

ICP Test Report Certification Packet

Company name:	Littelfuse, Inc.					
Product Series:	PulseGuard ESD Protector					
Product #:	PGB102ST23 – Lov	PGB102ST23 – Low Halogen				
Issue Date:	November 13, 2013					
2011/65/EU)-restricted s packing/packaging mate In addition, it is hereby re	substance nor such us rials, and for additives a eported to you that the p g/packaging materials, a	ere is neither RoHS (EU Directive 2002/95/EC, se, for materials to be used for unit parts, for and the like in the manufacturing processes. Dearts and sub-materials, the materials to be used and the additives and the like in the manufacturing imponents.				
	Issued by: -	JORDANUFF H. CABILAN [Global EHS Engineer]				
(1) Parts, sub-materials This document comanufactured by L	vers the PulseGuard E	ESD Protector RoHS-Compliant series products				
< Raw Materials I Please see Tal						
(2) The ICP data on all Please see ap	measurable substance propriate pages as iden					
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	13-16
3	010113	Tin Anode	17-20
4	010114	Copper Anode	21-24
5	090418	Soldermask Green	25-34
6	4501-WPM	VVM Material	35-44



: 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
ppiii		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 t	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	rest Metriod	Submitted samples	IXL	
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 ⁶⁺) content	0.1% (1000ppm)
Polybrominated Biphenyls (PBBs)	0.1% (1000ppm)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000ppm)

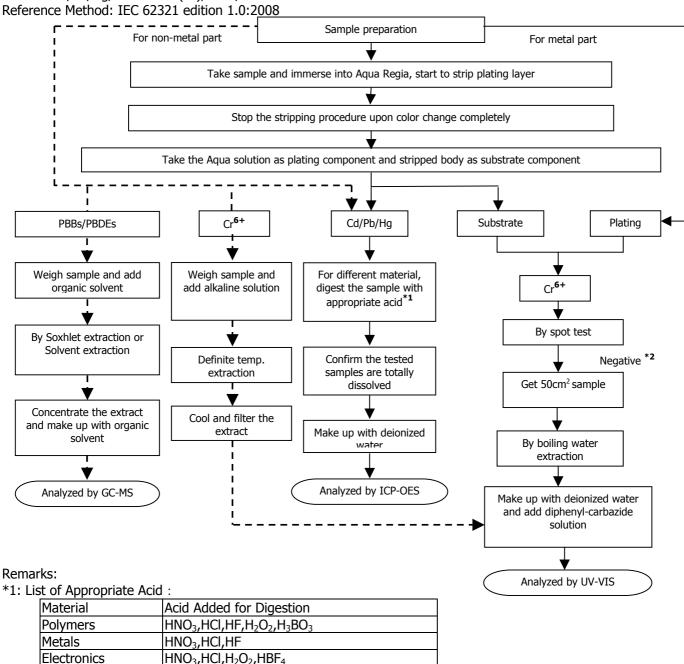
The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



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.



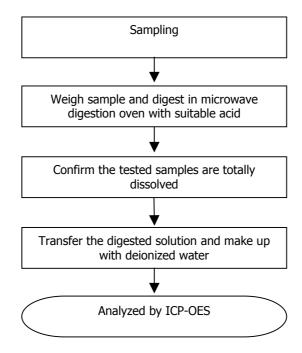


Number: TWNC00319520

Test Conducted

Measurement Flowchart:

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

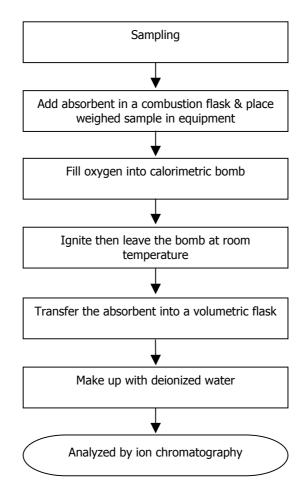




Number: TWNC00319520

Test Conducted

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

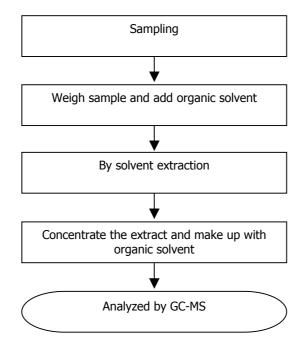




Number: TWNC00319520

Test Conducted

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





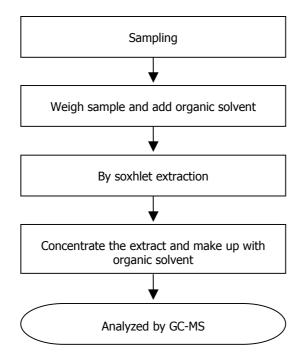
Number: TWNC00319520

Test Conducted

Measurement Flowchart:

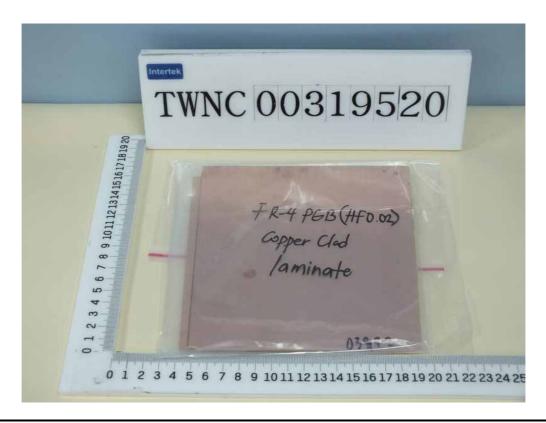
Test for Hexabromocyclododecane (HBCDD) Content

Reference Method: USEPA 3540C





Number: TWNC00319520



End of Report

This report is made solely on the basis of your instructions and/or information and materials supplied by you. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and onlyaccepts liability to the Client insofar as expressly contained in the terms and conditions governing Intertek's provision of services to you. Intertek makes nowarranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conductthe Review on a diligent and careful basis and we do not accept any liability to you for any loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.



Number : TWNC00340094

Date : Nov 07, 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 Nickel Anode 010104 Part Number Date Sample Received Oct 30, 2013 **Date Test Started** Oct 31, 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: TWNC00340094

Test Conducted

Test Result Summary:

<u>Test Item</u>	<u>Unit</u>	<u>Test Method</u>	Result	RL
Heavy Metal			Silvery metal	
Cadmium (Cd) content	ppm	With reference to IEC 62321-5: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Lead (Pb) content	ppm	With reference to IEC 62321-5: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Mercury (Hg) content	ppm	With reference to IEC 62321-4: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Chromium VI (Cr ⁶⁺) content	mg/kg with 50 cm ²	With reference to IEC 62321: 2008, by boiling water extraction and determined by UV-Vis Spectrophotometer.	Negative(#)	0.02

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

ND = Not detected

RL = Reporting Limit, Quantitation limit of analyte in sample mg/kg with 50cm² = milligram per kilogram with 50 square centimeter

Negative = A negative test result indicated positive observation was not found at the time of test

= Due to the insufficient sample area, reduced total sample surface of 10 cm² was used and the dilution factor was adjusted accordingly.

Responsibility of Chemist: Kevin Liu/ Irene Chiou

Date Sample Received : Oct 30, 2013

Test Period : Oct 31, 2013 to Nov 07, 2013

RoHS Limit

10.10			
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 ⁶⁺) content	0.1% (1000ppm)		
The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.			

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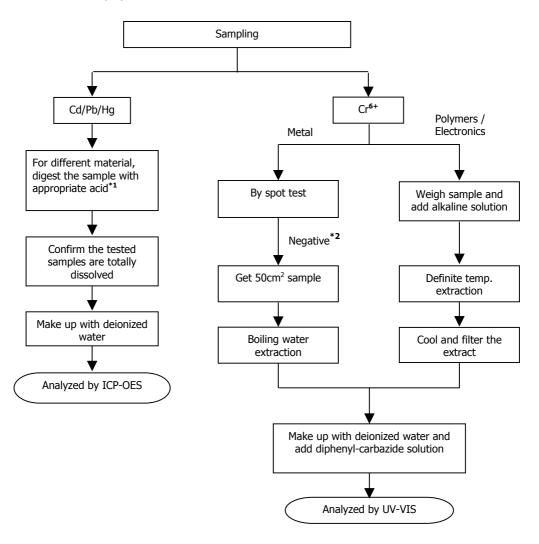
Number: TWNC00340094

Test Conducted Measurement Flowchart:

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

Reference Standard : Cd/Pb: IEC 62321-5:2013; Hg: IEC 62321-4:2013;

Chromium (VI): IEC 62321:2008



Remarks:

*1: List of Appropriate Acid :

