

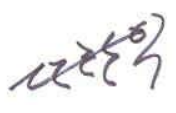

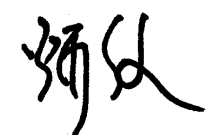
TBBP-A free



MSL Level 1

ROHS-Y

Approval Sheet

Products	FPCB Antenna		
Customer	PANTECH		
Model	ELVIS		
Customer CODE			
Supplier	PARTRON		
Supplier CODE	AFS2450ELV		
PANTECH	By designed	By checked	By approved
PARTRON	By designed	By checked	By approved
			
	Research 5Team	Quality Assurance	Laboratory
	Chanik.Jeon	Nam-Sik.Min	Byoung-Jun.Yim
	03 / 06	03 / 06	03 / 06

2008. 03. 06



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www.partron.co.kr

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MSL Level 1

ROHS-Y

SPECIFICATION




MODEL : AFS2450ELV

3D Structure



Top View

Bottom View

By designed	By checked	By approved
		
Research 5Team	Quality Assurance	Laboratory
Chanik.Jeon	Nam-Sik.Min	Byoung-Jun.Yim
03 / 06	03 / 06	03 / 06

2008. 03. 06

- Contents -

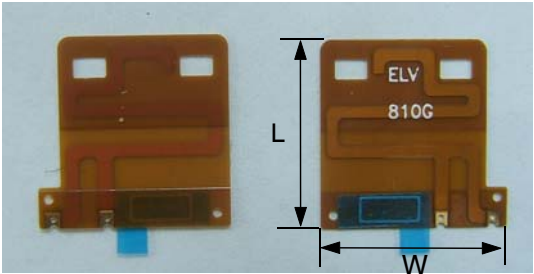
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2. Introduction

2.1 Introduction of Product

This product is a FPCB BT antenna that the thin copper is printed inside FPCB.


2.2 Specification and Dimension

Material	FPCB : Copper Foil + Aromatic polyimide	3D Structure
Size [mm]	W = 12.8±0.1	
	L = 12.5±0.1	
	T = 0.20±0.05 (FPCB Thickness)	
Temperature [°C]	-40 ~ +80	
Humidity [%]	At the normal temperature, RH 100	

3. Special Management()

- The below things are special management items.

CTQ	The reason
Dimension & Weight (after forming)	The plasticity dielectric block is influenced at this item
Dimension (after Plasticity)	The accuracy of printed pattern is influenced at this item
Dimension of Printing Pattern	The accuracy of printed pattern is the most special thing at electrical characteristic of dielectric chip antenna

CTF 	The reason
SWR Measurement	This item is an important parameter that fix an electrical characteristic

- Care about the below things.

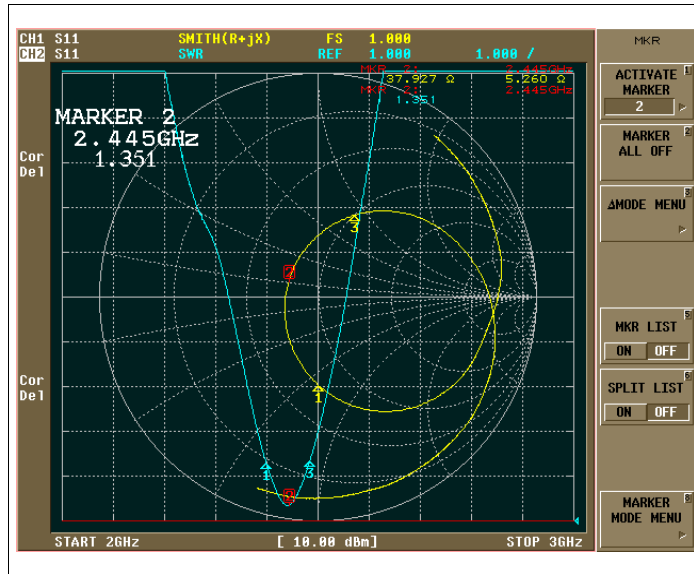
ITEM	Content
Keeping	Sealing tightly when keeping for a long time
Action	Maybe characteristics is changed when changed any design

4. Electrical Characteristics

4.1 Set Condition


ITEM				SPEC
Frequency Range [MHz]				2400 ~ 2485
SWR [Max]				3.0 : 1 (Typ 2.3 : 1)
Input Impedance [Ω]				50 Ohm
Polarization				Linear
Gain[dBi]	Total Gain (Peak / Avg) [dBi]			-1.5 / -9.2
	Azimuth	Theta	Peak	-6.77
			Average	-10.54
		Phi	Peak	-1.49
			Average	-6.59
	Elevation 1	Theta	Peak	-1.97
			Average	-7.21
		Phi	Peak	-6.45
			Average	-11.92
	Elevation 2	Theta	Peak	-7.41
			Average	-11.57
		Phi	Peak	-6.61
			Average	-10.35

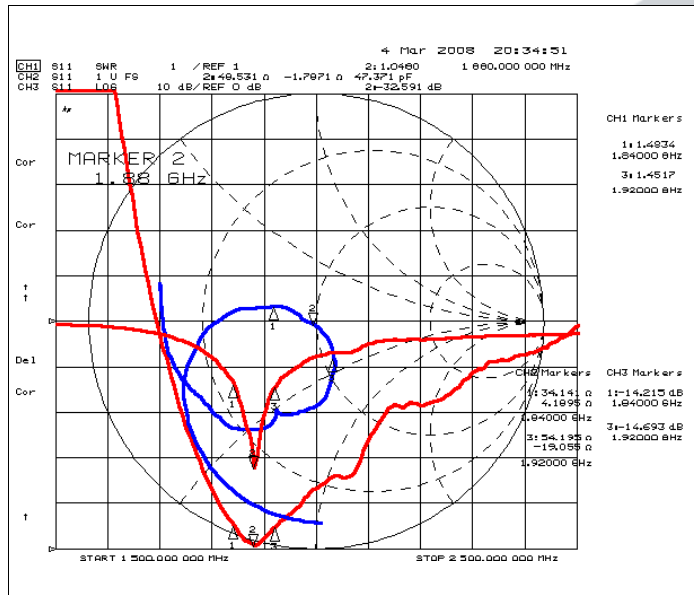
4.2 S11 Graph of Set Condition



4.3 Test Fixture Condition

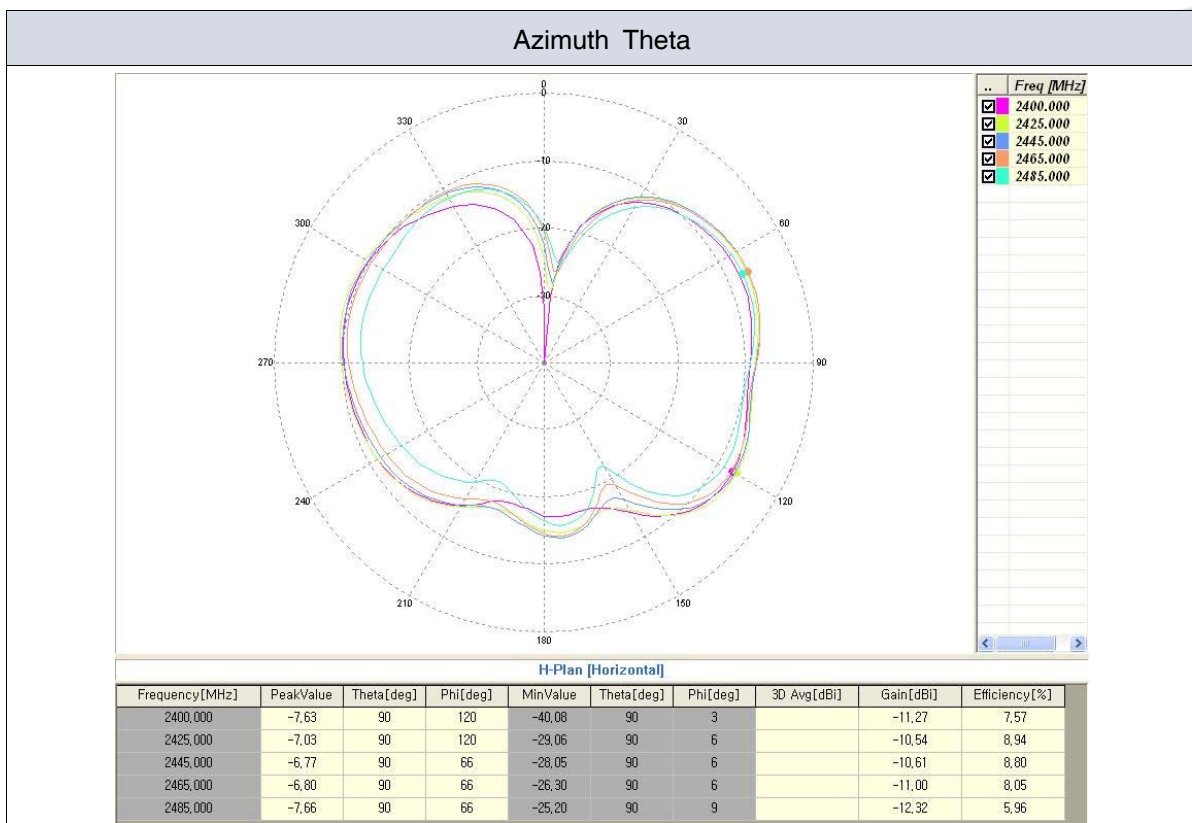
ITEM	SPEC
Frequency Range [MHz]	1840 ~ 1920
Lower frequency(1840MHz) SWR [Min~Max]	1.0 ~ 2.5 : 1 (Typ 1.5 : 1)
Upper frequency(1920MHz) SWR [Min~Max]	1.0 ~ 2.5 : 1 (Typ 1.5 : 1)

