
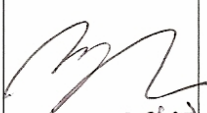




# APPROVAL SHEET

**Type : Multilayer Chip Antenna**  
**Part No. : ALA621C4**  
**Model No. :**

	Check	Consent	Approval



	Written	Checked		Approved
Amotech	 조영호	 이준호	 김희	 김희
	12/18	12/18	12/18	12/18

2006. 12. 18

**AMOTECH Co., Ltd.**

## 목 차

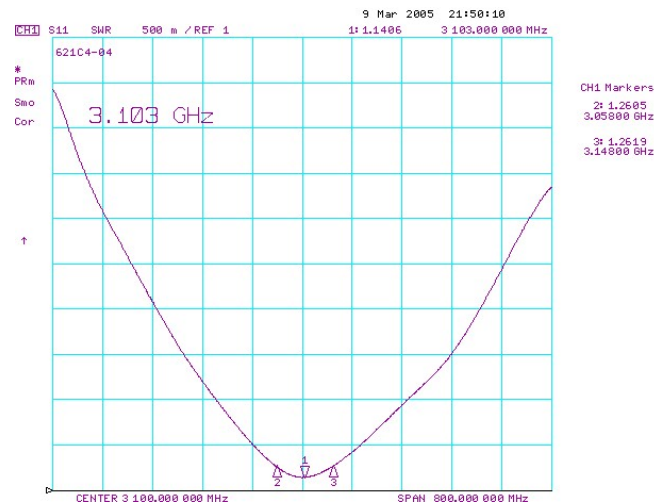
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## 2. 제품 규격

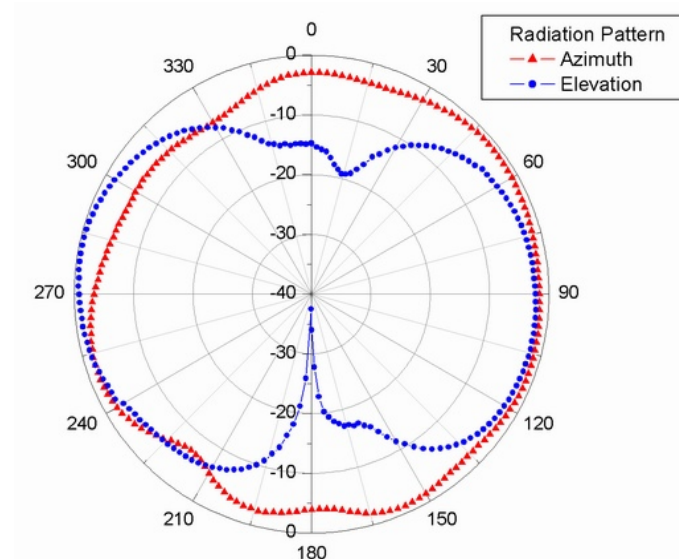
### 2.1 전기적 특성

구분	항목	규격		비고
1	동작 주파수	2.4 ~ 2.49 GHz		ISM band
2	정재파비	최대 2.5:1 @ 3103±45 MHz		수동 Jig 상에서 측정
3	방사이득	Avg.	-3.5 dBi	Reference board 상에서 ISM 대역으로 매칭 후 측정 (Azimuth)
		Peak	-1.0 dBi	
4	방사패턴	Omni-directional		
5	임피던스	공칭 50 Ω		

※ 상기 항목 중 출하 검사 시 2 번 항목만 측정하여 성적서 제출함.



[ VSWR : 수동 Jig 상에서의 측정 결과 ]

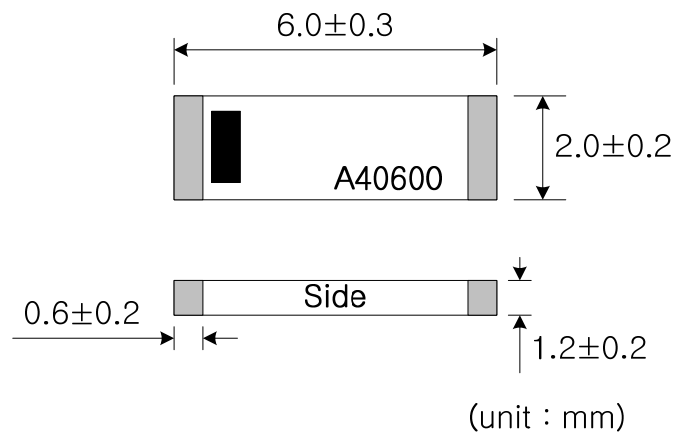


[ Radiation Pattern : Bluetooth 대역에 매칭 후 측정 ]

## 2.2 기계적 특성

구분	항목	규격		단위
1	크기	가로	$6.0 \pm 0.3$	mm
		세로	$2.0 \pm 0.2$	
		높이	$1.2 \pm 0.2$	
2	단위질량	$46 \pm 5$		mg
3	동작온도	$-30 \sim +70$		°C
4	저장온도	$-40 \sim +85$		°C

※ 출하 검사시 1 번 항목 측정하여 제출



## 2.3 Part No. 및 Lot No. 표기법

Part No.	<u>ALA</u> (1)	621 (2)	<u>C4</u> (3)
(1) : Amotech LTCC Antenna			
(2) : Chip size			
(3) : Version & 주파수규격			

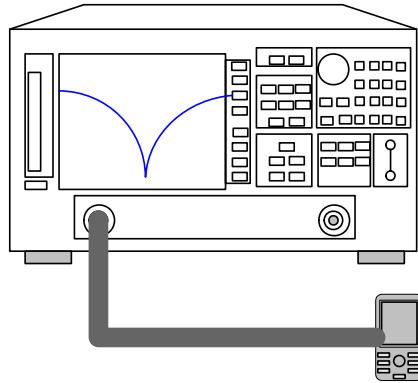
  

Lot No.	<u>MA</u> (1)	<u>06</u> (2)	<u>A4</u> (3)	<u>0506</u> (4)	<u>01</u> (5)
(1) : Mass-product Antenna					
(2) : Chip size					
(3) : Version & 주파수규격					
(4) : 제조년월					
(5) : 양산 일련번호					