Material	Acid Added for Digestion	
Polymers	HNO ₃ ,HCl,HF,H ₂ O ₂ ,H ₃ BO ₃	
Metals	HNO ₃ ,HCl,HF	
Electronics	HNO ₃ ,HCl,H ₂ O ₂ ,HBF ₄	

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



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Number: TWNC00340094



End of Report

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Number : TWNC00340093

Date : Nov 07, 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 Tin Anode 010113 Part Number Date Sample Received Oct 30, 2013 **Date Test Started** Oct 31, 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: TWNC00340093

Test Conducted

Test Result Summary:

Test Item	<u>Unit</u>	Test Method	Result	RL
Heavy Metal			<u>Silvery metal</u>	
Cadmium (Cd) content	ppm	With reference to IEC 62321-5: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Lead (Pb) content	ppm	With reference to IEC 62321-5: 2013, by microwave or acid digestion and determined by ICP-OES.	108	2
Mercury (Hg) content	ppm	With reference to IEC 62321-4: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Chromium VI (Cr ⁶⁺) content	mg/kg with 50 cm ²	With reference to IEC 62321: 2008, by boiling water extraction and determined by UV-Vis Spectrophotometer.	Negative	0.02

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

ND = Not detected

 $RL = Reporting Limit, quantitation limit of analyte in sample mg/kg with <math>50cm^2 = Milligram per kilogram with 50 square centimeter$

Negative = A negative test result indicated positive observation was not found at the time of test.

Responsibility of Chemist: Kevin Liu/ Irene Chiou

Date Sample Received : Oct 30, 2013

Test Period : Oct 31, 2013 to Nov 07, 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 ⁶⁺) content	0.1% (1000ppm)

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

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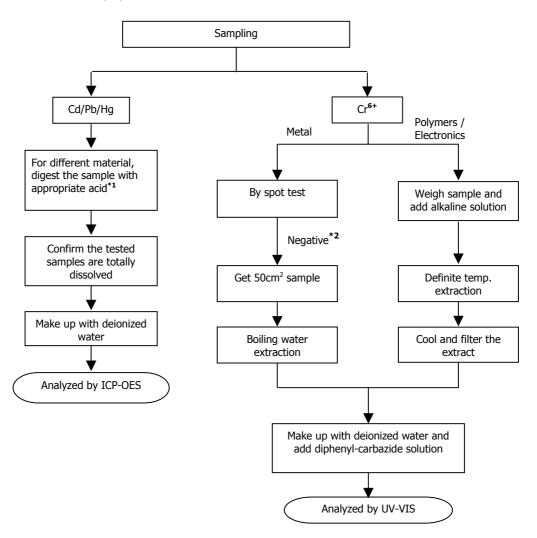
Number: TWNC00340093

Test Conducted

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

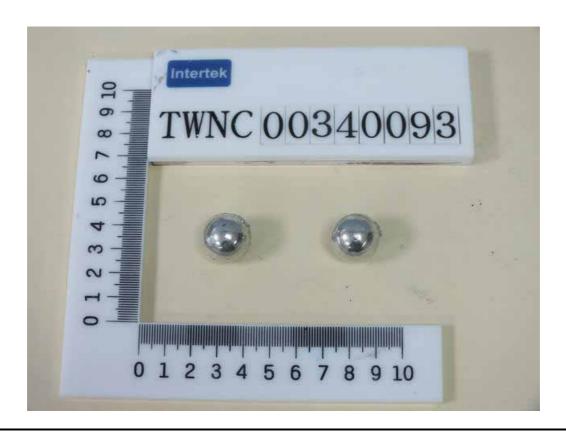
Reference Standard: Cd/Pb: IEC 62321-5:2013; Hg: IEC 62321-4:2013;

Chromium (VI): IEC 62321:2008





TWNC00340093 Number:



End of Report

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Applicant:

Test Report

Number : TWNC00340092

Date : Nov 07, 2013

Littelfuse Philippines Inc. 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 Date Sample Received Oct 30, 2013 **Date Test Started** Oct 31, 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

Page 1 of 6



Number: TWNC00340092

Test Conducted

Test Result Summary:

Test Item	<u>Unit</u>	Test Method	<u>Result</u>	RL
Heavy Metal			Coppery metal	
Cadmium (Cd) content	ppm	With reference to IEC 62321-5: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Lead (Pb) content	ppm	With reference to IEC 62321-5: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Mercury (Hg) content	ppm	With reference to IEC 62321-4: 2013, by microwave or acid digestion and determined by ICP-OES.	ND	2
Chromium VI (Cr ⁶⁺) content	mg/kg with 50 cm ²	With reference to IEC 62321: 2008, by boiling water extraction and determined by UV-Vis Spectrophotometer.	Negative(#)	0.02

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

> ND = Not detected

= Reporting Limit, Quantitation limit of analyte in sample mg/kg with 50cm² = milligram per kilogram with 50 square centimeter

Negative = A negative test result indicated positive observation was not found at the time of test

= Due to the insufficient sample area, reduced total sample surface of 10 cm² was used and the dilution factor was adjusted accordingly.

