

# **ICP Test Report Certification Packet**

Company name:	Littelfuse, Inc.	
Product Series:	PulseGuard ESD Protector	
Product #:	PGB102ST23 – Low Halogen	
Issue Date:	July 08, 2013	
2011/65/EU)-restricted so packing/packaging mater In addition, it is hereby re for unit parts, the packing/	Littelfuse, Inc. that there is neither RoHS (EU Directive 20 substance nor such use, for materials to be used for unit rials, and for additives and the like in the manufacturing proceseported to you that the parts and sub-materials, the materials to packaging materials, and the additives and the like in the manused of the following components.	parts, for sses.
	Issued by:  JENNY DINGLASAN <global ehs="" specialist=""></global>	
(1) Parts, sub-materials a This document cov manufactured by Li  < Raw Materials L Please see Tab	vers the PulseGuard ESD Protector RoHS-Compliant series ittelfuse, Inc.	s products
(2) The ICP data on all Please see app	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	039172	FR-4	3-12
2	010104	Nickel Anode	13-18
3	010113	Tin Anode	19-24
4	010114	Copper Anode	25-30
5	090418	Soldermask Green	31-40
6	4501-WPM	VVM Material	41-50



: TWNC00319520 Number

Littelfuse Philippines Inc. Applicant:

Date : Jun 27, 2013 LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

One (1) group of submitted samples said to be:

: FR-4(PGB HF 0.02") Copper Clad Laminate Part Description

Part Number 039172 Date Sample Received Jun 21, 2013 Date Test Started Jun 24, 2013

Test Conducted:

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

Authorized by: On Behalf of Intertek Testing Services Taiwan Limited



K. Y. Liang Director





Number: TWNC00319520

**Test Conducted** 

**Test Result Summary:** 

		Pocult	
<u>Unit</u>	Test Method		RL
		<u>Submitted samples</u>	
	With reference to IEC 62221:		
nnm		ND	2
ppiii		ND	
nnm		ND	2
ppm		ND	
		ND	_
ppm		ND	2
	· ·	ND	
ppm		ND	2
nnm		ND	1
ρρ			_
	Spectrophotometer.		
(PBBs)			1
nnm		ND	5
ΡΡ			
nnm		ND	5
РРП	<u> </u>	ואס	,
nnm		ND	5
ррпі		ND	,
nnm		ND	5
ррпі	With reference to IEC 62221.	IND	J
nnm		ND	5
ppiii		ND	)
		ND	_
ppm		ND	5
	when necessary.	MP	-
ppm		ND	5
	j	NE	_
ppm		ND	5
	j		_
ppm		ND	5
		-1-	_
ppm		ND	5
	ppm	ppm With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES. With reference to USEPA 3052, by microwave digestion and determined by ICP-OES. With reference to USEPA 3052, by microwave digestion and determined by UV-Vis Spectrophotometer.  S (PBBs)  ppm  ppm  ppm  ppm  ppm  ppm  ppm  p	ppm With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.  With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.  With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.  With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.  With reference to USEPA 3052, by microwave digestion and determined by ICP-OES.  With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer.  S (PBBs)  ppm



Test Conducted

Number: TWNC00319520

Result
Submitted samples

Test Item	Unit	Test Method	<u>Result</u>	RL	
<u>rest item</u>	Offic	Submitted samples		INL	
Polybrominated Diphenyl Ethers (PBDEs)					
Monobrominated Diphenyl Ethers (MonoBDE)	ppm		ND	5	
Dibrominated Diphenyl Ethers (DiBDE)	ppm		ND	5	
Tribrominated Diphenyl Ethers (TriBDE)	ppm		ND	5	
Tetrabrominated Diphenyl Ethers (TetraBDE)	ppm	With reference to IEC 62321:	ND	5	
Pentabrominated Diphenyl Ethers (PentaBDE)	ppm	2008, by solvent extraction and determined by GC-MS and	ND	5	
Hexabrominated Diphenyl Ethers (HexaBDE)	ppm	further HPLC-DAD confirmation when necessary.	ND	5	
Heptabrominated Diphenyl Ethers (HeptaBDE)	ppm	When necessary.	ND	5	
Octabrominated Diphenyl Ethers (OctaBDE)	ppm		ND	5	
Nonabrominated Diphenyl Ethers (NonaBDE)	ppm		ND	5	
Decabrominated Diphenyl Ether (DecaBDE)	ppm		ND	5	
Halogen Content	T			ı	
Fluorine (F)	ppm	With reference to EN	561	50	
Chlorine (CI)	ppm	14582:2007 by calorimetric	123	50	
Bromine (Br)	ppm	bomb with oxygen and determined by Ion	ND	50	
Iodine (I)	ppm	Chromatograph.	ND	50	
Phthalates		, , , , , , , , , , , , , , , , , , , ,		I.	
Di(2-ethylhexyl) Phthalate (DEHP)	ppm		ND	10	
Dibutyl Phthalate (DBP)	ppm	With reference to EN 14372:	ND	10	
Benzyl Butyl Phthalate (BBP)	ppm	2004, by solvent extraction and determined by GC-MS.	ND	10	
Diisobutyl Phthalate (DIBP)	ppm		ND	10	
Others					
Hexabromocyclododecane (HBCDD)	ppm	With reference to USEPA 3540C, by solvent extraction and determined by GC-MS.	ND	10	



Number: TWNC00319520

**Test Conducted** 

ppm = parts per million based on weight of tested sample = mg/kg Remarks:

= Not detected

RL = Reporting Limit, Quantitation limit of analyte in sample

Responsibility of Chemist: Kevin Liu/ Irene Chiou/ Vico Lin

Date Sample Received : Jun 21, 2013

**Test Period** : Jun 24, 2013 To Jun 26, 2013

#### **RoHS Limit**

Restricted Substances	<u>Limits</u>
Cadmium (Cd) content	0.01% (100ppm)
Lead (Pb) content	0.1% (1000ppm)
Mercury (Hg) content	0.1% (1000ppm)
Chromium VI (Cr <sup>6+</sup> ) content	0.1% (1000ppm)
Polybrominated Biphenyls (PBBs)	0.1% (1000ppm)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000ppm)

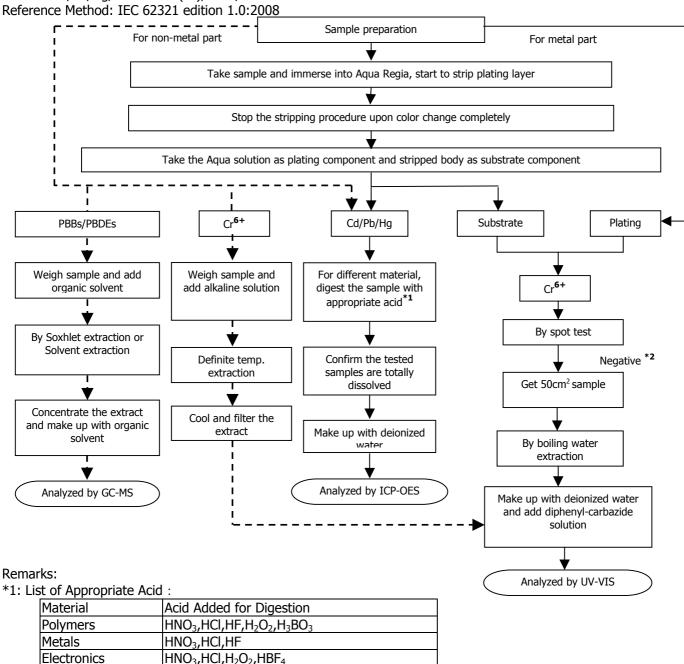
The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



Number: TWNC00319520

Test Conducted Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBs/PBDEs Contents



\*2: If the result of spot test is positive, Chromium VI would be determined as detected.



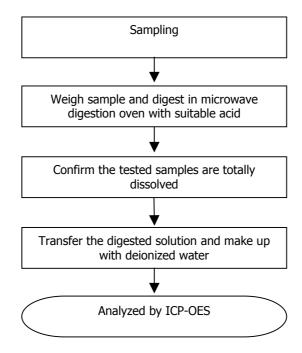


Number: TWNC00319520

**Test Conducted** 

Measurement Flowchart:

Test for Heavy Metal (Sb) Contents Reference Method: USEPA 3052

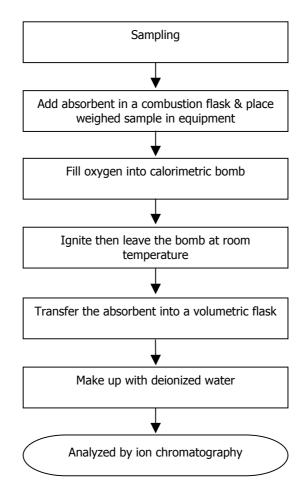




Number: TWNC00319520

**Test Conducted** 

Measurement Flowchart: Test for Halogen Contents Reference Method: EN 14582

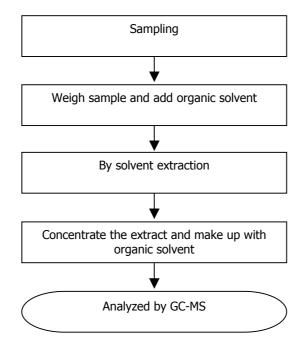




Number: TWNC00319520

**Test Conducted** 

Measurement Flowchart: **Test for Phthalates Contents** Reference Method: EN 14372: 2004





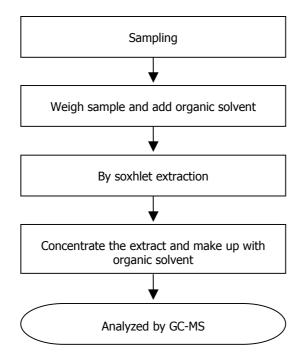
Number: TWNC00319520

**Test Conducted** 

Measurement Flowchart:

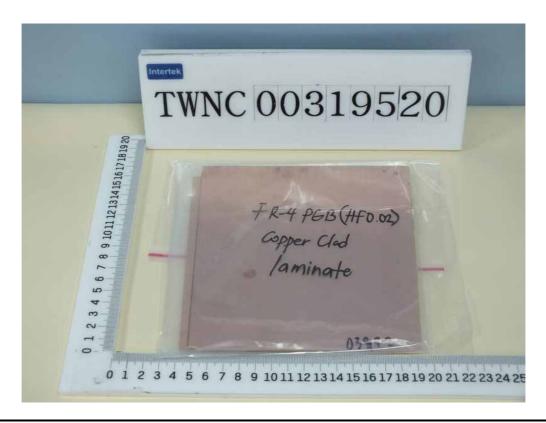
Test for Hexabromocyclododecane (HBCDD) Content

Reference Method: USEPA 3540C





Number: TWNC00319520



### End of Report

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Number: TWNC00285779 Test Report

Littelfuse Philippines Inc. Applicant: Date : Nov 19, 2012

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Nickel Anode

: 010104 Part Number

Date Sample Received : Nov 13, 2012 Date Test Started : Nov 13, 2012

Test Conducted :

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

Authorized By: On Behalf Of Intertek Testing Services Taiwan Limited



K. Y. Liang Director





#### Test Conducted

### ( I ) Test Result Summary :

	Result (ppm)
Test Item	Silvery plating
	<u>layer</u>
Heavy Metal	
Cadmium (Cd) content	ND
Lead (Pb) content	ND
Mercury (Hg) content	ND
Chromium VI (Cr <sup>6+</sup> ) content (mg/kg with 50cm <sup>2</sup> )	Negative (< 0.02)

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg

ND = Not detected < = Less than

mg/kg with 50cm<sup>2</sup> = milligram per kilogram with 50 square centimetre Negative = A negative test result indicated positive observation was not found at the time of Test.

