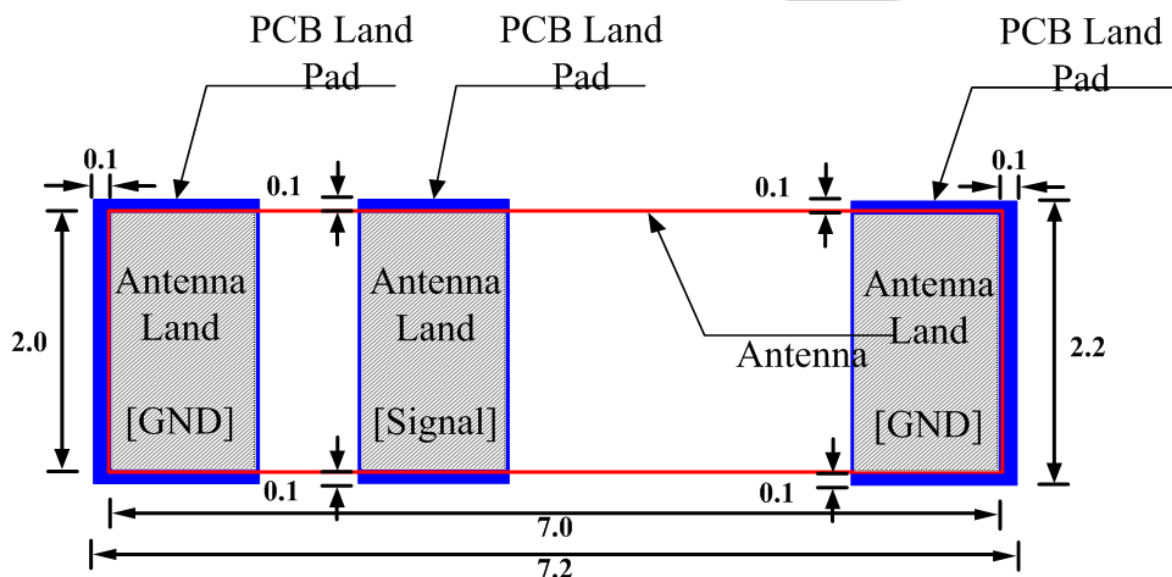
9.2 Manual Soldering

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

Soldering Temperature : 340°C ± 5°C , 5sec max per each terminal

9.3 PCB Pattern Design

As the following, the PCB land pattern lays out 0.1mm outside land pattern of antenna more than indicated antenna land dimension



10. Primary Inspection List

Item	Electrical Characteristic[MHz] 		Size [mm]		
Standard	VSWR 2.0 MAX		W=2.0±0.1	L=7.0±0.1	T=1.2±0.1
	2400MHz	2480MHz			
1	1.40	1.46	2.01	7.01	1.21
2	1.48	1.48	2.03	7.02	1.23
3	1.47	1.49	2.00	7.02	1.22
4	1.43	1.47	2.01	7.01	1.22
5	1.45	1.49	2.01	6.99	1.24
6	1.48	1.47	2.01	7.01	1.22
7	1.47	1.51	2.02	7.01	1.22
8	1.49	1.46	2.03	6.99	1.21
9	1.51	1.40	2.03	7.00	1.23
10	1.51	1.42	2.01	7.02	1.21
11	1.46	1.47	2.03	7.03	1.21
12	1.48	1.47	2.02	7.02	1.24
13	1.46	1.49	2.04	7.02	1.22
14	1.51	1.42	2.02	7.01	1.23
15	1.47	1.46	2.02	7.00	1.22
16	1.45	1.48	2.01	7.00	1.22
17	1.46	1.45	2.01	6.99	1.22
18	1.43	1.52	2.01	7.01	1.21
19	1.44	1.49	2.03	7.02	1.21
20	1.43	1.53	2.02	7.02	1.22
Min	1.40	1.40	2.00	6.99	1.21
Max	1.51	1.53	2.04	7.03	1.24
X	1.46	1.47	2.02	7.01	1.22
σ	0.03	0.03	0.01	0.01	0.01
Cpk	5.18	4.77	2.58	2.53	2.77
Decision	OK	OK	OK	OK	OK