Responsibility of Chemist: Kevin Liu/ Irene Chiou

Date Sample Received Oct 30, 2013

Test Period Oct 31, 2013 to Nov 07, 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 ⁶⁺) content	0.1% (1000ppm)		
The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.			

Page 2 of 6

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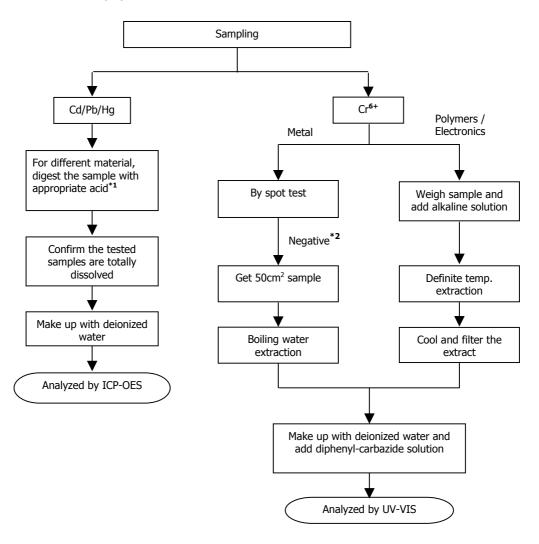
Number: TWNC00340092

Test Conducted Measurement Flowchart:

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

Reference Standard: Cd/Pb: IEC 62321-5:2013; Hg: IEC 62321-4:2013;

Chromium (VI): IEC 62321:2008



Remarks:

*1: List of Appropriate Acid :

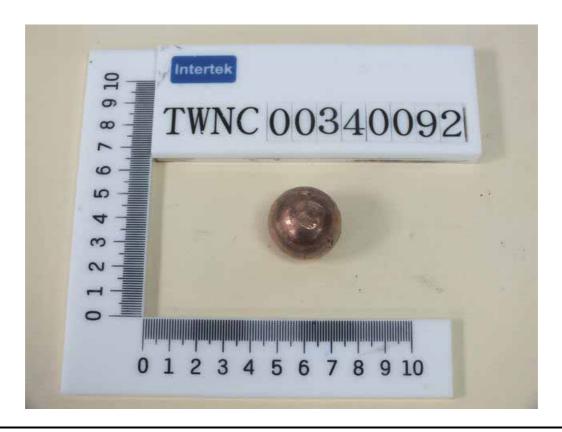
Material	Acid Added for Digestion	Acid Added for Digestion			
Polymers	HNO ₃ ,HCl,HF,H ₂ O ₂ ,H ₃ BO ₃	HNO ₃ ,HCl,HF,H ₂ O ₂ ,H ₃ BO ₃			
Metals	HNO ₃ ,HCl,HF				
Electronics	HNO ₃ ,HCl,H ₂ O ₂ ,HBF ₄				

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





TWNC00340092 Number:



End of Report

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: 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 ⁶⁺) 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		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
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				
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		ND	10
Dibutyl Phthalate (DBP)	ppm	With reference to EN 14372: 2004, by solvent extraction and determined by GC-MS.	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 ⁶⁺) 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.

