ICP Test Report Certification Packet

Company name: Littelfuse, Inc.

Product Series: TVS Array for ESD Protection

Product #: SP05xxBAHTG

Issue Date: October 4, 2010

It is hereby certified by Littelfuse, Inc. that there is neither RoHS (EU Directive 2002/95/EC)-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 TVS Array for ESD Protection 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:

Form 585-047 Rev. A 2/21/06
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>A194</td>
<td>Lead Frame</td>
<td>3-11</td>
</tr>
<tr>
<td>2</td>
<td>G600</td>
<td>Epoxy Moulding Compound</td>
<td>12-16</td>
</tr>
<tr>
<td>3</td>
<td>N/A</td>
<td>Pure Tin</td>
<td>17-21</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>Au Bonding Wire</td>
<td>22-27</td>
</tr>
<tr>
<td>5</td>
<td>2200D</td>
<td>Adhesive</td>
<td>28-32</td>
</tr>
</tbody>
</table>
Test Report

Test Report

Valid till: 2010/01/14

For Questions, Please Contact With SGS
www.tw.sgs.com

ASIM HK & ASIM TECHNOLOGY SINGAPORE
4F, WATSON CENTER, 16 KUNG YIP ST., KWAChng, HONG KONG (ASIM HK), 2 YISHUN AVENUE 7,
SINGAPORE (ASIM TECHNOLOGY SINGAPORE)

以下测试样品系由客户送样，且由客户确认并经客户确认如下 (The following samples was/were submitted and identified by/on behalf of the client as):

样品名称(Sample Description) : A194 Cu ALLOY

收件日期(Sample Receiving Date) : 2010/01/08

测试期间(Testing Period) : 2010/01/08 TO 2010/01/14

测试结果(Test Results) : 请见下页 (Please refer to next pages).

Ray Chang / Asst. Manager
Signed for and on behalf of SGS Taiwan Limited
## Test Results

### Test Item No. 1: Brown A194 Cu ALLOY (BROWN A194 Cu ALLOY)

<p>| 鉛 / Cadmium (Cd) | mg/kg | 參考 IEC 62321:2008方法，用感應耦合電磁原子發射光譜儀檢測。/ With reference to IEC 62321:2008 and performed by ICP-AES. | 2 | n.d. |
| 鉛 / Lead (Pb) | mg/kg | 參考 IEC 62321:2008方法，用感應耦合電磁原子發射光譜儀檢測。/ With reference to IEC 62321:2008 and performed by ICP-AES. | 2 | 34.8 |
| 水銀 / Mercury (Hg) | mg/kg | 參考 IEC 62321:2008方法，用感應耦合電磁原子發射光譜儀檢測。/ With reference to IEC 62321:2008 and performed by ICP-AES. | 2 | n.d. |
| 銻 / Hexavalent Chromium Cr(VI) by | ** | 參考 IEC 62321:2008方法，用Spot test / boiling water extraction方法檢測。/ With reference to IEC 62321:2008 and performed by Spot test / boiling water extraction Method. (See Note 6) | 0.02ug/kg with 50 cm² surface area | Negative |
| 鋁 / Antimony (Sb) | mg/kg | 參考US EPA 3052方法，用感應耦合電磁原子發射光譜儀檢測銦含量。/ With reference to US EPA Method 3052 for Antimony Content. Analysis was performed by ICP-AES. | 2 | n.d. |
| PFOA - Acid | | | | |
| PFOA - Metal Salt | | | | |
| PFOA - Anide | | | | |
| 全氟辛酸 (鈷) / PFOA (CAS No.: 600335-67-1) | μg/m² | 參考US EPA 3540C:1996方法，以液相層析質譜儀檢測全氟辛酸 (鈷)含量。/ With reference to US EPA Method 3540C:1996 method for PFOA Content. Analysis was performed by LC/MS. | 1 | n.d. |</p>
<table>
<thead>
<tr>
<th>測試項目</th>
<th>(Test Items)</th>
<th>單位 (Unit)</th>
<th>測試方法 (Method)</th>
<th>方法檢測極限值 (MDL) (Result)</th>
</tr>
</thead>
<tbody>
<tr>
<td>多溴聯苯醚和 / Sum of PBDEs</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>一溴聯苯 / Monobromobiphenyl</td>
<td></td>
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<tr>
<td>二溴聯苯 / Dibromobiphenyl</td>
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<tr>
<td>三溴聯苯 / Tribromobiphenyl</td>
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<tr>
<td>四溴聯苯 / Tetrabromobiphenyl</td>
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<td>五溴聯苯 / Pentabromobiphenyl</td>
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<td>六溴聯苯 / Hexabromobiphenyl</td>
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<td>七溴聯苯 / Heptabromobiphenyl</td>
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<td>八溴聯苯 / Octabromobiphenyl</td>
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<tr>
<td>九溴聯苯 / Nonabromobiphenyl</td>
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<tr>
<td>十溴聯苯 / Decabromobiphenyl</td>
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<td></td>
</tr>
<tr>
<td>多溴聯苯醚總和 / Sum of PBDEs ether</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>一溴聯苯醚 / Monobromobiphenyl ether</td>
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<td></td>
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</tr>
<tr>
<td>二溴聯苯醚 / Dibromodiphenyl ether</td>
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<tr>
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</tr>
<tr>
<td>酸素 / Halogen</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>酸素 (氟) / Halogen-Fluorine (F) (CAS No.: 014762-94-8)</td>
<td>mg/kg</td>
<td>參考BS EN 14582:2007方法，以離子子量相等於/測試/</td>
<td>50</td>
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</tr>
<tr>
<td>酸素 (氯) / Halogen-Chlorine (Cl) (CAS No.: 022537-15-1)</td>
<td>mg/kg</td>
<td>參考BS EN 14582:2007方法，以離子子量相等於/測試/</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>酸素 (溴) / Halogen-Bromine (Br) (CAS No.: 010997-32-2)</td>
<td>mg/kg</td>
<td>參考BS EN 14582:2007方法，以離子子量相等於/測試/</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>酸素 (碘) / Halogen-Iodine (I) (CAS No.: 014362-44-8)</td>
<td>mg/kg</td>
<td>參考BS EN 14582:2007方法，以離子子量相等於/測試/</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