11. Reliability Condition

11.1 Environment Test

ITEM	TEST CONDITION	LIMIT
High Temperature Action	85℃±3℃, 1hr	After test, Must meet the characteristics spec of 4.4 list
High Temperature	+85℃±3℃, 120hr±2hr	
Low Temperature Action	-40℃±3℃, 1hr	
Low Temperature	-40℃±3℃, 120hr±2hr	
Humidity Action	+85±3℃, RH85%	
Humidity Resistance	+85±3℃, RH85%, 120hr±2hr	

11.2 Thermal shock test , Reflow test

ITEM	TEST CONDITION	LIMIT
Thermal shock	condition : -40℃±3℃/1min ↔ +85℃±3℃/1min Test Cycle : 32 cycle Temperature change time : within 5 min	After test, Must meet the characteristics spec of 4.4 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 ×9.8m/s ² (G) Sweep time : 15 min , X.Y.Z each 5 times	After test, Must meet the characteristics spec of 4.4 list
Drop	18 times free fall Using the drop jig 152cm high Jig : 120g±20g Plastic Jig	

11.4 MSL LEVEL Test

1) JEDEC J-STD-020C Test

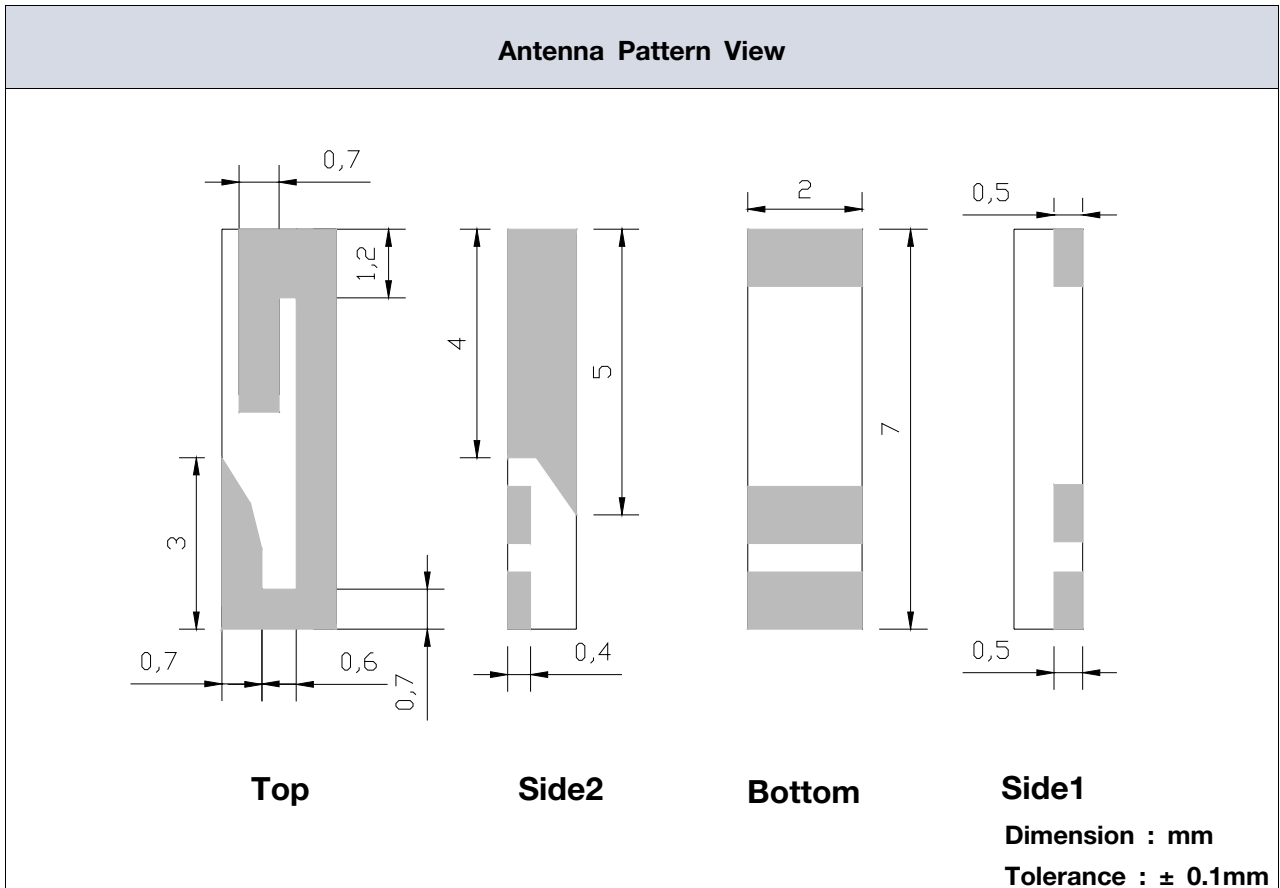
	Floor Life		Soak Requirements	
	Time	Conditions	Time	Conditions
1	Unlimited	= < 30℃/85%RH	168+5/-0	= < 85℃/85%RH

