ICP Test Report Certification Packet

Company name: Littelfuse, Inc.

Product Series: Telecom Brick Fuse

Product #: 461xxx Series

Issue Date: April 1, 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.

And it is certified by Littelfuse, Inc. that the series products listed above are compliant with Halogen Free permissible limits (Cl≤900ppm, Br≤900ppm, Cl +Br≤1500ppm), as defined according to IEC 61249-2-21 standard.

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:

[Signature]

< Global EHS Engineer>

(1) Parts, sub-materials and unit parts

This document covers the Telecom Brick Fuse 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:

Pb (lead) contained in the high temperature melting solder > 85% and is categorized as exempt under section 7a of the RoHS Annex.
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>910-259</td>
<td>Cap</td>
<td>3-7</td>
</tr>
<tr>
<td>2</td>
<td>909-422</td>
<td>Body</td>
<td>8-15</td>
</tr>
<tr>
<td>3</td>
<td>082xxx-001</td>
<td>Element – Cu99.9MSn</td>
<td>16-19</td>
</tr>
<tr>
<td>4</td>
<td>648106-001</td>
<td>Yarn</td>
<td>20-27</td>
</tr>
<tr>
<td>5</td>
<td>692235</td>
<td>Solder</td>
<td>28-33</td>
</tr>
</tbody>
</table>
Test Report

Applicant: Littelfuse Inc.,
LiMA Technology Center, Lipa City,
Malvar, Batangas

Number : TWNC00300505
Date : Mar 07, 2013

Sample Description:
One (1) group of submitted samples said to be:
Part Description : Cap
Part Number : 910-259
Date Sample Received : Feb 26, 2013
Date Test Started : Feb 26, 2013

Test Conducted:
As requested by the applicant, for details please refer to attached pages.

Authorized by:
On Behalf of Intertek Testing Services
Taiwan Limited

K. Y. Liang
Director
### (I) Test Result Summary:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Unit</th>
<th>Test Method</th>
<th>Result</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy Metal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cadmium (Cd) content</td>
<td>ppm</td>
<td>With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>ppm</td>
<td>With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.</td>
<td>34</td>
<td>119</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>ppm</td>
<td>With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium VI (Cr(^{6+})) content</td>
<td>mg/kg with 50 cm(^2)</td>
<td>With reference to IEC 62321: 2008, by boiling water extraction and determined by UV-Vis Spectrophotometer.</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Remarks: ppm = parts per million based on weight of tested sample = mg/kg  
ND = Not detected  
RL = Reporting Limit, Quantitation limit of analyte in sample  
mg/kg with 50 cm\(^2\) = milligram per kilogram with 50 square centimeter  
Negative = A negative test result indicated positive observation was not found at the time of Test.

Tested Components  
(1) Silvery metal cap  
(2) Silvery plating layer

Responsibility of Chemist: Kevin Liu/ Irene Chiou

Date Sample Received : Feb 26, 2013  
Test Period : Feb 26, 2013 to Mar 04, 2013

### (II) Limit:

<table>
<thead>
<tr>
<th>Restricted Substances</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) content</td>
<td>0.01% (100ppm)</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Chromium VI (Cr(^{6+})) content</td>
<td>0.1% (1000ppm)</td>
</tr>
</tbody>
</table>

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.
(Ⅲ) Measurement Flowchart:
Test For Cd/Pb/Hg/Chromium (VI)

Sample preparation

Take sample and immerse into Aqua Regia, start to strip plating layer

Stop the stripping procedure upon color change completely

Take the Aqua solution as plating component and stripped body as substrate component

Cd/Pb/Hg

For different material, digest the sample with appropriate acid *1

Confirm the tested samples are totally dissolved

Make up with deionized water

Analyzed by ICP-OES

Substrate

Cr\(^{6+}\)

By spot test

Negative *2

Get 50 cm\(^2\) sample

By boiling water extraction

Make up with deionized water and add diphenyl-carbazide solution

Analyzed by UV-VIS
Test Conducted

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.