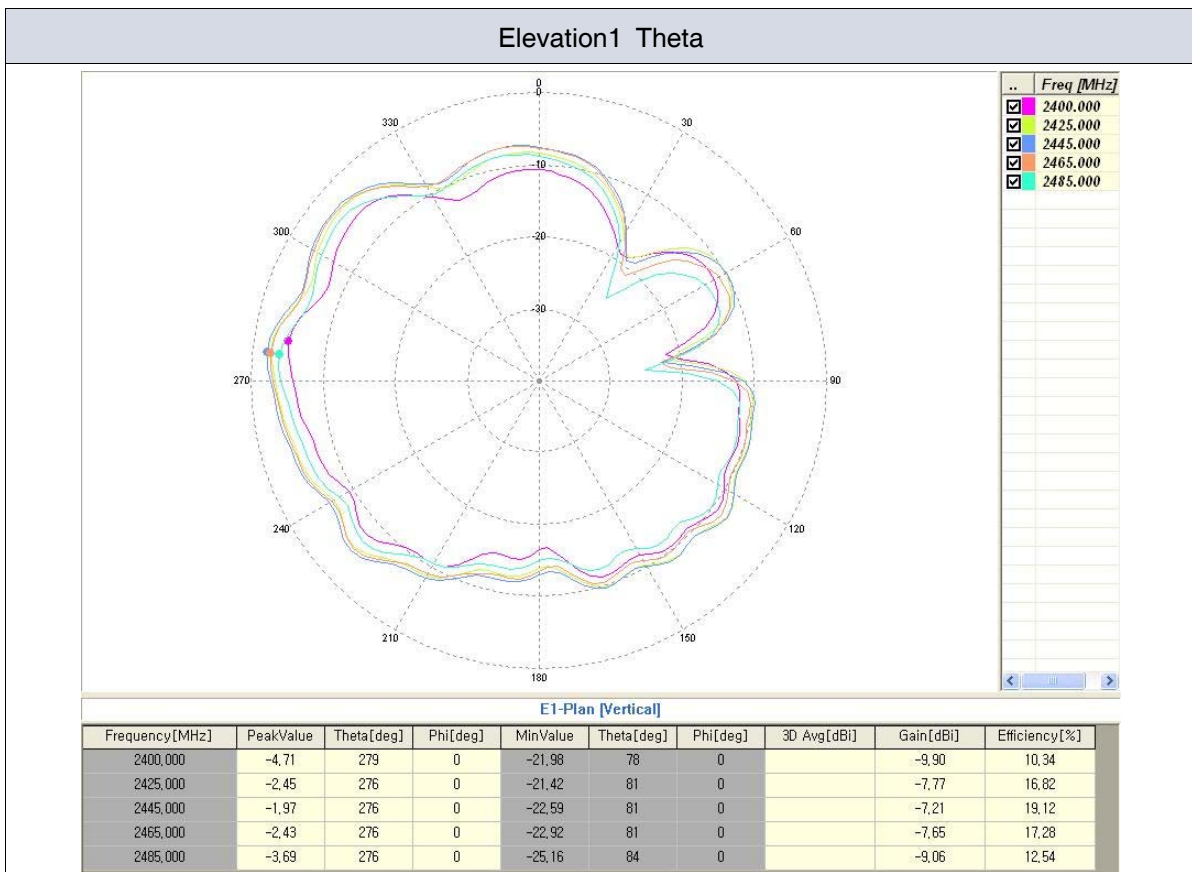
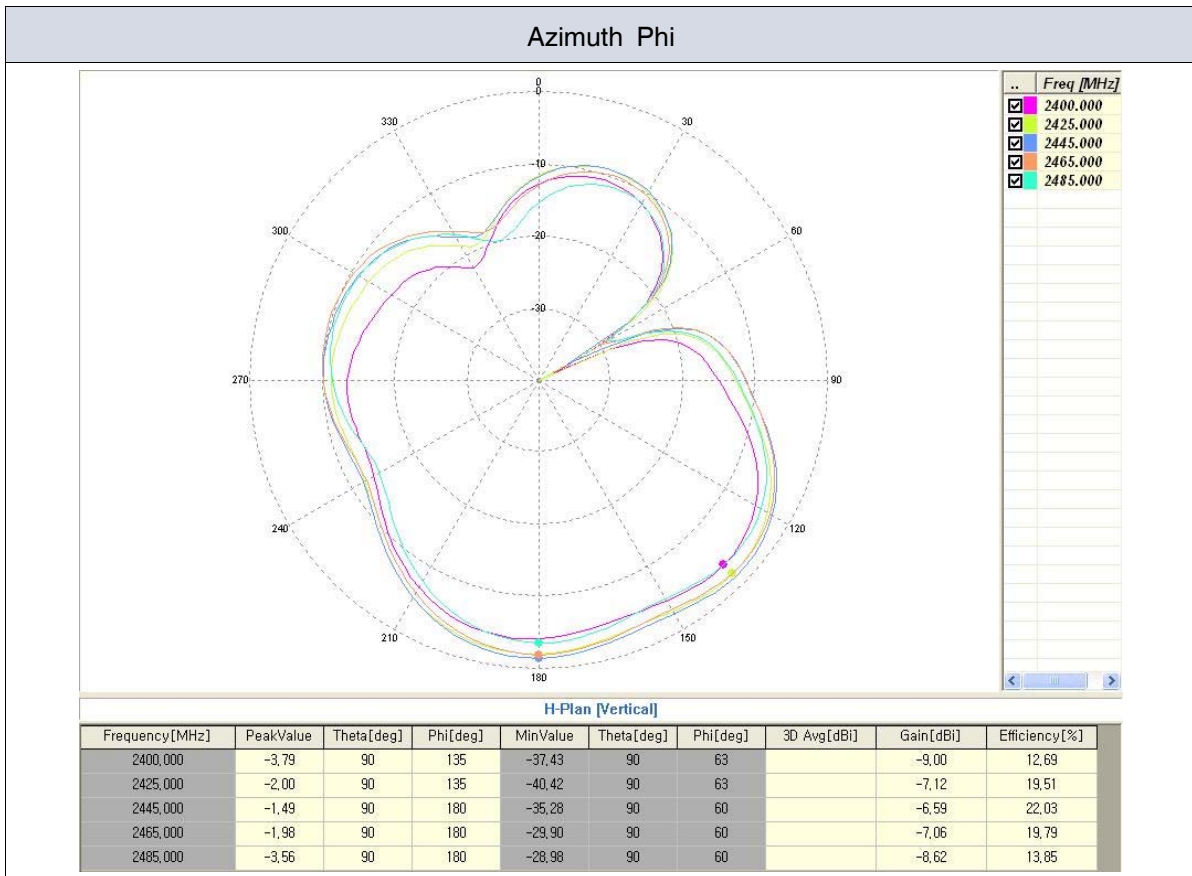
4.4 S11 Graph of Test Fixture Condition 