### 3. 시험방법

#### 3.1 VSWR 측정법

사용 계측기 : Network Analyzer 8753ES

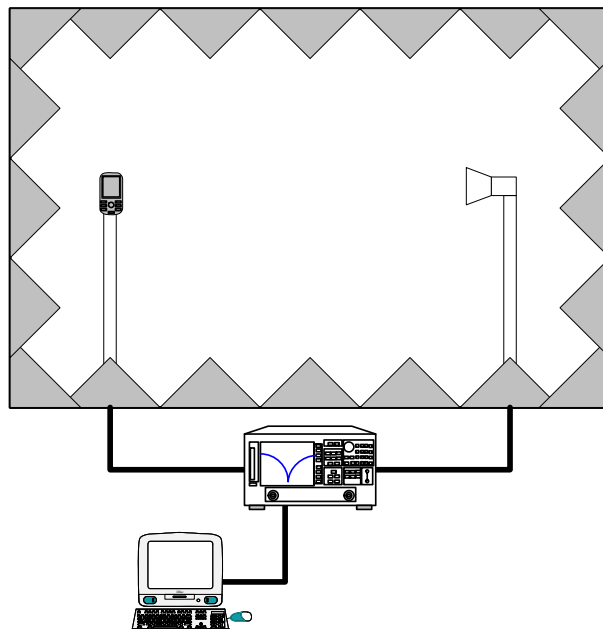


[시험절차]

- ㉠ 그림과 같이 계측기를 setup 한다.
- ㉡  $f_0 \pm 400$  MHz 대역에서 calibration 을 실시하여 50ohm 종단기를 달아 -55dB 이하임을 확인한다.
- ㉢ 측정 시료를 port cable 에 장착하여 규격주파수 대역에서 가장 높은 VSWR 을 기록 측정한다.

#### 3.2 방사이득 측정법

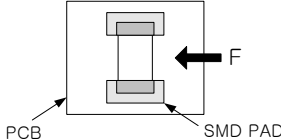
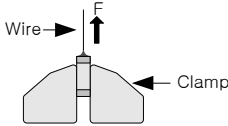
사용장비 및 계측기 : 무반향실 (8\*4\*4 size), Network Analyzer 8753ES



[시험절차]

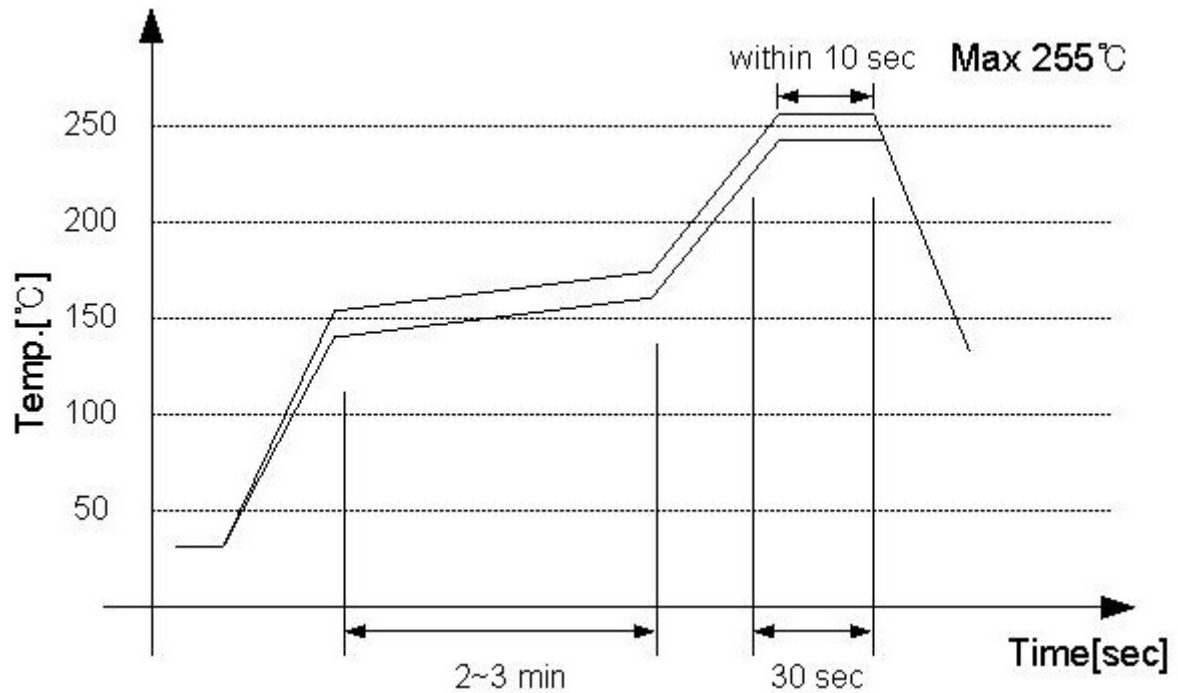
- ㉠ Reference 혼안테나를 사용하여 calibration 을 한다.
- ㉡ 사용주파수 대역을 설정하고 그림과 같이 시료를 장착하여 측정방위에 따라 측정한다.

#### 4. 신뢰성 시험조건

구분	항목	테스트 조건	요구 사항
1	고착 강도	1. SMT 되어 있는 시료가 PCB 에서 떨어질 때까지 힘 F 를 증가 	1. 옆으로 미는 힘 F 에 의한 기계적 손상 없음 2. 힘의 세기 $F > 5 \text{ kgf}$
2	인장 강도	1. Wire : 0.6~0.8mm Cu wire 	1. 잡아 당기는 힘 F 에 의한 기계적 손상 없음 2. 힘의 세기 $F > 3 \text{ kgf}$
3	열 충격	1. 1 cycle / 1 단계 : $-40 \pm 3^\circ\text{C}$ , 30 분 2 단계 : $+125 \pm 3^\circ\text{C}$ , 30 분 2. cycle 횟수 : 30 회 3. 상온에서 최소 48 시간 대기 후 측정	1. 외관 손상 없음 2. 전기적 특성(VSWR) 이상 없음
4	고온 저항력	1. 온도 : $+125 \pm 5^\circ\text{C}$ 2. 시간 : $1000 \pm 24$ 시간 3. 상온에서 최소 24 시간 대기 후 측정	1. 외관 손상 없음 2. 전기적 특성(VSWR) 이상 없음
5	저온 저항력	1. 온도 : $-40 \pm 5^\circ\text{C}$ 2. 시간 : $1000 \pm 24$ 시간 3. 상온에서 최소 48 시간 대기 후 측정	1. 외관손상 없음 2. 전기적 특성(VSWR) 이상 없음
6	고온 고습	1. 습도 : 85 % RH 1. 온도 : $+85 \pm 3^\circ\text{C}$ 2. 시간 : $1000 \pm 24$ 시간 3. 상온에서 최소 48 시간 대기 후 측정	1. 외관손상 없음 2. 전기적 특성(VSWR) 이상 없음

