ICP Test Report Certification Packet

Company name: Littelfuse, Inc.

Product Series: Surface Mount Diode Array

Product #: SP0503BAHTG (SOT-143 package)

Issue Date: September 30, 2013

It is hereby certified by Littelfuse, Inc. that there is neither RoHS (EU Directive 2002/95/EC, 2011/65/EU)-restricted substance nor such use, for materials to be used for unit parts, for packing/packaging materials, and for additives and the like in the manufacturing processes. In addition, it is hereby reported to you that the parts and sub-materials, the materials to be used for unit parts, the packing/packaging materials, and the additives and the like in the manufacturing processes, are all composed of the following components.

Issued by: <Global EHS Engineer>

(1) Parts, sub-materials and unit parts
    This document covers the Surface Mount Diode Array RoHS-Compliant series products manufactured by Littelfuse, Inc.

    < Raw Materials Used
    Please see Table 1

(2) The ICP data on all measurable substances
    Please see appropriate pages as identified in Table 1

Remarks : .
Table 1: List of Raw Materials covered by this report

<table>
<thead>
<tr>
<th>Total Parts</th>
<th>Raw Material Part Number</th>
<th>Raw Material Description</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NA</td>
<td>Leadframe (A194 Alloy)</td>
<td>3-11</td>
</tr>
<tr>
<td>2</td>
<td>EMEG600</td>
<td>Epoxy Molding Compound</td>
<td>12-26</td>
</tr>
<tr>
<td>3</td>
<td>N/A</td>
<td>99.9% Tin Plating</td>
<td>27-33</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>Gold (Au) Wire</td>
<td>34-42</td>
</tr>
<tr>
<td>5</td>
<td>84-1 LM1SR4</td>
<td>Adhesive</td>
<td>43-61</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
<td>IC Wafer</td>
<td>62-68</td>
</tr>
</tbody>
</table>
TEST REPORT

Applicant: PSMC Co., Ltd.
Address: #52, Banyeol-dong, Haeundae-gu,
Busan, Korea

Report No. RT12R-U12022-004-E
Date: Nov. 06, 2012

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

Name/Type of Product: Lead Frame
Name of Material: Ni-Fe Alloy-A42
Sample ID No.: RT12R-U12022-004
Manufacturer/Vender: PSMC Co., Ltd.

Sample received: Oct. 30, 2012
Testing Date: Oct. 30, 2012 - Nov. 06, 2012

Test Type: RoHS wet chemical analysis
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.

Approved by,

E.Y. Lee / Lab. Technical Manager

Authorized by,

H.W. Yoo / Lab. General Manager

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Seoul Office: Tel. 02-6040-9500 Fax. 02-3402-0026
Daejeon Office: Tel. 053-600-8647 Fax. 053-600-8645
Web Site: www.Intertek.co.kr
Ulsan Lab. Address: #340-2, Yongam-Ri, Chongyang-Myun, Ulsan-Gun, Ulsan 689-865 Korea.
# TEST REPORT

**Report No.**: RT12R-U2022-004-E  
**Sample ID No.**: RT12R-U2022-004  
**Sample Description**: Lead Frame

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>ppm/kg</td>
<td>With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP-OES</td>
<td>0.5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>ppm/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>ppm/kg</td>
<td></td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexavalent Chromium (Cr ^6+) (For metal)</td>
<td>ppm/kg</td>
<td>With reference to IEC 62321 Edition 1.0:2008, by Spot test</td>
<td>Threshold of 1 ppm/kg</td>
<td>Negative</td>
</tr>
<tr>
<td>Hexavalent Chromium (Cr ^6+) (For metal)</td>
<td>ppm/kg</td>
<td>With reference to IEC 62321 Edition 1.0:2008, by boiling water extraction and determined by UV-VIS Spectrophotometer</td>
<td>Threshold of 0.02 ppm/kg with 50 cm²</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Tested by: YK Cho, HJ Kim

**Notes**:
- **pm** = ppm = parts per million
- ppm/kg with 50 cm² = milligram per kilogram with 50 square centimeter
- <= Less than
- N.D. = Not detected (<=MDL)
- MDL = Method detection limit
- Positive = A positive test result indicated the presence of Cr(VI) at the time of testing, equal to or greater than threshold of 1 ppm/kg for spot test procedures or 0.02 ppm/kg for boiling water extraction procedures with a sample surface area of 50cm² used. However, it shall not be interpreted as the Cr(VI) concentration in the coating layer of the sample and should not be used as a method detection limit for this qualitative test.
- Negative = A negative test result indicates above positive observation was not found at the time of testing. When the spot test showed a negative result, the boiling water extraction procedure shall be used to verify the result.

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Ulsan Lab. Address: #340-2, Yongam-Ri, Changnyang-Myeon, Ulsan-Gun, Ulsan 689-889 Korea
# TEST REPORT

Report No. RT12R-U2022-004-E
Sample ID No. : RT12R-U2022-004
Sample Description : Lead Frame

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polybrominated Biphenyl (PBBs)</td>
<td></td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ether (PBDEs)</td>
<td></td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
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<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td>mg/kg</td>
<td></td>
<td>5</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

With reference to IEC 62321 Edition 1.0 : 2008, by solvent extraction and determined by GC/MS

Tested by : MB Song

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

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## TEST REPORT

**Report No.** RT12R-U2022-004-E  
**Sample ID No.** RT12R-U2022-004  
**Sample Description** Lead Frame

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony (Sb)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3052, by acid digestion and determined by ICP-OES</td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>Bromine (Br)</td>
<td>mg/kg</td>
<td>With reference to EN 14582, by oxygen combustion with bomb and determined by IC</td>
<td>30</td>
<td>N.D.</td>
</tr>
<tr>
<td>Chlorine (Cl)</td>
<td>mg/kg</td>
<td>With reference to EN 14582, by oxygen combustion with bomb and determined by IC</td>
<td>30</td>
<td>N.D.</td>
</tr>
<tr>
<td>Perfluorooctanoic acid (PFOA)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3550C &amp; 8321B, by ultrasonic extraction and determined by LC/MS/MS</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
<tr>
<td>Perfluorooctane sulfonate (PFOS)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3550C &amp; 8321B, by ultrasonic extraction and determined by LC/MS/MS</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

Tested by YK Cho, Ellen Jung

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

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Ulsan Lab. Address: #340-2, Yongam-Ri, Chongsanmyung, Ulsan-Gun, Ulju-Gun, Ulsan 689-860 Korea
TEST REPORT

