



# SPECIFICATION

## Surface Acoustic Wave Filter

USER

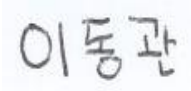


USER PART No.

WISOL PART No. **SFXG35EYN02**

DOC. No. SMS-51-L-SFT-FS-216

DATE April 29, 2019

REVISION 000

WISOL					
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## 1. REVISION HISTORY

000	April 29, 2019	All Page	Make specification
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## 2. DEFINITION

### 2-1. PART No.

**S F X G 3 5 E Y N 0 2**

①	②	③	④	⑤	⑥
No.	EXPLANATION				
①	SAW Filter				
②	Design Type				
③	Center Frequency :2535MHz(2500 ~ 2570)				
④	Input:50ohm,Output:50ohm				
⑤	Package size: 1.8×1.4mm <sup>2</sup>				
⑥	Design Revision (02 : Molding Type)				

### 2-2. APPLICATION : LTE BAND7 Unbalanced DPX

### 2-3. SPEC

ESD Level    HBM=300V

## 3. PRECAUTIONS

3-1. This device should not be used in any type of fluid such as water, oil, organic solvent, etc.

3-2. This is a hermetic device.

MSL(Moisture Sensitive Level) is the '2a' level.

3-3. Ultrasonic cleaning shall be avoided.

3-4. Isopropyl Alcohol and Ethyl Alcohol can be used for cleaning. Contact us before using other cleaning solvents than above

3-5. This is an electrostatic sensitive device.

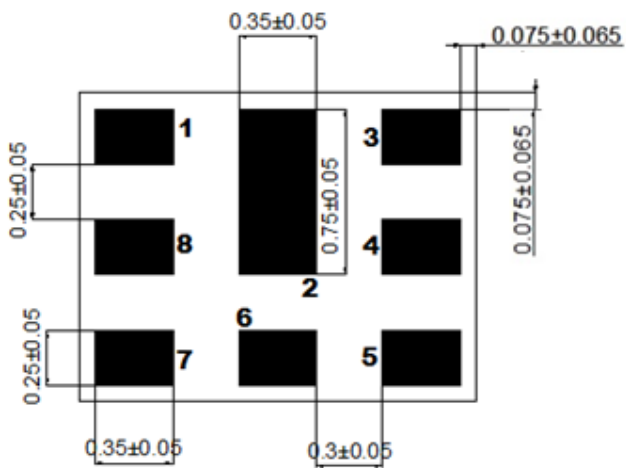
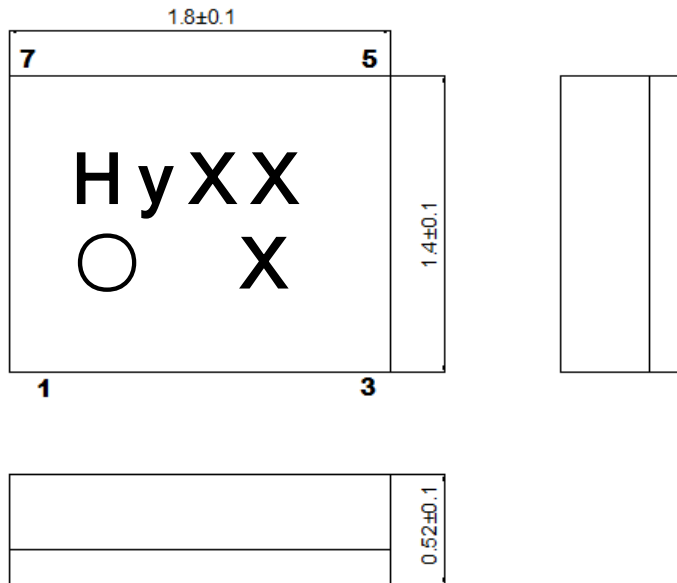
Please avoid static voltage during operation and storage.

3-6. Sudden change of temperature shall be avoided, deterioration of the characteristics can occur.

3-7. If any malfunction due to designing or manufacturing which is out of specification occurs within one year after the products have been delivered, the maker should exchange the defective products.

#### 4. OUTLINE DRAWING & DIMENSIONS

[Unit: mm]



No.	Function
1	Rx Output
3	Tx Input
6	Antenna
2, 4, 5, 7, 8	GND

## 5. MARKING

HyXX
○ X

### 5-1. H y X X X

- The 1<sup>st</sup> 2<sup>nd</sup> character 'Hy' indicates the model name of SAW Filter SFXG35EYN02.
- The 3<sup>rd</sup> character 'X' indicates the year and the month of manufacture..