End of Report

This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contrast, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.
Test Conducted Number: TWNC00300505

Photo

Intertek Testing Services Taiwan Ltd.
8F., No. 423, Ruiguang Rd., Neihu District, Taipei 11492, Taiwan, R.O.C.

全国公证检验股份有限公司
11492台北市內湖區瑞光路423號8樓
Tel: (+886-2) 6602-2888・2797-8885 Fax: (+886-2) 6602-2410
Test Report

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Date: Nov 19, 2012

Sample Description:
One (1) group of submitted samples said to be:
Part Description: Body
Part Number: 909-422
Date Sample Received: Nov 12, 2012
Date Test Started: Nov 13, 2012

Test Conducted:
As requested by the applicant, for details please refer to attached pages.

Authorized By:
On Behalf Of Intertek Testing Services
Taiwan Limited

K. Y. Liang
Director
Test Conducted

(I) Test Result Summary:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Result (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy Metal</strong></td>
<td></td>
</tr>
<tr>
<td>Cadmium (Cd) content</td>
<td>ND</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>ND</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Polybrominated Biphenyls (PBBs)</strong></td>
<td></td>
</tr>
<tr>
<td>Monobrominated Biphenyls (MonoBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Dibrominated Biphenyls (DiBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Tribrominated Biphenyls (TriBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Tetrabrominated Biphenyls (TetraBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Pentabrominated Biphenyls (PentaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Hexabrominated Biphenyls (HexaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Heptabrominated Biphenyls (HeptaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Octabrominated Biphenyls (OctaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Nonabrominated Biphenyls (NonaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Decabrominated Biphenyl (DecaBB)</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Polybrominated Diphenyl Ethers (PBDEs)</strong></td>
<td></td>
</tr>
<tr>
<td>Monobrominated Diphenyl Ethers (MonoBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Dibrominated Diphenyl Ethers (DiBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Tribrominated Diphenyl Ethers (TriBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Tetrabrominated Diphenyl Ethers (TetraBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Pentabrominated Diphenyl Ethers (PentaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Hexabrominated Diphenyl Ethers (HexaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Heptabrominated Diphenyl Ethers (HeptaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Octabrominated Diphenyl Ethers (OctaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Nonabrominated Diphenyl Ethers (NonaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Decabrominated Diphenyl Ether (DecaBDE)</td>
<td>ND</td>
</tr>
</tbody>
</table>
### Test Result Summary:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>White Plastic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Halogen Content</strong></td>
<td></td>
</tr>
<tr>
<td>Fluorine (F)</td>
<td>ND</td>
</tr>
<tr>
<td>Chlorine (Cl)</td>
<td>ND</td>
</tr>
<tr>
<td>Bromine (Br)</td>
<td>ND</td>
</tr>
<tr>
<td>Iodine (I)</td>
<td>ND</td>
</tr>
</tbody>
</table>

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg  
ND = Not detected

Responsibility of Chemist: Irene Chiou / Kevin Liu / Cathy Chen

Date Sample Received: Nov 12, 2012  
Test Period: Nov 13, 2012 To Nov 15, 2012

### RoHS Limits:

<table>
<thead>
<tr>
<th>Restricted Substances</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) Content</td>
<td>0.01% (100 ppm)</td>
</tr>
<tr>
<td>Lead (Pb) Content</td>
<td>0.1% (1000 ppm)</td>
</tr>
<tr>
<td>Mercury (Hg) Content</td>
<td>0.1% (1000 ppm)</td>
</tr>
<tr>
<td>Chromium VI (CrVI) Content</td>
<td>0.1% (1000 ppm)</td>
</tr>
<tr>
<td>Polybrominated Biphenyls (PBBs)</td>
<td>0.1% (1000 ppm)</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ethers (PBDEs)</td>
<td>0.1% (1000 ppm)</td>
</tr>
</tbody>
</table>

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.
**Test Conducted**

(Ⅲ) Test Method:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Test Method</th>
<th>Reporting Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in annex C, by alkaline digestion and determined by UV-Vis spectrophotometer.</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Polybrominated Biphenyls (PBBs)</td>
<td>With reference to IEC 62321 edition 1.0:2008 in annex A, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary.</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ethers (PBDEs)</td>
<td>With reference to IEC 62321 edition 1.0:2008 in annex A, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary.</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Halogen Content</td>
<td>With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph.</td>
<td>50 ppm</td>
</tr>
</tbody>
</table>