Report No. RT12R-U2022-004-E
Sample ID No. : RT12R-U2022-004
Sample Description : Lead Frame

* View of sample as received:

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Ulsan Lab. Address: #340-2, Yangnam-Ri, Chongpyeong-Myun, Ulju-Gun, Ulsan 689-865 Korea
Flow Chart
(IEC 62321 Edition 1.0 : 2008)

1. Receipt
2. Sampling/Grinding or Cutting
3. Pb, Cd, Hg
   - For different material, digest the sample with appropriate acid①
4. Confirm the tested samples are totally dissolved③
5. Make up with deionized water
6. Analyzed by ICP-OES
7. Data
8. Report
9. Seaweed extraction or solvent extraction
10. Concentrate the extract and make up with organic solvent
11. Analyzed by GC-MS
12. Data
13. Report
14. PBBs/PBDEs
15. Weigh sample and add organic solvent
16. Get 50cm² sample
17. Boiling water extraction
18. Make up with deionized water and add diphenyl-carbazide solution
19. Analyzed by UV-VIS
20. Data
21. Report
22. Cr⁷⁺
23. Spot test②
24. Negative
25. Metal
26. Pb, Cd, Hg

Remarks:
① List of appropriate acid:
<table>
<thead>
<tr>
<th>Material</th>
<th>Acid added for digestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymers</td>
<td>HNO₃, HCl, HF, H₂O₂, H₃BO₃</td>
</tr>
<tr>
<td>Metals</td>
<td>HNO₃, HCl, HF</td>
</tr>
<tr>
<td>Electronics</td>
<td>HNO₃, HCl, H₂O₂, HBF₄</td>
</tr>
</tbody>
</table>

② If the result of spot test is positive, Chromium (VI) would be determined as detected. No further analysis is required.

③ The samples were dissolved totally by pre-conditioning method according to above flow chart.

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Ulsan Lab. Address: #340-2, Yangnam-Ri, Chongryang-Myun, Ulu-Gun, Ulsan 689-865 Korea
Flow Chart (Metal Testing)

1. Receipt
2. Sample preparation
3. Sample measurement
4. Microwave digestion with HNO₃ / HCl / HF
5. Total digestion

- **YES**: Analyzed by ICP-OES
- **NO**: Repeat step 4

**Remarks**: The samples were dissolved totally by pre-conditioning method according to above flow chart.
Flow Chart (Halogen)

1. Receipt
2. Sample preparation
3. Sample weighing
4. Bomb preparation
5. Combustion
6. Cooling, for 1 hr
7. Absorption solvent preparation of absorption solution
8. Collection of halides make up Vol. 100mL
9. Analyzed by IC
10. Data
11. Report

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Seoul Lab. Address: 1 / F, Aju Digital Tower, #284-5A, Seoonggu 2-ga, Seogdong-Gu, Seoul, 132-833 Korea
Ulsan Lab. Address: #340-2, Yongam-Ri, Chongnyang-Myun, Uju-Gun, Ulsan 689-863 Korea
TEST REPORT

Report No. RT12R-U2022-004-E
Sample ID No. : RT12R-U2022-004
Sample Description : Lead Frame

Flow Chart (PFOS, PFOA)

1. Receipt
2. Sample preparation
3. Loading in a vial
4. Methanol loading
5. Ultrasonication
6. Filtering & Cleaning
7. Make up (Methanol)
8. Analyzed by LC/MS/MS
9. Data
10. Report

**** End of Report ****

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Ulsan Lab. Address: #340-2, Yongam-Ri, Chongnyang-Myun, Ulju-Gun, Ulsan 685-865 Korea
Test Report

No. : KA/2013/40559  Date: 2013/04/15  Page: 1 of 9

SUMITOMO BAKELITE SINGAPORE PTE CO., LTD.
NO. 1 SENOKO SOUTH ROAD, SINGAPORE 780869

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

Sample Description : EPOXY MOLDING COMPOUND
Style/Item No. : EME-9600 TYPE
Sample Receiving Date : 2013/04/09
Testing Period : 2013/04/09 TO 2013/04/15
Sample Submitted By : SUMITOMO BAKELITE SINGAPORE PTE CO., LTD.

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

Ray Chang / Asst. Manager
Signed for and on behalf of
SGS Taiwan Limited
## Test Result(s)

**PART NAME NO 1 : BLACK EPOXY MOLDING COMPOUND**

<table>
<thead>
<tr>
<th>Test Item(s):</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexavalent Chromium Cr(VI) by</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by UV-VIS.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>alkaline extraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of PBBs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by GC/MS.</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td></td>
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<tr>
<td>Decabromobiphenyl</td>
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<td></td>
<td></td>
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<tr>
<td>Sum of PDBEs</td>
<td></td>
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</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by GC/MS.</td>
<td>5</td>
<td>n.d.</td>
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<tr>
<td>Dibromodiphenyl ether</td>
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<td></td>
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</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unless otherwise stated the results shown in this test report refer only to the samples tested. This test report cannot be reproduced, except in full, without prior written permission of the Company. Further reproduction of this document may be the subject of any applicable national or international law, regulation, or other restriction. Any reproduction or disclosure of this document to anyone other than the person to whom it was originally provided is in violation of the law and the rights of the Company.
<table>
<thead>
<tr>
<th>Test Item (s):</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony (Sb)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3052 for Antimony Content. Analysis was performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Perfluorooctane sulfonates (PFOS - Acid, Metal Salt, Amide)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3550C: 2007. Analysis was performed by LC/MS.</td>
<td>10</td>
<td>n.d.</td>
</tr>
<tr>
<td>PFOA (CAS No.: 335-67-1)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3550C: 2007. Analysis was performed by LC/MS.</td>
<td>10</td>
<td>n.d.</td>
</tr>
<tr>
<td><strong>Halogen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halogen-Fluorine (F) (CAS No.: 014762-94-8)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007. Analysis was performed by IC.</td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>Halogen-Chlorine (Cl) (CAS No.: 022537-15-1)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007. Analysis was performed by IC.</td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>Halogen-Bromine (Br) (CAS No.: 010097-32-2)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007. Analysis was performed by IC.</td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>Halogen-Iodine (I) (CAS No.: 014362-44-8)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007. Analysis was performed by IC.</td>
<td>50</td>
<td>n.d.</td>
</tr>
</tbody>
</table>

**Note:**
1. mg/kg = ppm = 0.1wt% = 1000ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
4. "-" = Not Regulated

**PFOS Reference Information:** POPs - (EU) 757/2010
Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1%(1000ppm), in textiles or other coated materials above 1μg/m².
1) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr⁶⁺ test method excluded)