## 5. 납땜조건 (권고사항)

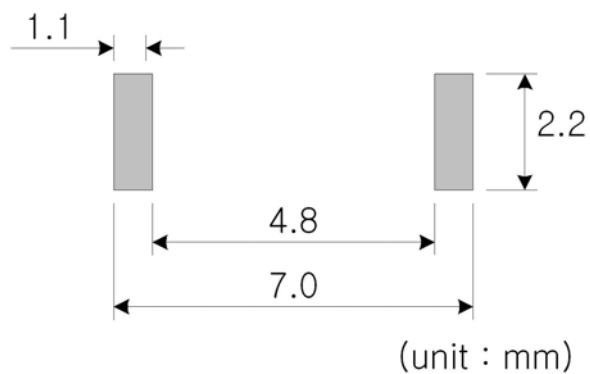
### 5.1 납땜온도조건 (Pb-free 조건)



안테나의 특성 저하를 막기 위해 다음과 같은 납땜 조건을 지켜야 한다.

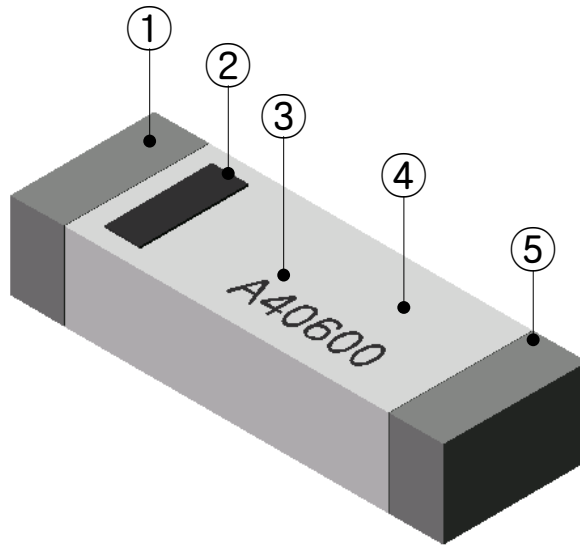
- Reflow soldering 조건으로 납땜을 진행하여야 하며, Flow soldering 을 하여서는 안 된다.
- 비활성 Flux 를 사용하여야 한다.(최대 CI 함량 0.2% 미만)
- Reflow cycle 횟수는 3 회 이내로 해야 한다.

### 5.2 PCB 패턴설계조건



## 6. 구조 및 재질

### 6.1 재료사양



구분	명칭	기능	재료
1	외부전극	납땀, 신호입력	Ag/Ni/Sn
2	방향 index	신호 입력단 표시	Ceramic
3	부품명 index	부품명, 주차 표시	Ceramic
4	세라믹 소체	-	Ceramic
5	외부전극	납땀	Ag/Ni/Sn

### 6.2 등가회로





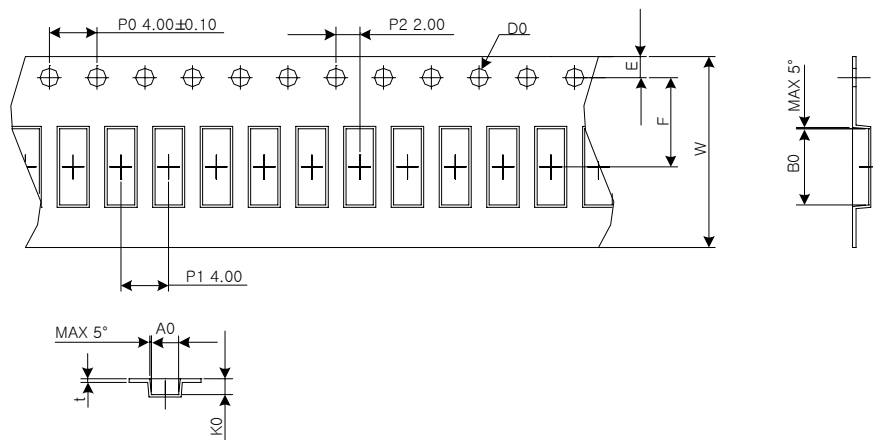
## 7. 주의사항

- ① 보관환경은 15~35℃, 상대습도 45~75 %의 대기에서 보관되어야 함. (MSL Level 2)
- ② 칩 안테나는 고온고습에서 방치되거나 또는 황이나 염소가스에 노출될 경우 전극의 납땜성 저하를 일으킬 수 있음.
- ③ 칩 안테나 자체 무게에 의한 세라믹 소재의 기계적 crack 을 막기 위해 충격, 낙하 등 을 피해야 함.

