



## ICP Test Report Certification Packet

Company name: Littelfuse, Inc.

Product Series: GDT

Product #: CG2, CG3, CG5, AC and PMT Series

Issue Date: December 11, 2013

It is hereby certified by Littelfuse, Inc. that there is neither RoHS (2011/65/EU – recast of 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 :   
JORDANUFF H. CABILAN

[Global EHS Engineer]

(1) Parts, sub-materials and unit parts

This document covers the GDT 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**

<b>Total Parts</b>	<b>Raw Material Part Number</b>	<b>Raw Material Description</b>	<b>Page(s)</b>
1	NA	Ceramic	3-8
2	NA	Silver Ring	9-14
3	NA	Fail Safe Clip	15-19
4	NA	Solder Pill (Unleaded)	20-25
5	NA	Cu Electrode	26-31
6	NA	Ni Electrode	32-37
7	NA	Tin Plated Wire	38-43
8	NA	Blue Ink	44-49

# Test Report

No. CTSSA/08643-1(B)/13

Date : 20/05/2013

Page: 1 of 6

CTS Ref. CTSSA/13/1281/Littelfuse

**LITTELFUSE INC.**  
**800E. NORTHWEST HIGHWAY**  
**DES PLAINES, IL 60016, USA**

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

Sample Description	:	Ceramic
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 13/05/2013
Date Completed	:	13/05/2013
Reporting Date	:	20/05/2013

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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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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# Test Report

No. CTSSA/08643-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

Test results:

Test Part Description :

Sample Description : Ceramic

## RoHS Directive 2011/65/EU Annex II

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium (Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI)	mg/kg	With reference to IEC 62321:2008, and performed by UV-Vis	N.D.	2
<b>Sum of PBBs</b>	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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# Test Report

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CTS Ref. CTSSA/13/1281/Littelfuse

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

Note : (a) mg/kg = ppm ; (0.1wt% = 1000ppm)

(b) N.D. = Not Detected

(c) MDL = Method Detection Limit

(d) - = Not regulated

(e) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 2-2)

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

No.26 Jalan Anggerik Vanilla 31/93 Kota Kemuning 40460 Shah Alam, Selangor Darul Ehsan, Malaysia  
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# Test Report

No. CTSSA/08643-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

Test result:

## Test Part Description :

Sample Description : Ceramic

## Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated

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## Test Report

No. CTSSA/08643-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

### Test Part Description :

Sample Description : Ceramic

LITTELFUSE INC.  
CTSSA/08643-1(B)/13



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*[Handwritten Signature]*

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## Test Report

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Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

### 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 Preparation  
↓  
Add colour-developing reagent  
↓  
Acidify with H<sub>2</sub>SO<sub>4</sub>  
↓  
Let stand for 5-10 min  
↓  
Analyses by UV- Spectrophotometer (540 nm)

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 um membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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# Test Report

No. CTSSA/08656-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

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

Sample Description	:	Silver Ring
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 16/05/2013
Date Completed	:	16/05/2013
Reporting Date	:	20/05/2013

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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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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# Test Report

No. CTSSA/08656-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

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Test results:

Test Part Description :

Sample Description : Silver Ring

## RoHS Directive 2011/65/EU Annex II

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

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# Test Report

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Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

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

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 cm<sup>2</sup> 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) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 2-2)

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# Test Report

No. CTSSA/08656-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

Test result:

## Test Part Description :

Sample Description : Silver Ring

## Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated

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## Test Report

No. CTSSA/08656-1(B)/13

Date : 20/05/2013

Page: 5 of 6

CTS Ref. CTSSA/13/1281/Littelfuse

### Test Part Description :

Sample Description : Silver Ring



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*[Signature]*

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## Test Report

No. CTSSA/08656-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

### 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  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 um membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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## Test Report