Year	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
2017	1	2	3	4	5	6	7	8	9	A	B	C
2018	D	E	F	G	H	I	J	K	L	M	N	O
2019	P	Q	R	S	T	U	V	W	X	Y	Z	a
2020	1	2	3	4	5	6	7	8	9	A	B	C

※ This rotates by the 3 years.

- The 4<sup>th</sup> ,5<sup>th</sup> character 'X' indicates Lot NO.

### 5-2. ○

- This symbol indicates input pin 1.
- This indicates the producing center
  - : China

### 5-3. Marking : Laser Marking

## 6. PERFORMANCE

### 6-1. MAXIMUM RATINGS

CHARACTERISTICS	RATINGS	UNITS	NOTES
DC Permissive Voltage	5	V	
Input Power	30	dBm	55 °C, 5000 h
Operating Temperature Range	− 20 ~ +85	°C	
Storage Temperature Range	− 40 ~ +85	°C	

**6-2. ELECTRICAL CHARACTERISTICS**
**6-2-1. TABLE**

Ta = -20 ~ +85℃

(\*1) PCB loss is de-embedded.

(\*2) Valid at room temperature.

(\*3) Integrated attenuation per 4.5MHz

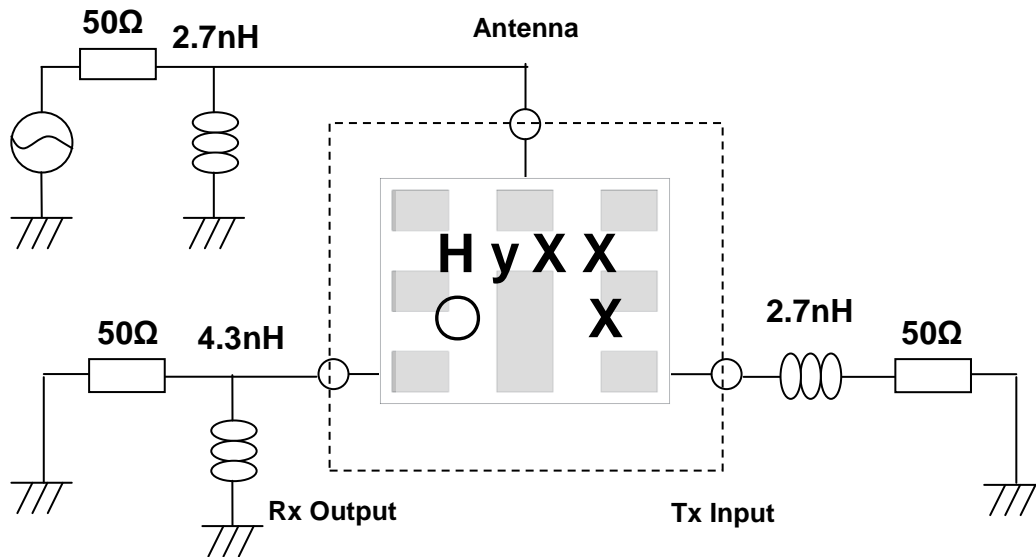
(\*4) Integrated attenuation per 18MHz

Item	CONDITION [MHz]	UNIT	RATING		
			Min.	Typ.(25℃)	Max.
TX → ANTENNA					
Insertion Loss	2500 ~ 2570 (*1)	dB	-	2.0	2.9
	2500 ~ 2570 (*1)(*2)	dB	-	2.0	2.7
	2502.5 ~ 2567.5 (*1)(*2) (*3)	dB <sub>INT</sub>	-	1.8	2.8
Inband Ripple	2500.25 ~ 2569.75	dB	-	0.9	2.0
Ant VSWR	2500.25 ~ 2569.75	-	-	1.5	2.1
TX VSWR	2500.25 ~ 2569.75	-	-	1.5	2.1
Absolute Attenuation	10 ~718	dB	30	55	-
	832 ~ 862	dB	30	51	-
	1559 ~ 1563	dB	38	40	-
	1565.42 ~ 1573.37	dB	38	40	-
	1573.37 ~ 1577.47	dB	38	40	
	1577.47 ~ 1585.42	dB	38	40	
	1597.55 ~ 1605.89	dB	38	40	
	1605.89 ~ 1680.0	dB	35	39	-
	1710.0 ~ 1785.0	dB	32	38	-
	1805.0 ~ 1880.0	dB	32	37	-
	1900.0 ~ 1920.0	dB	32	36	-
	2010.0 ~ 2025.0	dB	32	35	-
	2110.0 ~ 2170.0	dB	32	35	-
	2401.0 ~ 2468.0 (*4)	dB <sub>INT</sub>	40	50	-
	2451.0 ~ 2473.0 (*4)	dB <sub>INT</sub>	30	52	-
	2456.0 ~ 2478.0 (*4)	dB <sub>INT</sub>	15	52	-
	2461.0 ~ 2483.0 (*4)	dB <sub>INT</sub>	7	37	-
	2401.0 ~ 2468.0 (*2)(*4)	dB <sub>INT</sub>	40	50	-
	2451.0 ~ 2473.0 (*2)(*4)	dB <sub>INT</sub>	40	52	-
	2456.0 ~ 2478.0 (*2)(*4)	dB <sub>INT</sub>	20	52	-



