# APPROVAL SHEET

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

| | Check | Consent | Approval |
|---|---|---|---|
| | | | |
| | | | |


| Amotech | Written | Checked | | Approved |
|---|---|---|---|---|
| | | | | |
| | 12/18 | 12/18 | 12/18 | 12/18 |

2008. 2. 7

**AMOTECH Co., Ltd.**

# Content

# 1. Revision Record

| Date | Title | Content | Remark |
|---|---|---|---|
| 2006.12.18 | | New drawing up | |
| | | | |
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| | | | |
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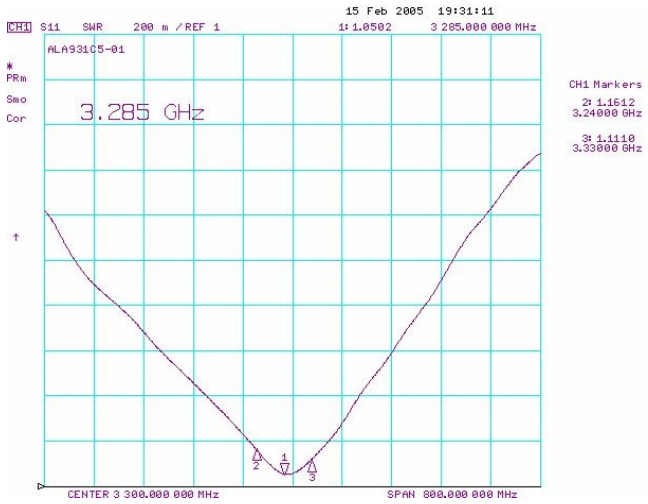
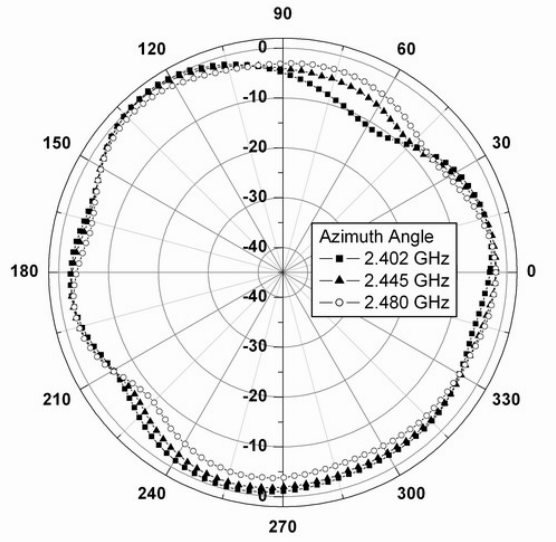
## 2. Specifications

### 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. -1 dBi @azimuth co-pol. | Measured after matching on testboard |
| 4 | Radiation Pattern | Omni-directional | |
| 5 | Impedance | Nominal 50 Ω | |



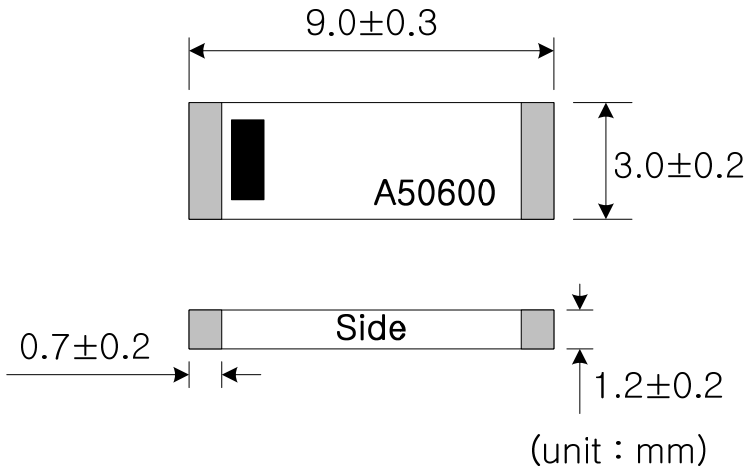

[VSWR : measured on manual jig]




[Radiation Gain : Measured on Ref. Board]

2.2 Mechanical specifications

| No | Item | Spec. | | Unit |
|---|---|---|---|---|
| 1 | Dimensions | W | 9.0 ±0.3 | mm |
| | | D | 3.0 ±0.2 | |
| | | H | 1.2 ±0.2 | |
| 2 | Unit Weight | 97± 9 | | mg |
| 3 | Operation Temp. | −30 ~ +70 | | ℃ |
| 4 | Storage Temp. | −40 ~ +85 | | ℃ |