## 8. 포장 사양

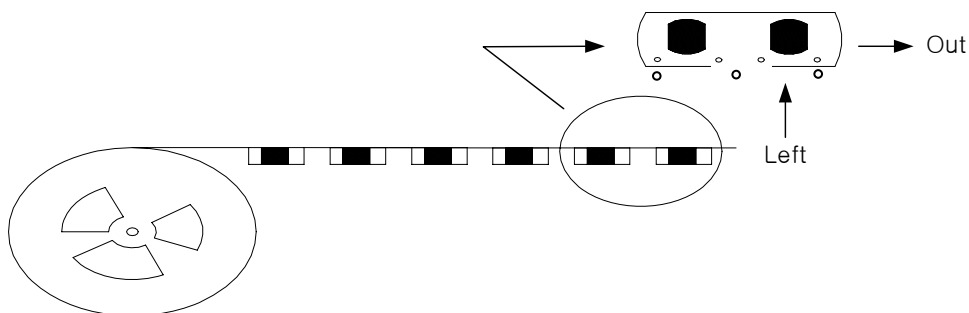
### 8.1 Carrier tape 사양

#### 8.1.1 크기



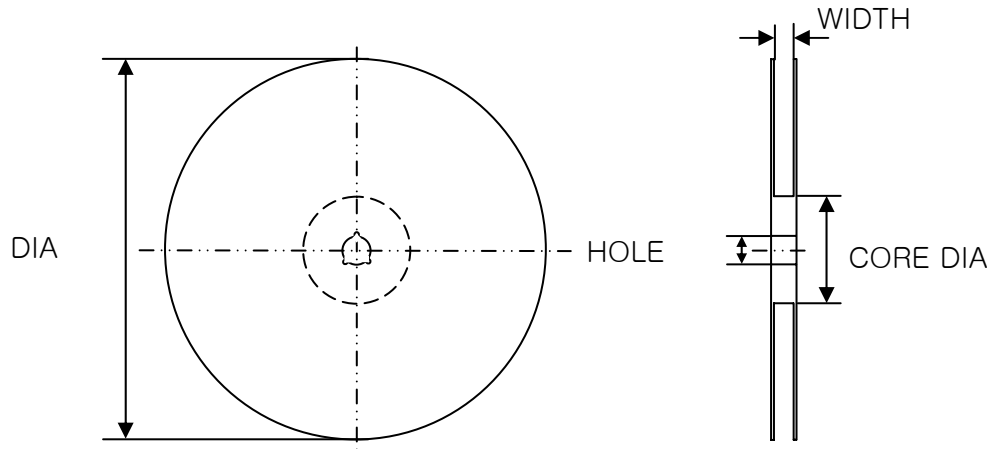
A0	2.30 ± 0.10	E	1.75 ± 0.10
B0	6.40 ± 0.10	F	7.50
K0	1.35 ± 0.10	t	0.30 ± 0.05
D0	1.55 ± 0.05	W	16.00 ± 0.30

#### 8.1.2 칩 위치



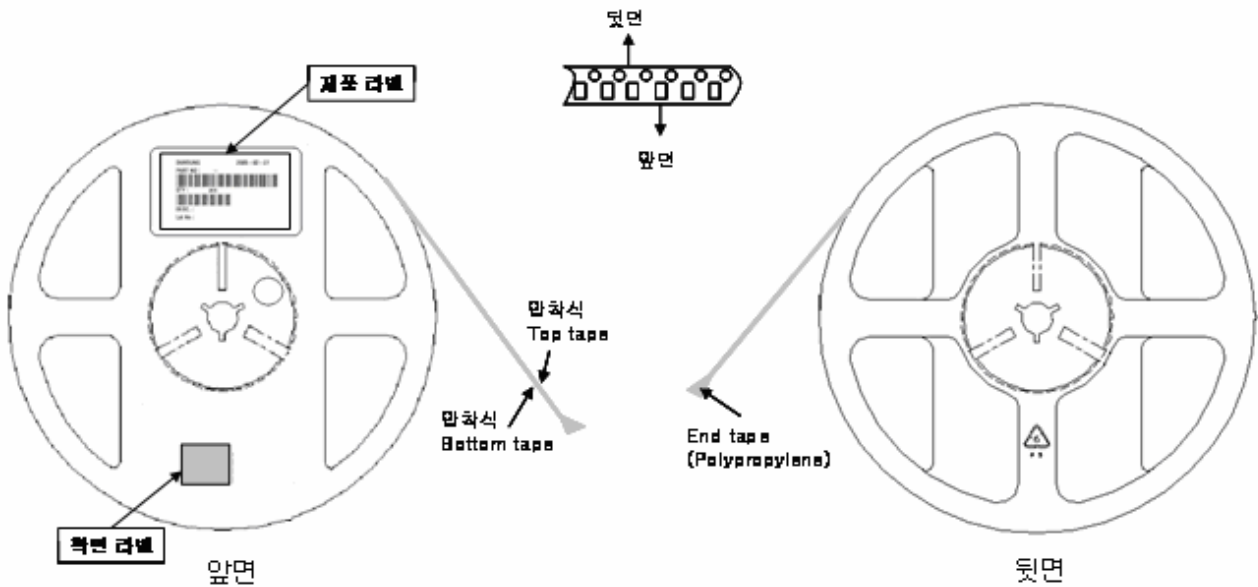
## 8.2 릴(Reel) 사양

### 8.2.1 크기



항목	DIA	WIDTH	CORE DIA	HOLE
치수(mm)	180.0 ± 0.3	17.0 ± 0.3	60.0 ± 1	13.0 ± 0.5

### 8.2.2 라벨 부착 및 Winding 방법

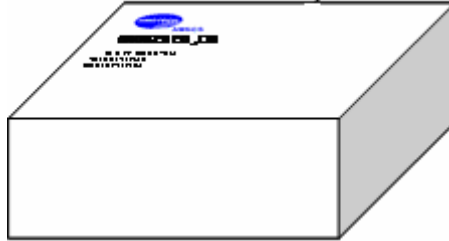


### 8.3 박스 포장 사양

#### 8.3.1 소형 박스

크기 : 185 (L) x 185 (W) x 68 (H) (mm<sup>3</sup>)

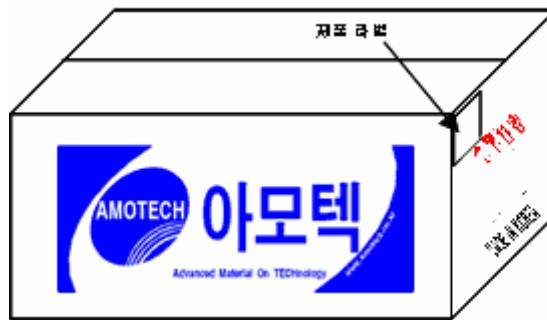
수량 : 3 reel (2,000 ea/reel x 3 reel = 6000 ea)



#### 8.3.2 중형 박스

크기 : 365 (L) x 200 (W) x 200 (H) (mm<sup>3</sup>)

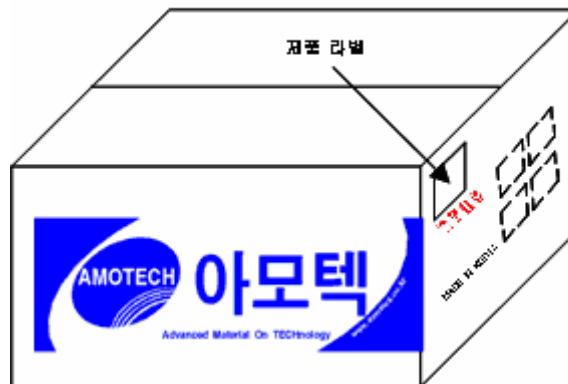
수량 : 5 소형 박스 (6,000 ea/소형 박스 x 5 소형 박스 = 30,000 ea)



#### 8.3.3 대형 박스

크기 : 390 (L) x 390 (W) x 280 (H) (mm<sup>3</sup>)