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測試報告
Test Report

ASML HK & ASML TECHNOLOGY SINGAPORE
4F, WATSON CENTER, 16 KUNG YIP ST., KWAI CHUNG, HONG KONG (ASH HK), 2 YISHUN AVENUE 7., SINGAPORE (ASML TECHNOLOGY SINGAPORE)

備註(Note):
1. mg/kg = ppm; 0.1wt% = 1000ppm
2. n.d. = Not Detected (未檢出)
3. MDL = Method Detection Limit (方法檢測極限值)
4. "=" = Not Regulated (無規格值)
5. ** = Qualitative analysis (No Unit) 定性分析（無單位）
6. Spot test:
   Negative = Absence of Cr(VI) coating / surface layer (鈷層中未檢測到六價鈷)
   Positive = Presence of Cr(VI) coating / surface layer (鈷層中檢測到六價鈷)
   The tested sample should be further verified by boiling-water-extraction method if the spot test result cannot be confirmed.
   (當該測項無法確認時，測試樣品可藉由boiling-water-extraction測試方法進一步確認)
   Boiling-water-extraction:
   Negative = Absence of Cr(VI) coating / surface layer (鈷層中未檢測到六價鈷)
   Positive = Presence of Cr(VI) coating / surface layer (鈷層中檢測到六價鈷)
   The detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm² sample surface area.
   該溶液濃度≥0.02 mg/kg with 50 cm² (sample surface area)

PFOs參考資料(Reference Information):
(1) 該物質不可販售於市場或使用於特殊物質或配置成分重量濃度等於或大於0.005%。
   (May not be placed on the market or used as a substance or constituent of preparations in a concentration equal to or higher than 0.005 % by mass.)
(2) 該物質不可販售於市場上的半成品或商品或其製品；假若零件上明顯地具有PFOs並參照結構上及微細構造上計算PFOs重量濃度等於或大於0.1%，而紡織品或其他覆蓋物質，如果PFOs在覆蓋物質中含量等於或大於1μg/m²。
   (May not be placed on the market in semi-finished products or articles, or parts thereof, if the concentration of PFOs is equal to or higher than 0.1 % by mass calculated with reference to the mass of structurally or microstructurally distinct parts that contain PFOs or, for textiles or other coated materials, if the amount of PFOs is equal to or higher than 1μg/m² of the coated material.)