Remark: Reporting limit = Quantitation limit of analyte in sample
(IV) Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBS/PBDES Contents

Sample preparation

For non-metal part

Take sample and immerse into Aqua Regia, start to strip plating layer

Stop the stripping procedure upon color change completely

Take the Aqua solution as plating component and stripped body as substrate component

For metal part

PBBs/PBDES

Weigh sample and add organic solvent

By Soxhlet extraction or Solvent extraction

Concentrate the extract and make up with organic solvent

Analyzed by GC-MSD

Cr**

Weigh sample and add alkaline solution

Definite temp. extraction

Cool and filter the extract

Analyzed by ICP-OES

Cd/Pb/Hg

For different material, digest the sample with appropriate acid*1

Confirm the tested samples are totally dissolved

Make up with deionized water

Analyzed by UV-VIS

Substrate

Plating

Cr**

By spot test

Negative *2

Get 50cm² sample

By boiling water extraction

Make up with deionized water and add diphenyl-carbazide solution

Analyzed by ICP-OES

*1

*2
Test Conducted

(IV) Measurement Flowchart:

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.
Test Conducted

(IV) Measurement Flowchart:
Test for Halogen Content
Reference Standard: EN 14582

Sampling/grinding or cutting

Add absorbent in a combustion flask & place weighed sample in equipment

Fill oxygen into calorimetric bomb

Ignite then leave the bomb at room temperature

Transfer the absorbent into a volumetric flask

Make up with deionized water

Analyzed by ion chromatography

End of Report

This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in these terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.

Intertek Testing Services Taiwan Ltd.
8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C.

Page 7 of 8
Test Conducted

Photo

![Image of test results](image-url)

---

Intertek Testing Services Taiwan Ltd.
8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C.
全國公證檢驗股份有限公司
114 台北市內湖區瑞光路 423 號 8 樓

Tel: (+886-2) 6602-2888 · 2797-8885  Fax: (+886-2) 6602-2410
Applicant: LITTELFUSE, INC.
800 E. NORTHWEST HWY
Attn: A. DIVIETRO/D. UNTIETDT

Date: JAN 16, 2013

Sample Description:
One (1) submitted sample said to be Grey Wire.
Item Name: Wire Tin Plated Cu.
Part No.: Element.

Tests Conducted:
As requested by the applicant, for details refer to attached page(s).

To be continued
(1) Test Result Summary:

<table>
<thead>
<tr>
<th>Testing Item</th>
<th>Result (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Metal</td>
<td>(1)</td>
</tr>
<tr>
<td>Cadmium (Cd) content</td>
<td>ND</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>ND</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content (mg/kg With 50cm²)</td>
<td>Negative (&lt; 0.02)</td>
</tr>
<tr>
<td>Heavy Metal</td>
<td>(2)</td>
</tr>
<tr>
<td>Cadmium (Cd) content / Plating</td>
<td>ND</td>
</tr>
<tr>
<td>Lead (Pb) content / Plating</td>
<td>60</td>
</tr>
<tr>
<td>Mercury (Hg) content / Plating</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content (mg/kg With 50cm²) / Plating</td>
<td>Negative (&lt; 0.02)</td>
</tr>
</tbody>
</table>

Remarks:
- ppm = parts per million = mg/kg
- ND = not detected
- @ = Due to the insufficient sample area, reduced total sample surface of 10 cm² was used and the dilution factor was adjusted accordingly.
  mg/kg with 50cm² = milligram per kilogram with 50 square centimetre

Tested components:
- (1) Substrate.
- (2) Plating.