No. CTSSA/08791-1(AD-B)/12  
CTS Ref. CTSSA/12/1396/Littel

Date : 18/05/2012

Page: 1 of 5

LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

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

Sample Description	:	Failsafe Clip
Sample Receiving Date	:	23/04/2012
Testing Period	:	23/04/2012 to 10/05/2012
Date Completed	:	10/05/2012
Reporting Date	:	18/05/2012

---

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	:	Teh Pui Sean & Tay Siam Pine

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## Test Report

No. CTSSA/08791-1(AD-B)/12  
CTS Ref. CTSSA/12/1396/Littel

Date : 18/05/2012

Page: 2 of 5

Test results:

### Test Part Description :

Sample Description : Failsafe Clip

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

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium(Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	8	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI) by Spot test / boiling water extraction (optional) #	---	With reference to IEC 62321:2008	Negative	-
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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## Test Report

No. CTSSA/08791-1(AD-B)/12  
CTS Ref. CTSSA/12/1396/Littel

Date : 18/05/2012

Page: 3 of 5

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

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 cm<sup>2</sup> 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/08791-1/12

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## Test Report

No. CTSSA/08791-1(AD-B)/12  
CTS Ref. CTSSA/12/1396/Littel

Date : 18/05/2012

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### Test Part Description :

Sample Description : Failsafe Clip



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## Test Report

No. CTSSA/08791-1(AD-B)/12  
CTS Ref. CTSSA/12/1396/Littel

Date : 18/05/2012

Page: 5 of 5

### 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  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 µm membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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## Test Report

No. CTSSA/08658-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

Page: 1 of 6

LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

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

Sample Description	:	Solder Pill (Unleaded)
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 16/05/2013
Date Completed	:	16/05/2013
Reporting Date	:	20/05/2013

---

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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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# Test Report

No. CTSSA/08658-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

Test results:

Test Part Description :

Sample Description : Solder Pill (Unleaded)

## RoHS Directive 2011/65/EU Annex II

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium(Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	14	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI) by Spot test / boiling water extraction (optional) #	---	With reference to IEC 62321:2008	Negative	-
<b>Sum of PBBs</b>	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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# Test Report

No. CTSSA/08658-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

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

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 cm<sup>2</sup> 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) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 2-2)

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# Test Report

No. CTSSA/08658-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

Test result:

## Test Part Description :

Sample Description : Solder Pill (Unleaded)

## Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

### Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated

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SENIOR LAB MANAGER

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## Test Report

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CTS Ref. CTSSA/13/1281/Littelfuse

### Test Part Description :

Sample Description : Solder Pill (Unleaded)



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*[Handwritten Signature]*

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## Test Report

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CTS Ref. CTSSA/13/1281/Littelfuse

### 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  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 um membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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## Test Report

No. CTSSA/08644-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

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LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

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

Sample Description	:	Copper Electrode
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 13/05/2013
Date Completed	:	13/05/2013
Reporting Date	:	20/05/2013

---

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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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## Test Report

No. CTSSA/08644-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

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Test results:

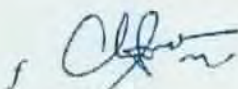
### Test Part Description :

Sample Description : Copper Electrode

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

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium(Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI) by Spot test / boiling water extraction (optional) #	---	With reference to IEC 62321:2008	Negative	-
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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# Test Report

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

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 cm<sup>2</sup> 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) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 2-2)

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# Test Report

No. CTSSA/08644-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

Test result:

Test Part Description :

Sample Description : Copper Electrode

## Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated

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## Test Report

No. CTSSA/08644-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

### Test Part Description :

Sample Description : Copper Electrode



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## Test Report

No. CTSSA/08644-1(B)/13

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CTS Ref. CTSSA/13/1281/Littelfuse

### 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

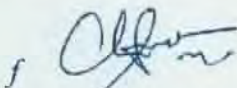
Sample Receiving and Registration  
↓  
Sample Preparation  
↓  
Spot-test (Qualitative)  
↓  
Boiling-water-extraction  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 um membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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## Test Report

No. CTSSA/08651-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

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LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

