

Test Report No. SHAEC2008498501 Date: 27 May 2020 Page 1 of 19

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.: SP20-014267 - SH

Date of Sample Received: 20 May 2020

Testing Period: 20 May 2020 - 26 May 2020

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).

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

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.



Approved Signatory





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Test Report Date: 27 May 2020 Page 2 of 19 No. SHAEC2008498501

Test Results:

Test Part Description:

Specimen No. SGS Sample ID Description SHA20-084985.001 SN₁ Golden 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, 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. SHAEC20084985	501	Date:	27 May 2020	Page 3 of 19
Test Item(s)	<u>Limit</u>	<u>Unit</u>	MDL	<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 https://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101::::FSP_ORG_ID,FSP_LANG_ID:1258637,25
- (2) $\overline{}$ = 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 $0.10 \,\mu g/cm^2$). The coating is considered a non-CrVI based coating
 - c. The result between 0.10 μ g/cm² and 0.13 μ g/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. SHAEC2008498501 Date: 27 May 2020 Page 4 of 19

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 Page 5 of 19 No. SHAEC2008498501 Date: 27 May 2020

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) 001 Unit **MDL** Bisphenol-A mg/kg 360

Hexabromocyclododecane (HBCDD)

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

Test Item(s) <u>Unit</u> **MDL** <u>001</u> 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. SHAEC2008498501	Date	e: 27 May 2020	Page 6	of 19
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	27554-26-3	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 6	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>Unit</u>	<u>MDL</u>	<u>001</u>
Perfluorooctane Sulfonates (PFOS) [^]	mg/kg	10	ND
Perfluorooctanoic Acid (PFOA)	mg/kg	10	ND

Notes:

(1) ^ PFOS refer to Perfluoroctanesulfonic acid and its derivatives including Perfluoroctanesulfonic acid, Perfluoroctane sulfonamide, N-Methylperfluoroctane sulfonamide, N-Ethylperfluoroctane sulfonamidoethanol and N-Ethylperfluoroctane sulfonamidoethanol.



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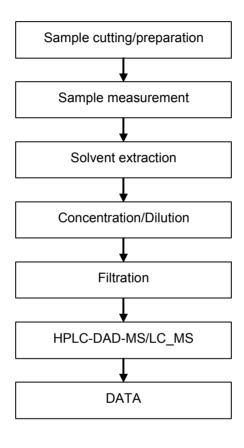


No. SHAEC2008498501

Page 7 of 19

Date: 27 May 2020

BPA Testing Flow Chart





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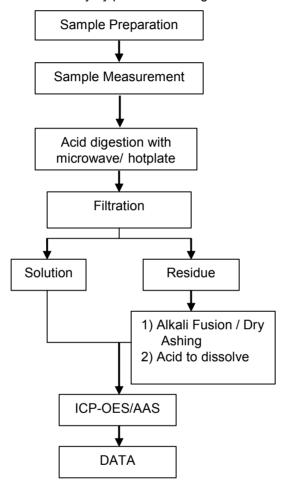
Page 8 of 19

Date: 27 May 2020

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Elements (IEC62321) Testing Flow Chart

1) These samples were dissolved totally by pre-conditioning method according to below flow chart.





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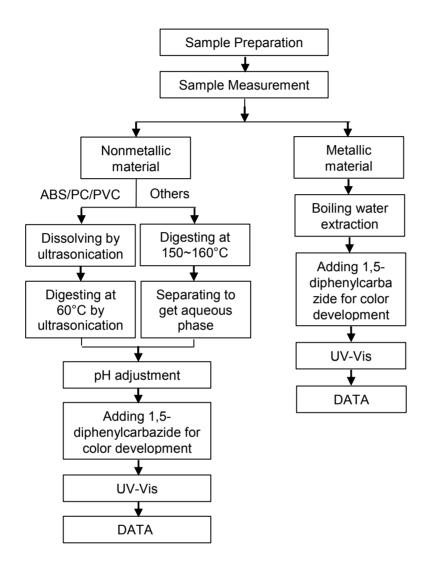
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Page 9 of 19

Date: 27 May 2020

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Hexavalent Chromium (Cr(VI)) Testing Flow Chart