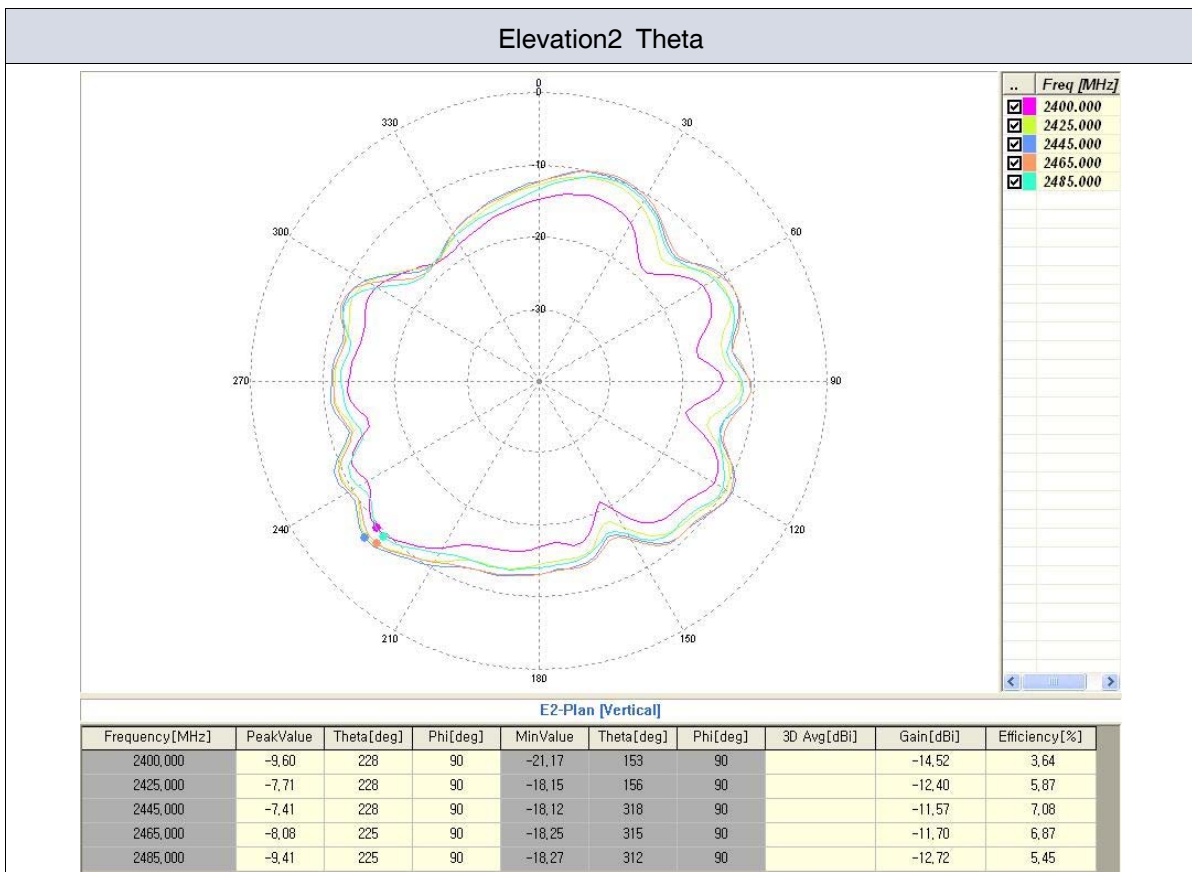
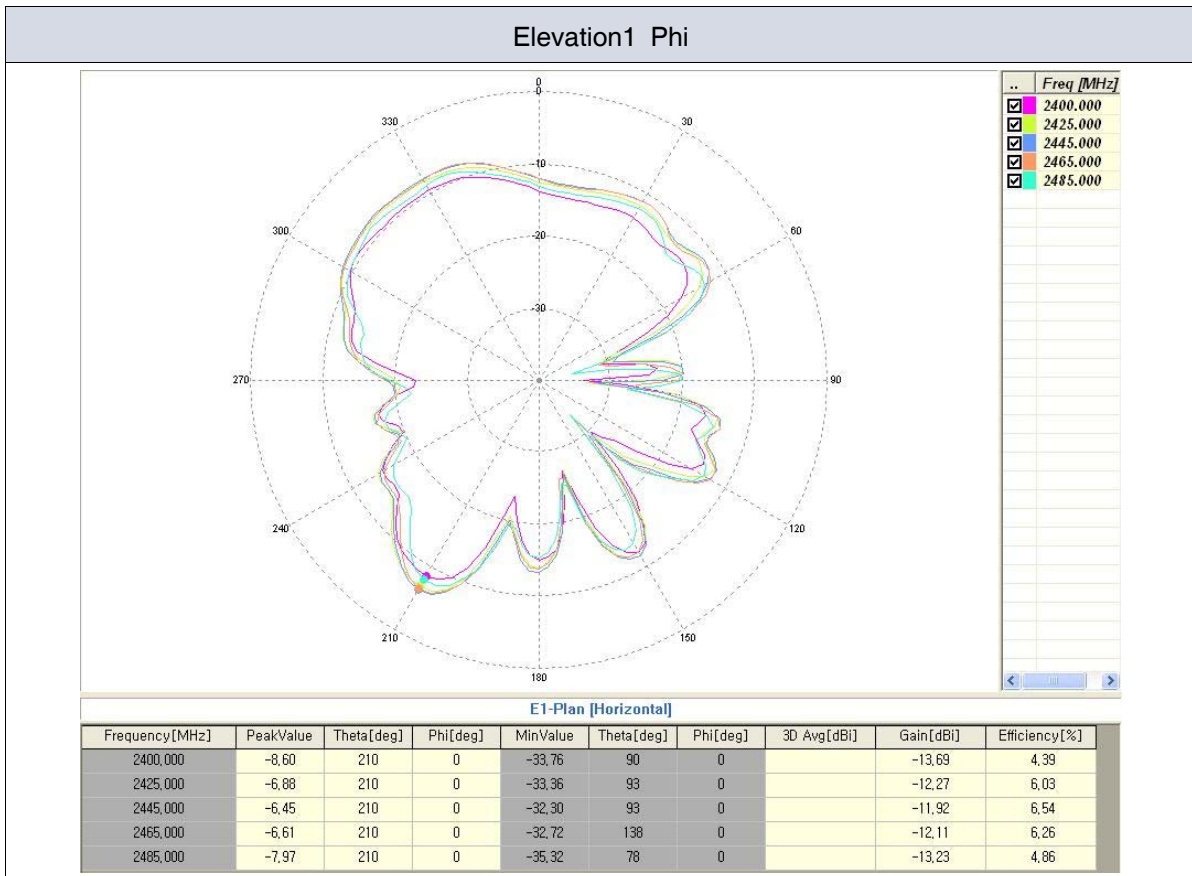