Responsibility of Chemist : Irene Chiou / Kevin Liu

Date Sample Received : Nov 13, 2012

Test Period : Nov 13, 2012 to Nov 16, 2012

#### $(\Pi)$ RoHS Limits:

Restricted Substances	<u>Limits</u>
Cadmium (Cd) Content	0.01% (100ppm)
Lead (Pb) Content	0.1% (1000ppm)
Mercury (Hg) Content	0.1% (1000ppm)
Chromium VI (Cr <sup>6+</sup> ) Content	0.1% (1000ppm)

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





Test Conducted

### (Ⅲ) Test Method:

Test Item	Test Method	Reporting Limit
Cadmium (Cd)	With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Lead (Pb) content	With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Mercury (Hg) content	With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Chromium VI (Cr <sup>6+</sup> ) content	With reference to IEC 62321 edition 1.0:2008 in annex B, by boiling water extraction and determined by UV-Vis Spectrophotometer.	0.02 mg/kg with 50cm <sup>2</sup>

Remark: Reporting limit = Quantitation limit of analyte in sample

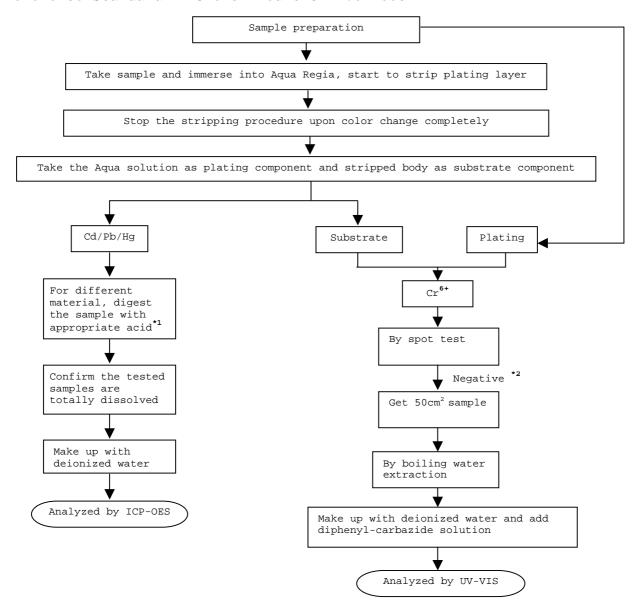




#### Test Conducted

#### (IV) Measurement Flowchart:

Test For Cd/Pb/Hg/Chromium (VI) Reference Standard: IEC 62321 edition 1.0:2008







#### Test Conducted

#### Remarks:

\*1: List Of Appropriate Acid:

<u>Material</u>	Acid Added For Digestion
Polymers	HNO <sub>3,</sub> HCl,HF,H <sub>2</sub> O <sub>2,</sub> H <sub>3</sub> BO <sub>3</sub>
Metals	HNO <sub>3,</sub> HCl,HF
Electronics	HNO <sub>3,</sub> HCl,H <sub>2</sub> O <sub>2,</sub> HBF <sub>4</sub>

\*2: If the result of spot test is positive, Chromium VI would be determined as detected.

End of Report

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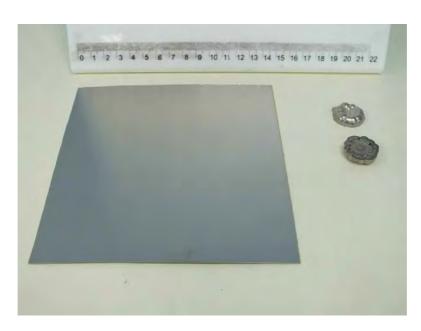




Test Conducted

### Photo





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# Intertek Testing Services Taiwan Ltd.

8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C. 全國公證檢驗股份有限公司



Number: TWNC00285780 Test Report

Littelfuse Philippines Inc. Applicant: Date : Nov 19, 2012

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Tin Anode : 010113 Part Number

Date Sample Received : Nov 13, 2012 Date Test Started : Nov 13, 2012

Test Conducted :

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

Authorized By: On Behalf Of Intertek Testing Services Taiwan Limited



K. Y. Liang Director





#### Test Conducted

### (I) Test Result Summary:

	Result (ppm)
Test Item	Silvery plating
	<u>layer</u>
Heavy Metal	
Cadmium (Cd) content	ND
Lead (Pb) content	ND
Mercury (Hg) content	ND
Chromium VI (Cr <sup>6+</sup> ) content (mg/kg with 50cm <sup>2</sup> )	Negative (< 0.02)

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg

ND = Not detected
< = Less than</pre>

mg/kg with 50cm<sup>2</sup> = milligram per kilogram with 50 square centimetre Negative = A negative test result indicated positive observation was not found at the time of Test.