2) Test Condition

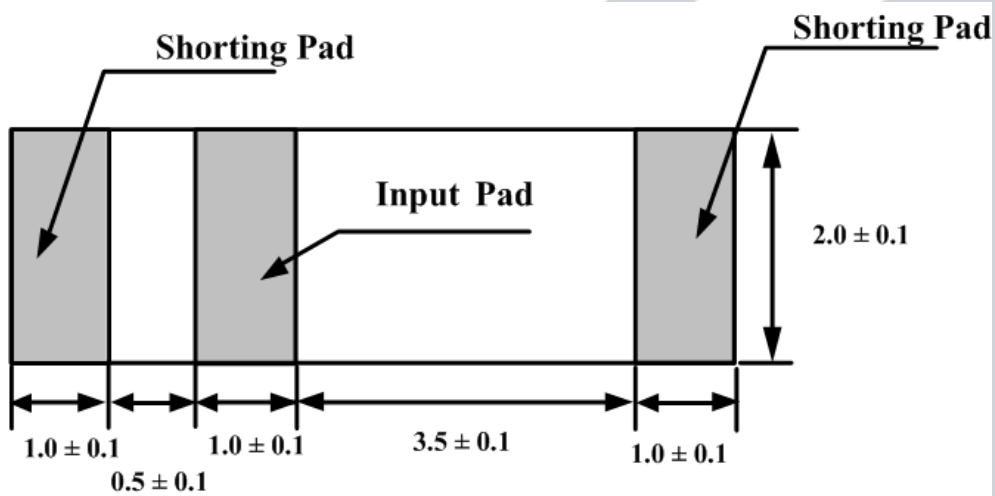
ITEM	Conditon	LIMIT
Soak Requirements	After leaving +85±3℃, RH85% 168hr±2hr 2 times Reflow without aging	After test, Must meet the characteristics spec of 4.4 list