수량 : 14 소형 박스 (6,000 ea/ 소형 박스 x 14 소형 박스 = 84,000 ea)



## 9.. 유해물질 성적서

### 9.1 칩안테나

**SGS**

**Test Report No. F690501/LF-CTSGP06-06713** Date: March 28, 2006 Page 1 of 3

To: **AMOTECH CO., LTD.**  
5BL-1L, 617  
Namchon-dong  
Namdong-gu,  
INCHEON 405-100  
Korea

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

Commodity	: Multilayer Chip Antenna
SGS File No.	: GP06-06713 *
Received Date	: March 21, 2006
Test Performing Date	: March 22, 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)

Brendan Lee  
Monet Jeong  
Jully Oh  
Jerry Jung  
/Testing Person

*Jeff Jang*  
Jeff Jang / Technical Mgr

SGS Testing Korea Co. Ltd.  
*Jason Han*  
Jason Han / Lab Director

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**Test Report No. F690501/LF-CTSGP06-06713**

Date: March 28, 2006

Page 2 of 3

Sample No. : GP06-06713.001  
Sample Description : Multilayer Chip Antenna  
Style/Item No. : Multilayer Chip Antenna

**Heavy Metals**

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

**Flame Retardants-PBBs/PBDEs**

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.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	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.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl 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

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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.

## 9.2 Powder



**Test Report No. F690501/LF-CTSGP06-05191**

Date: March 14, 2006

Page 1 of 2

To: **AMOTECH CO., LTD.**  
5BL-1L, 617  
Namchon-dong  
Namdong-gu,  
INCHEON 405-100  
Korea


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

<b>Commodity</b>	: CERAMIC POWDER
<b>SGS File No.</b>	: GP06-05191
<b>Received Date</b>	: March 07, 2006
<b>Test Performing Date</b>	: March 08, 2006
<b>Test Performed</b>	: SGS Testing Korea tested the sample(s) selected by applicant with following results
<b>Test Results</b>	: For further details, please refer to following page(s)

Brendan Lee  
Patrick An  
Monet Jeong  
Jinee Song  
/Testing Person

  
Jeff Jang / Technical Mgr

SGS Testing Korea Co. Ltd.

  
Jason Han / Lab Director

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.



Sample No. : GP06-05191.001

Sample Description : CERAMIC POWDER

Style/Item No. : MLS-22C

**Heavy Metals**

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



### 9.3 Ag Paste



**Test Report No.** F690501/LF-CTSGP06-05192

Date: March 14, 2006

Page 1 of 2

To: **AMOTECH CO., LTD.**  
5BL-1L, 617  
Namchon-dong  
Namdong-gu,  
INCHEON 405-100  
Korea

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

**Commodity** : AG PASTE  
**SGS File No.** : GP06-05192  
**Received Date** : March 07, 2006  
**Test Performing Date** : March 08, 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)

Brendan Lee  
Patrick An  
Monet Jeong  
Jinee Song  
/Testing Person

Jeff Jang / Technical Mgr

SGS Testing Korea Co. Ltd.

Jason Han / Lab Director

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

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**Sample No.** : GP06-05192.001

**Sample Description** : AG PASTE

**Style/Item No.** : ET-1833B

## Heavy Metals

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

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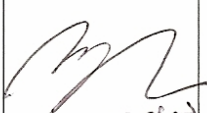


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# APPROVAL SHEET

**Type : Multilayer Chip Antenna**  
**Part No. : ALA931C5**

	Check	Consent	Approval



	Written	Checked		Approved
Amotech	 조영호	 이준호	 김희	 김희
	12/18	12/18	12/18	12/18

2007. 2. 7

**AMOTECH Co., Ltd.**

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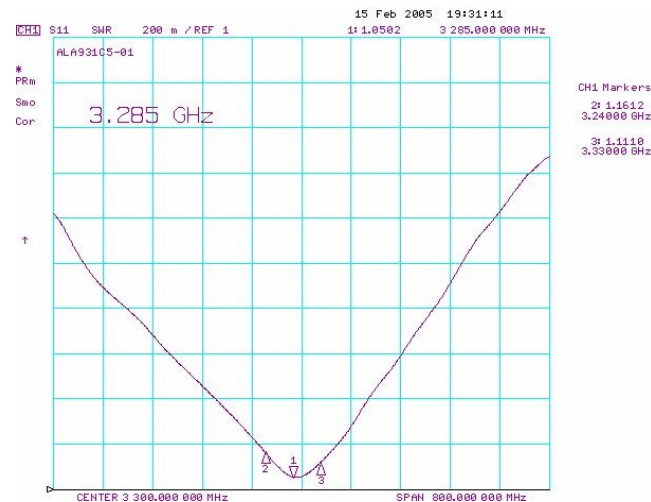
## 1. Revision Record

Date	Title	Content	Remark
2006.12.18		New drawing up	

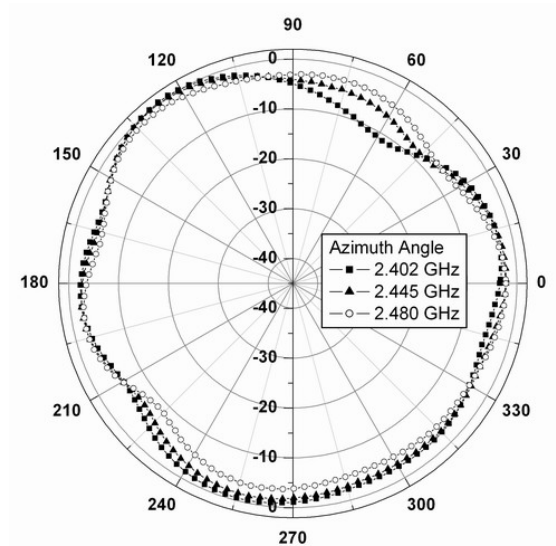
## 2. Specifications

### 2.1 Electrical specifications

No	Item	Spec.	Remark
1	Frequency Range	2400~2500	ISM Band
2	VSWR	Max. 3.0:1 @3285±45 MHz	On manual jig
3	Radiation Gain	Max. 0 dBi @azimuth co-pol.	Measured after matching on testboard
4	Radiation Pattern	Omni-directional	
5	Impedance	Nominal 50 $\Omega$	