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SGS
No. 64, Nan Fa Rd, NanFa Export Processing Zone, Tainan City, Taiwan / 64, Nan Fa Road, Nan Fa Export Processing Zone, Tainan City
Tel: +886-6-2873777 Fax: +886-6-2873888
www.sgs.com

Member of the SGS Group
測試報告
Test Report

1) 根據以下的流程圖之條件，樣品已完全溶解。（六價鉻測試方法除外）
   These samples were dissolved totally by
   pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> test method excluded)

2) 測試人員： 余宏明 / Name of the person who made measurement: Hungming Li

3) 測試負責人： 高仲安 / Name of the person in charge of measurement: Ray Chang

- 切裁、製樣 / Cutting - Preparation
- 測試樣品重量 / Sample Measurement
- 煉揵 / Fire
- 鉛、錫、鉛 / Sn, Pb, Cd
- 硝酸/鹽酸/氫氟酸的微波消化 / Microwave digestion with
  
  * HNO₃/HCl/HF

  - 氯 / Solution
  - 無 /無

  - 冷卻、過濾樣品 / Cool, filter digestate through filter
  - 加入發色劑偶氮 / Add diphenyl-carbazide for color development
  - 以紫外光-可见光光譜 / Measure the absorbance at 540 nm by UV-VIS

- 硝酸/鹽酸/氫氟酸的微波消化
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  - HNO₃/HCl/HF

- 硝酸/鹽酸/氫氟酸的微波消化
  - 硝酸/鹽酸/氫氟酸的微波消化 / Microwave digestion with
  - HNO₃/HCl/HF

- 硝酸/鹽酸/氫氟酸的微波消化
  - 硝酸/鹽酸/氫氟酸的微波消化 / Microwave digestion with
  - HNO₃/HCl/HF

- 硝酸/鹽酸/氫氟酸的微波消化
  - 硝酸/鹽酸/氫氟酸的微波消化 / Microwave digestion with
  - HNO₃/HCl/HF

- 硝酸/鹽酸/氫 fluoride
Test Report

多溴聯苯/多溴聯苯醚 分析流程圖 / PBB/PBDE analytical FLOW CHART

1) 測試人員：Anson Tsao / Name of the person who made measurement: Anson Tsao
2) 測試負責人：Ray Chang / Name of the person in charge of measurement: Ray Chang

**Initial Test Process** → **Optional Screen Process**

Sample / 樣品

Sample pretreatment / 樣品前處理

Screen analysis / 初篩分析

Sample extraction / 樣品萃取

Concentrate/Dilute Extracted solution / 萃取液濃縮/稀釋

Filter / 萃取液過濾

Analysis by GC/MS / 氣相層析質譜儀分析

Issue Report / 作業報告
Test Report

ASIM HK & ASIM TECHNOLOGY SINGAPORE
4F, WATSON CENTER, 16 KUNG VIP ST., KWI CHUNG, HONG KONG (ASIM HK), 2 YISHUN AVENUE 7, SINGAPORE (ASIM TECHNOLOGY SINGAPORE)

Analytical flow chart of PFOA/ PFOS content

1) 测试人员：曾嘉琪 / Name of the person who made measurement: Anson Tsao

2) 测试负责人：张伯霖 / Name of the person in charge of measurement: Ray Chang

- 样品前处理 / Sample pretreatment

- 索式萃取法萃取 / Sample extraction by Soxhlet extraction (Reference method US EPA 3540)

- 萃取液浓缩/ 液化 / Concentrate/Dilute Extracted solution

- 以液相层析质谱仪分析萃取液 / Analysis was performed by LC/MS

- 数据 / Data

除非另有说明，本报告中的结果仅适用于所测样品。本报告不得在未经书面许可的情况下复制。
卤素分析流程图 / Analytical flow chart of halogen content

1) 测试人员：李宏伟 / Name of the person who made measurement: Hungming Li
2) 测试负责人：张伯勇 / Name of the person in charge of measurement: Ray Chang

- 样品拍照及报告编号 / Sample picture and report number
- 样品前处理/分样 / Sample pretreatment/separation
- 称重及将样品放入样品槽中 / Weighting and putting sample in cell
- 氧气爆炸/吸收 / Oxygen Bomb Combustion / Absorption
- 稀释至固定体积 / Dilution to fixed volume
- 分析是IC进行 / Analysis was performed by IC

除非另有指示，所有在本报告中所示的数据在未得到所有方的事先同意和书面许可下，不得复制、传递和出版。
Test Report

No. SHAEC1005451803 Date: 06 May 2010 Page 1 of 5

SUMITOMO BAKELITE (SUZHOU) CO., LTD.
140 JINJIHU ROAD, START-UP AREA, CHINA-SINGAPORE SUZHOU INDUSTRIAL PARK

The following sample(s) was/were submitted and identified on behalf of the clients as: EME-6300 TYPE H7L

SGS Job No.: SP10-014090 - SH
Date of Sample Received: 29 Apr 2010
Testing Period: 29 Apr 2010 - 06 May 2010
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).