2) Name of the person who made measurement: Alex Chang

3) Name of the person in charge of measurement: Ray Chang

<table>
<thead>
<tr>
<th>Sample Measurement</th>
<th>Pb · Cd</th>
<th>Hg</th>
<th>Cr⁶⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid digestion by suitable acid</td>
<td>Microwave digestion with</td>
<td>Add appropriate amount of</td>
<td>Heat to appropriate</td>
</tr>
<tr>
<td>depended on different sample material</td>
<td>HNO₃·HCl·HF</td>
<td>digestion reagent</td>
<td>temperature to extract</td>
</tr>
<tr>
<td>Filtration</td>
<td>Solution</td>
<td>Residue</td>
<td>1) Alkali Fusion</td>
</tr>
<tr>
<td>ICP-AES</td>
<td>Measure the absorbance</td>
<td>Add diphenyl-carbazide for color development</td>
<td></td>
</tr>
</tbody>
</table>

Sample Material: Steel, copper, aluminum, silver, Glass, Gold, platinum, palladium, ceramic, Silver, Plastic, Others

Digestion Acid: Aqua regia, HNO₃·HCl·HF, H₂SO₄, H₂O₂, HNO₃

Note** : (1) For non-metallic material, add alkaline digestion reagent and heat to 90~95 °C.
(2) For metallic material, add pure water and heat to boiling.
PBB/PBDE analytical FLOW CHART

1) Name of the person who made measurement: Anson Tsao
2) Name of the person in charge of measurement: Ray Chang
1) These samples were dissolved totally by pre-conditioning method according to below flow chart.
2) Name of the person who made measurement: Alex Chang
3) Name of the person in charge of measurement: Ray Chang

Flow Chart of digestion for the elements analysis performed by ICP-AES

- Cutting - Preparation
- Sample Measurement

Acid digestion by suitable acid depended on different sample material (as below table)

- Filtration
- Solution
- Residue
  1) Alkali Fusion
  2) HCl to dissolve

<table>
<thead>
<tr>
<th>Steel, copper, aluminum, solder</th>
<th>Aqua regia, HNO₃, HCl, HF, H₂O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>HNO₃/HF</td>
</tr>
<tr>
<td>Gold, platinum, palladium, ceramic</td>
<td>Aqua regia</td>
</tr>
<tr>
<td>Silver</td>
<td>HNO₃</td>
</tr>
<tr>
<td>Plastic</td>
<td>H₂SO₄, H₂O₂, HNO₃, HCl</td>
</tr>
<tr>
<td>Others</td>
<td>Any acid to total digestion</td>
</tr>
</tbody>
</table>
Analytical flow chart of PFOA/PFOS content

1) Name of the person who made measurement: Anson Tsao

2) Name of the person in charge of measurement: Ray Chang
Analytical flow chart of halogen content

1) Name of the person who made measurement: Jean Hung
2) Name of the person in charge of measurement: Ray Chang

- Sample picture and report number
- Sample pretreatment/separation
- Weighting and putting sample in cell
- Oxygen Bomb Combustion/Absorption
- Dilution to fixed volume
- Analysis was performed by IC
* The tested sample/part is marked by an arrow if it's shown on the photo. *

** End of Report **
Test Report

No. : KA/2013/31656  Date : 2013/03/22  Page : 1 of 6

SUMITOMO BAKELITE SINGAPORE PTE CO., LTD.
NO. 1 SENOKO SOUTH ROAD, SINGAPORE 758069

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

Sample Description : EPOXY MOLDING COMPOUND
Style/Item No. : EME-G600 TYPE C
Sample Receiving Date : 2013/03/18
Testing Period : 2013/03/18 TO 2013/03/22
Sample Submitted By : SUMITOMO BAKELITE SINGAPORE PTE CO., LTD.

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

PART NAME NO.1: BLACK EPOXY MOLDING COMPOUND

<table>
<thead>
<tr>
<th>Test Item (s):</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexabromocyclododecane (HBCDD) (CAS No.: 25637-99-4 and 3194-55-8)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3540C: 1996 method. Analysis was performed by GC/MS.</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Phthalates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBP (Benzyl butyl phthalate) (CAS No.: 85-68-7)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DBP (Dibutyl phthalate) (CAS No.: 84-74-2)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DIDP (Di-isodecyl phthalate) (CAS No.: 26761-40-0)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.01</td>
<td>n.d.</td>
</tr>
<tr>
<td>DINP (Di-isonorlyl phthalate) (CAS No.: 28553-12-0)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.01</td>
<td>n.d.</td>
</tr>
<tr>
<td>DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DMEP (Bis (2-methoxyethyl) phthalate) (CAS No.: 117-82-8)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DNHP (Di-n-hexyl phthalate) (CAS No.: 84-75-3)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
<tr>
<td>DPP (Di-pentyl phthalate) (CAS No.: 131-18-0)</td>
<td>%</td>
<td>With reference to EN 14372. Analysis was performed by GC/MS.</td>
<td>0.003</td>
<td>n.d.</td>
</tr>
</tbody>
</table>
Test Report

No.: KA/2013/31656   Date: 2013/03/22   Page: 3 of 6

SUMITOMO BAKEITE SINGAPORE PTE CO., LTD.
NO. 1 SENOKO SOUTH ROAD, SINGAPORE 758069

Note:
1. mg/kg = ppm : 0.1 wt% = 1000 ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
HBCDD Analytical FLOW CHART

1) Name of the person who made measurement: Anson Tsao
2) Name of the person in charge of measurement: Ray Chang

```
Sample pretreatment

→
Sample extraction by Soxhlet extraction

→
Concentrate/Dilute Extracted solution

→
Filter

→
Analysis was performed by GC/MS

→
Data
```
Analytical flow chart of phthalate content

1) Name of the person who made measurement: Anson Tsao
2) Name of the person in charge of measurement: Ray Chang

Sample pretreatment/separation

Sample extraction by soxhlet method

Concentrate/Dilute Extracted solution

Analysis was performed by GC/MS

Data
* The tested sample / part is marked by an arrow if it's shown on the photo. *

** End of Report **
The following merchandise was (were) submitted and identified by the client as:

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>Pure Tin Solder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Receiving Date</td>
<td>14/12/2012</td>
</tr>
<tr>
<td>Testing Date</td>
<td>14/12/2012 to 20/12/2012</td>
</tr>
</tbody>
</table>

