

Test Report No. SHAEC1910772201 Date: 31 May 2019 Page 1 of 17

NAN YA PRINTED CIRCUIT BOARD (KUNSHAN) CO.,LTD

201 CHANG JIANG ROAD(S), KUNSHAN ECONOMIC & TECHNICAL DEVELOPMENT ZONE, KUNSHAN, JIANG SU. CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as: Gold Plating

SGS Job No.: SP19-017252 - SH

Date of Sample Received: 23 May 2019

Testing Period: 23 May 2019 - 29 May 2019

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).

Based on the performed tests on submitted sample(s), the results of Cadmium, Conclusion:

Lead, Mercury, Hexavalent chromium, Polybrominated biphenyls (PBBs),

Polybrominated diphenyl ethers (PBDEs) and Phthalates such as

Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

Dora Hu

Approved Signatory



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Test Report Date: 31 May 2019 Page 2 of 17 No. SHAEC1910772201

Test Results:

Test Part Description:

Specimen No. SGS Sample ID **Description**

SHA19-107722.001 SN₁ Golden/coppery metal foil

Remarks:

(1) 1 mg/kg = 0.0001%

(2) MDL = Method Detection Limit

(3) ND = Not Detected (< MDL)

(4) "-" = Not Regulated

RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU

Test Method: With reference to IEC 62321-4:2013+AMD1:2017, IEC62321-5:2013, IEC62321-7-1:2015, IEC 62321-6:2015 and IEC62321-8:2017, analyzed by ICP-OES, AAS, UV-Vis and GC-MS.

Test Item(s)	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▼	-	µg/cm²	0.10	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND



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Test Report	No. SHAEC19107722	EC1910772201 Date: 31 May 2019 Page		Page 3 of 17	
Test Item(s)	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>	
Pentabromodiphenyl ether	-	mg/kg	5	ND	
Hexabromodiphenyl ether	-	mg/kg	5	ND	
Heptabromodiphenyl ether	-	mg/kg	5	ND	
Octabromodiphenyl ether	-	mg/kg	5	ND	
Nonabromodiphenyl ether	-	mg/kg	5	ND	
Decabromodiphenyl ether	-	mg/kg	5	ND	
Di-butyl Phthalate (DBP)	1000	mg/kg	50	ND	
Benzyl Butyl Phthalate (BBP)	1000	mg/kg	50	ND	
Di-2-Ethyl Hexyl Phthalate (DEHP)	1000	mg/kg	50	ND	
Diisobutyl Phthalates (DIBP)	1000	mg/kg	50	ND	

Notes:

- (1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863. IEC 62321 series is equivalent to EN 62321 series http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101::::FSP_ORG_ID,FSP_LANG _ID:1258637,25
- (2)▼ = a. The sample is positive for CrVI if the CrVI concentration is greater than 0.13 µg/cm². The sample coating is considered to contain CrVI
 - b. The sample is negative for CrVI if CrVI is ND (concentration less than 0.10 µg/cm²). The coating is considered a non-CrVI based coating
 - c. The result between 0.10 µg/cm² and 0.13 µg/cm² is considered to be inconclusive unavoidable coating variations may influence the determination Information on storage conditions and production date of the tested sample is unavailable and thus Cr(VI) results represent status of the sample at the time of testing.

<u>Halogen</u>

Test Method: With reference to EN 14582: 2016, analysis was performed by IC.

Test Item(s)	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (CI)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
lodine (I)	mg/kg	50	ND

Element(s)

Test Method: With reference to US EPA 3052:1996, analysis was performed by ICP-OES.



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Test Report No. SHAEC1910772201 Date: 31 May 2019 Page 4 of 17

Test Item(s)	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Arsenic (As)	mg/kg	10	ND
Beryllium (Be)	mg/kg	5	ND
Antimony (Sb)	mg/kg	10	ND

Monomethyldibromodiphenylmethane, Monomethyldichlorodiphenylmethane, Monomethyltetrachlorodiphenylmethane

Test Method: SGS In house method, analysis was performed by GC-MS.

Test Item(s)	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Monomethyldibromodiphenylmethane	mg/kg	10	ND
Monomethyldichlorodiphenylmethane	mg/kg	10	ND
Monomethyltetrachloro-diphenylmethane	mg/kg	10	ND

Red Phosphorus

Test Method: SGS in house method(SHTC- CHEM- SOP -342-T), Analysis was performed by ICP-OES and

Pyrolysis-GC/MS

Test Item(s)	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Red Phosphorus	mg/kg	500	ND

Notes:

For Positive result, the testing result is based on the worst-case scenario, and confirmed by Pyrolysis-GC-MS.

Tetrabromobisphenol A (TBBP-A)

Test Method: With reference to US EPA 3540C: 1996, analysis was performed by GC-MS.