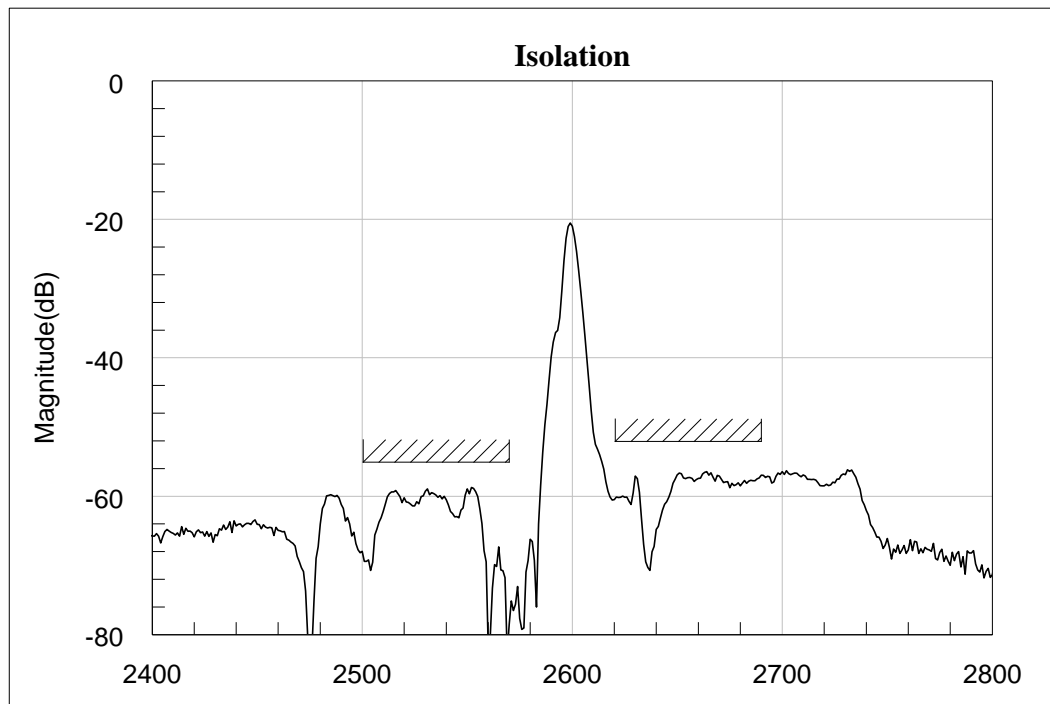
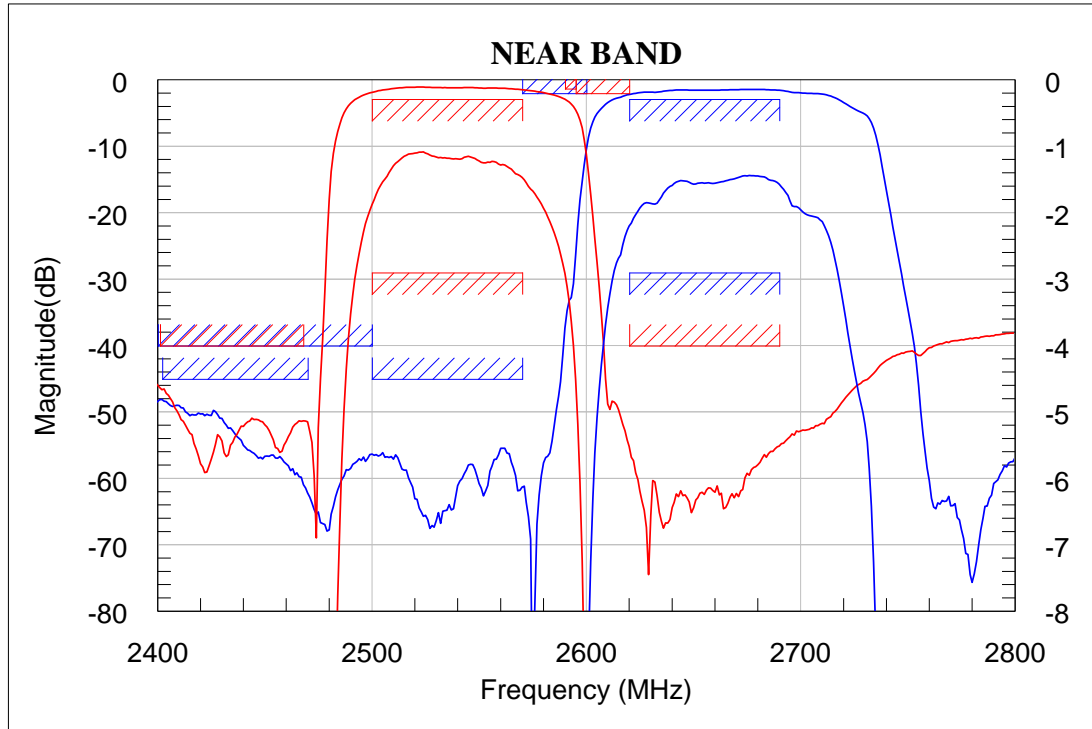
	2461.0 ~ 2483.0 (*2)(*4)	dB <sub>INT</sub>	7	37	-
	2590.0 ~ 2595.0	dB	1.3	3	-
	2595.0 ~ 2620.0	dB	2	5	-
	2620.0 ~ 2690.0	dB	40	55	-
	2620.0 ~ 2690.0 (*2)	dB	45	55	-
	5000.0 ~ 5140.0	dB	25	61	-
	5140.0 ~ 5280.0	dB	20	58	-
Termination Impedance : INPUT / ANTENNA			50Ω(+2.7nH) / 50Ω(// 2.7nH)		
ANTENNA → RX					
Insertion Loss	2620 ~ 2690 (*1)	dB	-	2.2	2.9
	2620 ~ 2690 (*1)(*2)	dB	-	2.2	2.7
	2622.5 ~ 2687.5 (*1)(*2)(*3)	dB <sub>INT</sub>	-	2.1	2.8
Inband Ripple	2620 ~ 2690	dB	-	0.8	1.8
Ant VSWR	2620 ~ 2690	-	-	1.7	2.3
RX VSWR	2620 ~ 2690	-	-	1.6	2.2
Absolute Attenuation	1.0 ~ 2500.0	dB	40	48	-
	2402.0 ~ 2470.0	dB	45	48	-
	2500.0 ~ 2570.0	dB	45	55	-
	2570.0 ~ 2600.0	dB	2	7	-
	4900.0 ~ 5950.0	dB	30	42	-
Termination Impedance : ANTENNA / OUTPUT			50Ω (//2.7nH) /50Ω(//4.3nH)		
TX → RX					
Isolation between Rx and Tx	2500.25 ~ 2569.75	dB	55	58	-
	2500.25 ~ 2569.75 (*2)	dB	55	58	
	2502.5 ~ 2567.5 (*3)	dB <sub>INT</sub>	55	58	-
	2620.25 ~ 2689.75	dB	52	57	-
	2620.25 ~ 2689.75 (*2)	dB	55	57	-
	2622.5 ~ 2687.5 (*3)	dB <sub>INT</sub>	55	57	-