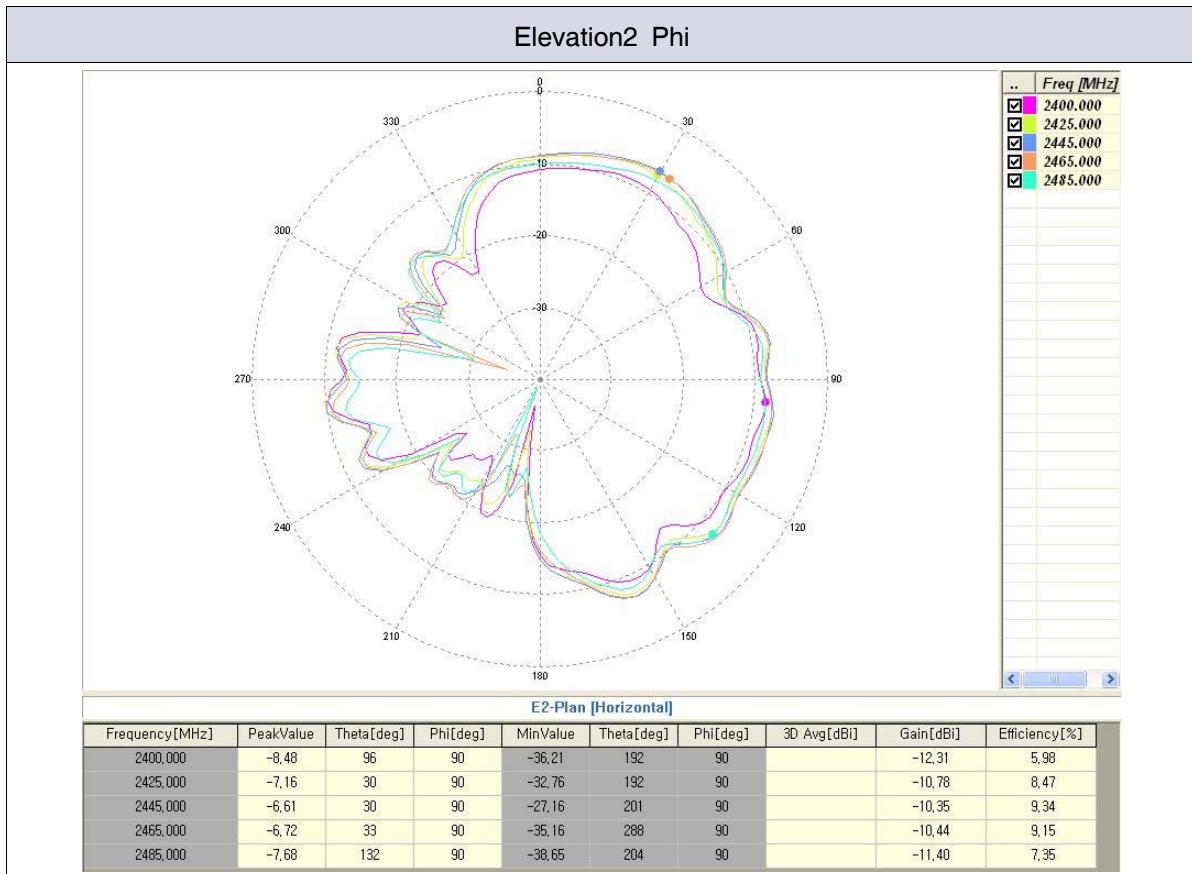
4.5 Radiation Pattern

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











5. Measurement Process

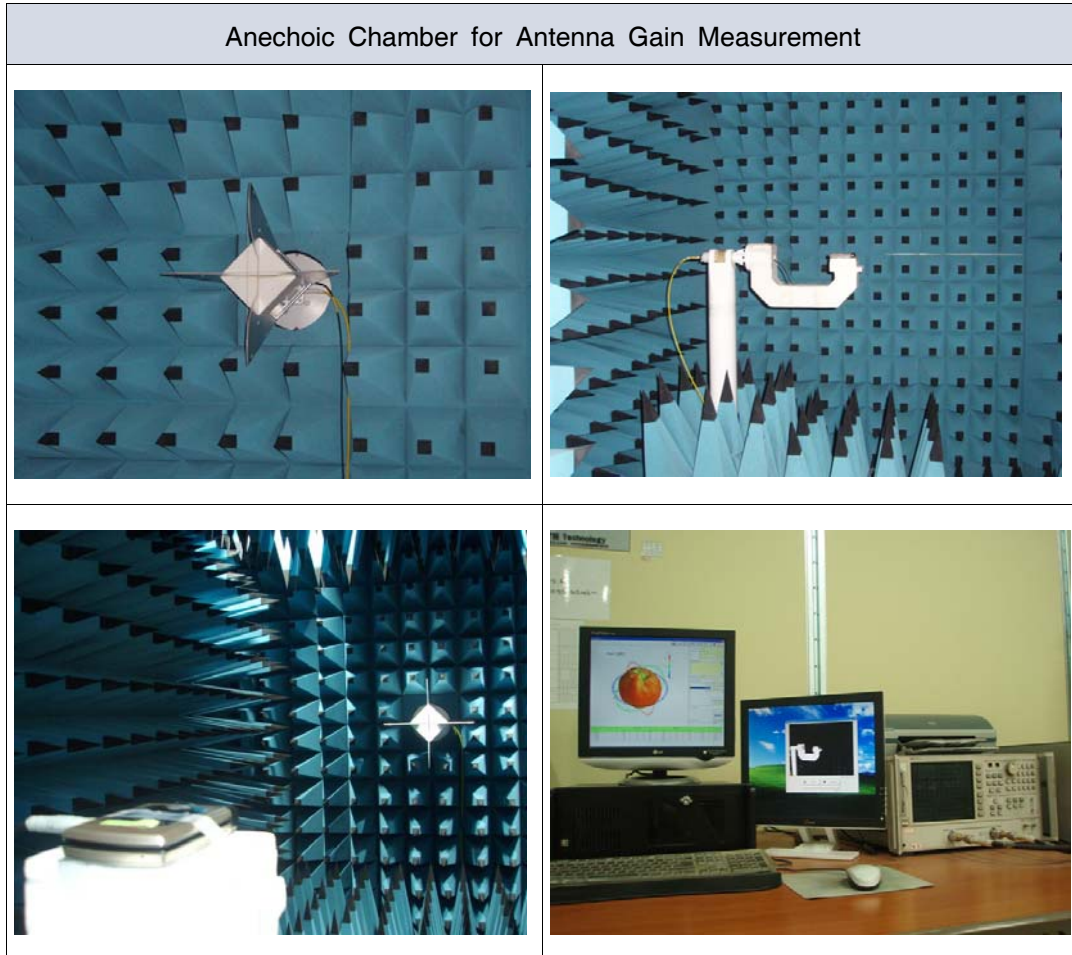
5.1 SWR / Return loss

The SWR / Return loss is measured by Network Analyzer. Using the test fixture, the Selected reference sample is a standard product.

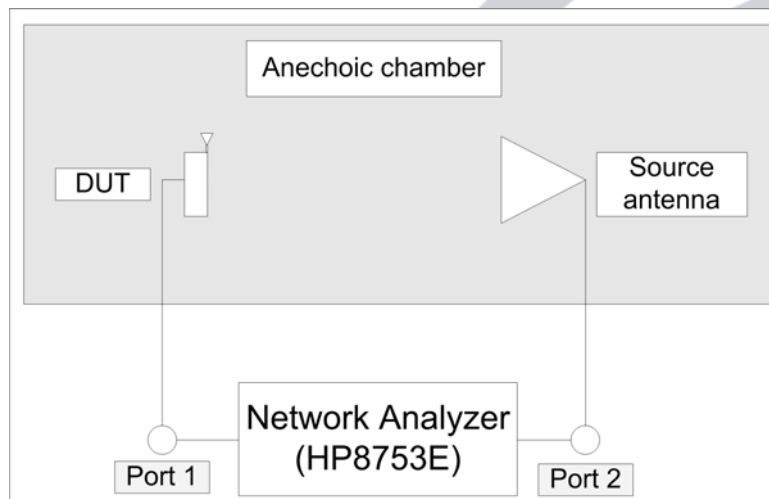
	Set Condition	Test Fixture Condition
Network Analyzer	Agilent HP8753E or Advantest R3765CH	Agilent HP8753E or Advantest R3765CH
Cable	RF cable (300 mm)	RF cable (300 mm)
Test condition		

5.2 Gain

The Antenna Gain is measured by using the Passive DUT at Anechoic Chamber.



5.3 Gain Measurement block diagram



6. Primary Inspection List 

Item	Frequency [MHz]		Dimension [mm]		
	SWR 2.5 Max		L=12.5±0.1	W=12.8±0.1	T=0.20±0.05
	1840	1920			
1	1.48	1.45	12.50	12.78	0.20
2	1.56	1.43	12.51	12.79	0.20
3	1.41	1.54	12.50	12.79	0.20
4	1.43	1.52	12.50	12.80	0.21
5	1.57	1.40	12.49	12.80	0.20
6	1.52	1.40	12.50	12.78	0.20
7	1.60	1.36	12.49	12.78	0.21
8	1.63	1.30	12.51	12.79	0.21
9	1.58	1.36	12.49	12.80	0.20
10	1.49	1.44	12.48	12.80	0.20
11	1.61	1.33	12.51	12.79	0.20
12	1.51	1.40	12.50	12.80	0.20
13	1.42	1.50	12.50	12.80	0.20
14	1.54	1.36	12.50	12.80	0.20
15	1.44	1.50	12.49	12.79	0.20
16	1.52	1.39	12.51	12.79	0.20
17	1.56	1.42	12.50	12.78	0.21
18	1.47	1.49	12.51	12.80	0.21
19	1.57	1.41	12.49	12.80	0.21
20	1.58	1.39	12.49	12.80	0.20
X	1.52	1.41	12.49	12.79	0.20
σ	0.06	0.06	0.01	0.01	0.004
Cpk	2.60	2.13	3.70	3.82	3.29
Result	OK	OK	OK	OK	OK

7. Reliability Condition

7.1 Environment Test

ITEM	TEST CONDITION	LIMIT
PCT	+121±5 °C, RH=100%, 96 hr	* After the test, specimen would be kept at 25±5 °C for 1 hours * specimen sheet meets the electrical specification
High Temperature Resistance	Leaving that for 120±2 hr at +85±3 °C	
Low Temperature Operation	After leaving that for 1 hr at -40±3 °C Measure that at test temperature	
Low Temperature Resistance	Leaving that for 120±2 hr at -40±3 °C	
Humidity Operation	After leaving that for 1 hr at -40±3 °C, RH 85% Measure that at test temperature	
Humidity Resistance	Leaving that for 120±2 hr at -40±3 °C, RH 85%	

7.2 Thermal shock test, Reflow test

ITEM	TEST CONDITION	LIMIT
Thermal Shock	-40±3 °C/min ↔ +85±3 °C/min cycle : 32 cycle recovery time : within 5 min	* Same as 4.4
Reflow	Pre Heating : 200±5 °C, 30~60 sec Peak Heating : 260±5 °C, 30 sec Max	

7.3 Mechanical Test

ITEM	TEST CONDITION	LIMIT
Vibration	Freq : 10~500 Hz , Acceleration : 10 ×9.8 m/s ² (G) Sweep time : 15 min, X.Y.Z each 5 times	* After the test, specimen sheet meets the electrical specification
Drop	18 times free fall Using the drop jig 152 cm high Jig : 120±20 g Plastic Jig Bottom : Concrete or Iron	