Test Requested: Selected test(s) as requested by client

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

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

Analysts: Ng Jing Wei, Cho Kar Yen, Tay Siam Pine & Teh Pui Sean
### Test Report

No. CTSSA/27277(AD)/12  Date: 20/12/2012  Page: 2 of 7

**CTS Ref. CTSSA/12/4439/Redring**

**Test Part Description:**

Sample Description: Pure Tin Solder

**RoHS Directive 2011/65/EU Annex II**

<table>
<thead>
<tr>
<th>Test Item(s):</th>
<th>Unit</th>
<th>Test Method</th>
<th>Results</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by ICP-OES</td>
<td>N.D.</td>
<td>2</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by ICP-OES</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by ICP-OES</td>
<td>N.D.</td>
<td>2</td>
</tr>
<tr>
<td>Hexavalent Chromium (CrVI) by</td>
<td>---</td>
<td>With reference to IEC 62321:2008</td>
<td>Negative</td>
<td>0.02mg/kg per 50cm³ sample in 50mL solution</td>
</tr>
<tr>
<td>Spot test / boiling water</td>
<td></td>
<td>extraction (optional) #</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of PBBs</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>-</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
</tbody>
</table>

---

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CHONG KIEN LEN
B.Sc. (HONS) AMIC
SENIOR LAB MANAGER

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SGS Laboratory Services (M) Sdn. Bhd. (Company No. 63972-M)

SGS Laboratory Services (M) Sdn. Bhd.

No. 26 Jalan Anggerik Vanilla 51930 Kota Kemuning, 40480 Shah Alam, Selangor Darul Ehsan, Malaysia.

t +6(03) 5121 2320  f +6(03) 5121 9082  www.sgs.com
# Test Report

**No. CTSSA/27277(AD)/12**  
**Date:** 20/12/2012  
**CTSS Ref. CTSSA/12/4439/Redring**

<table>
<thead>
<tr>
<th>Sum of PBDEs</th>
<th>mg/kg</th>
<th>With reference to IEC 62321:2008, and performed by GC-MS</th>
<th>N.D.</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monobromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Heptabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, and performed by GC-MS</td>
<td>N.D.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Note:**

(a) mg/kg = ppm; (0.1wt% = 1000ppm)
(b) N.D. = Not Detected
(c) MDL = Method Detection Limit
(d) # = Spot-Test:
   a. Negative means the absence of Cr(VI) on the tested areas
   b. Positive means the presence of Cr(VI) on the tested areas
      (The tested sample should be further verified by boiling-water-extraction method if the spot test result is negative or cannot be confirmed)
 Boiling water extraction:
   a. Negative means the absence of Cr(VI) on the tested areas
   b. Positive means the presence of Cr(VI) on the tested areas;
      The detected concentration in 50 mL boiling water extraction solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.

For corrosion protection coatings on metals: Information on storage conditions and production date of the tested sample is unavailable and thus results of Cr(VI) represent status of the sample at the time of testing.

(e) - = Not regulated
(f) This report supersedes report no. CTSSA/27277/12

---

SGS LABORATORY SERVICES (M) SDN. BHD.

CHONG KIEN LEN  
B.Sc.(HONS) AMIC  
SENIOR LAB MANAGER

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# Test Report

**No. CTSSA/27277(AD)/12**  
**Date: 20/12/2012**  
**Page: 4 of 7**  
**CTS Ref. CTSSA/12/4439/Redring**

## Test results by chemical method:

<table>
<thead>
<tr>
<th>Test Item(s):</th>
<th>Unit</th>
<th>Method</th>
<th>Result</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony (Sb)</td>
<td>mg/kg</td>
<td>With reference EPA Method 3051A, and performed by ICP-OES</td>
<td>N.D.</td>
<td>2</td>
</tr>
<tr>
<td>Halogen</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Halogen-Fluorine (F)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582. Analysis was performed by IC method for Fluorine content.</td>
<td>N.D.</td>
<td>50</td>
</tr>
<tr>
<td>Halogen-Chlorine (Cl)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582. Analysis was performed by IC method for Chlorine content.</td>
<td>N.D.</td>
<td>50</td>
</tr>
<tr>
<td>Halogen-Bromine (Br)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582. Analysis was performed by IC method for Bromine content.</td>
<td>N.D.</td>
<td>50</td>
</tr>
<tr>
<td>Halogen-Iodine (I)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582. Analysis was performed by IC method for Iodine content.</td>
<td>N.D.</td>
<td>50</td>
</tr>
</tbody>
</table>

## Test Part Description:

**Sample Description**: Pure Tin Solder

**Note**:  
(a) mg/kg = ppm  
(b) N.D. = Not Detected  
(c) MDL = Method Detection Limit  
(d) --- = Not Conducted  
(e) This report supersedes report no. CTSSA/27277/12

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**SGS LABORATORY SERVICES (M) SDN. BHD.**

**CHONG KIEN LEN**  
B.Sc.(Hons) AMIC  
SENIOR LAB MANAGER

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SGS Laboratory Services (M) Sdn. Bhd.  
(Company No. 63972-M)  
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Member of the SGS Group (505 9A)
Test Report

No. CTSSA/27277(AD)/12  Date: 20/12/2012
CTS Ref. CTSSA/12/4439/Redring

Test Part Description:

Sample Description: Pure Tin Solder

SGS authenticate the photo on original report only

SGS LABORATORY SERVICES (M) SDN. BHD.

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B.Sc.(HONS) AMIC
SENIOR LAB MANAGER

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Member of the SGS Group (SGS SA)
1. DETERMINATION OF CADMIUM CONTENT BY IEC 62321 2008
Sample Receiving and Registration
Cut sample in small pieces
Weight sample (0.2-0.5g) into digestion vessel
Acid digestion (Microwave)
"Totally Dissolved"
Filtration
Analyses by ICP

2. DETERMINATION OF LEAD CONTENT BY IEC 62321 2008
Sample Receiving and Registration
Cut sample in small pieces
Weight sample (0.2-0.5g) into digestion vessel
Acid digestion (Microwave)
"Totally Dissolved"
Filtration
Analyses by ICP

3. DETERMINATION OF MERCURY CONTENT BY IEC 62321 2008
Sample Receiving and Registration
Cut sample in small pieces
Weight sample (0.2-0.5g) into digestion vessel
Acid digestion (Microwave)
"Totally Dissolved"
Filtration
Analyses by ICP

4. DETERMINATION OF HEXAVALENT CHROMIUM BY IEC 62321 2008
Sample Receiving and Registration
Sample Preparation
Spot-test (Qualitative)
Boiling-water extraction
Add diphenylcarbazide for color development
Analyses by UV- Spectrophotometer

5. DETERMINATION OF PBB/PBDE WITH GC-MS BY IEC 62321 2008
Cut sample in small pieces
Weight sample (0.5-4.0g) into extraction thimble
Saxthet Extraction with Toluene
Filter through 0.45 um membrane filter
Analyses by GC-MS (with appropriate dilution)

SGS LABORATORY SERVICES (M) SDN. BHD.