Test Item(s)	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND

PVC (Polyvinyl chloride)



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Test Report No. SHAEC1910772201 Date: 31 May 2019 Page 5 of 17

Test Method: In-house method (SHTC-CHEM-SOP-115-T), analysis was performed by FTIR/HATR.

 Test Item(s)
 CAS NO.
 Unit
 MDL
 001

 PVC
 9002-86-2
 Negative

Notes:

(1) Negative=Undetectable, Positive=Detectable

Bisphenol-A

Test Method: SGS In-house method (RSTS-CHEM-239-1), analysis was performed by HPLC-MS.

 Test Item(s)
 Unit
 MDL
 001

 Bisphenol-A
 mg/kg
 1
 ND

Hexabromocyclododecane (HBCDD)

Test Method: With reference to IEC 62321:2008, analysis was performed by GC-MS.

Test Item(s) Unit MDL 001

Hexabromocyclododecane (HBCDD) mg/kg 10 ND

Notes:

CAS NO.: 25637-99-4 and 3194-55-6 (134237-51-7,134237-50-6,134237-52-8)

Phthalates Content

Test Method: With reference to IEC 62321-8:2017, determination of phthalates by GC-MS.

Test Item(s)	CAS NO.	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Diisononyl Phthalate (DINP)	28553-12-0	mg/kg	50	ND
	/68515-48-0			
Di-n-octyl Phthalate (DNOP)	117-84-0	mg/kg	50	ND
Diisodecyl Phthalate (DIDP)	26761-40-0	mg/kg	50	ND
	/68515-49-1			
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	mg/kg	50	ND
Dihexyl Phthalates (DHP, DHxP)	84-75-3	mg/kg	50	ND
Di-n-pentyl Phthalates (DnPP)	131-18-0	mg/kg	50	ND



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Test Report	No. SHAEC1910772201	Date: 31 May 2019		Page 6 of 17	
Test Item(s)		CAS NO.	<u>Unit</u>	MDL	<u>001</u>
Diphenyl Phthalates (DPhP)		84-62-8	mg/kg	50	ND
Dimethyl Phthalates (DMP)		131-11-3	mg/kg	50	ND
Diethyl Phthalates (DEP)		84-66-2	mg/kg	50	ND
Dicyclohexyl Phthalates (DCHP)		84-61-7	mg/kg	50	ND
Dibenzyl Phthalates (DBzP)	:	523-31-9	mg/kg	50	ND
Diiso-octyl Phthalates (DIOP)	2	7554-26-3	mg/kg	50	ND
Dipropyl Phthalates (DPrP)		131-16-8	mg/kg	50	ND
Dinonyl Phthalates (DNP)		84-76-4	mg/kg	50	ND
Diisopentylphthalate (DiPP)		605-50-5	mg/kg	50	ND
1,2-Benzenedicarboxylic acid, di-C7-	-11-branched and 68	8515-42-4	mg/kg	50	ND
linear alkyl esters(DHNUP)					
Diisoheptyl phthalate (DIHP)	7	1888-89-6	mg/kg	50	ND

PFOS (Perfluorooctane Sulfonates) and Perfluorooctanoic Acid (PFOA)

Test Method: With reference to CEN/TS 15968:2010, analysis was performed by LC-MS.

Test Item(s)	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>001</u>
Perfluorooctane Sulfonates (PFOS) [^]	1000	mg/kg	10	ND
Perfluorooctanoic Acid (PFOA)	-	mg/kg	10	ND

Notes:

- (1) Max. limit specified by commission regulation (EU) No. 757/2010 amending regulation (EC) No
- (2) ^ PFOS refer to Perfluorooctanesulfonic acid and its derivatives including Perfluoroctanesulfonic acid, Perfluoroctane sulfonamide, N-Methylperfluoroctane sulfonamide, N-Ethylperfluoroctane sulfonamide, N-Methylperfluoroctane sulfonamidoethanol and N-Ethylperfluoroctane sulfonamidoethanol.



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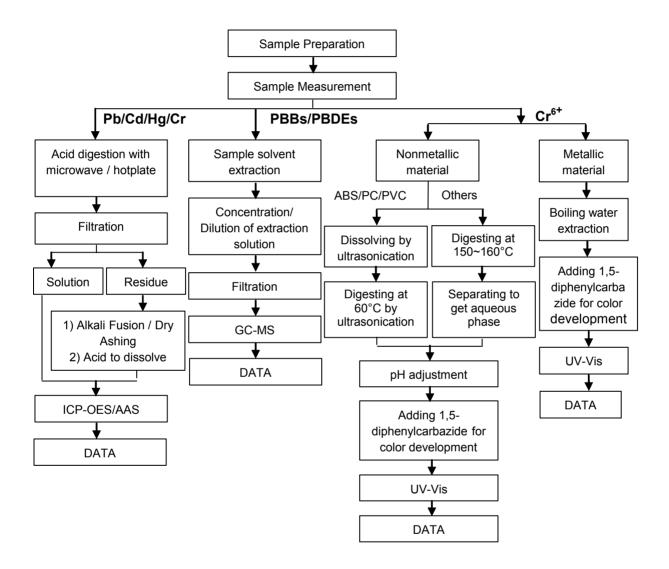


