

Company name:

# **ICP Test Report Certification Packet**

Littelfuse, Inc.

Product Series:	GDT
Product #:	SL1011
Issue Date:	July 2, 2012
2011/65/EU)-restricted supacking/packaging materi In addition, it is hereby refor unit parts, the packing/	Littelfuse, Inc. that there is neither RoHS (EU Directive 2002/95/EC ubstance nor such use, for materials to be used for unit parts, for als, and for additives and the like in the manufacturing processes. ported to you that the parts and sub-materials, the materials to be used packaging materials, and the additives and the like in the manufacturing sed of the following components.
	Issued by: KRISTEEN BACILA <global ehs="" engineer=""></global>
(1) Parts, sub-materials a This document cov Littelfuse, Inc.	·
< Raw Materials U Please see Tab	
(2) The ICP data on all r	measurable substances propriate pages as identifed in Table 1
Remarks :	



Table 1: List of Raw Materials covered by this report

Total Parts	Raw Material Part Number	Raw Material Description	Page(s)
1	NA	Silver Ring	3-10
2	NA	Ceramic	11-18
3	NA	Nickel Electrode	19-26
4	NA	Blue Ink	27-34
5	NA	Terminal wire	35-42



No. CTSSA/08802-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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

Silver Ring

Sample Receiving Date

23/04/2012

**Testing Period** 

23/04/2012 to 11/05/2012

**Date Completed** Reporting Date

11/05/2012 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

SGS LABORATORY SERVICES (M) SDN. BHD.

**CHONG KIEN LEN** B.Sc.(HONS) AMIC

SENIOR LAB MANAGER



No. CTSSA/08802-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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	Q
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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No. CTSSA/08802-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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) This report supersedes report no. CTSSA/08802-1/12

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No. CTSSA/08802-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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**Test Part Description:** 

Sample Description

Silver Ring



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No. CTSSA/08802-1(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

# 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

#### 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

#### 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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**CHONG KIEN LEN** 

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No. CTSSA/08802-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

Page: 1 of 3

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

23/04/2012

Testing Period

23/04/2012 to 11/05/2012

Date Completed Reporting Date 11/05/2012 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).

Analyst

Yee Sook Wai

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



No. CTSSA/08802-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

Page: 2 of 3

Member of the SGS Group (SGS SA)

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
- (f) This report supersedes report no. CTSSA/08802-2/12

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No. CTSSA/08802-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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Test Part Description:

Sample Description

Silver Ring



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

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No. CTSSA/08789-1(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 Sample Receiving Date Ceramic 23/04/2012

Sample Receiving Date Testing Period

23/04/2012 to 10/05/2012

Date Completed : 1
Reporting Date : 1

10/05/2012

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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No. CTSSA/08789-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

Page: 2 of 5

Test results:

**Test Part Description:** 

Sample Description : 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
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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No. CTSSA/08789-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Page: 3 of 5 Date: 18/05/2012

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) This report supersedes report no. CTSSA/08789-1/12

SGS LABORATORY SERVICES (M) SDN. BHD.

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



No. CTSSA/08789-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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Test Part Description :

Sample Description

Ceramic



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No. CTSSA/08789-1(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 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 \*\*\*\*

SGS LABORATORY SERVICES (M) SDN. BHD.

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No. CTSSA/08789-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

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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 Sample Receiving Date

Ceramic 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).

Analyst

14.

Yee Sook Wai

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No. CTSSA/08789-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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
- (f) This report supersedes report no. CTSSA/08789-2/12

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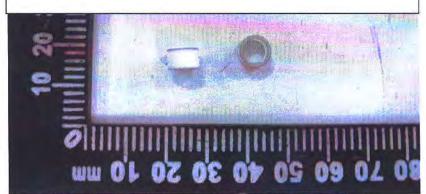
Page: 3 of 3

**Test Part Description:** 

Sample Description

Ceramic

### LITTELFUSE INC. CTSSA/08789-2(AD-B)/12



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No. CTSSA/08796-1(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 Sample Receiving Date Nickel Electrode 23/04/2012

Testing Period

23/04/2012 to 11/05/2012

Date Completed Reporting Date 11/05/2012 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

SGS LABORATORY SERVICES (M) SDN. BHD.