Signed for and on behalf of SGS-CSTC Ltd.

Liu Haipeng, Helen
Report Reviewer
## Test Results:

### Test Part Description:

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>SGS Sample ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHA10-054518.002</td>
<td>Dark grey solid grain</td>
</tr>
</tbody>
</table>

### Remarks:

1. $1 \text{ mg/kg} = 1 \text{ ppm} = 0.0001\%$
2. MDL = Method Detection Limit
3. ND = Not Detected ($< \text{ MDL}$)
4. '-' = Not Regulated

## RoHS Directive 2002/95/EC

### Test Method:

With reference to IEC 62321:2008

1. Determination of Cadmium by ICP-OES (section 8).
2. Determination of Lead by ICP-OES (section 8).
3. Determination of Mercury by ICP-OES (section 7).
5. Determination of PBBs / PBDEs content by GC-MS (Annex A).

### Test Item(s)

<table>
<thead>
<tr>
<th>Test Item(s)</th>
<th>Limit</th>
<th>Unit</th>
<th>MDL</th>
<th>002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>100</td>
<td>mg/kg</td>
<td>2</td>
<td>ND</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>1,000</td>
<td>mg/kg</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>1,000</td>
<td>mg/kg</td>
<td>2</td>
<td>ND</td>
</tr>
<tr>
<td>Hexavalent Chromium (Cr(VI))</td>
<td>1,000</td>
<td>mg/kg</td>
<td>2</td>
<td>ND</td>
</tr>
<tr>
<td>Sum of PBBs</td>
<td>-</td>
<td>mg/kg</td>
<td>-</td>
<td>ND</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
<tr>
<td>Sum of PBDEs</td>
<td>1,000</td>
<td>mg/kg</td>
<td>-</td>
<td>ND</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td>-</td>
<td>mg/kg</td>
<td>5</td>
<td>ND</td>
</tr>
</tbody>
</table>
## Test Report

**Test Item(s)** | **Limit** | **Unit** | **MDL** | **002**
--- | --- | --- | --- | ---
Dibromodiphenyl ether | - | mg/kg | 5 | ND
Tri dibromodiphenyl ether | - | mg/kg | 5 | ND
Tetrabromodiphenyl ether | - | mg/kg | 5 | ND
Pentabromodiphenyl ether | - | mg/kg | 5 | ND
Hexabromodiphenyl ether | - | mg/kg | 5 | ND
Heptabromodiphenyl ether | - | mg/kg | 5 | ND
Octabromodiphenyl ether | - | mg/kg | 5 | ND
Nonabromodiphenyl ether | - | mg/kg | 5 | ND
Decabromodiphenyl ether | - | mg/kg | 5 | ND

**Notes:**

1. The maximum permissible limit is quoted from the document 2005/618/EC amending RoHS directive 2002/95/EC

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ATTACHMENTS

1) Name of the person who made measurement: Allan Xiao/Spring Zuo/Frank Fang/ Elim Lin
2) Name of the person in charge of measurement: Terry Wang/Phoebe Shen
3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr\(^{3+}\) and PBBs/PBDEs test method excluded)

Sample Preparation

Sample Measurement

**Pb/Cd/Hg**
- Acid digestion with microwave/ hotplate
- Filtration
- Solution
- Residue
- Total digestion
- ICP-OES
- DATA

**PBBs/PBDEs**
- Sample solvent extraction
- Concentration/ Dilution of extraction solution
- Nonmetallic material
- Adding extraction solution
- Heating to 90~95°C for extraction
- Filtration and pH adjustment
- Adding 1,5-diphenylcarbazide for color development
- A red color indicates the presence of Cr\(^{3+}\). If necessary, confirm with UV-Vis.
- UV-Vis
- DATA