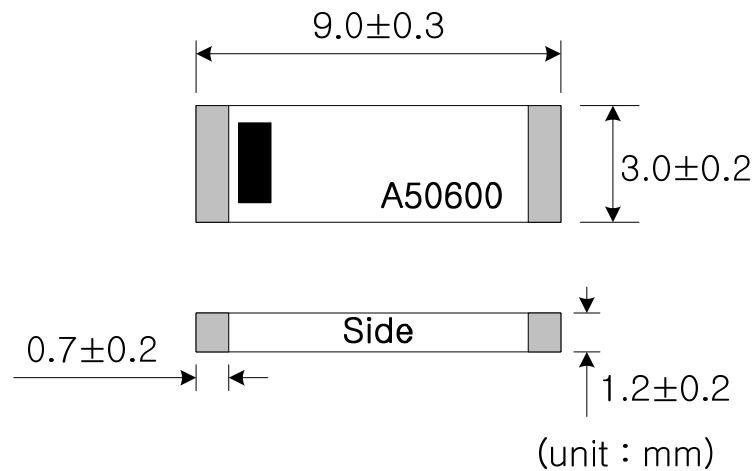
[VSWR : measured on manual jig]



[Radiation Gain : Measured on Ref. Board]

## 2.2 Mechanical specifications

No	Item	Spec.		Unit
1	Dimensions	W	$9.0 \pm 0.3$	mm
		D	$3.0 \pm 0.2$	
		H	$1.2 \pm 0.2$	
2	Unit Weight	$97 \pm 9$		mg
3	Operation Temp.	$-30 \sim +70$		°C
4	Storage Temp.	$-40 \sim +85$		°C



[Chip Antenna dimension]

## 2.3 Index method of Part No. & Lot No.

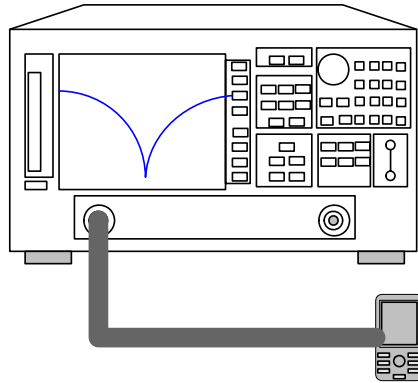
Part No.	<u>ALA</u> (1)	931 (2)	<u>C5</u> (3)
(1) : Amotech Antenna			
(2) : Chip size			
(3) : Version & frequency			

Lot No.	<u>MA</u> (1)	<u>09</u> (2)	<u>A5</u> (3)	<u>0506</u> (4)	<u>01</u> (5)
(1) : Mass product Antenna					
(2) : Chip size					
(3) : Version & frequency					
(4) : Y/M					
(5) : Serial No. of product					

### 3. Test Method

#### 3.1 VSWR

Equipment : Network Analyzer 8753ES

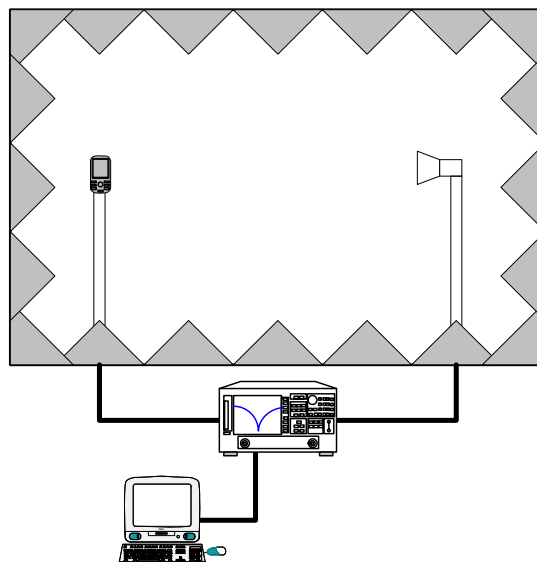


[Test procedure]

- ① Setup as shown picture.
- ② Calibrate Network Analyzer in frequency range of  $f_0 \pm 400$  MHz, verify that the value of return loss( $S_{11}$ ) is under  $-55\text{dB}$  with termination( $50\Omega$ )
- ③ After connect a mobile set or manual jig for single chip antenna to Network Analyzer, measure the max. value of VSWR in frequency range of spec.

#### 3.2 Radiation gain

Equipment : Anechoic chamber , Network Analyzer 8753ES

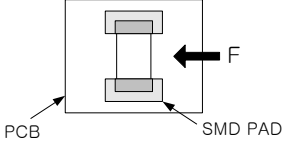
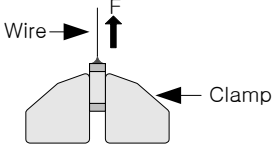


[Test procedure]

- ① Calibrate network analyzer and anechoic chamber using reference horn antenna.
- ② Set-up operation software (frequency, angle step, etc.)
- ③ After connecting AUT on holder, measure radiation gain.