[Chip Antenna dimension]

2.3 Index method of Part No. & Lot No.

Part No. ALA (1) 931 (2) C5 (3)

(1) : Amotech Antenna
(2) : Chip size
(3) : Version & frequency

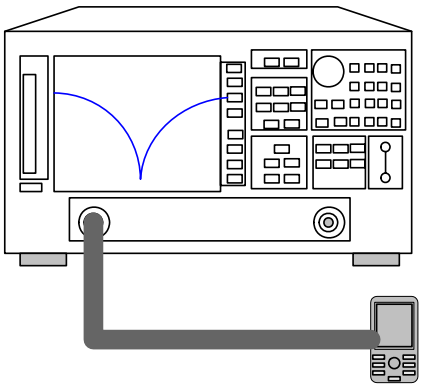
Lot No. MA (1) 09 (2) A5 (3) 0506 (4) 01 (5)

(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]

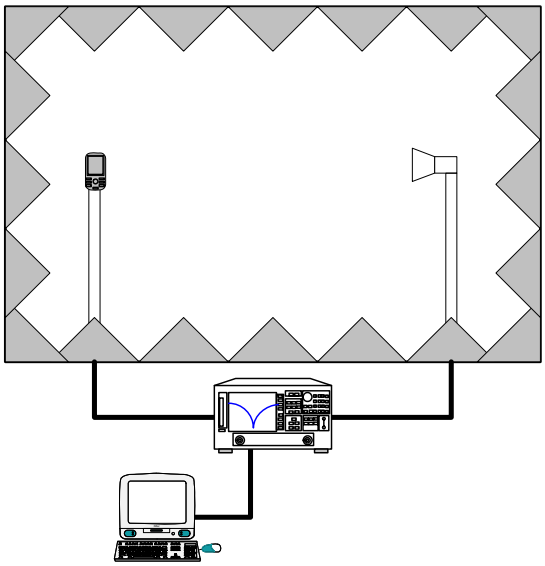
ⓐ Setup as shown picture.

ⓑ Calibrate Network Analyzer in frequency range of $f_0 \pm$ 400 MHz, verify that the value of return loss($S_{11}$) is under -55dB with termination(50ohm)

ⓒ 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



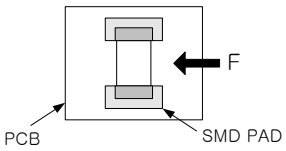
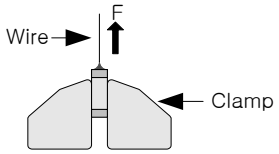
[Test procedure]

ⓐ Calibrate network analyzer and anechoic chamber using reference horn antenna.

ⓑ Set-up operation software (frequency, angle step, etc.)

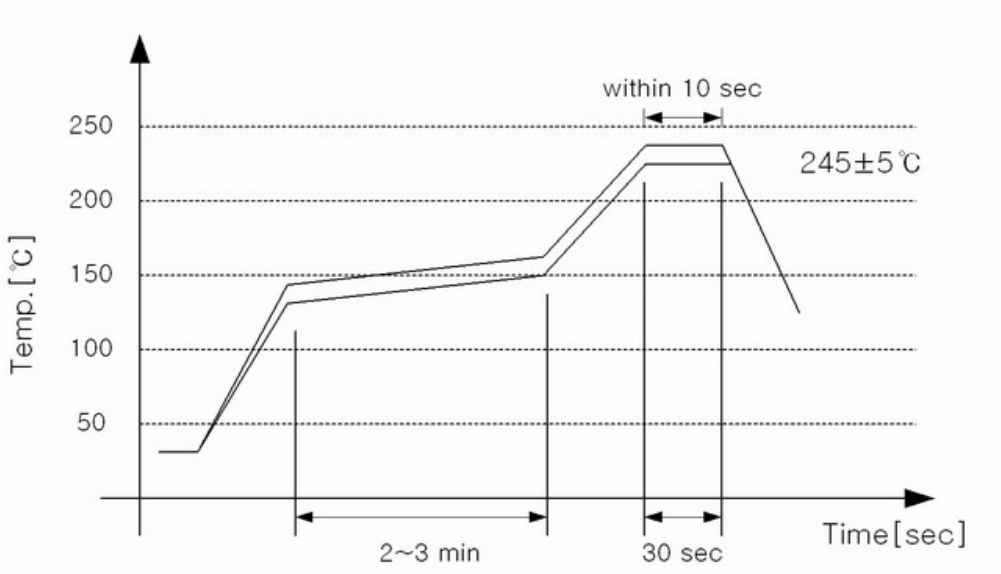
ⓒ After connecting AUT on holder, measure radiation gain.