Responsibility of Chemist: Dent Fang / Ken He

(II) RoHS Requirement:

<table>
<thead>
<tr>
<th>Restricted substances</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) Content</td>
<td>0.01% (100ppm)</td>
</tr>
<tr>
<td>Lead (Pb) Content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Mercury (Hg) Content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) Content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Polybrominated Biphenyls (PBBs)</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ethers (PBDEs)</td>
<td>0.1% (1000ppm)</td>
</tr>
</tbody>
</table>

The above limits were quoted from RoHS Directive 2011/65/EU for homogeneous material.

(III) Test Method:

<table>
<thead>
<tr>
<th>Testing item</th>
<th>Testing method</th>
<th>Reporting limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in Annex B, by boiling water extraction and determined by UV-VIS Spectrophotometer.</td>
<td>0.02 mg/kg with 50cm²</td>
</tr>
</tbody>
</table>

Remark: Reporting limit = Quantitation limit of analyte in sample

Date Sample Received: Jan.9, 2013

To be continued
Test Report

Tests Conducted

(IV) MEASUREMENT FLOWCHART:
Test for Cd/ Pb/ Hg/Cr (VI)/ PBBs/PBDEs contents
Reference standard: IEC 62321 edition 1.0:2008

Sampling/grinding or cutting

Cd/Pb/Hg
Weigh sample and for different material, digest the sample with appropriate acid

Polymers / electronics
Cr⁶⁺
Spot test

MATERIAL
Polymers
Metals
Electronics

ACID ADDED FOR DIGESTION
HNO₃,HCl,HF,H₂O₂,H₃BO₃
HNO₃,HCl,HF
HNO₃,HCl,H₂O₂,HBF₄

Weigh sample and add alkaline solution

Definite temp. Extraction

Get 50cm² samples

Cool and filter the extract

Concentrate the extract and make up with organic solvent

Soxhlet extraction or Solvent extraction

Concentrate the extract and make up with organic solvent

Analyzed by GC-MSD

PBBs/PBDEs

Weigh sample and add organic solvent

Analyzed by UV-VIS

Asbestos

Cd/Pb/Hg

Analyzed by ICP-OES

Spot test

Negative

Yes

Make up with deionized water

No

Confirm the tested samples are totally dissolved

Make up with deionized water

Analyzed by ICP-OES

Sampling/grinding or cutting

REMKS:

*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.

To be continued
This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.
Test Report

Applicant: Littelfuse Philippines Inc.
LIMA Technology Center, Lipa City,
Malvar, Batangas

Number: TWNC00285760
Date: Nov 19, 2012

Sample Description:
One (1) group of submitted samples said to be:
Part Description: Yarn
Part Number: 648106-001
Date Sample Received: Nov 12, 2012
Date Test Started: Nov 13, 2012

Test Conducted:
As requested by the applicant, for details please refer to attached pages.

Authorized By:
On Behalf Of Intertek Testing Services
Taiwan Limited

K. Y. Liang
Director
### Test Conducted

#### (I) Test Result Summary:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Result (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy Metal</strong></td>
<td></td>
</tr>
<tr>
<td>Cadmium (Cd) content</td>
<td>ND</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>ND</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Polybrominated Biphenyls (PBBs)</strong></td>
<td></td>
</tr>
<tr>
<td>Monobrominated Biphenyls (MonoBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Dibrominated Biphenyls (DiBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Tribrominated Biphenyls (TriBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Tetrabrominated Biphenyls (TetraBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Pentabrominated Biphenyls (PentaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Hexabrominated Biphenyls (HexaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Heptabrominated Biphenyls (HeptaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Octabrominated Biphenyls (OctaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Nonabrominated Biphenyls (NonaBB)</td>
<td>ND</td>
</tr>
<tr>
<td>Decabrominated Biphenyl (DecaBB)</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Polybrominated Diphenyl Ethers (PBDEs)</strong></td>
<td></td>
</tr>
<tr>
<td>Monobrominated Diphenyl Ethers (MonoBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Dibrominated Diphenyl Ethers (DiBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Tribrominated Diphenyl Ethers (TriBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Tetrabrominated Diphenyl Ethers (TetraBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Pentabrominated Diphenyl Ethers (PentaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Hexabrominated Diphenyl Ethers (HexaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Heptabrominated Diphenyl Ethers (HeptaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Octabrominated Diphenyl Ethers (OctaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Nonabrominated Diphenyl Ethers (NonaBDE)</td>
<td>ND</td>
</tr>
<tr>
<td>Decabrominated Diphenyl Ether (DecaBDE)</td>
<td>ND</td>
</tr>
</tbody>
</table>
Test Conducted