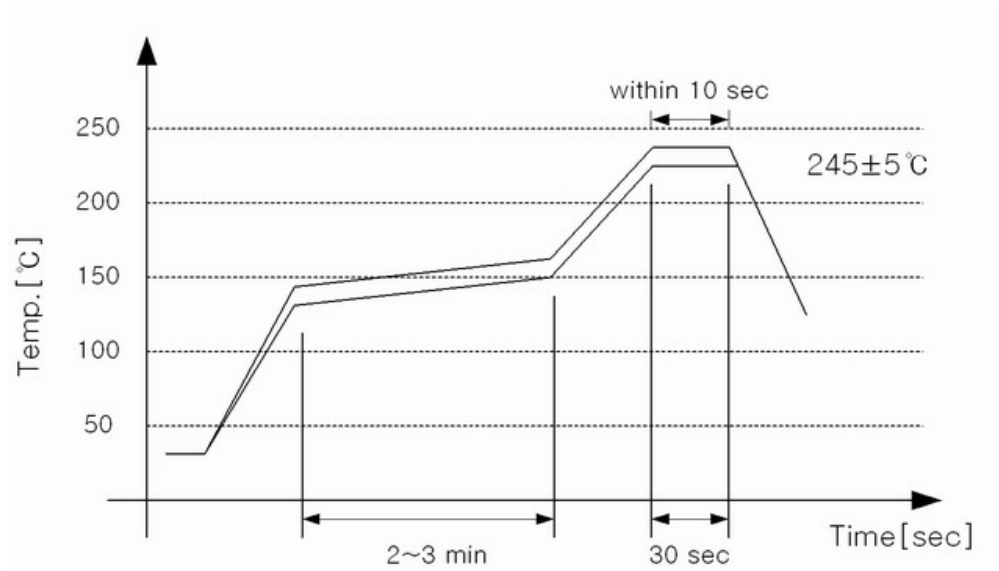


#### 4. Reliability Test

No	ITEM	TEST CONDITION	TEST REQUIREMENTS
1	Adhesive Strength of Termination	<p>1. Applied force on SMD chip till detached point from PCB.</p> 	<p>1. No mechanical damage by forces applied on the right. 2. Strength (F) &gt; 7 kgf</p>
2	Tensile Strength	<p>1. Wire : 0.6~0.8 tined Cu wire</p> 	<p>1. No mechanical damage by forces applied on the right. 2. Strength (F) &gt; 3 kgf</p>
3	Thermal Shock (Temperature Cycle)	<p>1. 1 cycle / step 1 : <math>-40 \pm 3^{\circ}\text{C}</math>, 30 min step 2 : <math>+125 \pm 3^{\circ}\text{C}</math>, 30 min 2. Number of cycle : 30 3. Measure after left for 48 hrs min. at room temperature</p>	<p>1. No visual damage 2. Within electric spec (VSWR)</p>
4	High Temperature Resistance	<p>1. Temperature : <math>+125 \pm 5^{\circ}\text{C}</math> 2. Time : <math>1000 \pm 24</math> hrs 3. Measure <math>f_c</math> after left for 24 hrs min. at room temperature</p>	<p>1. No visual damage 2. Within electric spec (VSWR)</p>
5	Low Temperature Resistance	<p>1. Temperature : <math>-40 \pm 5^{\circ}\text{C}</math> 2. Time : <math>1000 \pm 24</math> hrs 3. Measure <math>f_c</math> after left for 48 hrs min. at room temperature</p>	<p>1. No visual damage 2. Within electric spec (VSWR)</p>
6	Humidity (Steady Condition)	<p>1. Humidity : 85 % RH 1. Temperature : <math>+85 \pm 3^{\circ}\text{C}</math> 2. Time : <math>1000 \pm 24</math> hrs 3. Measure <math>f_c</math> after left for 48 hrs min. at room temperature</p>	<p>1. No visual damage 2. Within electric spec (VSWR)</p>

## 5. Soldering Recommend

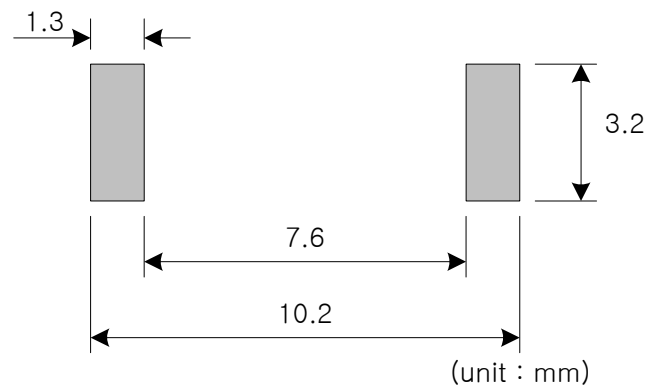
### 5.1 Reflow profile for Pb-free



This product is designed for reflow soldering only. Do not use flow (wave) soldering.

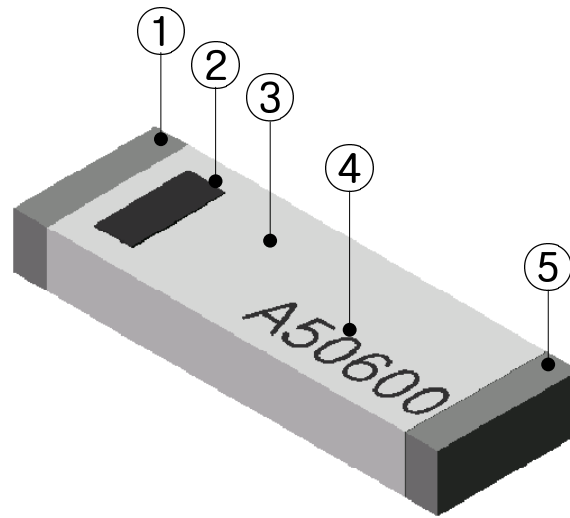
- ① Use non-activated flux (Cl content 0.2% max.)
- ② Follow the recommended soldering conditions to avoid damage.
- ③ Reflow-cycle is max. 3 times.

### 5.2 PCB land pattern



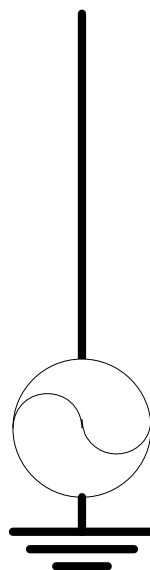
## 6. Structure and Material

### 6.1 Material



No	Part	Function	Material
1	External Electrode	Soldering, Feeding	Ag/Ni/Sn
2	Direction Index	Feeding Index	Ceramic
3	Ceramic Body	–	Ceramic
4	Text	Part No. Index	Ceramic
5	External Electrode	Soldering	Ag/Ni/Sn