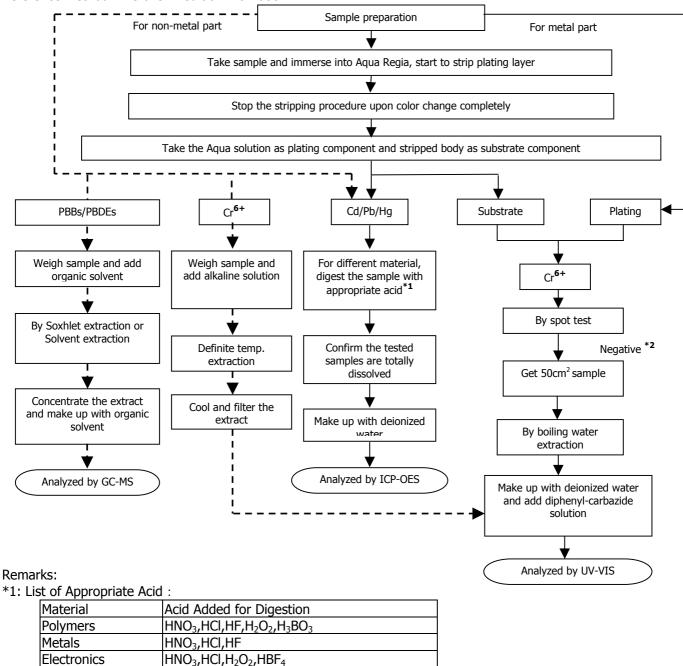


Number: TWNC00319525

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.



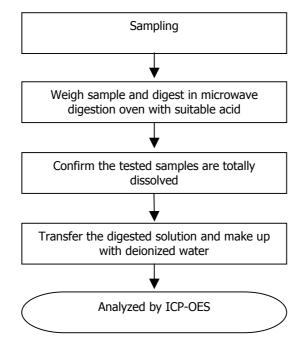
Page 5 of 12



Number: TWNC00319525

Test Conducted Measurement Flowchart:

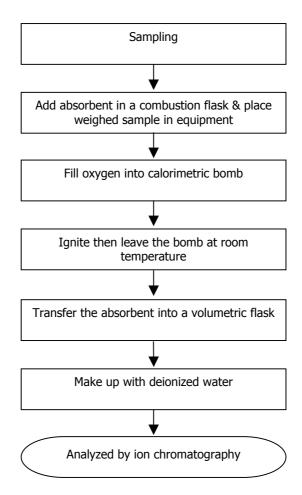
Test for Heavy Metal (Sb) Contents Reference Method: USEPA 3052





Number: TWNC00319525

Test Conducted Test for Halogen Contents Reference Method: EN 14582

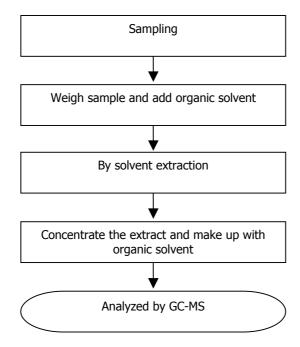




Number: TWNC00319525

Test Conducted Test for Phthalates Contents

Reference Method: EN 14372: 2004



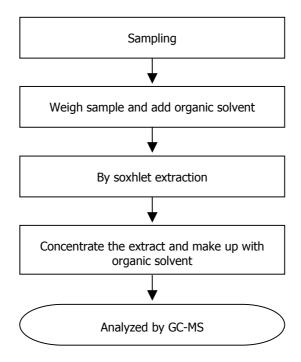


Number: TWNC00319525

Test Conducted

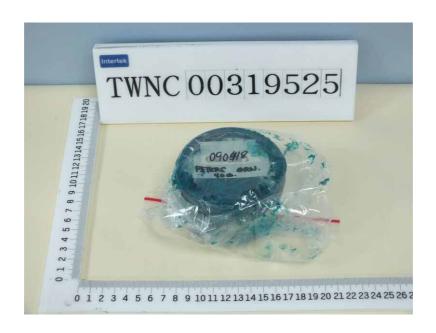
Test for Hexabromocyclododecane (HBCDD) Content

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>rest item</u>	Offic	rest Metriod	<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 ⁶⁺) 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		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



Test Conducted

Number: TWNC00319524

Test Item	Unit Test Method	Tost Mathad	<u>Result</u>	RL
<u>rest item</u>	Offic	<u>rest Metriou</u>	Dark grey paste	KL
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	Mith reference to IFC (2221)	ND	5
Pentabrominated Diphenyl Ethers (PentaBDE)	ppm	With reference to IEC 62321: 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	•			•
Fluorine (F)	ppm	With reference to EN	ND	50
Chlorine (CI)	ppm	14582:2007 by calorimetric	ND	50
Bromine (Br)	ppm	bomb with oxygen and determined by Ion	ND	50
Iodine (I)	ppm	Chromatograph.	ND	50
Phthalates		e eaceg. ap		
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 ⁶⁺) content	0.1% (1000ppm)
Polybrominated Biphenyls (PBBs)	0.1% (1000ppm)
Polybrominated Diphenyl Ethers (PBDEs)	0.1% (1000ppm)