7.4 MSL LEVEL Test

1) JEDEC J-STD-020C Test

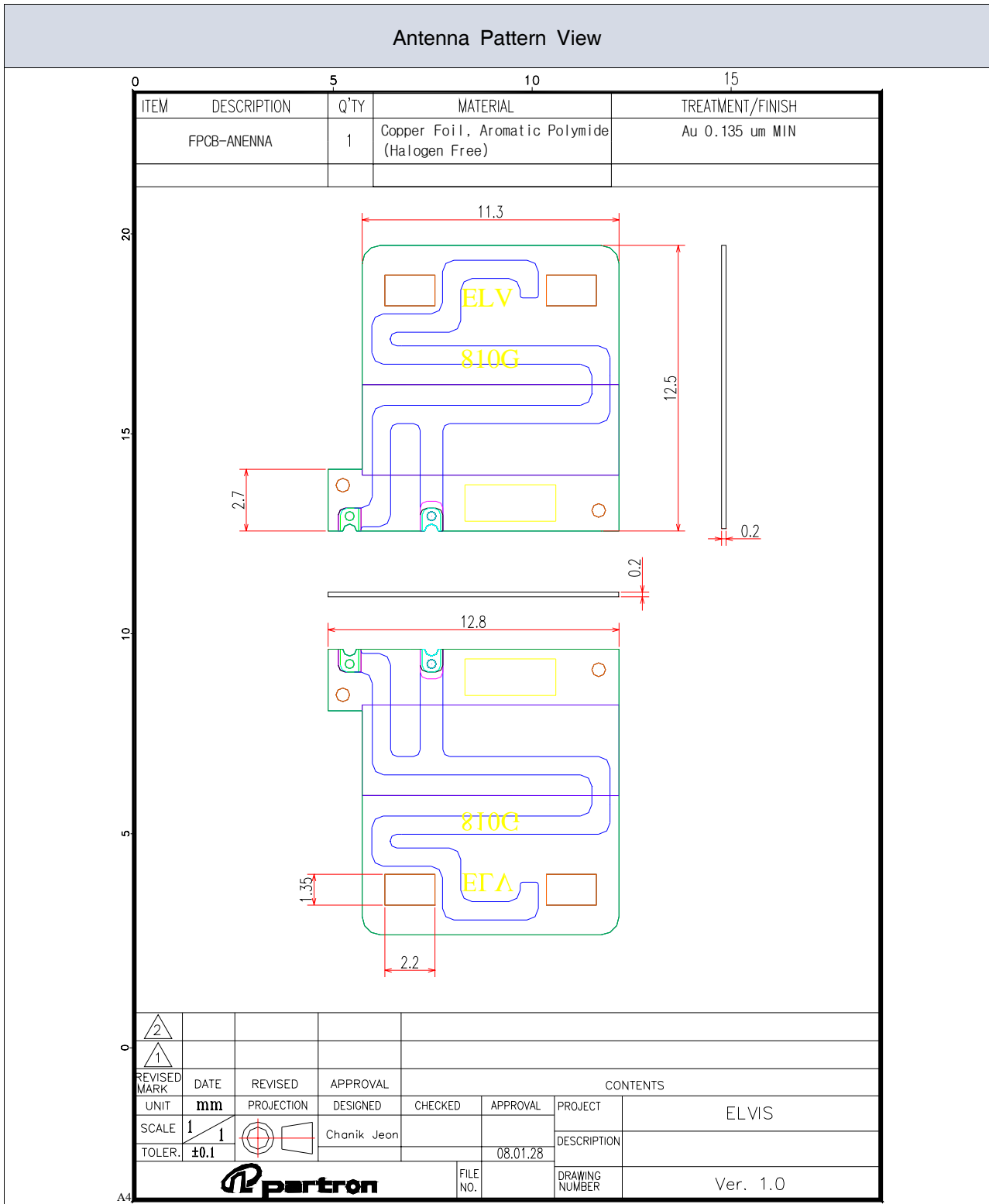
	Floor Life		Soak Requirement	
	Time	Condition	Time	Condition
1	Unlimited	= < 30°C / RH 85%	168+5/-0	= < 85°C / RH 85%

2) Test Condition

ITEM	Conditon	LIMIT
Soak Requirements	After leaving that for 168±2 hr at +85±3 °C, RH 85%, without Aging, Reflow 3 times	* After the test, specimen sheet meets the electrical specification

8. Mechanical Characteristics

8.1 Antenna Pattern Drawing

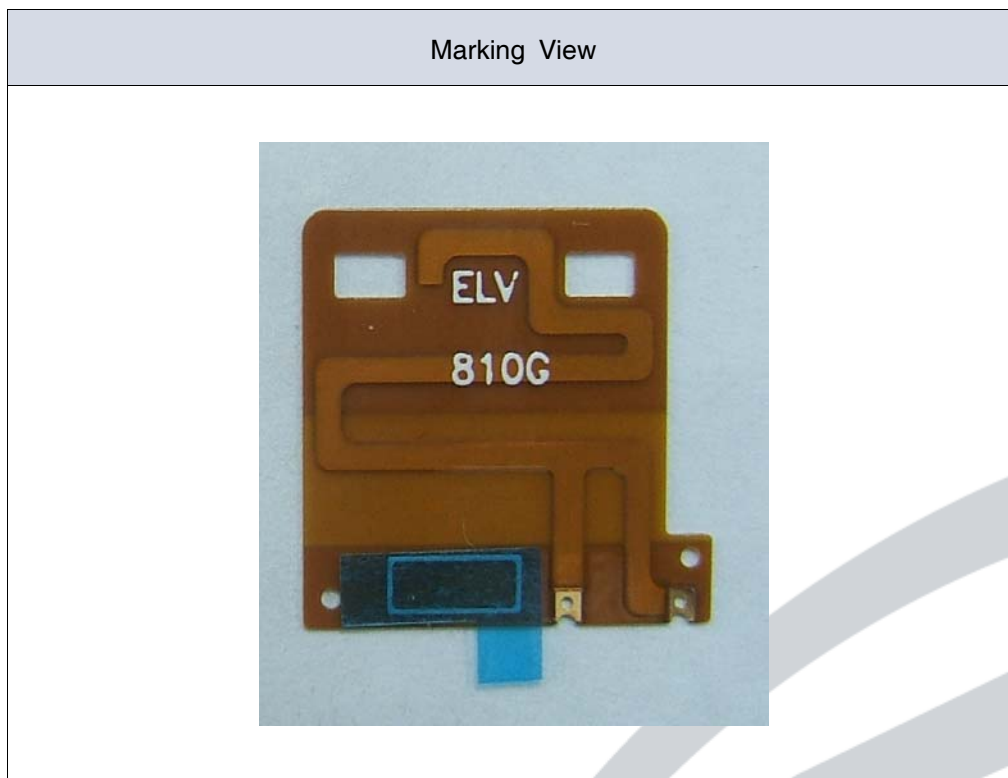


8.2 Lot Notation

8	10	G
①	②	③

- ① Year : 1 - 2001, 2 - 2002, …… 8 - 2008 ……
- ② Week : 1 - First week, 2 - Second …… 9 - Ninth, 10 - Tenth, ……
- ③ Green : Halogen Free

8.3 Marking Specification



E	L	V	8	10	G
①	②	③	④		

- ① Serial
- ② Year : 1 - 2001, 2 - 2002, …… 8 - 2008 ……
- ③ Week : 1 - First week, 2 - Second …… 9 - Ninth, 10 - Tenth, ……
- ③ Green : Halogen Free

9. Attention

9.1 Temperature Condition

	Range	Unit
Operating Temperature	-40 ~ +100℃	℃
Keeping Temperature	-40 ~ +70℃	℃

9.2 Temperature Test Condition

Item	Condition	Temperature Range
Operating Temperature	Low	at -75 ℃, for 24 hr, Good Operating
	High	at +150 ℃, for 24 hr, Good Operating
Keeping Temperature	Low	at -75 ℃, after 1000 hr, Good Operating
	High	at +85 ℃, after 1000 hr, Good Operating

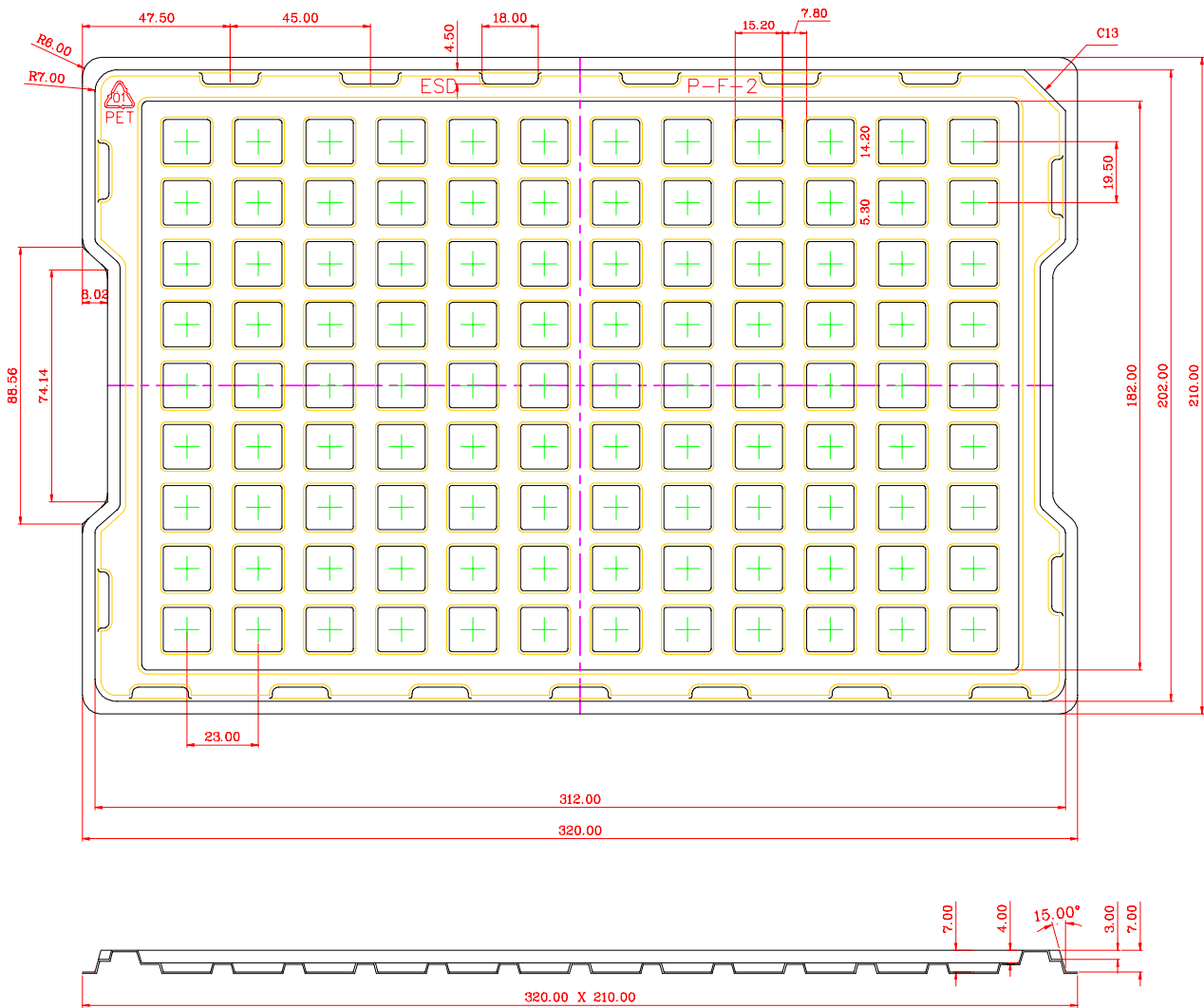
* In case of "High Temperature Resistance", because the packing material is broken at higher temperature than +85 ℃, the test is not able.