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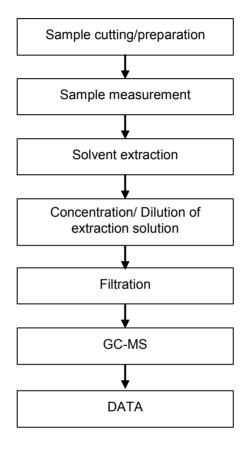
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No. SHAEC2008498501

Date: 27 May 2020 Page 10 of 19

PBBs/PBDEs Testing Flow Chart





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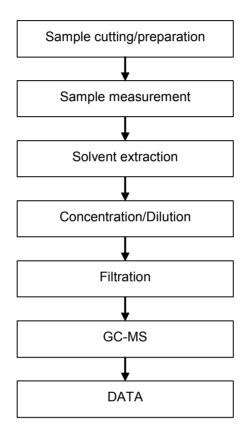


No. SHAEC2008498501

Page 11 of 19

Date: 27 May 2020

Phthalates Testing Flow Chart





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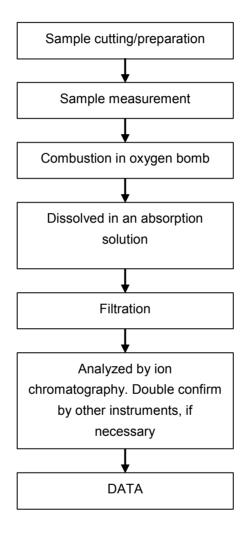
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Page 12 of 19

Date: 27 May 2020

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Halogen Testing (oxygen bomb) Flow Chart





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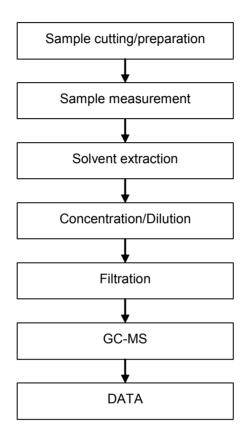


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Page 13 of 19

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HBCDD Testing Flow Chart





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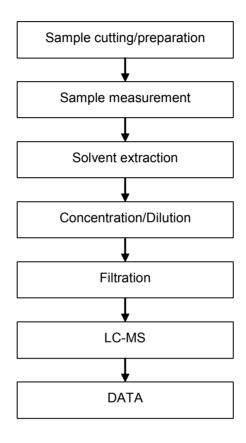
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No. SHAEC2008498501

Date: 27 May 2020 Page 14 of 19

PFOS/PFOA Testing Flow Chart





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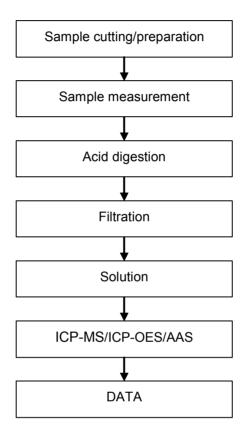
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No. SHAEC2008498501

Page 15 of 19

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Elements Testing Flow Chart





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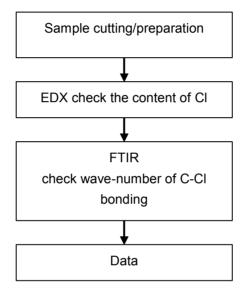
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Date: 27 May 2020 Page 16 of 19

PVC Testing Flow Chart





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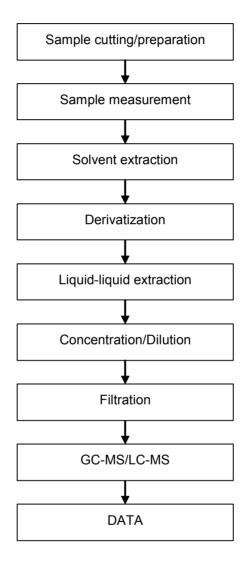


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Page 17 of 19

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TBBP-A Testing Flow Chart





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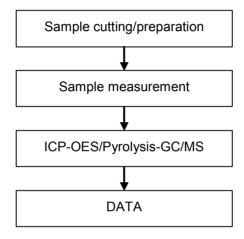


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Page 18 of 19

Red Phosphorus Testing Flow Chart





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No. SHAEC2008498501

Page 19 of 19

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