Responsibility of Chemist : Irene Chiou / Kevin Liu

Date Sample Received : Nov 13, 2012

Test Period : Nov 13, 2012 to Nov 16, 2012

#### (Ⅱ) RoHS Limits:

Restricted Substances	<u>Limits</u>
Cadmium (Cd) Content	0.01% (100ppm)
Lead (Pb) Content	0.1% (1000ppm)
Mercury (Hg) Content	0.1% (1000ppm)
Chromium VI (Cr <sup>6+</sup> ) Content	0.1% (1000ppm)

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





Test Conducted

### (Ⅲ) Test Method:

Test Item	Test Method	Reporting Limit
Cadmium (Cd)	With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Lead (Pb) content	With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Mercury (Hg) content	With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Chromium VI (Cr <sup>6+</sup> ) content	With reference to IEC 62321 edition 1.0:2008 in annex B, by boiling water extraction and determined by UV-Vis Spectrophotometer.	0.02 mg/kg with 50cm <sup>2</sup>

Remark: Reporting limit = Quantitation limit of analyte in sample

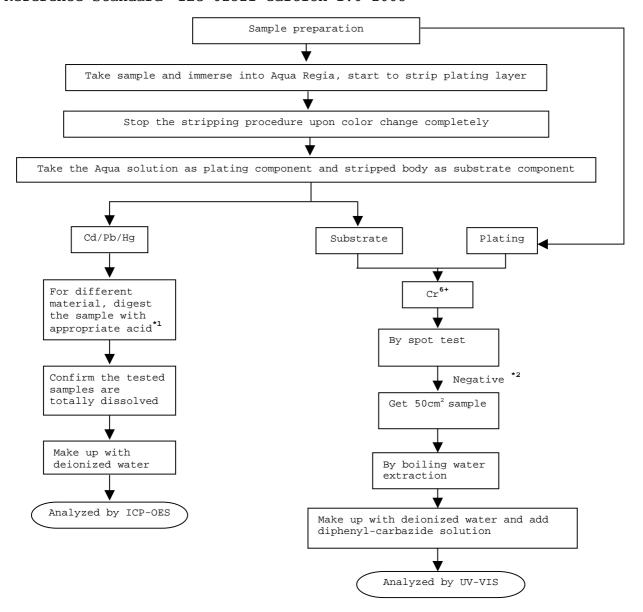




#### Test Conducted

#### (IV) Measurement Flowchart:

Test For Cd/Pb/Hg/Chromium (VI) Reference Standard: IEC 62321 edition 1.0:2008





# Intertek Testing Services Taiwan Ltd.



#### Test Conducted

#### Remarks:

\*1: List Of Appropriate Acid:

<u>Material</u>	Acid Added For Digestion
Polymers	HNO <sub>3,</sub> HCl,HF,H <sub>2</sub> O <sub>2,</sub> H <sub>3</sub> BO <sub>3</sub>
Metals	HNO <sub>3,</sub> HCl,HF
Electronics	HNO <sub>3,</sub> HCl,H <sub>2</sub> O <sub>2,</sub> HBF <sub>4</sub>

\*2: If the result of spot test is positive, Chromium VI would be determined as detected.

End of Report

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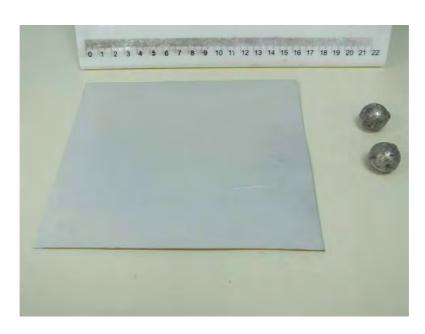




Test Conducted

### Photo





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# Intertek Testing Services Taiwan Ltd.

8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C. 全國公證檢驗股份有限公司



Number: TWNC00285778 Test Report

Littelfuse Philippines Inc. Applicant: Date : Nov 19, 2012

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

One (1) group of submitted samples said to be :

Part Description : Copper Anode

: 010114 Part Number

: Nov 13, 2012 Date Sample Received Date Test Started : Nov 13, 2012

Test Conducted :

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

Authorized By: On Behalf Of Intertek Testing Services Taiwan Limited



K. Y. Liang Director





#### Test Conducted

### ( I ) Test Result Summary :

Test Item	Result (ppm)	
<u> </u>	Coppery Metal	
Heavy Metal		
Cadmium (Cd) content	ND	
Lead (Pb) content	ND	
Mercury (Hg) content	ND	
Chromium VI ( $Cr^{6+}$ ) content ( $mg/kg$ with $50cm^2$ )	Negative (< 0.02)	

Remarks: ppm = Parts per million based on weight of tested sample = mg/kg

ND= Not detected = Less than

mg/kg with 50cm<sup>2</sup> = milligram per kilogram with 50 square centimetre Negative = A negative test result indicated positive observation was not found at the time of Test.