10. Packing

10.1 Carrier/Reel

ITEM	Material	Surface Resistance	Electricity	method
Tray	A-PET	Typical $10^8\Omega$	10V MAX	Heat press



11. Process control

Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
BT ANTENNA	Issued	07.02.13		PRCP-C001			
	Revised	00.00.00					

Input Materials	FLOW CHART	Process name	Management of Factors					Management of quality					
			Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Method of Inspection	Margin	Cycle of management	Record	Action
FPCB	◇	import inspection	Network	proofreading Condition		Per LOT 1/day	C/sheet	aspect dimension Electrical Characteristic	Network microscope Visual Inspection	refer to Guide Sheet	Per LOT 1/day	Result Paper	return
A'SSY	◇	Characteristic inspection	Network (CTQ)	proofreading Condition	refer to Guide Sheet	Per LOT 1/day	C/sheet	VSWR (CTQ)	Network	refer to Guide Sheet	all	LOT CARD	exhaust
A'SSY	◇	aspect inspection						aspect	visual inspection	refer to Guide Sheet	all	LOT CARD	exhaust
Tray A'ssy 포장재	○	packing						quantity packing Mixing	visual inspection	refer to Guide Sheet	all	LOT CARD	rework
A'SSY	◇	shipper inspection	Network	proofreading Condition	refer to Guide Sheet	Per LOT 1/day	-	Electrical Characteristic aspect packing	Network microscope Visual Inspection	refer to Guide Sheet	Per LOT 1/day	Result Paper	rework

12. RoHS Data

1) FPCB FCCL

TEST REPORT

Applicant : HANWHA L&C Corporation
 Address : 229, Kumho-Ri, Buyong-Myun, Cheongwon-Kun, Chungbuk, Korea

Page: 1 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-006
 Sample ID No. : RT07R-1149-006
 Sample Description : The following submitted sample(s) said to be:-

Name/Type of Product : HANWHAFLEX HGL series
 Name of Material : PI film + Epoxy type Adhesive + Copper foil
 Sample ID No. : RT07R-1149-006
 Manufacturer/Vender : HANWHA L&C Corporation

Sample received : Aug. 29, 2007
 Testing Date : Aug. 29, 2007 ~ Sep. 03, 2007
 Testing Laboratory : Intertek Testing Center
 Testing Environment : Temperature : (22 ~ 26) °C Relative Humidity: (55 ~ 65) %

Test Method(s) : Please see the following page(s).
 Test Result(s) : Please see the following page(s).

* Note 1: The test results presented in this report relate only to the object tested.
 * Note 2: This report shall not be reproduced except in full without the written approval of the testing laboratory.

Tested by:

E.Y. Lee / Chemist

Authorized by:

H.W. Yoo / Lab Manager

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 Seoul Lab : #909, 7F, Ase Techno Tower N, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-764 Korea Tel : 02-2109-1260 Fax : 02-2109-1258
 Ulsan Lab : #340-2, Yungam-Ri, Chongryang-Myun, Ulsu-Gu, Ulsan 689-865 Korea Tel : 052-257-6254 Fax : 052-276-6792

TEST REPORT

Page: 2 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-006
 Sample ID No. : RT07R-1149-006
 Sample Description : HANWHAFLEX HGL series

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	0.5	N.D.
Lead (Pb)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	5	N.D.
Mercury (Hg)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Hexavalent Chromium (Cr ⁶⁺)	mg/kg	US EPA 3060A and determined by UV-visible	1	N.D.
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by GC/MS Analysis	5	N.D.
Dibromobiphenyl	mg/kg		5	N.D.
Tri bromobiphenyl	mg/kg		5	N.D.
Tetrabromobiphenyl	mg/kg		5	N.D.
Pentabromobiphenyl	mg/kg		5	N.D.
Hexabromobiphenyl	mg/kg		5	N.D.
Heptabromobiphenyl	mg/kg		5	N.D.
Octabromobiphenyl	mg/kg		5	N.D.
Nonabromobiphenyl	mg/kg		5	N.D.
Decabromobiphenyl	mg/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by GC/MS Analysis	5	N.D.
Dibromodiphenyl ether	mg/kg		5	N.D.
Tri bromodiphenyl ether	mg/kg		5	N.D.
Tetrabromodiphenyl ether	mg/kg		5	N.D.
Pentabromodiphenyl ether	mg/kg		5	N.D.
Hexabromodiphenyl ether	mg/kg		5	N.D.
Heptabromodiphenyl ether	mg/kg		5	N.D.
Octabromodiphenyl ether	mg/kg		5	N.D.
Nonabromodiphenyl ether	mg/kg		5	N.D.
Decabromodiphenyl ether	mg/kg		5	N.D.

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 Ulsan Lab : #340-2, Yungam-Ri, Chongryang-Myun, Ulsu-Gu, Ulsan 689-865 Korea Tel : 052-257-6254 Fax : 052-276-6792

TEST REPORT

Page: 3 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-006
 Sample ID No. : RT07R-1149-006
 Sample Description : HANWHAFLEX HGL series

Test Items	Unit	Test Method	MDL	Results
Bromine (Br)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D.
Chlorine (Cl)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D.
Antimony (Sb)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.

Notes : mg/kg = ppm = parts per million
 <= Less than
 N.D = Not detected (<MDL)
 MDL = Method detection limit

* View of sample as received:

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TEST REPORT

Page: 4 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-006
 Sample ID No. : RT07R-1149-006
 Sample Description : HANWHAFLEX HGL series

Flow Chart Of Digestion (EPA 3052 For Cd, Pb)

```

    graph TD
      A[Receipt] --> B[Sample Preparation]
      B --> C[Sample Measurement]
      C --> D[Microwave Digestion with HNO3 / HF]
      D --> E{Total Digestion}
      E -- NO --> C
      E -- YES --> F[Analyzed by ICP-OES]
      F --> G[/Data/]
      G --> H[Report]
  
```

** Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart.

Prepared by : **Eung Yang Lee, Chemist**
 Confirmed by : **Sang Chol Park, Senior Researcher**

**** End of Report ****

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 Ulsan Lab : #340-2, Yungam-Ri, Chongryang-Myun, Ulsu-Gu, Ulsan 689-865 Korea Tel : 052-257-6254 Fax : 052-276-6792

2) FPCB Ink

Test Report No. F690501/LF-CTSAYA07-19445 Issued Date: September 04, 2007 Page 1 of 3

To: SEUL CHEMICAL RESEARCH LABORATORY CO., LTD
1099-7
Jungwong-dong
Shiheung-city
GYEONGSI-DO
Korea

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

Product Name : SPM-700-2W
SGS File No. : AYA07-19445
Received Date : August 29, 2007
Test Performing Date : August 30, 2007
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
Monet Jeong
Billy Oh / Testing Person

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F002 Version2

Test Report No. F690501/LF-CTSAYA07-19445 Issued Date: September 04, 2007 Page 2 of 3

Sample No. : AYA07-19445.001
Sample Description : SPM-700-2W
Item No./Part 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 (mg)	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-PRBx/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) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

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F002 Version2

Test Report No. F690501/LF-CTSAYA07-19445 Issued Date: September 04, 2007 Page 3 of 3

Sample No. : AYA07-19445.001
Sample Description : SPM-700-2W
Item No./Part No. : N/A

Halogen Contents

Test Items	Unit	Test Method	MDL	Results
Bromine(Br)	mg/kg	prEN14582 Method A , IC	50	N.D.
Chlorine(Cl)	mg/kg	prEN14582 Method A , IC	50	312

Picture of Sample as Received:

Sample Color : White

*** End ***

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

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F002 Version2



3) FPCB Coverlay

TEST REPORT

Applicant : HANWHA L&C Corporation
 Address : 229, Kumho-Rl, Buyong-Myun, Cheongwon-Kun, Chungbuk, Korea

Page: 1 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-001

Sample Description : The following submitted sample(s) said to be-

Name/Type of Product : HANWHALEX HGC series
 Name of Material : PI film + Epoxy type adhesive
 Sample ID No. : RT07R-1149-001
 Manufacturer/Vender : HANWHA L&C Corporation

Sample received : Aug. 29, 2007
 Testing Date : Aug. 29, 2007 ~ Sep. 03, 2007
 Testing Laboratory : Intertek Testing Center
 Testing Environment : Temperature : (22 ~ 26) °C Relative Humidity : (55 ~ 65) %

Test Method(s) : Please see the following page(s).
 Test Result(s) : Please see the following page(s).