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

Sample Description	:	Nickel Electrode
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 14/05/2013
Date Completed	:	14/05/2013
Reporting Date	:	20/05/2013

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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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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## Test Report

No. CTSSA/08651-1(B)/13  
CTS Ref. CTSSA/13/1281/LittelFuse

Date : 20/05/2013

Page: 2 of 6

Test results:

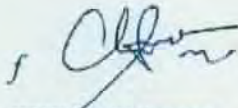
### Test Part Description :

Sample Description : Nickel Electrode

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

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium(Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI) by Spot test / boiling water extraction (optional) #	---	With reference to IEC 62321:2008	Negative	-
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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## Test Report

No. CTSSA/08651-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

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

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;

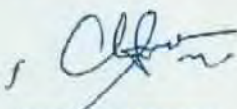
The detected concentration in 50 mL boiling water extraction solution is equal or greater than 0.02 mg/kg with 50 cm<sup>2</sup> sample surface area.

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) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 2-2)

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## Test Report

No. CTSSA/08651-1(B)/13  
CTS Ref. CTSSA/13/1281/LittelFuse

Date : 20/05/2013

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Test result:

### Test Part Description :

Sample Description : Nickel Electrode

### Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

#### Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated

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## Test Report

No. CTSSA/08651-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

Page: 5 of 6

### Test Part Description :

Sample Description : Nickel Electrode



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## Test Report

No. CTSSA/08651-1(B)/13  
CTS Ref. CTSSA/13/1281/LittelFuse

Date : 20/05/2013

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### 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  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 µm membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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## Test Report

No. CTSSA/08659-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

Page: 1 of 6

LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

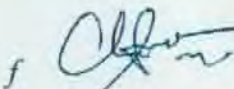
The following merchandise was (were) submitted and identified by the client as:

Sample Description	:	Tin Plated Wire
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 16/05/2013
Date Completed	:	16/05/2013
Reporting Date	:	20/05/2013

---

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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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# Test Report

No. CTSSA/08659-1(B)/13  
CTS Ref. CTSSA/13/1281/LittleFuse

Date : 20/05/2013

Page: 2 of 6

Test results:

## Test Part Description :

Sample Description : Tin Plated Wire

## RoHS Directive 2011/65/EU Annex II

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium(Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI) by Spot test / boiling water extraction (optional) #	---	With reference to IEC 62321:2008	Negative	-
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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# Test Report

No. CTSSA/08659-1(B)/13  
CTS Ref. CTSSA/13/1281/LittleFuse

Date : 20/05/2013

Page: 3 of 6

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

Note : (a) mg/kg = ppm ; (0.1 wt% = 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;

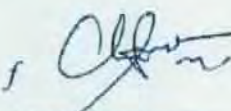
The detected concentration in 50 mL boiling water extraction solution is equal or greater than 0.02 mg/kg with 50 cm<sup>2</sup> sample surface area.

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

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## Test Report

No. CTSSA/08659-1(B)/13  
CTS Ref. CTSSA/13/1281/LittelFuse

Date : 20/05/2013

Page: 4 of 6

Test result:

### Test Part Description :

Sample Description : Tin Plated Wire

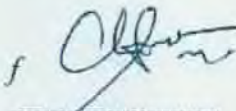
### Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

### Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated

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## Test Report

No. CTSSA/08659-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

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### Test Part Description :

Sample Description : Tin Plated Wire



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## Test Report

No. CTSSA/08659-1(B)/13  
CTS Ref. CTSSA/13/1281/LittelFuse

Date : 20/05/2013

Page: 6 of 6

### 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  
↓  
Analyses by UV- Spectrophotometer  
↓  
Test Report

### 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  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 µm membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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## Test Report

No. CTSSA/08640-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

Page: 1 of 6

LITTELFUSE INC.  
800E. NORTHWEST HIGHWAY  
DES PLAINES, IL 60016, USA

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

Sample Description	:	Blue Ink
Sample Receiving Date	:	17/04/2013
Testing Period	:	17/04/2013 to 10/05/2013
Date Completed	:	10/05/2013
Reporting Date	:	20/05/2013