**Cr**
- Metallic material
- Positive
- Spot test
- Negative
- Boiling water extraction
- Adding 1,5-diphenylcarbazide for color development
- A red color indicates the presence of Cr\(^{3+}\). If necessary, confirm with UV-Vis.
- UV-Vis
- DATA
SGS authenticate the photo on original report only

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

Sample Description : Tin
Sample No. : 1865971
Sample Condition : As per attached photograph
Part No. : Sn 100A
Batch/Lot No. : 497

Sample Receiving Date : 11-May-2010
Testing Period : 11-May-2010 to 18-May-2010

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

Test Method :
1. With reference to IEC 62321:2008 for Lead content, Analysis was performed by ICP-OES.
2. With reference to IEC 62321:2008 for Cadmium content, Analysis was performed by ICP-OES.
3. With reference to IEC 62321:2008 for Mercury content, Analysis was performed by ICP-OES.
4. With reference to IEC 62321:2008 for Hexavalent Chromium by Colorless and Colored Chromate Coating on Metals/ Colorimetric Method, Analysis was performed by UV-Vis spectrometry.
5. With reference to IEC 62321:2008 for PBB/PBDE content, Analysis was performed by GC/MS.

Test Results : Please refer to next page.

CONCLUSION

Based on the performed tests on submitted samples, the result comply with the RoHS Directive 2002/95/EC and its subsequent amendments.

Signed for and on behalf of
SGS (Thailand) Limited

Pompana Lirathpong
Hardlines Testing Manager

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Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested and such sample(s) are retained for 70 days only. This Test Report cannot be reproduced, except in full, without prior written permission of the Company.
## TEST RESULTS

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

<table>
<thead>
<tr>
<th>Test Item(s):</th>
<th>Method (Refer to)</th>
<th>Result (1)</th>
<th>MDL</th>
<th>RoHS Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead (Pb)</td>
<td>(1)</td>
<td>34</td>
<td>2</td>
<td>1000</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>(2) n.d.</td>
<td></td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>(3) n.d.</td>
<td></td>
<td>2</td>
<td>1000</td>
</tr>
<tr>
<td>Hexavalent Chromium (Cr(VI))</td>
<td>(4) Negative</td>
<td></td>
<td></td>
<td>#</td>
</tr>
<tr>
<td>Spot test / boiling water extraction (optional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sum of PBBS</td>
<td>(5)* n.d.</td>
<td></td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td>n.d.</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# TEST RESULTS

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

<table>
<thead>
<tr>
<th>Test Item(s):</th>
<th>Method (Refer to)</th>
<th>Result (1)</th>
<th>MDL</th>
<th>RoHS Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum of PBDEs</td>
<td>(5)*</td>
<td>n.d.</td>
<td>-</td>
<td>1000</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Heptabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td>n.d.</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Test Part Description**

Result (1) metal

Note:

(a) mg/kg = ppm; 0.1 wt% = 1000 ppm
(b) The results shown are based on the total weight of dry sample
(c) n.d. = Not Detected
(d) MDL = Method Detection Limit
(e) The exemption of DecaBDE in polymeric application according 2005/17/EC was overruled by the European Court of Justice by its decision of 01.04.2008. Subsequently DecaBDE will be included in the sum of PBDE after 01.07.2008
(f) Spot-test: Negative - Absence of CrVI coating, Positive = Presence of CrVI coating.
   (The tested sample should be further verified by boiling-water-extraction method if the spot test result cannot be confirmed.)
   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 area.
(g) # = Positive indicates the presence of Hexavalent Chromium on the areas and result be regarded as conflict with RoHS requirement.
   Negative indicates the absence of CrVI on the tested areas and result be regarded as no conflict with RoHS requirement.
(h) "--" = Not regulated

"Test(s) marked * on this Report are not included in the TISI Accreditation Schedule for our Laboratory"
Flow Chart for RoHS : Pb/Cd/Hg/Cr6+-PBBs/PBDEs Testing

1. Operator : Slam Polavut
2. Section Chief : Laddawan Urampit
3. The sample was dissolved totally by pre-conditioning method according to below flowchart. (Cr6+ and PBBs/PBDEs test method excluded)