* Note 1 : The test results presented in this report relate only to the object tested.
 * Note 2 : This report shall not be reproduced except in full without the written approval of the testing laboratory.

Tested by, Authorized by,

E.Y. Lee / Chemist H.W. Yoo / Lab Manager

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Intertek Testing Center

Seoul Office : Tel : 02-2109-1250 Fax : 02-2109-1259 Gumi Office : Tel : 054-462-7647 Fax : 054-462-7657 Web Site : www.intertek.co.kr
 Seoul Lab. : #900, 7F, Ase Techno Tower V, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-766 Korea Tel : 02-2109-1260 Fax : 02-2109-1258
 Ulsan Lab. : #340-2, Yongam-Rl, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6254 Fax : 052-276-6292

TEST REPORT

Page: 2 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-001
 Sample ID No. : RT07R-1149-001
 Sample Description : HANWHALEX HGC series

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	0.5	N.D
Lead (Pb)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	5	N.D
Mercury (Hg)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D
Hexavalent Chromium (Cr ^{VI})	mg/kg	US EPA 3060A and determined by UV-visible	1	N.D
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by GC/MS Analysis	5	N.D
Dibromobiphenyl	mg/kg		5	N.D
Tri bromobiphenyl	mg/kg		5	N.D
Tetrabromobiphenyl	mg/kg		5	N.D
Pentabromobiphenyl	mg/kg		5	N.D
Hexabromobiphenyl	mg/kg		5	N.D
Heptabromobiphenyl	mg/kg		5	N.D
Octabromobiphenyl	mg/kg		5	N.D
Nonabromobiphenyl	mg/kg		5	N.D
Decabromobiphenyl	mg/kg		5	N.D
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by GC/MS Analysis	5	N.D
Dibromodiphenyl ether	mg/kg		5	N.D
Tri bromodiphenyl ether	mg/kg		5	N.D
Tetrabromodiphenyl ether	mg/kg		5	N.D
Pentabromodiphenyl ether	mg/kg		5	N.D
Hexabromodiphenyl ether	mg/kg		5	N.D
Heptabromodiphenyl ether	mg/kg		5	N.D
Octabromodiphenyl ether	mg/kg		5	N.D
Nonabromodiphenyl ether	mg/kg		5	N.D
Decabromodiphenyl ether	mg/kg		5	N.D

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 Ulsan Lab. : #340-2, Yongam-Rl, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6254 Fax : 052-276-6292

TEST REPORT

Report No. RT07R-1149-001
 Sample ID No. : RT07R-1149-001
 Sample Description : HANWHALEX HGC series

Page: 3 of 4
Date: Sep. 03, 2007

Test Items	Unit	Test Method	MDL	Results
Bromine (Br)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	N.D
Chlorine (Cl)	mg/kg	With reference to EN 14582, by oxygen combustion with bomb and determined by IC	30	299
Antimony (Sb)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D

Notes : mg/kg = ppm = parts per million
 <= Less than
 N.D = Not detected (<MDL)
 MDL = Method detection limit

* View of sample as received -

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TEST REPORT

Page: 4 of 4
Date: Sep. 03, 2007

Report No. RT07R-1149-001
 Sample ID No. : RT07R-1149-001
 Sample Description : HANWHALEX HGC series

Flow Chart Of Digestion (EPA 3052 For Cd, Pb)

*** Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart

Prepared by : Eung Yong Lee, Chemist
 Confirmed by : Sang Chul Park, Senior Researcher

***** End of Report *****

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 Ulsan Lab. : #340-2, Yongam-Rl, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6254 Fax : 052-276-6292

4) FPCB Glit

Test Report No. F690501LF-CTSA07-16653 **Issued Date:** July 27, 2007 **Page 1 of 3**

To: INTECH ELECTRONIC CO., LTD.
63G-1
Sunggok-dong
Ansan-city
GYEONGGI-DO
Korea

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

Product Name : Gold(Au)

SGS File No. : AYAD7-16653

Received Date : July 20, 2007

Test Performing Date : July 23, 2007

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)

Buyer(s) : SAMSUNG

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

Plato Kim
Monet Jeong
Billy Oh / Testing Person

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PGS2 Version2

Test Report No. F690501LF-CTSA07-16653 **Issued Date:** July 27, 2007 **Page 2 of 3**

Sample No. : AYAD7-16653.001

Sample Description : Gold(Au)

Item No./Part No. : Au

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 7195A(1992), LV	1	N.D.

Flame Retardants-PBBA/PDDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromobiphenyl	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) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

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PGS2 Version2

Test Report No. F690501LF-CTSA07-16653 **Issued Date:** July 27, 2007 **Page 3 of 3**

Sample No. : AYAD7-16653.001

Sample Description : Gold(Au)

Item No./Part No. : Au

Halogen Contents

Test Items	Unit	Test Method	MDL	Results
Bromine(Br)	mg/kg	prEN14582 Method A, IC	50	N.D.
Chlorine(Cl)	mg/kg	prEN14582 Method A, IC	50	N.D.

Picture of Sample as Received:
Sample Color : White

*** End ***

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

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PGS2 Version2

13. Raw Material Features, Manufacturing Certification (FPCB)

1. Material : Polyimide
2. Type of Circuit : Double Side
3. Structure of Layer

	L1	L2	L3	L4
COPPER THICKNESS	1mil	1/2oz		
DIELECTRIC THICKNESS	25um			
NAME of LAYER	Component Side	Solder Side		

4. Finished

(1) Through Hole : Cu plating Fusing Solder
 HASL Ni
 Ni/Au(All, Selective) NONE

(2) Solder Resistance: Solder Side Comp.Side NONE
 Film [Polyimide Polyester LCP]
 INK [UV IR PSR]

Color:

(3) MARKING : Solder Side Comp.Side NONE
 INK [UV IR PSR]

Color: WHITE



(4) Surface Treatment

- ① Plating : Ni/Au
- ② Thickness : [Ni: 2~5um Au:min. 0.03um]
- ③ Instrument : CMI-900
- ④ Plating Company : SurfaceTech
82-31-493-4102
447-5 Moknae-Dong Danwon-Gu Ansan-Si
Kyunggi-DO

(5) Finished by

- Stamping Thomson

5. The Others



14. Certification of Raw Material (FPCB)

1. Manufacturer : 쉐이노플렉스

2. Model : ELVIS

3. NAME : F-PCB

4. Structure of Materials

No.	Structure	Material	Thickness	Model [Mfg.]
1	Base (CCL)	Copper Foil	18 um	MDH-1H-12NE [INNOX]
		Adhesive	12 um	
		Polyimide	25 um	
		Adhesive	12 um	
		Copper Foil	18 um	
2	Solder Resistance	Polyimide	25 um	MAH-1X-30NX [INNOX]
		Adhesive	30um	



INNOX

RoHS

TEL : 82-31-671-0290

FAX : 82-31-671-0225

Certificate of Analysis

Grade : MDH-OH-12NE

Lot No :

Item	Unit	Specification	Test Results	Test Method
Appearance	-	Pass	Pass	INNOX Method
Thickness Total	μm	77±5	77	1/1000 Gauge
Curl	mm	0±5	1	INNOX Method
Dimensional Change MD	%	0±0.15	0.02	IPC-FC-241B
Dimensional Change TD	%	0±0.15	-0.04	IPC-FC-241B
Surface Resistivity	Ωcm	1.0*10 ¹³ min.	1.0*10 ¹³	JIS C 6481
Volume Resistivity	Ωcm	1.0*10 ¹⁵ min.	1.0*10 ¹⁵	JIS C 6471
Dielectric Constant(100KHz)	-	4.0 max.	3.5	IPC TM-650 2.5.5.3
Peel Strength Normal	gf/cm	700min.	1,200	JPCA-BM-02
Peel Strength After Sloder	gf/cm	700min.	1,200	JPCA-BM-02
Solder Resistance	-	300°C/10sec	Pass	JIS C 6471
Flammability	-	94 Vo	Pass	UL94
Chemical Resistance	-	No Change	Pass	JPCA-BM-02
Storage Condition Temp	Temp	25±3°C	-	-
Storage Condition Humidity	Humidith	60%↓	-	-
Storage Condition Shelf Life	Shelf Life	12 month	-	-