CHONG KIEN LEN
B.Sc.(HONS) AMIC
SENIOR LAB MANAGER
6. MICROWAVE ASSISTED ACID DIGESTION OF ORGANICALLY BASED METALLICS (US EPA 3051A)

- Cut sample in small pieces
- Weight sample (0.2-0.5g) into digestion vessel
- Acid digestion (HNO₃) – Microwave
  - “Totally Dissolved”
  - Filtration
  - Analyses by ICP

7. DETERMINATION OF HALOGEN CONTENT

- Sample pretreatment
- Weighting and putting sample in cell
- Combustion / Absorption
- Dilution to fixed volume
- Analyses by ICP

**** End of Report ****
Test Report No. F690101/LF-CTSAAYAA13-14908

Issued Date: 2013. 04. 10 Page 1 of 9

To: HERAEUS ORIENTAL HITEC CO., LTD
#587-122
Hakik-dong
Nam-gu
Incheon
Korea

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

SGS File No. : AYAA13-14908
Product Name : Au wire
Item No./Part No. : N/A
Received Date : 2013. 03. 26
Test Period : 2013. 03. 27 to 2013. 04. 10
Test Results : For further details, please refer to following page(s)
Test Performed : SGS Korea tested the sample(s) selected by applicant with following results.

Timothy Jeon
Jinhee Kim
Cindy Park
Jerry Jung / Testing Person

SGS Korea Co., Ltd.

Jeff Jang / Chemical Lab Mgr
## Test Report No. F690101/LF-CTAYA13-14908

**Sample No.:** AYAA13-14908.001  
**Sample Description:** Au wire  
**Item No./Part No.:** N/A  
**Materials:** Gold

### Heavy Metals

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, ICP</td>
<td>0.5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, ICP</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, ICP</td>
<td>2</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexavalent Chromium (Cr VI) By boiling water extraction*</td>
<td></td>
<td>With reference to IEC 62321:2008</td>
<td>-</td>
<td>Negative</td>
</tr>
<tr>
<td>Hexavalent Chromium (Cr VI)</td>
<td>mg/kg</td>
<td>With reference to US EPA 3050A(1996), US EPA 7196A(1992), UV</td>
<td>1</td>
<td>N.D.</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>mg/kg</td>
<td>With reference to EPA 3052(1996), US EPA 6010B(1996), ICP</td>
<td>0.5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Sb (Sb2O3)*</td>
<td>mg/kg</td>
<td>With reference to EPA 3052(1996), US EPA 6010B(1996), ICP</td>
<td>10</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

### Flame Retardants-PBBS/PBDEs

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monobromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

**NOTE:**
(1) N.D. = Not detected (<MDL)  
(2) mg/kg = ppm  
(3) MDL = Method Detection Limit  
(4) = No regulation  
(5) Negative = Undetectable / Positive = Detectable  
(6) ** = Qualitative Analysis (No Unit)  
(7) * = Boiling-water-extraction: Negative = Absence of Cr(VI) coating; Positive = Presence of Cr(VI) coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.
### Test Report No. F690101/LF-CTAYAA13-14908

**Sample No.** : AYAA13-14908.001  
**Sample Description** : Au wire  
**Item No/Part No.** : N/A  
**Materials** : Gold

#### Flame Retardants-PBBr/PBDEs

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heptabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td>mg/kg</td>
<td>With reference to IEC 62321:2008, GC-MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

#### Phthalates

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Di-(2-ethylhexyl) phthalate</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Dibutyl phthalate (DBP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Benzyl butyl phthalate (BBP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-isodecyl phthalate (DIDP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di(isononyl phthalate (DINP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-n-octyl phthalate (DNOP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-isobutyl phthalate (DBIP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Di-n-hexyl phthalate (DNHP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
<tr>
<td>Bis(2-methoxyethyl) phthalate (BMP)</td>
<td>mg/kg</td>
<td>With reference to EPA 8061A, GC/MS</td>
<td>50</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

#### Polymer Identification

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC</td>
<td>**</td>
<td>FT-IR</td>
<td></td>
<td>Negative</td>
</tr>
</tbody>
</table>

#### Halogen Content

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromine(Br)</td>
<td>mg/kg</td>
<td>BS EN 14582:2007, IC</td>
<td>30</td>
<td>N.D.</td>
</tr>
<tr>
<td>Chlorine(Cl)</td>
<td>mg/kg</td>
<td>BS EN 14582:2007, IC</td>
<td>30</td>
<td>N.D.</td>
</tr>
<tr>
<td>Fluorine(F)</td>
<td>mg/kg</td>
<td>BS EN 14582:2007, IC</td>
<td>30</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

#### Organotin Compounds

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
</table>

**NOTE:**

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

---

*SGS Testing Co., Ltd.*

Member of the SGS Group (Switzerland) - Standardization of Switzerland
### Organotin Compounds

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tributyltin (TBT)</td>
<td>mg/kg</td>
<td>DIN 38407-13, GC/MS</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
<tr>
<td>Triphenyltin (TPhT)</td>
<td>mg/kg</td>
<td>DIN 38407-13, GC/MS</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
<tr>
<td>Bis (tributyltin)oxide (TBTO)</td>
<td>mg/kg</td>
<td>DIN 38407-13, GC/MS</td>
<td>0.1</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

### Flame Retardants

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrabromobisphenol A</td>
<td>mg/kg</td>
<td>US EPA 3540C, GC/MS</td>
<td>10</td>
<td>N.D.</td>
</tr>
<tr>
<td>Hexabromocyclododecane</td>
<td>mg/kg</td>
<td>USEPA 3540C, LC/MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

### Halogenated Organic Substances

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monomethyl Dibromodiphenyl Methane, DBBT(#)</td>
<td>mg/kg</td>
<td>US EPA 8270D, GC/MS</td>
<td>0.5</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

### Others

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzotriazole (UV-320)</td>
<td>mg/kg</td>
<td>US EPA 3540C, GC/MS</td>
<td>5</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