12. Mechanical Characteristics

12.1 Antenna Pattern Dimension



12.2 Pin name

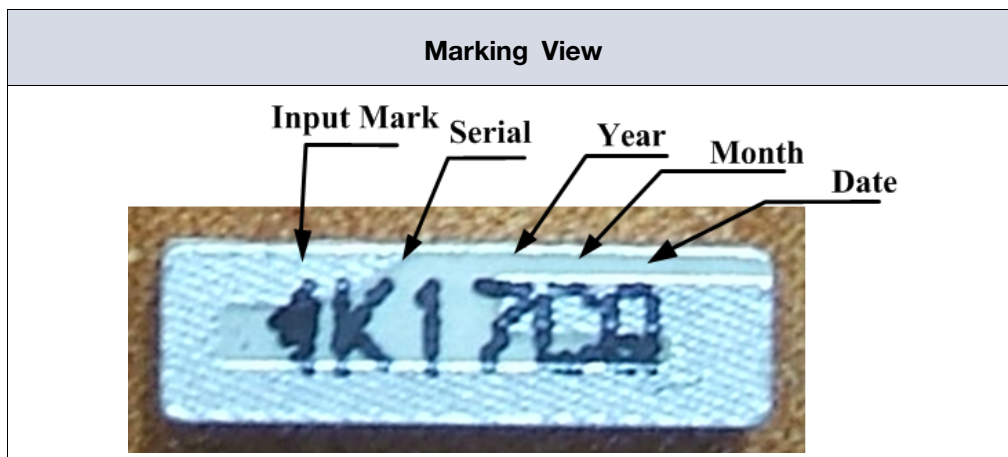


12.3 Lot number notation

7	C	Q
①	②	③

- ① **Year** : 7 - 2007 ····
 ② **Month** : 1 - January, 2 - February ··· 9 - September, A - October, B - November ···
 ③ **Date** : 1 - 1st , 2 - 2nd ···· A - 10th, B - 11th ····

12.4 Marking



◀	<u>K 1</u>	<u>7</u>	<u>C</u>	<u>Q</u>
①	②	③	④	⑤

- ① **Input Signal**
 ② **Serial**
 ③ **Year** : 1 - 2001, 2 - 2002, ···· 7 - 2007 ····
 ④ **Month** : 1 - January, 2 - February ··· 9 - September, A - October, B - November ···
 ⑤ **Date** : 1 - 1st , 2 - 2nd ···· A - 10th, B - 11th ····

12.5 Marking type

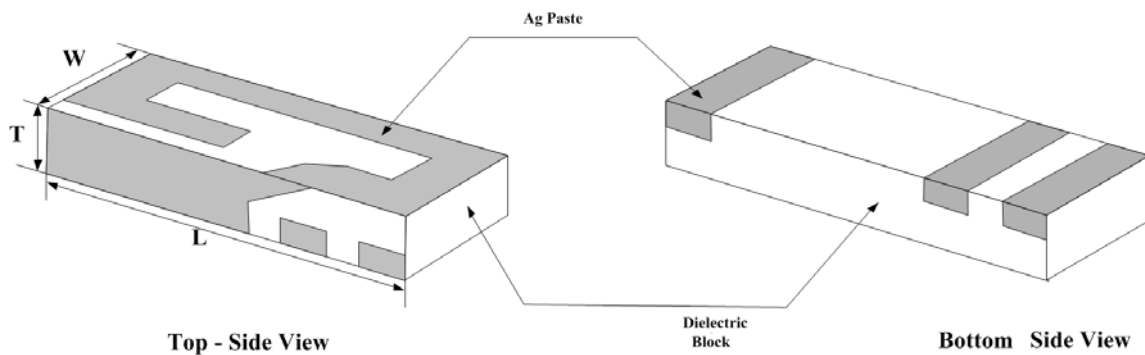
Ink marking - Using Black Ink

13. Structure and Material

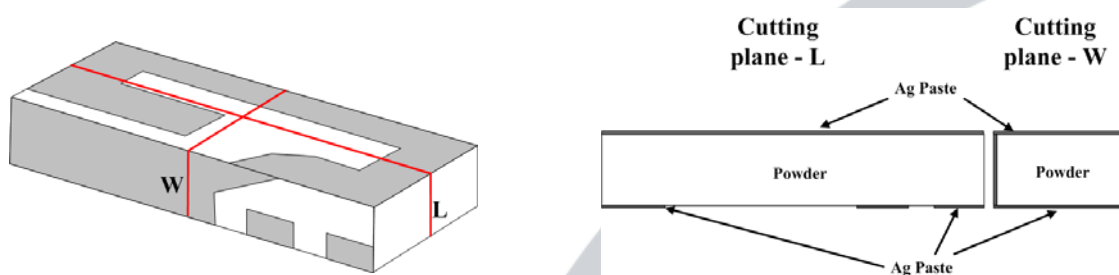
13.1 materialization method

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	Fuji	
PATTERN	Ag Paste	METECH	Thickness : TYP 10 μ m
PAD	Ag paste	METECH	Thickness : Min 10 μ m (TYP 16~20