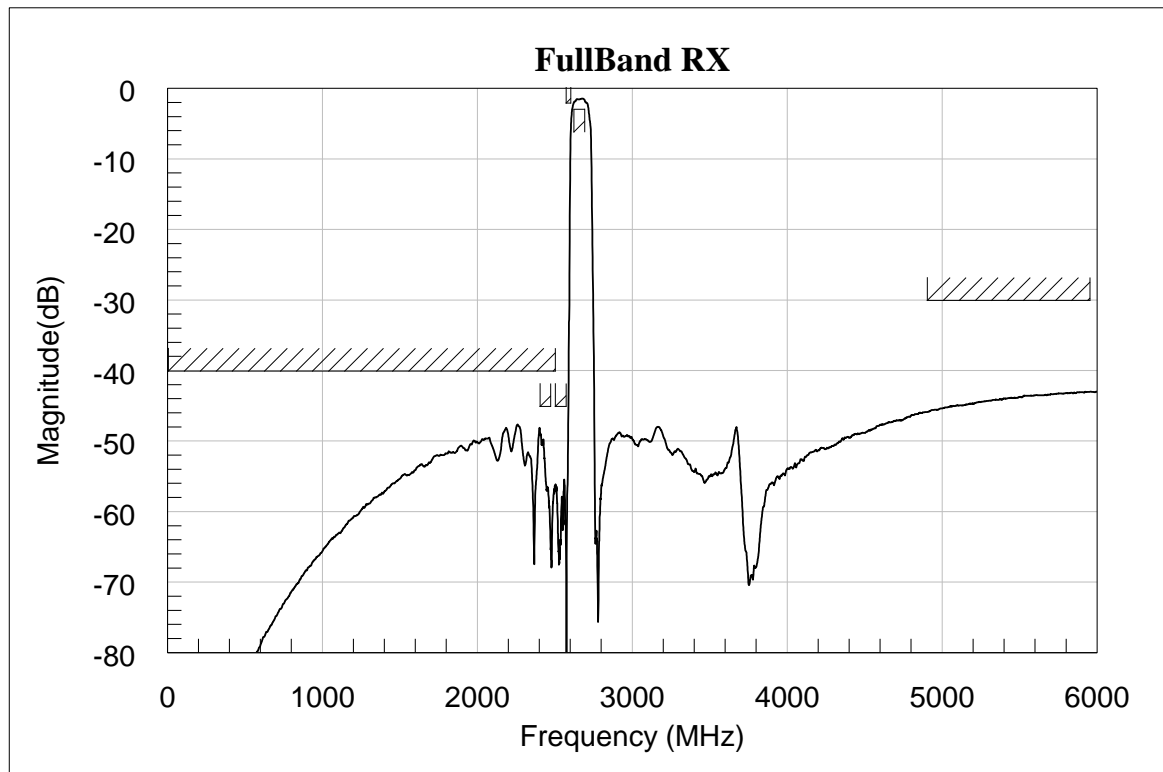
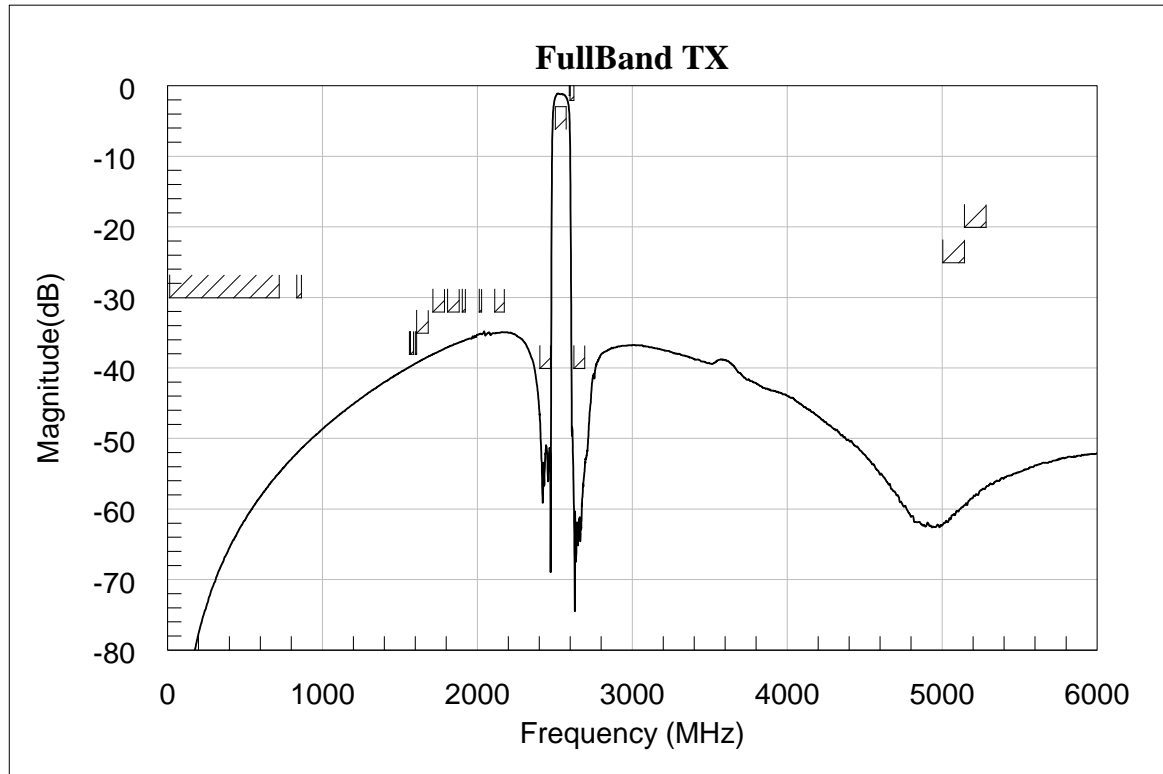
## 6-2-2. TEST FIXTURE