---

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, Tan Li Wei, Choong Lap Kit & Tay Siam Pine

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## Test Report

No. CTSSA/08640-1(B)/13  
CTS Ref. CTSSA/13/1281/LittelFuse

Date : 20/05/2013

Page: 2 of 6

Test results:

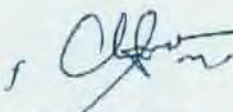
### Test Part Description :

Sample Description : Blue Ink

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

Test Item(s):	Unit	Test Method	Results	MDL
Cadmium (Cd)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, and performed by ICP-OES	N.D.	2
Hexavalent Chromium (CrVI)	mg/kg	With reference to IEC 62321:2008, and performed by UV-Vis	N.D.	2
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	-
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	5

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## Test Report

No. CTSSA/08640-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

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

Note : (a) mg/kg = ppm ; (0.1wt% = 1000ppm)

(b) N.D. = Not Detected

(c) MDL = Method Detection Limit

(d) - = Not regulated

(e) Testing based on original basis

(f) Upon Customer's request, this report has been issued in more than one original. Only the first original is a legally binding document and may be used for any legal purpose, including payment. (Original 2-2)

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## Test Report

No. CTSSA/08640-1(B)/13  
CTS Ref. CTSSA/13/1281/Littelfuse

Date : 20/05/2013

Page: 4 of 6

Test result:

### Test Part Description :

Sample Description : Blue Ink

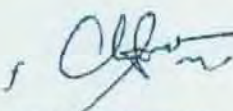
### Optional: RoHS Directive 2011/65/EU, priority substances

Test Item(s):	Unit	Test Method	Results	MDL
Hexabromocyclododecane (HBCDD)	mg/kg	Based on IEC 62321:2008, and performed by GC-MS	N.D.	10
Bis (2-ethylhexyl) phthalate (DEHP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Butyl benzyl phthalate (BBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30
Dibutyl phthalate (DBP)	mg/kg	Based on EN 14372: 2004, and performed by GC-MS	N.D.	30

Note:

- (a) Reference Information: Directive 2011/65/EU recasting RoHS directive 2002/95/EC: Hexabromocyclododecane (HBCDD), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP) and Dibutyl phthalate (DBP) are considered as a priority for risk evaluation and substance restriction.
- (b) mg/kg = ppm; 0.1wt% = 1000ppm
- (c) N.D. = Not detected
- (d) MDL = Method Detection Limit
- (e) - = not regulated
- (f) Testing based on original basis

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## Test Report

No. CTSSA/08640-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

### Test Part Description :

Sample Description : Blue Ink



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## Test Report

No. CTSSA/08640-1(B)/13

Date : 20/05/2013

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CTS Ref. CTSSA/13/1281/Littelfuse

### 1. DETERMINATION OF CADMIUM CONTENT BY

IEC 62321 2008

Sample Receiving and Registration  
↓  
Sample Preparation  
↓  
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  
↓  
Sample Preparation  
↓  
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  
↓  
Sample Preparation  
↓  
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 Preparation  
↓  
Add colour-developing reagent  
↓  
Acidify with H<sub>2</sub>SO<sub>4</sub>  
↓  
Let stand for 5-10 min  
↓  
Analyses by UV- Spectrophotometer (540 nm)

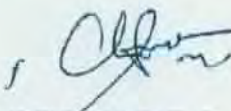
### 5. DETERMINATION OF PBB/PBDE WITH GC-MS

BY IEC 62321 2008

Sample Preparation  
↓  
Weight sample (0.5-4.0g) into extraction thimble  
↓  
Soxhlet Extraction with Toluene  
↓  
Filter through 0.45 µm membrane filter  
↓  
Analyses by GC-MS (with appropriate dilution)

\*\*\*\* End of Report \*\*\*\*

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