14. Attention

14.1 Temperature Condition

	Range of Temperature	Unit
Application temperature	-40 ~ +85	℃
Keeping temperature	-40 ~ +85	℃

14.2 Temperature Test Condition

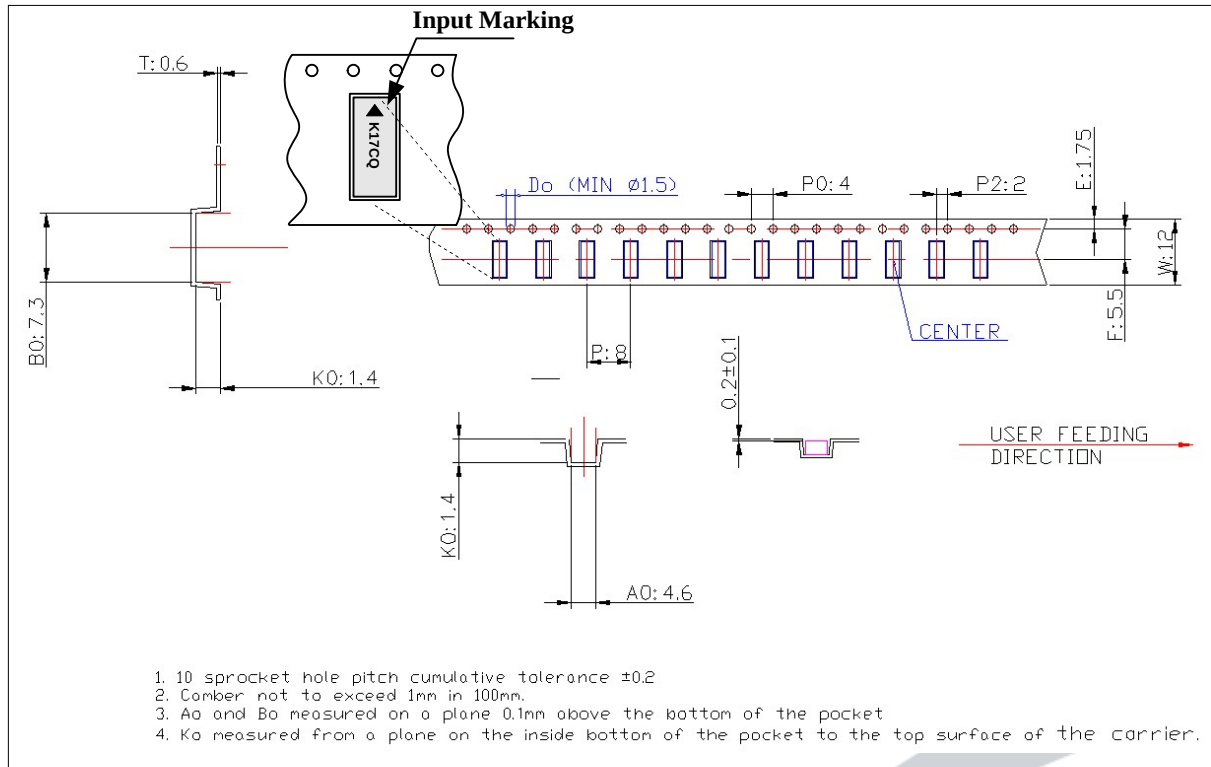
	Condition	Range of Temperature
Application temperature	Low	24hr normal action at -75℃
	High	24hr normal action at +150℃
Keeping temperature	Low	normal action when left for 1000hr at -75℃
	High	normal action when left for 1000hr at +85℃