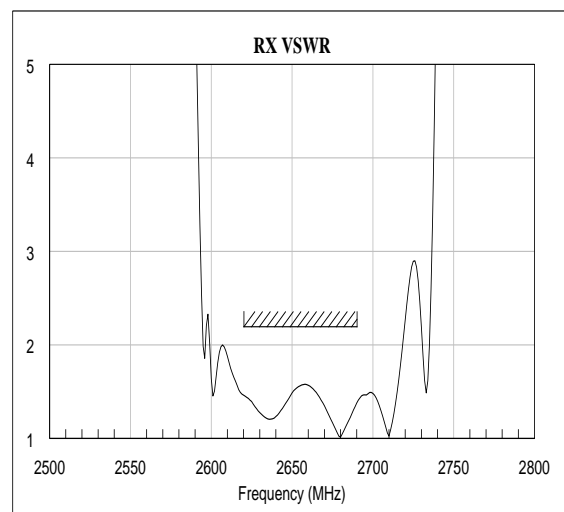
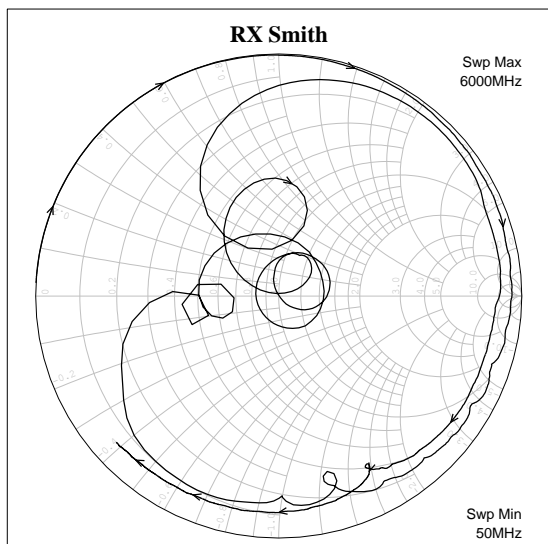
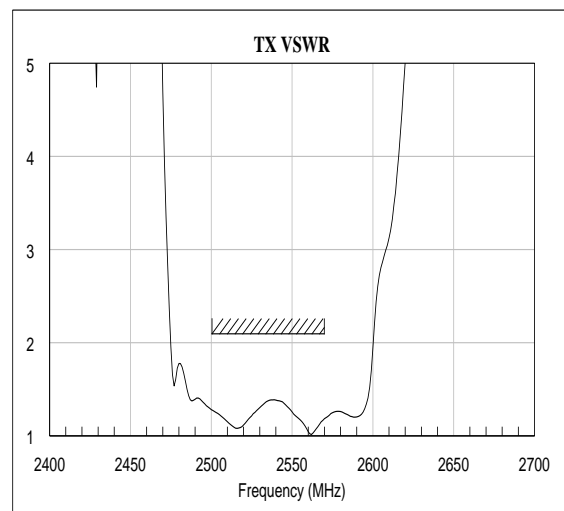
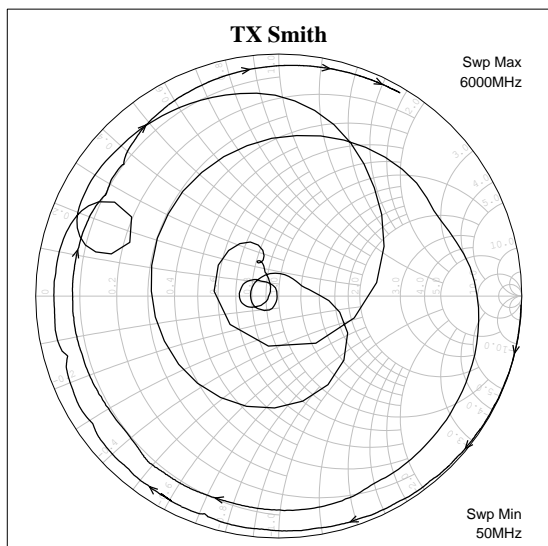
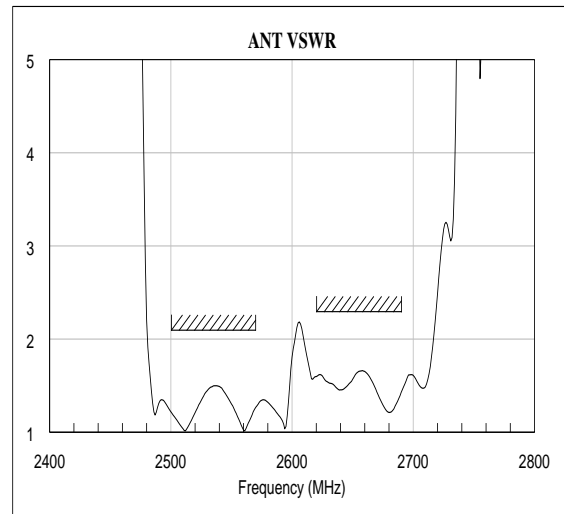
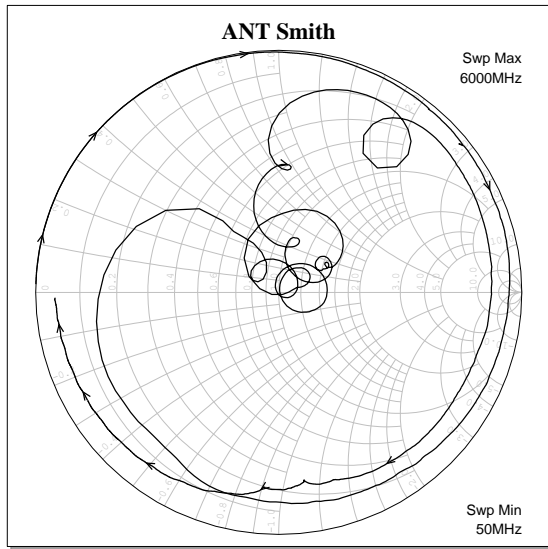