(I) Test Result Summary:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Result (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Halogen Content</strong></td>
<td></td>
</tr>
<tr>
<td>Fluorine (F)</td>
<td>ND</td>
</tr>
<tr>
<td>Chlorine (Cl)</td>
<td>ND</td>
</tr>
<tr>
<td>Bromine (Br)</td>
<td>ND</td>
</tr>
<tr>
<td>Iodine (I)</td>
<td>ND</td>
</tr>
</tbody>
</table>

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg
ND = Not detected

Responsibility of Chemist: Irene Chiou / Kevin Liu / Cathy Chen

Date Sample Received: Nov 12, 2012
Test Period: Nov 13, 2012 To Nov 15, 2012

(II) RoHS Limits:

<table>
<thead>
<tr>
<th>Restricted Substances</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) Content</td>
<td>0.01% (100ppm)</td>
</tr>
<tr>
<td>Lead (Pb) Content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Mercury (Hg) Content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Chromium VI (CrVI) Content</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Polybrominated Biphenyls (PBBs)</td>
<td>0.1% (1000ppm)</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ethers (PBDEs)</td>
<td>0.1% (1000ppm)</td>
</tr>
</tbody>
</table>

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.
### Test Conducted

#### (III) Test Method:

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Test Method</th>
<th>Reporting Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content</td>
<td>With reference to IEC 62321 edition 1.0:2008 in annex C, by alkaline digestion and determined by UV-Vis spectrophotometer.</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Polybrominated Biphenyls (PBBs)</td>
<td>With reference to IEC 62321 edition 1.0:2008 in annex A, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary.</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Polybrominated Diphenyl Ethers (PBDEs)</td>
<td>With reference to IEC 62321 edition 1.0:2008 in annex A, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary.</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Halogen Content</td>
<td>With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by ion Chromatograph.</td>
<td>50 ppm</td>
</tr>
</tbody>
</table>

**Remark:** Reporting limit = Quantitation limit of analyte in sample
(IV) Measurement Flowchart:
Test for Cd/Pb/Hg/Cr (VI)/PBBS/PBDES Contents

Sample preparation

For non-metal part
Take sample and immerse into Aqua Regia, start to strip plating layer
Stop the stripping procedure upon color change completely
Take the Aqua solution as plating component and stripped body as substrate component

PBBs/PBDEs
Weigh sample and add organic solvent
By Soxhlet extraction or Solvent extraction
Concentrate the extract and make up with organic solvent
Analyzed by GC-MSD

Cd/Pb/Hg
Weigh sample and add alkaline solution
Definite temp. extraction
Cool and filter the extract
Analyzed by ICP-OES

Cr^{6+}
For different material, digest the sample with appropriate acid
Make up with deionized water
Analyzed by UV-Vis

Substrate
Plating
Cr^{6+}
By spot test
Negative
Get 50cm² sample
By boiling water extraction
Make up with deionized water and add diphenyl-carbazide solution
Analyzed by ICP-OES

For metal part

Sample preparation

Test Conducted

Intertek Testing Services Taiwan Ltd.
8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C.
全國公證檢驗股份有限公司
114 台北市內湖區瑞光路 423 號 8 樓
Tel: (+886-2) 6602-2888 • 2797-8885 Fax: (+886-2) 6602-2410
Test Conducted

(IV) Measurement Flowchart:

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.
Test Conducted

(IV) Measurement Flowchart:
Test for Halogen Content
Reference Standard: EN 14582

1. Sampling/grinding or cutting
2. Add absorbent in a combustion flask & place weighed sample in equipment
3. Fill oxygen into calorimetric bomb
4. Ignite then leave the bomb at room temperature
5. Transfer the absorbent into a volumetric flask
6. Make up with deionized water
7. Analyzed by ion chromatography