## 4. Reliability Test

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

## 5. Soldering Recommend

### 5.1 Reflow profile for Pb-free



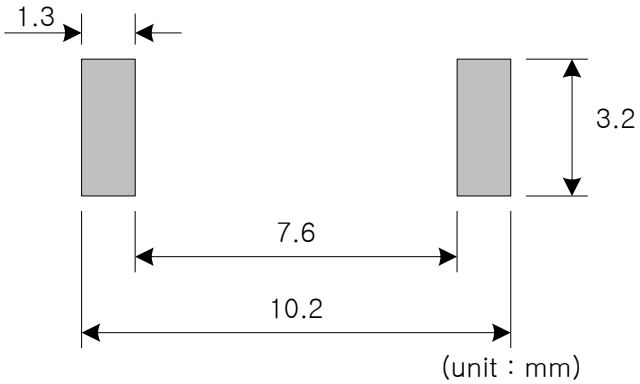

This product is designed for reflow soldering only. Do not use flow (wave) soldering.

① Use non-activated flux (Cl content 0.2% max.)

② Follow the recommended soldering conditions to avoid damage.

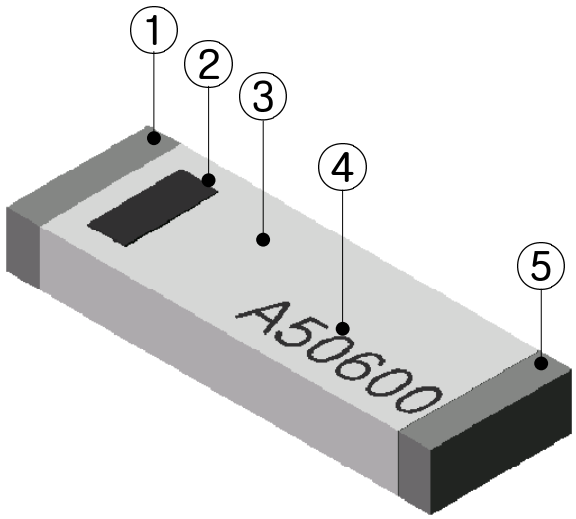
③ Reflow-cycle is max. 3 times.

### 5.2 PCB land pattern



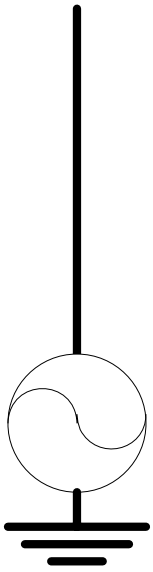
# 6. Structure and Material

## 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

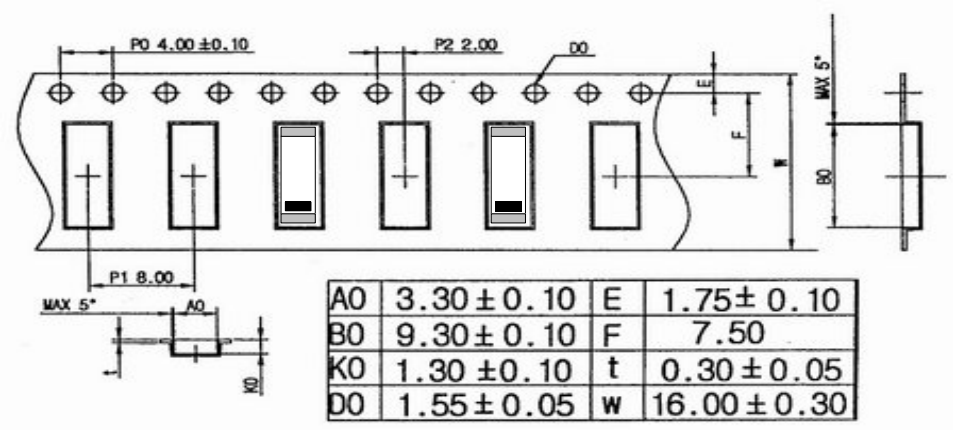


## 7. Cautions

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.