### Others

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Unit</th>
<th>Test Method</th>
<th>MDL</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOA (Perfluorooctanoic acid)</td>
<td>mg/kg</td>
<td>US EPA 3540C/3550C, LC/MS</td>
<td>1</td>
<td>N.D.</td>
</tr>
<tr>
<td>PFOS (Perfluorooctane Sulfonates-Acid/Metal Salt/Amide)</td>
<td>mg/kg</td>
<td>US EPA 3540C/3550C, LC/MS</td>
<td>1</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

### NOTE:

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

(1) N.D. = Not detected (<MDL)
(2) mg/kg = ppm
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(7) * = Boiling-water-extraction:
  Negative = Absence of CrVI coating
  Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction
  solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.
# Testing Flow Chart for RoHS: Cd/Pb/Hg/Cr\(^{6+}\)/PBBs&PBDEs Testing

<table>
<thead>
<tr>
<th>Cd/Pb/Hg</th>
<th>PBBs/PBDEs</th>
<th>Cr(^{6+})</th>
<th>Cr(^{6+})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanic Sample</td>
<td>Mechanic Sample</td>
<td>Mechanic Sample</td>
<td>Mechanic Sample</td>
</tr>
<tr>
<td>Sample Measurement</td>
<td>Sample Measurement</td>
<td>Sample Measurement</td>
<td>Sample Measurement</td>
</tr>
<tr>
<td>Acid Digestion with Microwave/Hotplate</td>
<td>Solvent Extraction of the Sample</td>
<td>Nonmetallic Material</td>
<td>Metallic Material</td>
</tr>
<tr>
<td>Filtration</td>
<td>Screen Analysis</td>
<td>Adding Extraction Solution</td>
<td>Spot Test / Boiling Water Extraction</td>
</tr>
<tr>
<td>Residue</td>
<td>Concentration/Dilution of Extraction Solution</td>
<td>Heating to 90~95°C for Extraction</td>
<td>Adding 1,5-Diphenylcarbazide for Color Development</td>
</tr>
<tr>
<td>Total Digestion</td>
<td>Filtration</td>
<td>Filtration and pH Adjustment</td>
<td>A Red Color Indicates the Presence of Cr(^{6+})</td>
</tr>
<tr>
<td>ICP-AES/AAS/MS</td>
<td>GC/MS</td>
<td>Adding 1,5-Diphenylcarbazide for Color Development</td>
<td>Confirm with UV-Vis</td>
</tr>
<tr>
<td>DATA</td>
<td>DATA</td>
<td>DATA</td>
<td>DATA</td>
</tr>
</tbody>
</table>

The samples were dissolved totally by pre-conditioning method according to above flow chart for Cd, Pb, Hg.

Section Chief: Gilsae Yi

**NOTE:**

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5. Negative = Undetectable / Positive = Detectable
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7. * = Boiling-water-extraction: Negative = Absence of Cr\(^{6+}\) coating; Positive = Presence of Cr\(^{6+}\) coating, the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm\(^2\) sample surface area.

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*The image contains a flowchart showing the testing process for RoHS (Restriction of Hazardous Substances) compliance testing for Cd, Pb, Hg, Cr\(^{6+}\), PBBs, and PBDEs. The chart outlines the steps from sample preparation to data analysis.*
Testing Flow Chart for RoHS:Cr$^{6+}$ Testing

Cr$^{6+}$

Mechanic_Sample

Sample Measurement

Adding Extraction Solution

Heating to 90~95°C for Extraction

Filtration and pH Adjustment

Adding 1,5-Diphenyl-carbazide for Color Development

UV-Vis

DATA

NOTE:

1. N.D. = Not detected (<MDL)
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5. Negative = Undetectable / Positive = Detectable
6. ** = Qualitative analysis (No Unit)
7. * = Boiling-water-extraction;
   Negative = Absence of CrVI coating
   Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm$^2$ sample surface area.
Flow Chart for Inorganic Elements Testing

Inorganic Elements

Mechanic_Sample

Sample Measurement

Acid Digestion with Microwave/Hotplate

Filtration

Residue

Total Digestion

ICP-AES

DATA

NOTE:

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

Sample screening using XRF.

Liquid containing water (>80%)?

No

Weigh the samples into the combustion boat.

Add absorption solution into the bomb or tube.

Admit O₂ gas or O₂+Ar₂ gas and start the combustion.

Allow during absorption of the burnt gas.

Analyze absorbed solution using Ion Chromatography.

Data

*** End ***

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

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>ADHESIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style/Item No.</td>
<td>84-1LMISR4</td>
</tr>
<tr>
<td>Sample Receiving Date</td>
<td>2013/07/09</td>
</tr>
<tr>
<td>Testing Period</td>
<td>2013/07/09 TO 2013/07/15</td>
</tr>
</tbody>
</table>

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

**PART NAME No.1** : SILVER COLORED PASTE

<table>
<thead>
<tr>
<th>Test Item(s)</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexavalent Chromium Cr(VI)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by UV-VIS.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Antimony (Sb)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Beryllium (Be)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Polychlorinated Biphenyls (PCBs) (CAS No.: 1336-36-3)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by GC/MS.</td>
<td>0.5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Polychlorinated Naphthalene (PCNs)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by GC/MS.</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Polychlorinated Terphenyls (PCTs)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by GC/MS.</td>
<td>0.5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins) (CAS No.: 85535-84-8)</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by GC/MS.</td>
<td>100</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (α-HBCDD, β-HBCDD, γ-HBCDD) (CAS No.: 26637-99-4 and 3194-55-6 (134237-51-7, 134237-50-6, 134237-52-8))</td>
<td>mg/kg</td>
<td>With reference to US EPA Method 3050B. Analysis was performed by GC/MS.</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007. Analysis was performed by IC.</td>
<td>50</td>
<td>236</td>
</tr>
<tr>
<td>Halogen-Bromine (Br) (CAS No.: 10097-32-2)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007. Analysis was performed by IC.</td>
<td>50</td>
<td>n.d.</td>
</tr>
</tbody>
</table>
## Test Report

**No.**: CE/2013/71868  **Date**: 2013/07/16  **Page**: 3 of 19

### Test Item(s) | Unit | Method | MDL | Result
--- | --- | --- | --- | ---
BBP (Benzyl butyl phthalate) (CAS No.: 85-68-7) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
DEHP (Di-(2-ethylhexyl) phthalate) (CAS No.: 117-81-7) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
DiDP (Di-isodecyl phthalate) (CAS No.: 26781-40-0) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.01 | n.d.
DiNP (Di-isononyl phthalate) (CAS No.: 28955-12-0) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.01 | n.d.
DNOP (Di-n-octyl phthalate) (CAS No.: 117-84-0) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
DBP (Dibutyl phthalate) (CAS No.: 84-74-2) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
DMEP (Bis (2-methoxyethyl) phthalate) (CAS No.: 117-82-8) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
DHNUP (1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters) (CAS No.: 68515-42-4) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.01 | n.d.
DIHP (1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich) (CAS No.: 71888-89-6) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.01 | n.d.
DNHP (Di-n-hexyl phthalate) (CAS No.: 84-75-3) | % | With reference to EN 14372. Analysis was performed by GC/MS. | 0.003 | n.d.
**PVC** | **Analysis was performed by FTIR and FLAME Test.** | **-** | **Negative**