Responsibility of Chemist : Irene Chiou / Kevin Liu

Date Sample Received : Nov 13, 2012

Test Period : Nov 13, 2012 To Nov 16, 2012

#### (Ⅱ) RoHS Limits:

Restricted Substances	<u>Limits</u>
Cadmium (Cd) Content	0.01% (100ppm)
Lead (Pb) Content	0.1% (1000ppm)
Mercury (Hg) Content	0.1% (1000ppm)
Chromium VI (Cr <sup>6+</sup> ) Content	0.1% (1000ppm)

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





### Test Conducted

# (Ⅲ) Test Method:

Test Item	Test Method	Reporting Limit
Cadmium (Cd) content	With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Lead (Pb) content	With reference to IEC 62321 edition 1.0:2008 in clause 8/9/10, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Mercury (Hg) content	With reference to IEC 62321 edition 1.0:2008 in clause 7, by microwave digestion until the tested samples are totally dissolved and determined by ICP-OES.	2 ppm
Chromium VI (Cr <sup>6+</sup> ) content	With reference to IEC 62321 edition 1.0:2008 in annex B, by boiling water extraction and determined by UV-Vis Spectrophotometer.	0.02 mg/kg with 50cm <sup>2</sup>

Remark: Reporting limit = Quantitation limit of analyte in sample



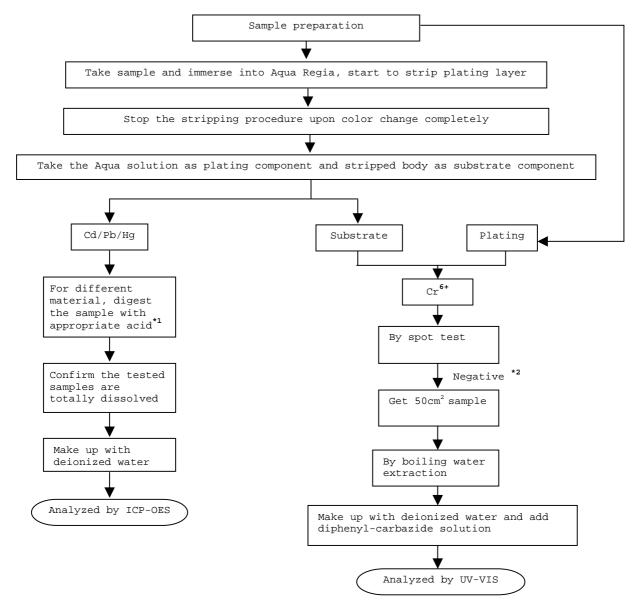


#### Test Conducted

#### (IV) Measurement Flowchart:

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

Reference Standard: IEC 62321 edition 1.0:2008







Test Conducted

(IV) Measurement Flowchart:

#### Remarks:

\*1: List Of Appropriate Acid:

Material	Acid Added For Digestion
Polymers	HNO <sub>3,</sub> HCl,HF,H <sub>2</sub> O <sub>2,</sub> H <sub>3</sub> BO <sub>3</sub>
Metals	HNO <sub>3,</sub> HCl,HF
Electronics	HNO <sub>3,</sub> HCl,H <sub>2</sub> O <sub>2,</sub> HBF <sub>4</sub>

\*2: If the result of spot test is positive, Chromium VI would be determined as detected.

End of Report

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Test Conducted

### Photo







# Intertek Testing Services Taiwan Ltd.

8F., No. 423, Ruiguang Rd., Neihu District, Taipei 114, Taiwan, R.O.C. 全國公證檢驗股份有限公司



: TWNC00319525 Number

Littelfuse Philippines Inc. Applicant:

: Jun 27, 2013 Date

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

One (1) group of submitted samples said to be:

Part Description Photoimageable solder mask green(Peters)

Part Number 090418 Jun 21, 2013 **Date Sample Received Date Test Started** Jun 24, 2013 :

Test Conducted:

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

Authorized by: On Behalf of Intertek Testing Services Taiwan Limited



K. Y. Liang Director





Number: TWNC00319525

**Test Conducted** 

**Test Result Summary:** 

Test Result Summary:	Llait	Took Mathad	<u>Result</u>	DI
<u>Test Item</u>	<u>Unit</u>	<u>Test Method</u>	Green paste	RL
Heavy Metal				
Cadmium (Cd) content	ppm	With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.	ND	2
Lead (Pb) content	ppm	With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.	ND	2
Mercury (Hg) content	ppm	With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.	ND	2
Antimony (Sb) Content	ppm	With reference to USEPA 3052, by microwave digestion and determined by ICP-OES.	ND	2
Chromium VI (Cr <sup>6+</sup> ) content	ppm	With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer.	ND	1
<b>Polybrominated Biphenyls</b>	(PBBs)			
Monobrominated Biphenyls (MonoBB)	ppm		ND	5
Dibrominated Biphenyls (DiBB)	ppm		ND	5
Tribrominated Biphenyls (TriBB)	ppm		ND	5
Tetrabrominated Biphenyls (TetraBB)	ppm		ND	5
Pentabrominated Biphenyls (PentaBB)	ppm	With reference to IEC 62321: 2008, by solvent extraction	ND	5
Hexabrominated Biphenyls (HexaBB)	ppm	and determined by GC-MS and further HPLC-DAD confirmation when necessary.	ND	5
Heptabrominated Biphenyls (HeptaBB)	ppm		ND	5
Octabrominated Biphenyls (OctaBB)	ppm		ND	5
Nonabrominated Biphenyls (NonaBB)	ppm		ND	5
Decabrominated Biphenyl (DecaBB)	ppm		ND	5



Number:

TWNC00319525

**Test Conducted** 

Took Itom	Linit	Toot Mathad	<u>Result</u>	DI	
<u>Test Item</u>	<u>Unit</u>	<u>Test Method</u>	<u>Green paste</u>	RL	
<b>Polybrominated Diphenyl</b>	Polybrominated Diphenyl Ethers (PBDEs)				
Monobrominated Diphenyl Ethers (MonoBDE)	ppm		ND	5	
Dibrominated Diphenyl Ethers (DiBDE)	ppm		ND	5	
Tribrominated Diphenyl Ethers (TriBDE)	ppm		ND	5	
Tetrabrominated Diphenyl Ethers (TetraBDE)	ppm	With reference to IEC 62321:	ND	5	
Pentabrominated Diphenyl Ethers (PentaBDE)	ppm	2008, by solvent extraction and determined by GC-MS and	ND	5	
Hexabrominated Diphenyl Ethers (HexaBDE)	ppm	further HPLC-DAD confirmation	ND	5	
Heptabrominated Diphenyl Ethers (HeptaBDE)	ppm	when necessary.	ND	5	
Octabrominated Diphenyl Ethers (OctaBDE)	ppm		ND	5	
Nonabrominated Diphenyl Ethers (NonaBDE)	ppm		ND	5	
Decabrominated Diphenyl Ether (DecaBDE)	ppm		ND	5	
Halogen Content					
Fluorine (F)	ppm	With reference to EN	ND	50	
Chlorine (CI)	ppm	14582:2007 by calorimetric	254	50	
Bromine (Br)	ppm	bomb with oxygen and determined by Ion	167	50	
Iodine (I)	ppm	Chromatograph.	ND	50	
Phthalates		·			
Di(2-ethylhexyl) Phthalate (DEHP)	ppm	With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS.	ND	10	
Dibutyl Phthalate (DBP)	ppm		ND	10	
Benzyl Butyl Phthalate (BBP)	ppm		ND	10	
Diisobutyl Phthalate (DIBP)	ppm		ND	10	
Others					
Hexabromocyclododecane (HBCDD)	ppm	With reference to USEPA 3540C, by solvent extraction and determined by GC-MS.	ND	10	



Number: TWNC00319525

**Test Conducted** 

ppm = parts per million based on wet weight of tested sample = mg/kg Remarks:

= Not detected

RL = Reporting Limit, Quantitation limit of analyte in sample

Responsibility of Chemist: Kevin Liu/ Irene Chiou/ Vico Lin

Date Sample Received : Jun 21, 2013

**Test Period** : Jun 24, 2013 To Jun 26, 2013

#### **RoHS Limit**

Restricted Substances	<u>Limits</u>
Cadmium (Cd) content	0.01% (100ppm)
Lead (Pb) content	0.1% (1000ppm)
Mercury (Hg) content	0.1% (1000ppm)
Chromium VI (Cr <sup>6+</sup> ) content	0.1% (1000ppm)
Polybrominated Biphenyls (PBBs)	0.1% (1000ppm)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000ppm)

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

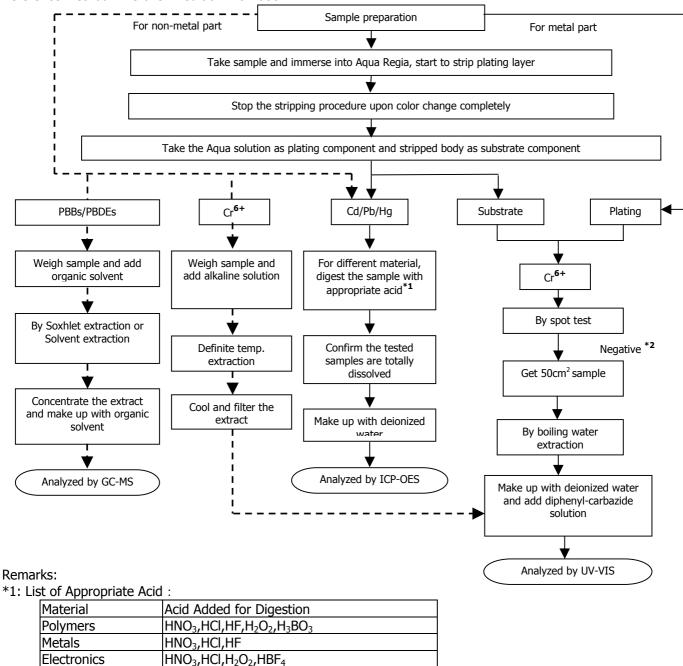


Number: TWNC00319525

Test Conducted Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBs/PBDEs Contents

Reference Method: IEC 62321 edition 1.0:2008



\*2: If the result of spot test is positive, Chromium VI would be determined as detected.



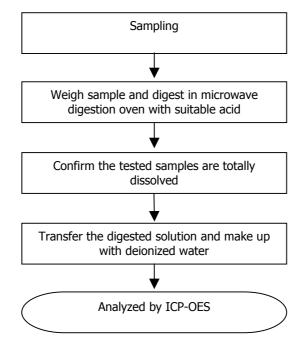
Page 5 of 12



Number: TWNC00319525

**Test Conducted** Measurement Flowchart:

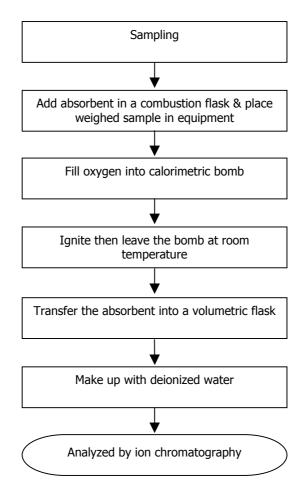
Test for Heavy Metal (Sb) Contents Reference Method: USEPA 3052