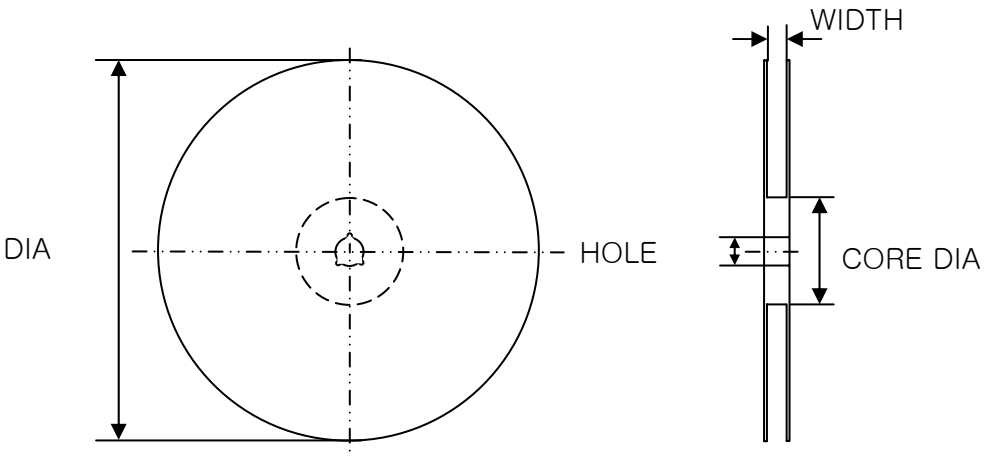
## 8. Packing Method

### 8.1 Carrier-tape




| | | | |
|---|---|---|---|
| A0 | 3.30±0.10 | E | 1.75±0.10 |
| B0 | 9.30±0.10 | F | 7.50 |
| K0 | 1.30±0.10 | t | 0.30±0.05 |
| D0 | 1.55±0.05 | W | 16.00±0.30 |

### 8.2 Reel



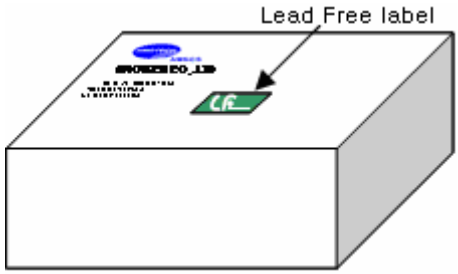

| item | DIA | WIDTH | CORE DIA | HOLE |
|---|---|---|---|---|
| dimension(mm) | 180.0 ± 0.3 | 17.0 ± 0.3 | 60.0 ± 1 | 13.0 ± 0.5 |

## 8.3 Packing box

### 8.3.1 Small box

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

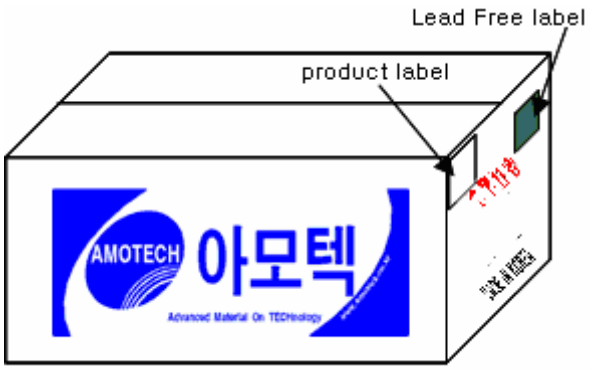
Q'TY : 3 reel (1,000 ea/reel × 3 reel = 3,000 ea)




### 8.3.2 Middle box

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

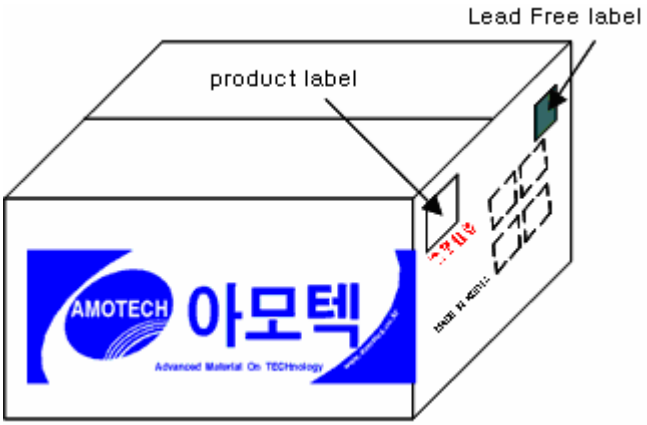
Q'TY : 5 small box(3,000 ea/small box × 5 small box = 15,000 ea)




### 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



**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) |

**SGS Testing Korea Co. Ltd.**

**Jade Jang**
**Monet Jeong**
**Jully Oh**
**Jerry Jung**
**/Testing Person**

**Jeff Jang / Chemical Lab Mgr**

**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

**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