### Organic-tin compounds

| Component | Unit | Method | MDL | Result |
--- | --- | --- | --- | ---
Tributyl Tin (TBT) | mg/kg | With reference to ISO 17353. Analysis was performed by GC/FPD. | 0.03 | n.d.
Triphenyl Tin (TPhT) | mg/kg | With reference to ISO 17353. Analysis was performed by GC/FPD. | 0.03 | n.d.
Dibutyl Tin (DBT) | mg/kg | With reference to ISO 17353. Analysis was performed by GC/FPD. | 0.03 | n.d.
Dioctyl Tin (DOT) | mg/kg | With reference to ISO 17353. Analysis was performed by GC/FPD. | 0.03 | n.d.

---

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## Test Report

No.: CE/2013/71868  Date: 2013/07/16  Page: 4 of 19

<table>
<thead>
<tr>
<th>Test Item(s)</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tributyl Tin Oxide (TBTO)*** (CAS No.: 56-35-9)</td>
<td>mg/kg</td>
<td>With reference to ISO 17353. Analysis was performed by GC/FPD.</td>
<td>-</td>
<td>n.d.</td>
</tr>
<tr>
<td>Sum of PBBs</td>
<td>mg/kg</td>
<td>-</td>
<td>-</td>
<td>n.d.</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Sum of PBDEs</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by GC/MS.</td>
<td>-</td>
<td>n.d.</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Heptabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td>mg/kg</td>
<td>5</td>
<td>5</td>
<td>n.d.</td>
</tr>
</tbody>
</table>

Note:
1. mg/kg = ppm : 0.1wt% = 1000ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
4. " - " = Not Regulated
5. ** = Qualitative analysis (No Unit)
6. Negative = Undetectable / Positive = Detectable
7. ***: The substance was calculated by the test result of Tributyl Tin. The MDL was evaluated for Tributyl Tin. AX = A × F

<table>
<thead>
<tr>
<th>AX</th>
<th>A</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis(trIBUTyltin)oxide</td>
<td>Tributyl Tin (TBT)</td>
<td>1.0276</td>
</tr>
</tbody>
</table>

8. This report supersedes the previous document bearing the test report number CE/2013/71868 which was issued on 2013/07/15.
PFOS Reference Information : POPs - (EU) 757/2010
Outlawing PFOS as substances or preparations in concentrations above 0.001% (10ppm), in semi-finished products or articles or parts at a level above 0.1% (1000ppm), in textiles or other coated materials above 1μg/m².
1) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr\textsuperscript{6+} test method excluded)

2) Name of the person who made measurement: Climbgreat Yang

3) Name of the person in charge of measurement: Troy Chang

---

**Note\textsuperscript{**}\hspace{1cm}**:(1) For non-metallic material, add alkaline digestion reagent and heat to 90\textasciitilde95 \degree \text{C}.**

**Note\textsuperscript{**}\hspace{1cm}**(2) For metallic material, add pure water and heat to boiling.**
1. These samples were dissolved totally by pre-conditioning method according to below flow chart.
2. Name of the person who made measurement: Climb great Yang
3. Name of the person in charge of measurement: Troy Chang

**Flow Chart of digestion for the elements analysis performed by ICP-AES**

1. Cutting / Preparation
2. Sample Measurement
3. Acid digestion by suitable acid depended on different sample material (as below table)
4. Filtration

- **Solution**
  - Steel, copper, aluminum, solder: Aqua regia, HNO₃, HCl, HF, H₂O₂
  - Glass: HNO₃/HF
  - Gold, platinum, palladium, ceramic: Aqua regia
  - Silver: HNO₃
  - Plastic: H₂SO₄, H₂O₂, HNO₃, HCl
  - Others: Added appropriate reagent to total digestion

5. **Residue**
6. 1) Alkali Fusion
7. 2) HCl to dissolve

---

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PBB/PBDE analytical FLOW CHART

- Name of the person who made measurement: Roman Wong
- Name of the person in charge of measurement: Troy Chang

First testing process → Sample

Optional screen process

 Confirmation process → Sample pretreatment

→ Screen analysis

→ Sample extraction/ Soxhlet method

→ Concentrate/Dilute Extracted solution

→ Filter

→ Analysis by GC/MS

→ Issue Report
Analytical flow chart of Organic-Tin content

- Name of the person who made measurement: Ginny Chen
- Name of the person in charge of measurement: Troy Chang

1. Sample pretreatment
2. Sample extraction by organic solvent
3. Derived by Sodium tetraethylborate
4. Concentrate/Dilute Extracted solution
5. Analysis was performed by GC/FPD
6. Data
Chlorinated Paraffins analytical flow chart

- Name of the person who made measurement: Barry Tseng
- Name of the person in charge of measurement: Troy Chang

Sample pretreatment

Sample extraction by organic solvent

Concentrate/Dilute the extracted solution

Analysis was performed by GC/MS

Data
PCTs analytical flow chart

- Name of the person who made measurement: Barry Tseng
- Name of the person in charge of measurement: Troy Chang

Sample pretreatment

Sample extraction by organic solvent

Concentrate/Dilute the extracted solution

Analysis was performed by GC/MS

Data
PCNs analytical flow chart

- Name of the person who made measurement: Barry Tseng
- Name of the person in charge of measurement: Troy Chang

1. Sample pretreatment
2. Sample extraction by organic solvent
3. Concentrate/Dilute the extracted solution
4. Analysis was performed by GC/MS
5. Data
PCBs analytical flow chart

- Name of the person who made measurement: Barry Tseng
- Name of the person in charge of measurement: Troy Chang

Sample pretreatment

Sample extraction by organic solvent

Concentrate/Dilute the extracted solution

Analysis was performed by GC/MS

Data
Analysis flow chart for determination of PVC in material

- Name of the person who made measurement: Ginny Chen
- Name of the person in charge of measurement: Troy Chang