Mechanical Sample Preparation

Sample Measurement

Pb/Cd/Hg

Acid digestion with microwave / hotplate

Filtration

Residue

Yes

Total Digestion

ICP-OES/AAS

DATA

No

PBBs/PBDEs

Sample solvent extraction

Concentration / Dilution of extraction solution

Nonmetallic material

Adding extraction solution

Heating to 90-95 degree C for extraction

Filtration and pH adjustment

Adding 1,1-diphenylcarbazide for color development

UV-Vis

DATA

Metallic material

Positive

Spot Test

Negative

Boiling water extraction

Adding 1,1-diphenylcarbazide for color development

A red color indicates the presence of Cr6+ if necessary, confirm with UV-Vis

DATA
Test Report

No.: KA/2009/C1254A-06  Date: 2009/12/18  Page: 1 of 6

TANAKA ELECTRONICS (MALAYSIA) SDN. BHD.
PLOT 11, PHASE IV, BAYAN LEPAS FREE INDUSTRIAL ZONE,
11900 PENANG, MALAYSIA.

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

Sample Description: AU BONDING WIRE
Sample Receiving Date: 2009/12/15
Testing Period: 2009/12/15 TO 2009/12/18

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

Procedures for the Determination of Levels of Regulated Substances in Electrotechnical Products.

(1) Determination of Cadmium by ICP-AES.
(2) Determination of Lead by ICP-AES.
(3) Determination of Mercury by ICP-AES.
(4) Determination of Hexavalent Chromium by UV/Vis Spectrometry.
(5) Determination of PBB and PBDE by GC/MS.

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

Ray Chang / Asst. Manager
Signed for and on behalf of
SGS Taiwan Limited
### Test Report

**Test Report**

**No.** KA/2009/C1254A-06  **Date:** 2009/12/18  **Page:** 2 of 6

**TANAKA ELECTRONICS (MALAYSIA) SDN. BHD.**
**PLOT 11, PHASE IV, BAYAN LEPAS FREE INDUSTRIAL ZONE, 11900 PENANG, MALAYSIA.**

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

<table>
<thead>
<tr>
<th>Test Item (s):</th>
<th>Method (Refer to)</th>
<th>Result No.1</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>(1)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>(2)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>(3)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Hexavalent Chromium Cr(VI) by alkaline extraction</td>
<td>(4)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Sum of PBBs</td>
<td>(5)</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Sum of PBDEs</td>
<td></td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tetrabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Pentabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Hexabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Heptabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
</tbody>
</table>

**TEST PART DESCRIPTION:**

**NO.1:** GOLD AU BONDING WIRE
Test Report  
No. : KA/2009/C1254A-08  
Date : 2009/12/18  
Page : 3 of 6  

TANAKA ELECTRONICS (MALAYSIA) SDN. BHD.  
PLOT 11, PHASE IV, BAYAN LEPAS FREE INDUSTRIAL ZONE,  
11900 PENANG, MALAYSIA.  

Note :  
1. mg/kg = ppm : 0.1wt% = 1000ppm  
2. n.d. = Not Detected  
3. MDL = Method Detection Limit  
4. "*" = Not Regulated  
5. This is the additional test report of KA/2009/C1254 which was issued on 2009/12/18.  
   Please refer to KA/2009/C1254 for original information.
Test Report

No.: KA2009/C1254A-06  Date: 2009/12/18  Page: 4 of 6

TANAKA ELECTRONICS (MALAYSIA) SDN. BHD.
PLOT 11, PHASE IV, BAYAN LEPAS FREE INDUSTRIAL ZONE,
11900 PENANG, MALAYSIA.

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: Hungming Li

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>Cr³⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid digestion by suitable acid depended on different sample material (as below table)</td>
<td>Microwave digestion with HNO₃/HCl/HF</td>
<td>Add appropriate amount of digestion reagent</td>
<td>Heat to appropriate temperature to extract</td>
</tr>
<tr>
<td>Filtration</td>
<td></td>
<td></td>
<td>Cool, filter digestate through filter</td>
</tr>
<tr>
<td>Solution</td>
<td></td>
<td></td>
<td>Add diphenyl-carbazide for color development</td>
</tr>
<tr>
<td>Residue</td>
<td>1) Alkali fusion</td>
<td>2) HCl to dissolve</td>
<td>Measure the absorbance at 540 nm by UV-VIS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Material</th>
<th>Digestion Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel, copper, aluminum, solder</td>
<td>Aqua regia, HNO₃, HCl, HF, H₂O₂</td>
</tr>
<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>

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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Test Report
No. : K2A2009/C1254A-06 Date : 2009/12/18 Page : 5 of 6

TANAKA ELECTRONICS (MALAYSIA) SDN. BHD.
PLOT 11, PHASE IV, BAYAN LEPAS FREE INDUSTRIAL ZONE,
11900 PENANG, MALAYSIA.