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

15. Packing

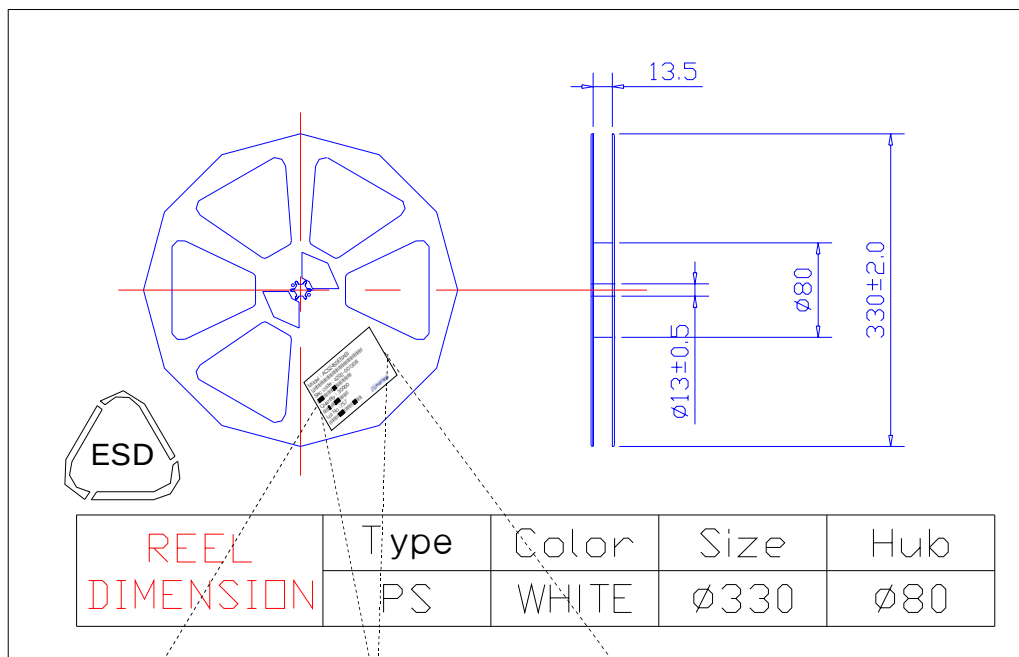
15.1 Carrier/Reel

ITEM	Material	Surface Resistance	electrostatic emission	Packing
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-1208-048
DIMENSIONAL UNIT	MM
UNTOLERANCED DIMENSION	± 0.1
CAD FILE NAME	050504
DESIGNED BY	K. M. J
SCALE	1/1
TITLE	CARRIER TAPE 2*7*1.2p
PART.	CARRIER TAPE
MATERIAL	C-PET
LENGTH	48,4M
COUNT	6050P

NAME	SPEC.
W	120 ± 0.2
E	1.75 ± 0.1
F	5.5 ± 0.1
D0	1.5 ± 0.1
P	8.0 ± 0.1
P0	4.0 ± 0.1
P2	2.0 ± 0.1
A0	2.3 ± 0.1
B0	7.3 ± 0.1
K0	1.4 ± 0.1
T	0.3 ± 0.05



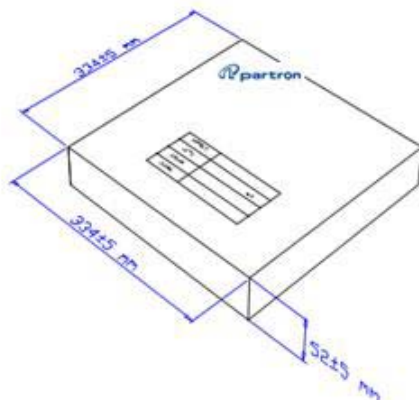
Model : ACS2450GBAK1
 Quantity : 5000
 Lot No : 7CQ