Number: TWNC00319525

**Test Conducted** Test for Halogen Contents Reference Method: EN 14582

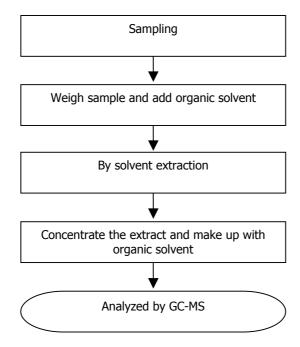




Number: TWNC00319525

**Test Conducted Test for Phthalates Contents** 

Reference Method: EN 14372: 2004



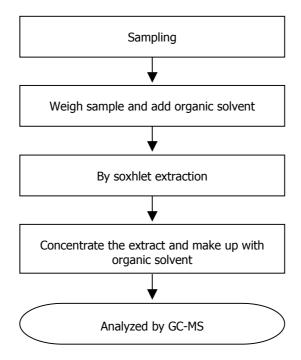


Number: TWNC00319525

**Test Conducted** 

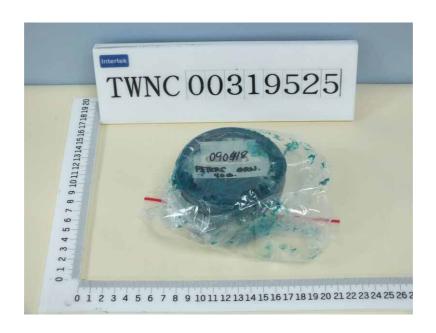
Test for Hexabromocyclododecane (HBCDD) Content

Reference Method: USEPA 3540C





Number: TWNC00319525





End of Report

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: TWNC00319524 Number

Date : Jun 27, 2013

Littelfuse Philippines Inc. Applicant:

LIMA Technology Center, Lipa City,

Malvar, Batangas

Sample Description:

One (1) group of submitted samples said to be:

Part Description : VVM Meterial Part Number 4501-WPM Jun 21, 2013 Date Sample Received **Date Test Started** Jun 24, 2013

Test Conducted:

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

Authorized by: On Behalf of Intertek Testing Services Taiwan Limited



K. Y. Liang Director





Number: TWNC00319524

**Test Conducted** Test Result Summary:

Test Item	<u>Unit</u>	Test Method	<u>Result</u>	- RL
			<u>Dark grey paste</u>	
Heavy Metal				
Cadmium (Cd) content	ppm	With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.	ND	2
Lead (Pb) content	ppm	With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.	ND	2
Mercury (Hg) content	ppm	With reference to IEC 62321: 2008, by microwave digestion and determined by ICP-OES.	ND	2
Antimony (Sb) Content	ppm	With reference to USEPA 3052, by microwave digestion and determined by ICP-OES.	ND	2
Chromium VI (Cr <sup>6+</sup> ) content	ppm	With reference to IEC 62321: 2008, by alkaline digestion and determined by UV-Vis Spectrophotometer.	ND	1
Polybrominated Biphenyls	(PBBs)			
Monobrominated Biphenyls (MonoBB)	ppm	With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary.	ND	5
Dibrominated Biphenyls (DiBB)	ppm		ND	5
Tribrominated Biphenyls (TriBB)	ppm		ND	5
Tetrabrominated Biphenyls (TetraBB)	ppm		ND	5
Pentabrominated Biphenyls (PentaBB)	ppm		ND	5
Hexabrominated Biphenyls (HexaBB)	ppm		ND	5
Heptabrominated Biphenyls (HeptaBB)	ppm		ND	5
Octabrominated Biphenyls (OctaBB)	ppm		ND	5
Nonabrominated Biphenyls (NonaBB)	ppm		ND	5
Decabrominated Biphenyl (DecaBB)	ppm		ND	5



**Test Conducted** 

Number: TWNC00319524

Test Item	<u>Unit</u>	Test Method	<u>Result</u>	- RL		
			<u>Dark grey paste</u>			
Polybrominated Diphenyl Ethers (PBDEs)						
Monobrominated Diphenyl Ethers (MonoBDE)	ppm	With reference to IEC 62321: 2008, by solvent extraction and determined by GC-MS and further HPLC-DAD confirmation when necessary.	ND	5		
Dibrominated Diphenyl Ethers (DiBDE)	ppm		ND	5		
Tribrominated Diphenyl Ethers (TriBDE)	ppm		ND	5		
Tetrabrominated Diphenyl Ethers (TetraBDE)	ppm		ND	5		
Pentabrominated Diphenyl Ethers (PentaBDE)	ppm		ND	5		
Hexabrominated Diphenyl Ethers (HexaBDE)	ppm		ND	5		
Heptabrominated Diphenyl Ethers (HeptaBDE)	ppm		ND	5		
Octabrominated Diphenyl Ethers (OctaBDE)	ppm		ND	5		
Nonabrominated Diphenyl Ethers (NonaBDE)	ppm		ND	5		
Decabrominated Diphenyl Ether (DecaBDE)	ppm		ND	5		
Halogen Content						
Fluorine (F)	ppm	With reference to EN 14582:2007 by calorimetric bomb with oxygen and determined by Ion Chromatograph.	ND	50		
Chlorine (CI)	ppm		ND	50		
Bromine (Br)	ppm		ND	50		
Iodine (I)	ppm		ND	50		
Phthalates		Gill Gillacograpini		l		
Di(2-ethylhexyl) Phthalate (DEHP)	ppm	With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS.	ND	10		
Dibutyl Phthalate (DBP)	ppm		ND	10		
Benzyl Butyl Phthalate (BBP)	ppm		ND	10		
Diisobutyl Phthalate (DIBP)	ppm		ND	10		



Number: TWNC00319524

#### Test Conducted

<u>Test Item</u>	<u>Unit</u>	Test Method	Result Dark grey paste	RL
Others				
Hexabromocyclododecane (HBCDD)	ppm	With reference to USEPA 3540C, by solvent extraction and determined by GC-MS.	ND	10

ppm = parts per million based on wet weight of tested sample = mg/kg Remarks:

> = Not detected ND

RL= Reporting Limit, Quantitation limit of analyte in sample

Responsibility of Chemist: Kevin Liu/ Irene Chiou/ Vico Lin

Date Sample Received : Jun 21, 2013

Test Period : Jun 24, 2013 To Jun 26, 2013

### **RoHS Limit**

Restricted Substances	<u>Limits</u>
Cadmium (Cd) content	0.01% (100ppm)
Lead (Pb) content	0.1% (1000ppm)
Mercury (Hg) content	0.1% (1000ppm)
Chromium VI (Cr <sup>6+</sup> ) content	0.1% (1000ppm)
Polybrominated Biphenyls (PBBs)	0.1% (1000ppm)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000ppm)

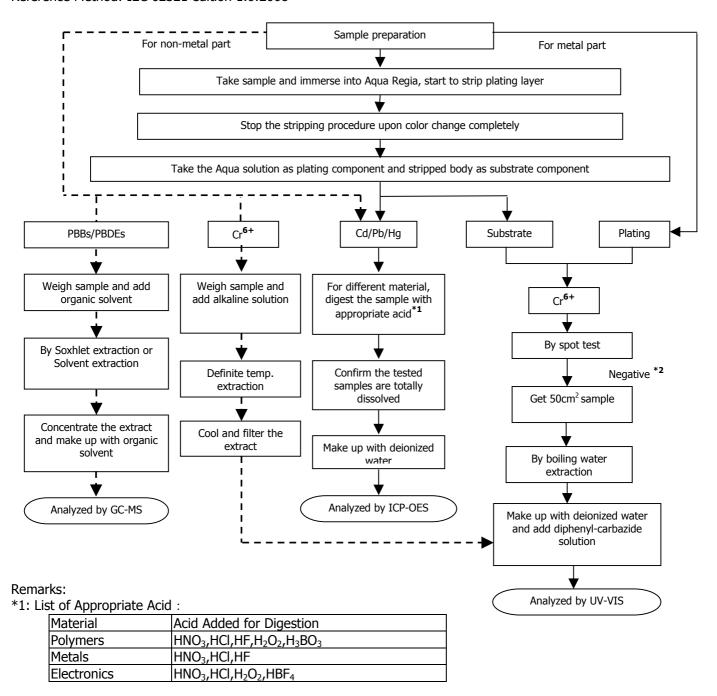
The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



Number: TWNC00319524

Test Conducted Measurement Flowchart:

Test for Cd/Pb/Hg/Chromium (VI)/PBBs/PBDEs Contents Reference Method: IEC 62321 edition 1.0:2008



\*2: If the result of spot test is positive, Chromium VI would be determined as detected.



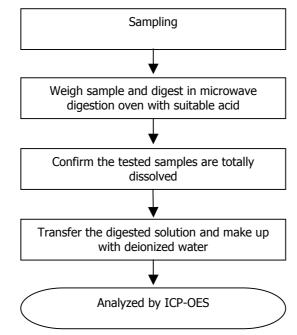


Number: TWNC00319524

**Test Conducted** 

Measurement Flowchart:

Test for Heavy Metal (Sb) Contents Reference Method: USEPA 3052



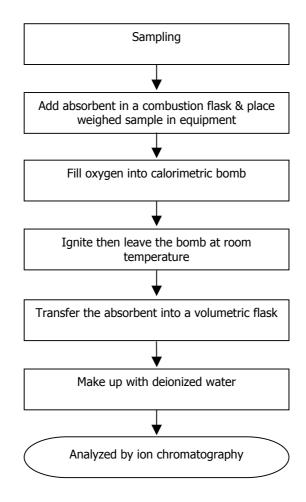


Number: TWNC00319524

**Test Conducted** 

Measurement Flowchart:

**Test for Halogen Contents** Reference Method: EN 14582





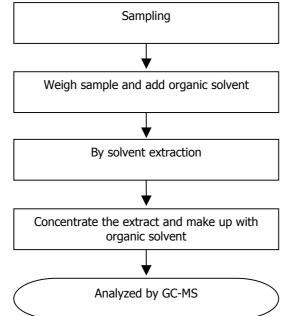
Number: TWNC00319524

**Test Conducted** 

Measurement Flowchart:

**Test for Phthalates Contents** 

Reference Method: EN 14372: 2004





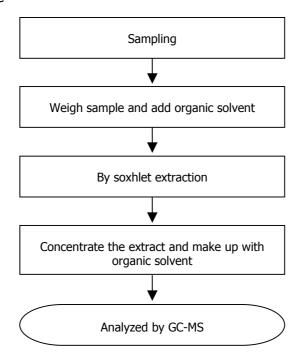
Number: TWNC00319524

**Test Conducted** 

Measurement Flowchart:

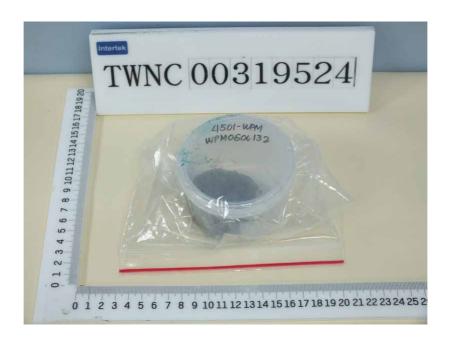
Test for Hexabromocyclododecane (HBCDD) Content

Reference Method: USEPA 3540C





Number: TWNC00319524





End of Report

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