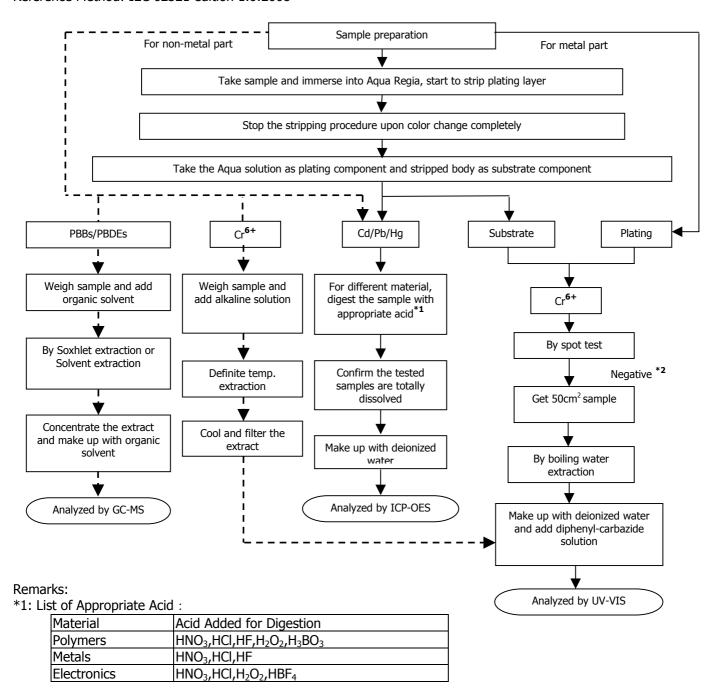
The above limits were quoted from Annex II of 2011/65/EU for homogeneous material.



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.



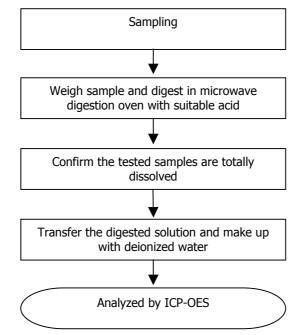


Number: TWNC00319524

Test Conducted

Measurement Flowchart:

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



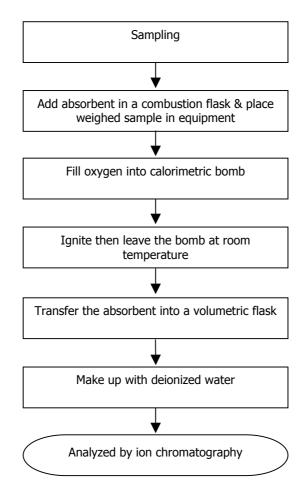


Number: TWNC00319524

Test Conducted

Measurement Flowchart:

Test for Halogen Contents Reference Method: EN 14582





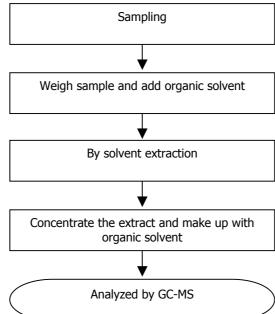
Number: TWNC00319524

Test Conducted

Measurement Flowchart:

Test for Phthalates Contents

Reference Method: EN 14372: 2004





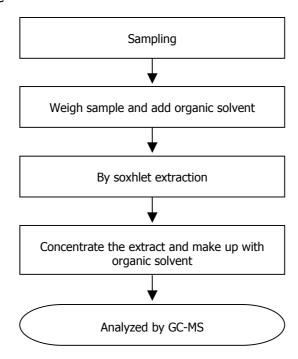
Number: TWNC00319524

Test Conducted

Measurement Flowchart:

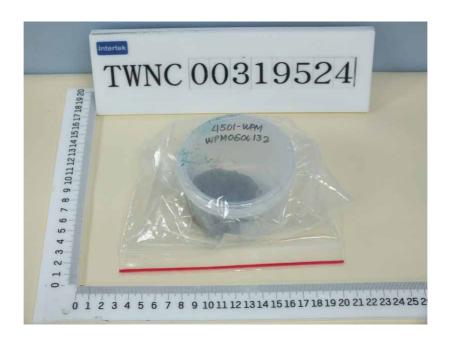
Test for Hexabromocyclododecane (HBCDD) Content

Reference Method: USEPA 3540C





Number: TWNC00319524





End of Report

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