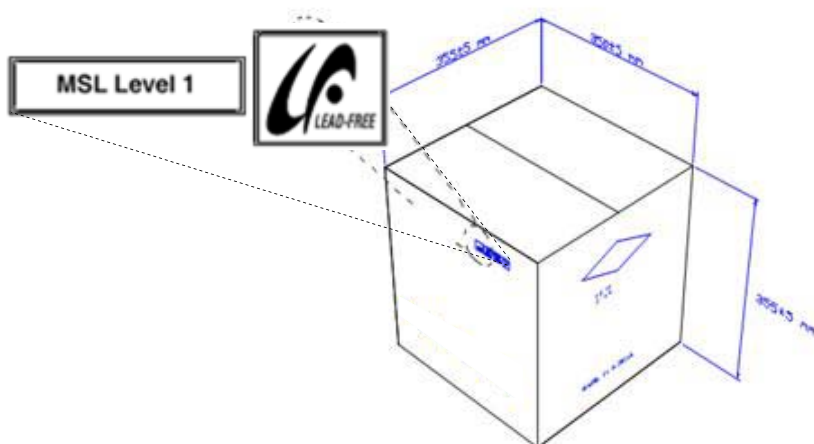
MSL Level 1



15.2 BOX



Material : SK/S/K-B
Corrugated cardboard



15.3 Actual packing Picture



Reel



Internal Box



External Box



Reel / Internal Box label



External 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					
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				
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				
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	White Powder(MMS-08)
Tester Organization	SGS Taiwan LTD.
Measurement Tester	Please see the 'method' in the test report
Measurement Data	Please see the report under the table

SGS

Test Report No: CE/2006/C0568 Date: 2006/12/11 Page: 1 of 3

FUJII TITANIUM IND. CO., LTD.
12-8, SENDEN-CHO, HIRATSUKA-CITY,
KANAKAWA-PREF. JAPAN

Report on the submitted sample said to be MIXTURE OF (1) MAGNESIUM OXIDE
(2) STRONTIUM ZIRCONATE (3) BARIUM TITANATE

System No: MMS-08 (S)
Sample Receiving Date: 2006/12/04
Testing Period: 2006/12/04 TO 2006/12/11

Test Requested: In accordance with the RoHS Directive 2002/95/EC, and its amendment directives.

Test Method: (1) With reference to BS EN 1122:2001, Method B for Cadmium Content. Analysis was performed by ICP-AES.
(2) With reference to US EPA Method 3050B for Lead Content. Analysis was performed by ICP-AES.
(3) With reference to US EPA Method 3052 for Mercury Content. Analysis was performed by ICP-AES.
(4) With reference to US EPA Method 2052A & 7195A for Hexavalent Chromium for non-metallic samples. Analysis was performed by UV/VIS Spectrometry.

Test Result(s): Please refer to next page(s).

David Yeh, M.S., Operation Manager
Signed for and on behalf of
SGS TAIWAN LTD.

The content of this PDF file is in accordance with the original issued reports for reference only. This Test Report cannot be reproduced, stored in full, without prior written permission of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this report is unlawful and offenders may be prosecuted to the fullest extent of the law.
SGS Taiwan Ltd. 110, Xinyi Road, Taipei, Taiwan.

SGS

Test Report No: CE/2006/C0568 Date: 2006/12/11 Page: 2 of 3

FUJII TITANIUM IND. CO., LTD.
12-8, SENDEN-CHO, HIRATSUKA-CITY,
KANAKAWA-PREF. JAPAN

Test results by chemical method (Unit: mg/kg)

Test Item (s)	Method (Reference)	Result	MDL
Cadmium (Cd)	(1)	<0.5	2
Lead (Pb)	(2)	<0.5	3
Mercury (Hg)	(3)	<0.5	3
Hexavalent Chromium (CrVI)	(4)	<0.5	2

Test Part Description:
MD-1 WHITE POWDER

Note: 1. mg/kg = ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit

The content of this PDF file is in accordance with the original issued reports for reference only. This Test Report cannot be reproduced, stored in full, without prior written permission of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this report is unlawful and offenders may be prosecuted to the fullest extent of the law.
SGS Taiwan Ltd. 110, Xinyi Road, Taipei, Taiwan.