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No. CTSSA/08796-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

Page: 2 of 5

Test results:

**Test Part Description:** 

Sample Description

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	14
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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No. CTSSA/08796-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

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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) This report supersedes report no. CTSSA/08796-1/12

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No. CTSSA/08796-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

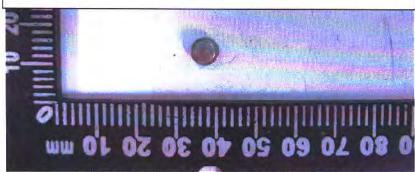
Page: 4 of 5

**Test Part Description:** 

Sample Description

Nickel Electrode

LITTELFUSE INC. CTSSA/08796-1(AD-B)/12



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No. CTSSA/08796-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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 um membrane filter

Analyses by GC-MS (with appropriate dilution)

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

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No. CTSSA/08796-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

Page: 1 of 3

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 23/04/2012

Sample Receiving Date Testing Period

23/04/2012 to 11/05/2012

Date Completed Reporting Date

11/05/2012 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).

Analyst

Yee Sook Wai

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No. CTSSA/08796-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

Page: 2 of 3

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
- (f) This report supersedes report no. CTSSA/08796-2/12

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No. CTSSA/08796-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

Page: 3 of 3

Test Part Description:

Sample Description

Nickel Electrode



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

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No. CTSSA/08786-1(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

Blue Ink

Sample Receiving Date

23/04/2012

Testing Period

23/04/2012 to 10/05/2012 10/05/2012

Date Completed 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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No. CTSSA/08786-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

Page: 2 of 5

Test results:

Test Part Description:

Sample Description

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.	i <del>t</del>
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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No. CTSSA/08786-1(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) - = Not regulated

(e) Testing based on original basis (f) This report supersedes report no. CTSSA/08786-1/12

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No. CTSSA/08786-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

Page: 4 of 5

**Test Part Description:** 

Sample Description

Blue Ink

#### LITTELFUSE INC. CTSSA/08786-1(AD-B)/12



SGS LABORATORY SERVICES (M) SDN. BHD.

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

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No. CTSSA/08786-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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#### 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 um membrane filter

Analyses by GC-MS (with appropriate dilution)

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

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No. CTSSA/08786-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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
Sample Receiving Date

Blue Ink 23/04/2012

Sample Receiving Date Testing Period

23/04/2012 to 10/05/2012

Date Completed Reporting Date

10/05/2012 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

Yee Sook Wai

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No. CTSSA/08786-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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
- (g) This report supersedes report no. CTSSA/08786-2/12

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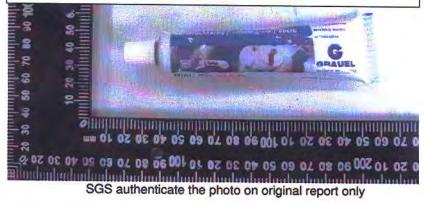
Page: 3 of 3

Test Part Description:

Sample Description

Blue Ink

# LITTELFUSE INC. CTSSA/08786-2(AD-B)/12



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

SGS LABORATORY SERVICES (M) SDN. BHD.

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No. CTSSA/08805-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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

**Tin Plated Wire** 

Sample Receiving Date

23/04/2012

**Testing Period** 

23/04/2012 to 11/05/2012

**Date Completed** Reporting Date

11/05/2012

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

SGS LABORATORY SERVICES (M) SDN. BHD.

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



No. CTSSA/08805-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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	٠
Sum of PBBs	mg/kg	With reference to IEC 62321:2008, and performed by GC-MS	N.D.	1.0
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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No. CTSSA/08805-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

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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

(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/08805-1/12

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No. CTSSA/08805-1(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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Test Part Description:

Sample Description

**Tin Plated Wire** 

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No. CTSSA/08805-1(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

1

Analyses by ICP

#### 3Y

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

# 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

# 4. <u>DETERMINATION OF HEXAVALENT CHROMIUM</u> 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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No. CTSSA/08805-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

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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:

Tin Plated Wire

Sample Description
Sample Receiving Date

Sample Receiving Date : 23/04/2012 Testing Period : 23/04/2012 to 11/05/2012

Date Completed : 11/05/2012 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).

Analyst : Yee Sook Wai

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No. CTSSA/08805-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel Date: 18/05/2012

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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
- (f) This report supersedes report no. CTSSA/08805-2/12

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No. CTSSA/08805-2(AD-B)/12 CTS Ref. CTSSA/12/1396/Littel

Date: 18/05/2012

Page: 3 of 3

**Test Part Description:** 

Sample Description

Tin Plated Wire



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

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