Test Report No. SHAEC1910772201 Date: 31 May 2019 Page 7 of 17

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Pb/Cd/Hg/Cr⁶⁺/PBBs/PBDEs Testing Flow Chart

1) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr⁶⁺ and PBBs/PBDEs test method excluded)





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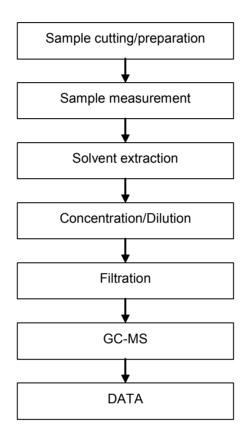


No. SHAEC1910772201

Page 8 of 17

Date: 31 May 2019

Phthalates Testing Flow Chart





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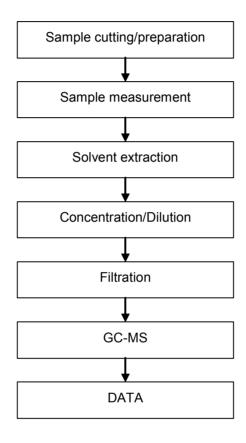


No. SHAEC1910772201

Page 9 of 17

Date: 31 May 2019

HBCDD Testing Flow Chart





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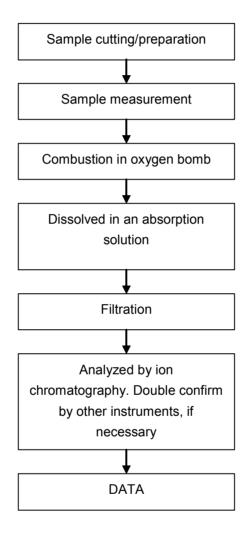
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No. SHAEC1910772201

Date: 31 May 2019 Page 10 of 17

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Halogen Testing (oxygen bomb) Flow Chart





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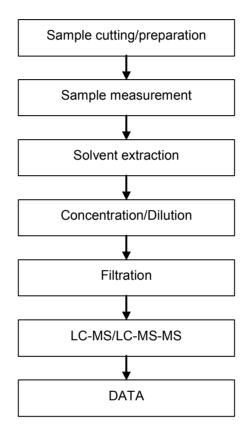
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No. SHAEC1910772201

Date: 31 May 2019 Page 11 of 17

PFOS/PFOA Testing Flow Chart





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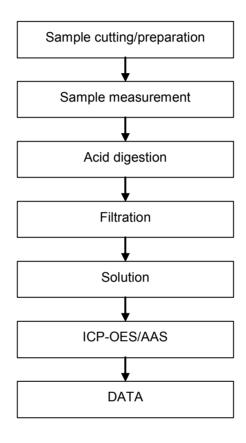
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No. SHAEC1910772201

Date: 31 May 2019 Page 12 of 17

Elements Testing Flow Chart





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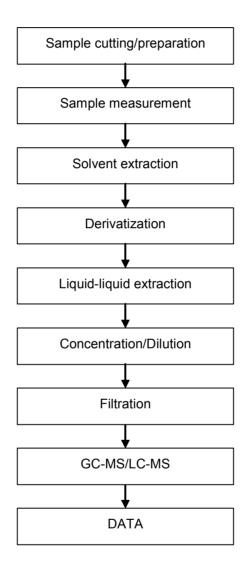


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Page 13 of 17

TBBP-A Testing Flow Chart





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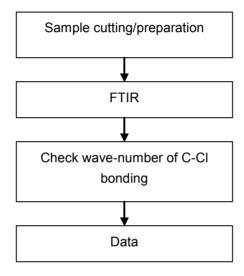


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Page 14 of 17

PVC Testing Flow Chart





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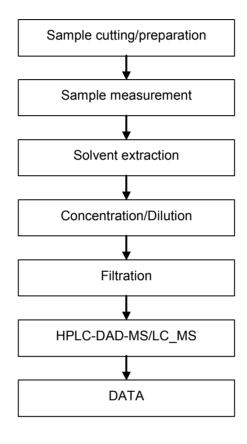


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Page 15 of 17

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BPA Testing Flow Chart





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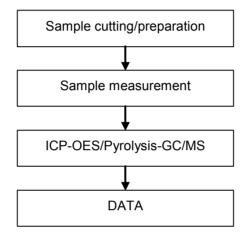


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Page 16 of 17

Red Phosphorus Testing Flow Chart





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Page 17 of 17

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