SGS

Test Report No: CE/2006/C0568 Date: 2006/12/11 Page: 3 of 3

FUJII TITANIUM IND. CO., LTD.
12-8, SENDEN-CHO, HIRATSUKA-CITY,
KANAKAWA-PREF. JAPAN

CE/2006/C0568



P3/4

** End of Report **

The content of this PDF file is in accordance with the original issued reports for reference only. This Test Report cannot be reproduced, stored in full, without prior written permission of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this report is unlawful and offenders may be prosecuted to the fullest extent of the law.
SGS Taiwan Ltd. 110, Xinyi Road, Taipei, Taiwan.

2) Ag Paste

Parts Name	Silver Paste
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



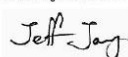
Test Report No. F690501/LF-CTSGP06-26952 **Date:** October 27, 2006 **Page** 1 of 2

To: METECH KOREA CO., LTD.
B-801 Dongyang Paragon office 17-2 Jeongja-dong
Bundang-gu
Sungnam-city
GYEONGGI-DO
Korea

The following merchandise was submitted and identified by the client as :

Commodity : PCC11837HV
SGS File No. : GP06-26952
Received Date : October 20, 2006
Test Performing Date : October 23, 2006
Test Performed : SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results : For further details, please refer to following page(s)

SGS Testing Korea Co. Ltd.


 Jeff Jang / Chemical Lab Mgr

Pluto Kim
Patrick An
Monet Jeong
Jinee Song
/Testing Person

The above certificate is the accredited test items by Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA.

This Test Report is issued by the Company subject to its General Conditions of service printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full, without prior written permission of the Company.



Test Report No. F690501/LF-CTSGP06-26952 **Date:** October 27, 2006 **Page** 2 of 2

Sample No. : GP06-26952.001
Sample Description : PCC11837HV
Item No./Part No. : N/A
Comments : Material is silver paste.

Heavy Metals

Test Item	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Picture of Sample as Received:



*** End ***

NOTE: (1) N.D. = Not detected (<MDL)
(2) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) Estimated expanded uncertainty U with a coverage factor k =2, corresponding to a level of confidence of about 95%

The above certificate is the accredited test items by Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA.

This Test Report is issued by the Company subject to its General Conditions of service printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full, without prior written permission of the Company.

3) Marking Ink

Parts Name	Black 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
Test Report No. F690501/LF-CTSGP06-27074 Date: October 27, 2006 Page 1 of 3

To: **IMAJE KOREA CO., LTD**
 %1302, Daeyang Techno Town 7th
 Kasan-dong
 Keumcheon-ku
 SEOUL
 Korea

The following merchandise was submitted and identified by the client as:

Commodity : ink-5135E black ink

SGS File No. : GP06-27074

Received Date : October 20, 2006

Test Performing Date : October 23, 2006

Test Performed : SGS Testing Korea tested the sample(s) selected by applicant with following results

Test Results : For further details, please refer to following page(s)

SGS Testing Korea Co. Ltd.
Jeff Jang
 Jeff Jang / Chemical Lab Mgr

Pluto Kim
 Monet Jeong
 Jilly Oh
 Jerry Jung
 /Testing Person

This Test Report is issued by the Company subject to its General Conditions of Service printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full, without prior written permission of the Company.

SGS
Test Report No. F690501/LF-CTSGP06-27074 Date: October 27, 2006 Page 2 of 3

Sample No. : GP06-27074.001

Sample Description : ink-5135E black ink

Style/Item No. : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Monobromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

NOTE: (1) N.D. = Not detected (<MDL)
 (2) ppm = mg/kg
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) ** = Qualitative analysis (No Unit)
 (6) Negative = Undetectable / Positive = Detectable

This Test Report is issued by the Company subject to its General Conditions of Service printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full, without prior written permission of the Company.

SGS
Test Report No. F690501/LF-CTSGP06-27074 Date: October 27, 2006 Page 3 of 3

Picture of Sample as Received:



*** End ***

NOTE: (1) N.D. = Not detected (<MDL)
 (2) ppm = mg/kg
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) ** = Qualitative analysis (No Unit)
 (6) Negative = Undetectable / Positive = Detectable

This Test Report is issued by the Company subject to its General Conditions of Service printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full, without prior written permission of the Company.