INNOFLEX®

Made in Korea

QUALITY ASSURANCE TEAM

Draft	Approval
	

User Approval	



INNOX

RoHS

TEL : 82-31-671-0290

FAX : 82-31-671-0225

Certificate of Analysis

Grade : MAH-OX-25NX

Lot No :

Item	Unit	Specification	Test Results	Test Method
Appearance	-	PASS	PASS	INNOX Method
Width	mm	Width±1	Pass	1/1000 Gauge
Thickness Total	μm	39±5	39	1/1000 Gauge
Shrinkage	mm	0±0.5	0.01	INNOX Method
Curl	mm	0±15	5	INNOX Method
Resin Flow	μm	200max.	120	IPC TM-650 2.3.17
Peel Strength	gf/cm	700min.	1,200	JPCA-BM-02
Solder Resistance	-	300℃/10sec	Pass	JIS c 6471
Flammability	-	94 Vo	Pass	UL94
Storage Condition Temp	Temp	5℃	-	-
Storage Condition Humidity	Humidith	60%↓	-	-
Storage Condition Shelf Life	Shelf Life	6 month	-	-

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QUALITY ASSURANCE TEAM

Draft	Approval
	

User Approval	

15. Q.C Flow (FPCB)
Q C FLOW

CUSTOMER : PARTRON		DEPARTMENT : QUALITY MANAGEMENT TEAM								
TYPE : CL TYPE DOUBLE SIDE		PREPARATION : KIM MYOUNG HOAN								
MODEL : C-MIC		DATE : FEB 14 2008								
MATERIAL	SYMBOL OF PROCESSES	PROCESS	INSPECTION ITEMS & METHOD			CONTENTS OF MANAGEMENT		TERM OF MANAGEMENT	STANDARE OF MANAGEMENT	
			CONTENTS	STANDARD OF INSPECTION	METHOD OF INSPECTION	CONTROLLING CONTENTS	STANDADR OF MANAGEMENT			
MAIN/SUB MATERIAL	◇	WAREHOUSING						1 TIME/LOT		
		INSPECTION	1. THICKNESS 2. CONDITION OF SURFACE		1. MICROMETER 2. MAGNIFYING GLASS	1. MEASUREMENT 2. EXTERNAL	1. CERTIFICATION OF MATERIAL	1 TIME / LOT		
		CUTTING	1. SIZE: STANDARD OF EACH 2. COPPER, C/L ADESIVE	1. APPLICATE OF PROCESSING SHEET 2. INSPECTION OF SPEC		1. SIZE 2. EXTERNAL		1 TIME / LOT		
		PROCESSING OF SUB MATERIAL	1. SPEC OF CUTTING 2. CONDON OF TOOL 3. MIS-PRESS		1. YARD STICK 2. MAGNIFIER 3. MICROSCOPE			1 TIME / LOT		
DRY FILM	▽	PROCESSING OF CNC				1. HOLE SIZE(PH) 2. Hole BURR		APPLICATE OF AQL		
		INSPECTION OF WAREHOUSING	1. HOLE SIZE 2. Hole BURR	1. PIN GAGE 2. MICROSCOPE(X5)				1TIME/LOT APPLICATE OF AQL		
		COPPER PLATE	1. CHECK OF LOT DIVISION	1. CHECK OF PLATTING LIQUID				1TIME/LOT APPLICATE OF AQL		
		INSPECTION OF WAREHOUSING	1. PROTUBERANCE, SPOTS 2. THICKNESS, CONDITION OF SURFACE		1. MAGNIFIER 2. MICRO METER					
		Lamination	1. DENT 2. CUTTING, MIXING	1. DISALLOWANCE	1. INSPECTION OF ALL (MAGNIFIER)	1. TEMPREATURE 2. SPEED	1. 100 ± 5 °C 2. 1.5kg/cm ² , 1m/min			
		EXPOSURE	1. CHECK OF THE SURFACE ON FILM		1. CHECK (MAGNIFIER)	1. FILM SCRATCH	1. 7~8/216STEP 25 ± 4m/cm ²			
		NaCo3	DEVELOPPING	1. MIS-DEVELOPPING 2. OVER ETCHING	1. DISALLOWANCE 2. DISALLOWANCE	1. INSPECTION OF ALL (MAGNIFYING GLASS)	1. TEMPERATURE 2. SPEED 3. PRESSURE	1. 30±3°C 2. 2.7±0.3m/min 3. 1.5±0.5kg/cm ²		
		Fecl3	ETCHING	1. OVER/LACK ETCHING 2. PITCH WIDE	1. DISALLOWANCE (ALLOWANCE OF SPEC IN)	1. CHECK (MAGNIFYING GLASS)	1. TEMPERATURE 2. SPEED 3. PRESSURE	1. 50±3°C 2. 2.7±0.3m/min 3. 2.0±0.5kg/cm ²		
		NaOH	STRIPPING	1. CONDIGION OF SURFACE 2. SPOTS, DUST	1. DISALLOWANCE 2. DISALLOWANCE	1. CHECK (MAGNIFYING GLASS)	1. TEMPERATURE 2. SPEED 3. PRESSURE	1. 50±3°C 2. 2.7±0.3m/min 3. 2.5±0.5kg/cm ²		
			CLEANNING OF SURFACE	1. CONDIGION OF OXIDIZATION	1. DISALLOWANCE	1. INSPECTION OF MAGNIFYING GLASS	1. SCRATCH, DUST	1. STANDARD SHEET OF MANUFACTURING		
	ATTACHED OF C-LAY FILM	1. CONDIGION OF CLOSE ADHESION 2. CONDIGION OF DISPOSITION	1. DISALLOWANCE 2. DISALLOWANCE	1. CHECK (MAGNIFYING GLASS)	1. TEMPERATURE	1. STANDARD SHEET OF MANUFACTURING				
	HOT PRESS(1st)	1. CONDIGION OF CLOSE ADHESION 2. DISLAMINATION, CONDIGION OF RESIN	1. DISALLOWANCE 2. DISALLOWANCE	1. CHECK (MAGNIFYING GLASS)	1. TEMPERATURE 2. SPEED 3. PRESSURE	1. 140 DRGREE 2. 50~60 MIN 3. 40kg				
	ATTACHED OF REINFORCEMENT (STIFFER)	1. CONDIGION OF CLOSE ADHESION 2. CONDIGION OF DISPOSITION	1. DISALLOWANCE 2. DISALLOWANCE	1. CHECK (MAGNIFYING GLASS)						
	HOT PRESS(2nd)	1. CONDIGION OF CLOSE ADHESION 2. CONDIGION UP-HIGHENMENT	1. DISALLOWANCE 2. DISALLOWANCE	CHECK (MAGNIFYING GLASS)	1. TEMPERATURE 2. SPEED 3. PRESSURE	1. 140 DEGREE 2. 50~60MIN 3. 20kg				
	PLATE (Au/Ni Plating)	1. CONDIGION OF SURFACE 2. THICKNESS	1. DISALLOWANCE 2. Sn/Pb(5~20μ) 3. Au(0.08~0.12)Ni(2~3)	1. MICROMETER 2. MAGNIFYING GLASS						
	INSPECTION OF WAREHOUSING	1. THICKNESS OF PLATE 2. CONDIGION OF SURFACE	1. Au(0.08~0.12)Ni(2~3)	1. TESTING SHEET OF INSPECTION						
	B.B.T CHECK	1. open/short	1. DISALLOWANCE	1. INSPECTION OF ALL	1. Open/Short 2. CONDIGION OF CIRCUIT					
	MEDTERM INSPECTION	1. INSPECTION OF EXTERNAL 2. INSPECTION OF MEASURE 3. INSPECTION OF OPEN&SHORT			1. SPEC IN/OUT CHECK	1. STANDARD SHEET OF INSPECTION				
	EXTERNAL SHAPE	1. DISPOSITION 2. MIS-PRESS	1. CHECK OF DISPOSITION 2. MIS-PRESS	1. MAGNIFYING GLASS		1. STADNARD OF INSPECTION				
	FINAL INSPECTION	1. INSPECTION OF EXTERNAL 2. INSPECTION OF MEASURE(THICKNESS) 3. CONDIGION OF PLATE	1. BASIS OF SPEC 2. 0.27 - 0.02, +0.09 3. GLOSS, DUST, POLLUTION	1. GII AQL- 0.25 2. MICRO METER 3. MAGNIFYING GLASS	1. POLLUTION, DUST 2. OPEN, DENT ETC.	1. REFERENCE OF DRAWING 2. BASIS TESTING SHEET OF SHIPMENT				
	SHIPPING	1. QUANTITY 2. CONDIGION OF PACK		1. INSPECTION OF QUAN 2. PACK OF CASE	1. Label 2. Inner PACKING 3. Out Packing	1. BASIS SHEET OF PACK				