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

First testing process
Optional screen process
Confirmation process

Sample
Sample pretreatment
Screen analysis
Sample extraction/ Soxhlet method
Concentrate/Dilute Extracted solution
Filter
Analysis by GC/MS
Issue Report
** End of Report **

HENKEL
MANUFACTURING SITES: USA, KOREA, CHINA, UK, AND JAPAN.
MAIN OFFICE: 20021 SUSANA ROAD, RANCHO DOMINGUEZ,
CALIFORNIA, 90221, USA

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

Sample Description: ADHESIVE
Style/Item No.: 2200D
Sample Receiving Date: 2009/11/11

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

Test Method
: With reference to IEC 62321: 2008
  Procedures for the Determination of Levels of Regulated Substances in
  Electrotechnical Products.
  (1) Determination of Cadmium by ICP-AES.
  (2) Determination of Lead by ICP-AES.
  (3) Determination of Mercury by ICP-AES.
  (4) Determination of Hexavalent Chromium by UV/Vis Spectrometry.
  (5) Determination of PBB and PBDE by GC/MS.

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

Chenyu Kung / Operation Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory – Taipei

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Member of the SGS Group (SGS SA)
Test Report
No.: CE/2009/B2959  Date: 2009/11/18  Page: 2 of 5

HENKEL
MANUFACTURING SITES: USA, KOREA, CHINA, UK, AND JAPAN.
MAIN OFFICE: 20021 SUSANA ROAD, RANCHO DOMINGUEZ,
CALIFORNIA, 90221, USA

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

<table>
<thead>
<tr>
<th>Test Item(s):</th>
<th>Method (Refer to)</th>
<th>Result No.1</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>(1)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>(2)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>(3)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td>Hexavalent Chromium Cr(VI) by alkaline extraction</td>
<td>(4)</td>
<td>n.d.</td>
<td>2</td>
</tr>
<tr>
<td><strong>Sum of PBBs</strong></td>
<td></td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Monobromobiphenyl</td>
<td>(5)</td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Dibromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tribromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tetrabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Pentabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Hexabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Heptabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Octabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Nonabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Decabromobiphenyl</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td><strong>Sum of PBDEs</strong></td>
<td></td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Monobromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Dibromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Tribromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
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<td>n.d.</td>
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<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Octabromodiphenyl ether</td>
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<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Nonabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
<tr>
<td>Decabromodiphenyl ether</td>
<td></td>
<td>n.d.</td>
<td>5</td>
</tr>
</tbody>
</table>

**TEST PART DESCRIPTION:**

NO.1 : SILVER COLORED PASTE

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

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Member of the SGS Group (SGS SA)
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

<table>
<thead>
<tr>
<th>Sample Material</th>
<th>Digestion Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel, copper, aluminum, solder</td>
<td>Aqua regia, HNO\textsubscript{3}, HCl, HF, H\textsubscript{2}O\textsubscript{2}</td>
</tr>
<tr>
<td>Glass</td>
<td>HNO\textsubscript{3}/HF</td>
</tr>
<tr>
<td>Gold, platinum, palladium, ceramic</td>
<td>Aqua regia</td>
</tr>
<tr>
<td>Silver</td>
<td>HNO\textsubscript{3}</td>
</tr>
<tr>
<td>Plastic</td>
<td>H\textsubscript{2}SO\textsubscript{4}, H\textsubscript{2}O\textsubscript{2}, HNO\textsubscript{3}, HCl</td>
</tr>
<tr>
<td>Others</td>
<td>Any acid to total digestion</td>
</tr>
</tbody>
</table>

Hot to appropriate temperature to extract

Cool, filter digestate through filter

Add diphenyl-carbazide for color development

measure the absorbance at 540 nm by UV-VIS
PBB/PBDE analytical FLOW CHART

1) Name of the person who made measurement: Roman Wong
2) Name of the person in charge of measurement: Shinjyh Chen

First testing process -> Sample

Optional screen process

Confirmation process -> Sample pretreatment

Sample pretreatment

Screen analysis

Sample extraction/Soxhlet method

Concentrate/Dilute Extracted solution

Filter

Analysis by GC/MS

Issue Report
** End of Report **