End of Report

This report is made solely on the basis of your instructions and/or information and materials supplied by you. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.
Test Conducted

Photo

![Image of test sample and date]

---

Intertek Testing Services Taiwan Ltd.
8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C.
全發公證檢驗股份有限公司
114台北市內湖區瑞光路423號8樓
Tel: (+886-2) 6602-2888 ・ 2797-8885  Fax: (+886-2) 6602-2410
Applicant: Littelfuse Philippines Inc. 
LIMA Technology Center, Lipa City, 
Malvar, Batangas 

Sample Description: 
One (1) group of submitted samples said to be: 
Part Description : Solder 
Part Number : 692235 
Date Sample Received : Jan 07, 2013 
Date Test Started : Jan 08, 2013 

Test Conducted: 
As requested by the applicant, for details please refer to attached pages. 

Authorized by: 
On Behalf of Intertek Testing Services 
Taiwan Limited 

K. Y. Liang 
Director
## Test Result Summary

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Unit</th>
<th>Test Method</th>
<th>Result</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cadmium (Cd) content</strong></td>
<td>ppm</td>
<td>With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.</td>
<td>ND 2</td>
<td></td>
</tr>
<tr>
<td><strong>Lead (Pb) content</strong></td>
<td>ppm</td>
<td>With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.</td>
<td>907965 2</td>
<td></td>
</tr>
<tr>
<td><strong>Mercury (Hg) content</strong></td>
<td>ppm</td>
<td>With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.</td>
<td>ND 2</td>
<td></td>
</tr>
<tr>
<td><strong>Chromium VI (Cr&lt;sup&gt;6+&lt;/sup&gt;) content</strong></td>
<td>mg/kg with 50 cm&lt;sup&gt;2&lt;/sup&gt;</td>
<td>With reference to IEC 62321: 2008, by boiling water extraction and determined by UV-Vis Spectrophotometer.</td>
<td>Negative(#) 0.02</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- ppm = parts per million based on weight of tested sample = mg/kg
- ND = Not detected
- RL = Reporting Limit, Quantitation limit of analyte in sample
- mg/kg with 50 cm<sup>2</sup> = milligram per kilogram with 50 square centimeter
- **Negative** = A negative test result indicated positive observation was not found at the time of test. When the spot test showed a negative result, the boiling water extraction procedure shall be used to verify the result.
- # = Due to the insufficient sample area, reduced total sample surface of 10 cm<sup>2</sup> was used and the dilution factor was adjusted accordingly.

**Responsibility of Chemist:** Kevin Liu/ Irene Chiou

**Date Sample Received:** Jan 07, 2013  
**Test Period:** Jan 08, 2013 To Jan 11, 2013
Test Conducted

(II) RoHS Limits:

<table>
<thead>
<tr>
<th>Restricted Substances</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd) content</td>
<td>0.01% (100 ppm)</td>
</tr>
<tr>
<td>Lead (Pb) content</td>
<td>0.1% (1000 ppm)</td>
</tr>
<tr>
<td>Mercury (Hg) content</td>
<td>0.1% (1000 ppm)</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺) content</td>
<td>0.1% (1000 ppm)</td>
</tr>
</tbody>
</table>

The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.
(III) Measurement Flowchart:

Test For Cd/Pb/Hg/Chromium (VI)

**Sampling/grinding or cutting**

**Cd/Pb/Hg**

*For different material, digest the sample with appropriate acid*¹

*Confirm the tested samples are totally dissolved*

*Make up with deionized water*

*Analyzed by ICP-OES*

**Cr⁶⁺**

**Metal**

**Polymers / Electronics**

*By spot test*

*Negative*²

*Get 50cm² sample*

*Boiling water extraction*

*Cool and filter the extract*

*Make up with deionized water and add diphenyl-carbazide solution*

*Analyzed by UV-VIS*
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.

End of Report

This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek’s provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in these terms and conditions. We have aimed to conduct the Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contrast, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.
Test Conducted

Photo

[Image of a test report with a date of Jan 7, 2013, and a label "10gms 692235"]]