Sample pre-treatment

Flame test

Sample analyzed by FTIR

Check wave-number of C-Cl bonding

Data
Analytical flow chart of halogen content

- Name of the person who made measurement: Rita Chen
- Name of the person in charge of measurement: Troy Chang

1. Sample pretreatment / Separation
2. Weighting and putting sample in cell
3. Oxygen Bomb Combustion / Absorption
4. Dilution to fixed volume
5. Analysis was performed by IC
Analytical flow chart of phthalate content

- Name of the person who made measurement: Roman Wong
- Name of the person in charge of measurement: Troy Chang

1. Sample pretreatment/separation
2. Sample extraction by Soxhlet method
3. Concentrate/Dilute Extracted solution
4. Analysis was performed by GC/MS
5. Data
HBCDD analytical flow chart

- Name of the person who made measurement: Roman Wong
- Name of the person in charge of measurement: Troy Chang

Sample pretreatment/separation

Sample extraction by soxhlet method

Concentrate/Dilute Extracted solution

Analysis was performed by GC/MS

Data
PFOA/PFOS analytical flow chart of Ultrasonic extraction (LC/MS) procedure

- Name of the person who made measurement: Roman Wong
- Name of the person in charge of measurement: Troy Chang

1. Sample pretreatment
2. Sample extraction by Ultrasonic extraction (Reference method: US EPA 3550C)
3. Concentrate/Dilute Extracted solution
4. Analysis was performed by LC/MS
5. Data
* The tested sample / part is marked by an arrow if it's shown on the photo. *

CE/2013/71868

** End of Report **
## Test Report

No.: CE/2012/C1068F  Date: 2013/01/18  Page: 1 of 7

EPISIL TECHNOLOGIES INC.
NO. 3, INNOVATION RD 1, SCIENCE BASED INDUSTRIAL PARK, HSIN-CHU, TAIWAN, R. O. C.

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

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>IC WAFER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style/Item No.</td>
<td>AI PROCESS</td>
</tr>
<tr>
<td>Sample Receiving Date</td>
<td>2012/12/07</td>
</tr>
<tr>
<td>Testing Period</td>
<td>2012/12/07 TO 2012/12/18</td>
</tr>
</tbody>
</table>

Test Requested:

1. As specified by client, with reference to RoHS Directive 2011/65/EU Annex II to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs contents in the submitted sample.
2. As specified by client, to test Halogen-Fluorine, Chlorine, Bromine, Iodine contents in the submitted sample.

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

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

**PART NAME No.1**: MULTICOLOR WAFER

<table>
<thead>
<tr>
<th>Test Item(s)</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by ICP-AES.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexavalent Chromium Cr(VI)</td>
<td>mg/kg</td>
<td>With reference to IEC 62321: 2008 and performed by UV-VIS.</td>
<td>2</td>
<td>n.d.</td>
</tr>
<tr>
<td>Sum of PBBS</td>
<td></td>
<td></td>
<td></td>
<td>n.d.</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Sum of PBDEs</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Heptabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td></td>
<td></td>
<td>5</td>
<td>n.d.</td>
</tr>
</tbody>
</table>

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# Test Report

EPISIL TECHNOLOGIES INC.

NO. 3, INNOVATION RD 1, SCIENCE BASED INDUSTRIAL PARK, HSIN-CHU, TAIWAN, R. O. C.

<table>
<thead>
<tr>
<th>Test Item(s)</th>
<th>Unit</th>
<th>Method</th>
<th>MDL</th>
<th>Result No.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halogen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halogen-Fluorine (F)</td>
<td>mg/kg</td>
<td>With reference to BS EN 14582:2007.</td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>(CAS No.: 14762-94-8)</td>
<td></td>
<td>Analysis was performed by IC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halogen-Chlorine (Cl)</td>
<td></td>
<td></td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>(CAS No.: 22537-15-1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halogen-Bromine (Br)</td>
<td></td>
<td></td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>(CAS No.: 10097-32-2)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Halogen-Iodine (I)</td>
<td></td>
<td></td>
<td>50</td>
<td>n.d.</td>
</tr>
<tr>
<td>(CAS No.: 14362-44-8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. mg/kg = ppm : 0.1wt% = 1000ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
4. " - " = Not Regulated
Test Report

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EPISIL TECHNOLOGIES INC.
NO. 3, INNOVATION RD 1, SCIENCE BASED INDUSTRIAL PARK, HSIN-CHU, TAIWAN, R. O. C.

1) These samples were dissolved totally by pre-conditioning method according to below flow chart.
   (Cr₆⁺ test method excluded)
2) Name of the person who made measurement: Climbgreat Yang
3) Name of the person in charge of measurement: Troy Chang

Cutting / Preparation

Sample Measurement

Pb · Cd

Acid digestion by suitable acid depending on different sample material (as below table)

Hg

Microwave digestion with HNO₃/HCl/HF

Cr₆⁺ (Note**)

Add appropriate amount of digestion reagent

Heat to appropriate temperature to extract

Cool, filter digestate through filter

Add diphenyl-carbazide for color development

ICP-AES

Filtration

Solution

Residue

1) Alkali Fusion
2) HCl to dissolve

Sample Material | Digestion Acid
----------------|-----------------|
Steel, copper, aluminum, solder | Aqua regia, HNO₃, HCl, HF, H₂O₂
Glass | HNO₃/HF
Gold, platinum, palladium, ceramic | Aqua regia
Silver | HNO₃
Plastic | H₂SO₄, H₂O₂, HNO₃, HCl
Others | Added appropriate reagent to total digestion

**Note**: (1) For non-metallic material, add alkaline digestion reagent and heat to 90—95°C.
(2) For metallic material, add pure water and heat to boiling.
Analytical flow chart of halogen content

1) Name of the person who made measurement: Rita Chen
2) Name of the person in charge of measurement: Troy Chang

- Sample pretreatment / Separation
- Weighting and putting sample in cell
- Oxygen Bomb Combustion / Absorption
- Dilution to fixed volume
- Analysis was performed by IC
PBB/PBDE analytical FLOW CHART

- Name of the person who made measurement: Roman Wong
- Name of the person in charge of measurement: Troy Chang

First testing process → Sample

Optional screen process → Sample pretreatment

Confirmation process → Screen analysis

Sample extraction/Solvent method → Concentrate/Dilute Extracted solution

Filter → Analysis by GC/MS

Issue Report

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EPISIL TECHNOLOGIES INC.
NO. 3, INNOVATION RD 1, SCIENCE BASED INDUSTRIAL PARK, HSIN-CHU, TAIWAN, R. O. C.

* The tested sample / part is marked by an arrow if it's shown on the photo. *

** End of Report **