### 6.2 Equivalent symbol

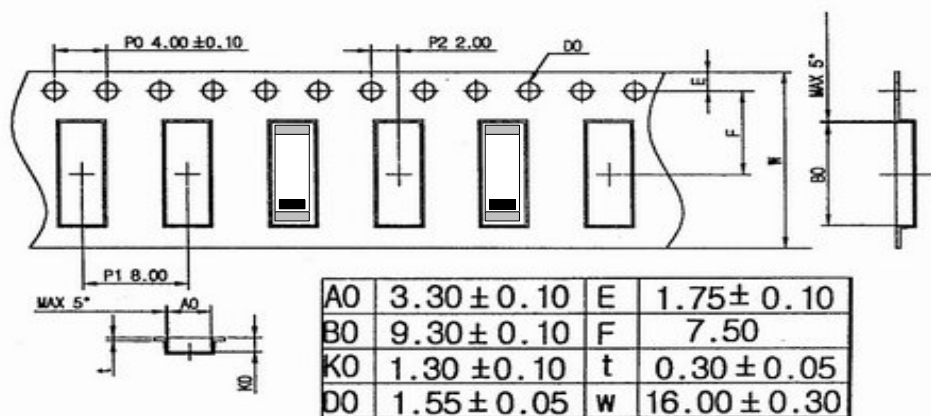


## 7. Cautions

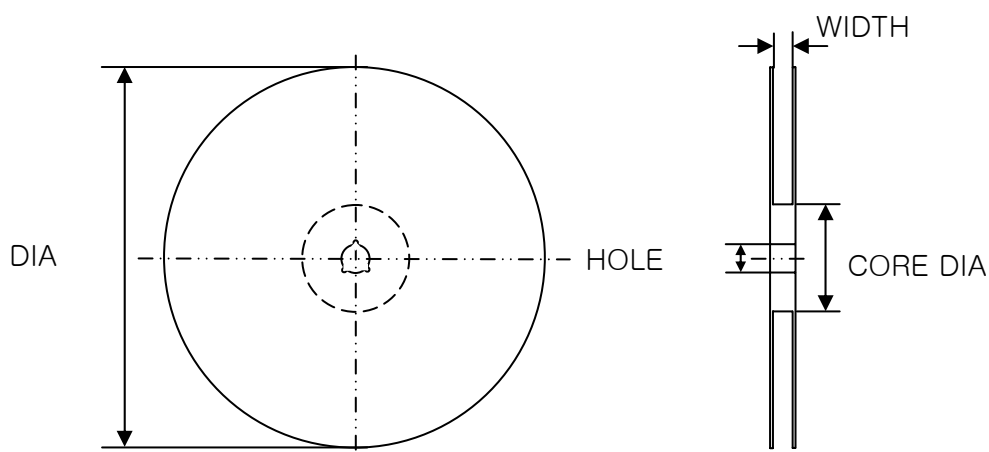
- ① Storage environment must be at ambient temperature of 15~35℃ and ambient humidity of 45~75 % RH. (MSL Level 2)
- ② Chip antenna can experience degradation of termination solder ability when subjected to high temperature of humidity, or if exposed to sulfur or chlorine gases.
- ③ Avoid mechanical shock (ex. falling) to the chip antenna to prevent mechanical cracking inside of the ceramic dielectric due to its own weight.

## 8. Packing Method

### 8.1 Carrier-tape



### 8.2 Reel



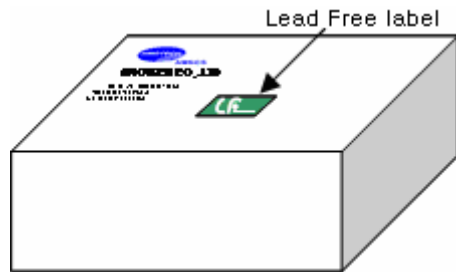
item	DIA	WIDTH	CORE DIA	HOLE
dimension(mm)	180.0 ± 0.3	17.0 ± 0.3	60.0 ± 1	13.0 ± 0.5

### 8.3 Packing box

#### 8.3.1 Small box

Size : 185 (W) x 185 (D) x 68 (H) (mm)

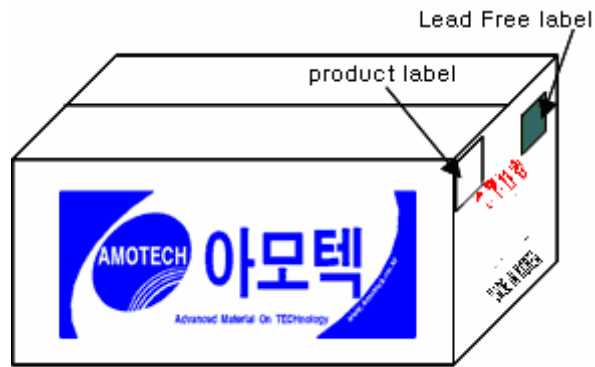
Q'TY : 3 reel (1,000 ea/reel × 3 reel = 3,000 ea)



#### 8.3.2 Middle box

Size : 365 (W) x 200 (D) x 200 (H) (mm)

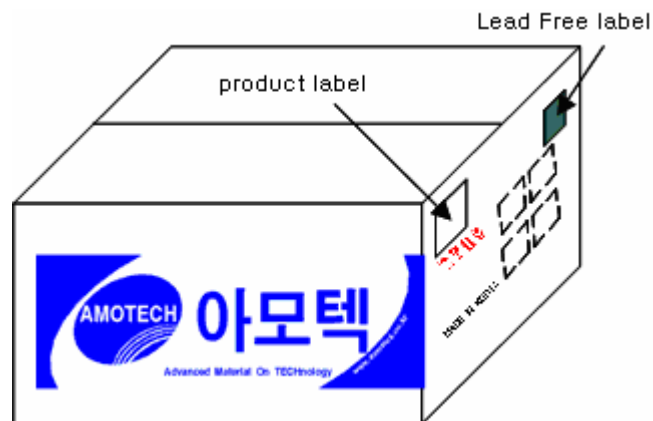
Q'TY : 5 small box(3,000 ea/small box × 5 small box = 15,000 ea)



#### 8.3.3 Large box

Size : 390 (W) x 390 (D) x 280 (H) (mm)

Q'TY : 14 small box(3,000 ea/ small box × 14 small box = 42,000 ea)



## 9. Manufacture and Place

### 9.1 Manufacture

Amotech Co., Ltd

### 9.2 Place

5B 1L, Namdong Industrial Complex, 617 Namchondong, Namdonggu,  
Incheon, Korea



## Test Report No. F690501/LF-CTSGP06-24480

Date: September 25, 2006

Page 1 of 3

To: **AMOTECH CO., LTD.**  
5BL-1L, 617  
Namchon-dong  
Namdong-gu  
INCHEON 405-100  
Korea

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

---

**Commodity** : Multilayer Chip Antenna  
**SGS File No.** : GP06-24480  
**Received Date** : September 18, 2006  
**Test Performing Date** : September 19, 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)

Jade Jang  
Monet Jeong  
Jully Oh  
Jerry Jung  
/Testing Person

SGS Testing Korea Co. Ltd.

Jeff Jang / Chemical Lab Mgr



## Test Report No. F690501/LF-CTSGP06-24480

Date: September 25, 2006

Page 2 of 3

Sample No. : GP06-24480.001  
Sample Description : Multilayer Chip Antenna  
Style/Item No. : Multilayer Chip Antenna

### Heavy Metals

Test Items	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.

### Flame Retardants-PBBs/PBDEs

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) ppm = mg/kg  
(3) MDL = Method Detection Limit  
(4) - = No regulation  
(5) \*\* = Qualitative analysis (No Unit)  
(6) Negative = Undetectable / Positive = Detectable

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**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