[Top View]

### 6-2-3. GRAPH

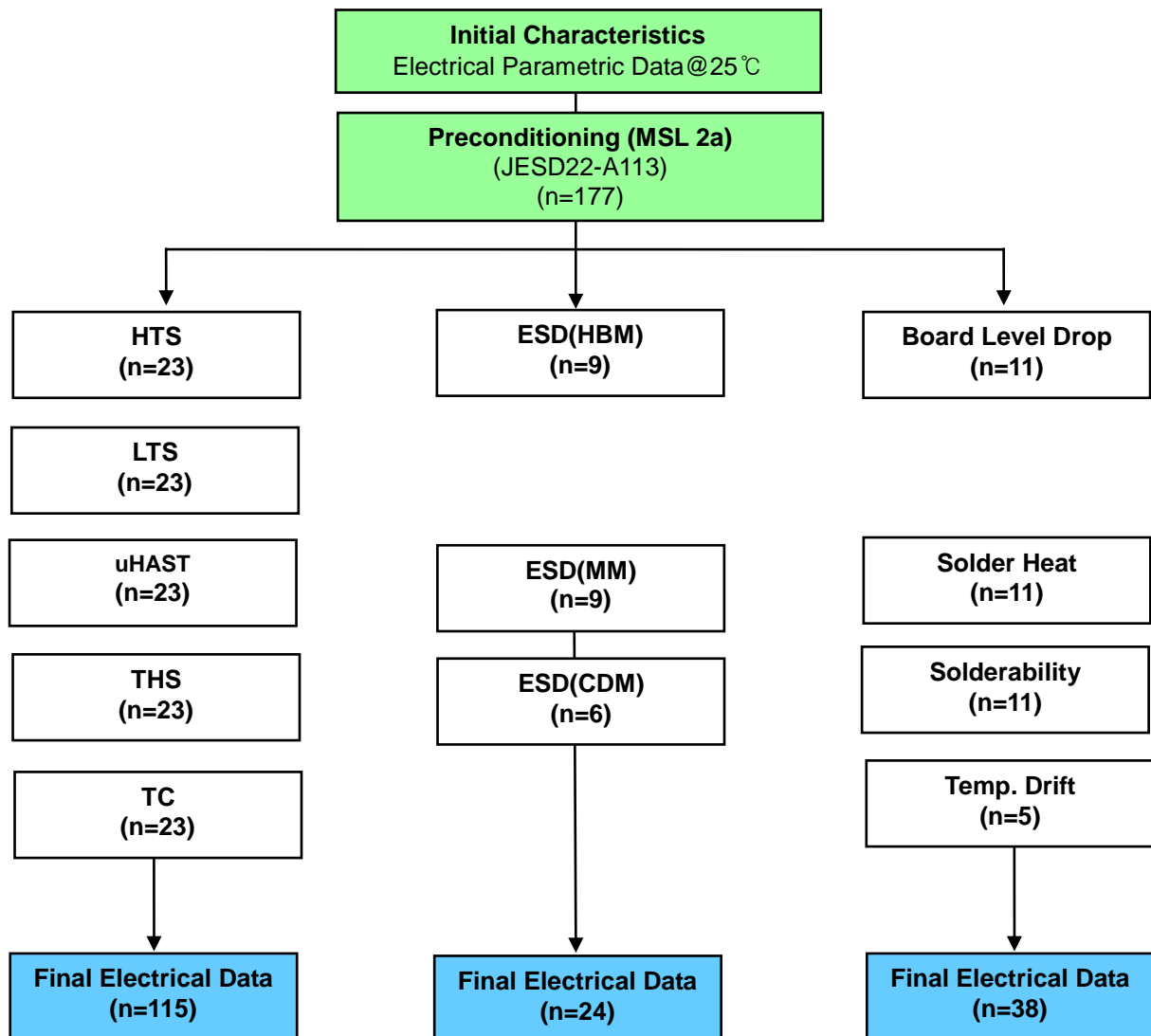






## 7. RELIABILITY

### 7-1. ENGINEERING SAMPLE FLOW CHART



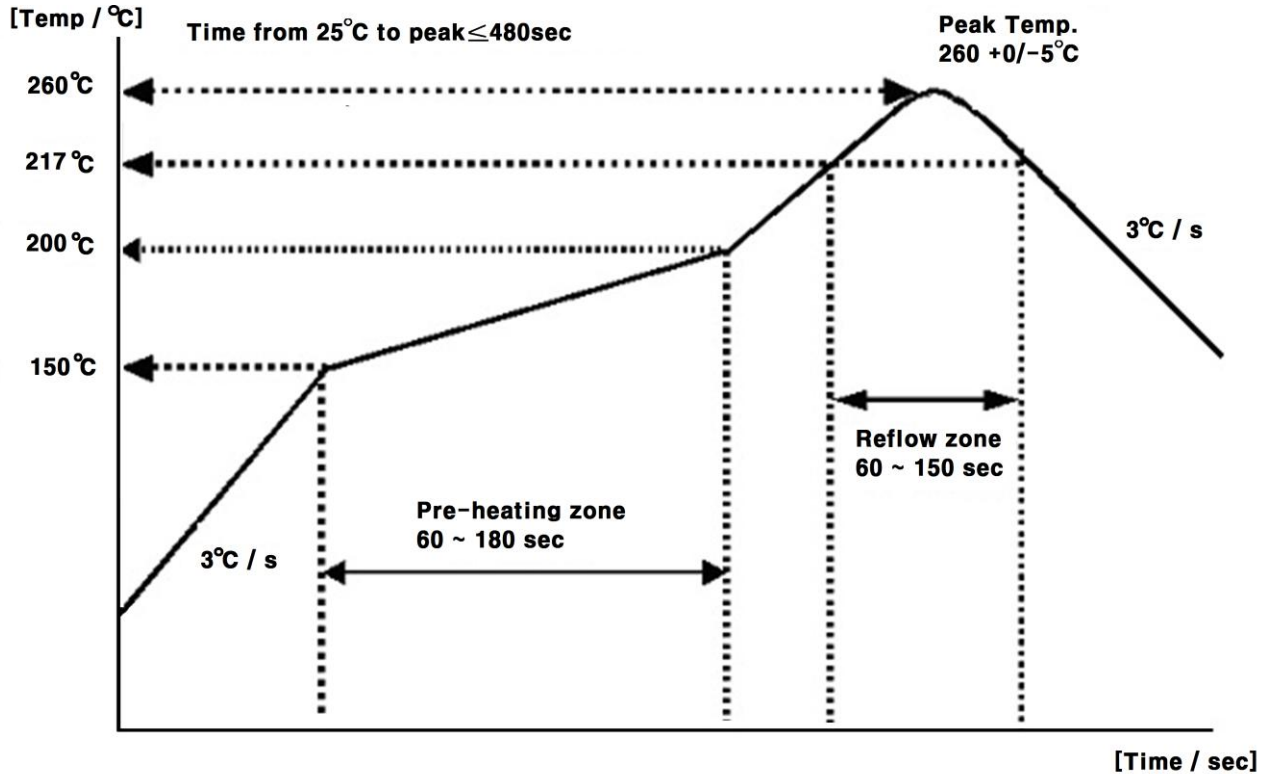
**7-2. TEST ITEM & CONDITION**

CATEGORY	TEST ITEM	TEST CONDITION	REMARK
	Preconditioning	Bake + Soak(MSL or above) + 3X Reflow duration ( Soak 60℃ 60% 120HR)	JESD22-A113



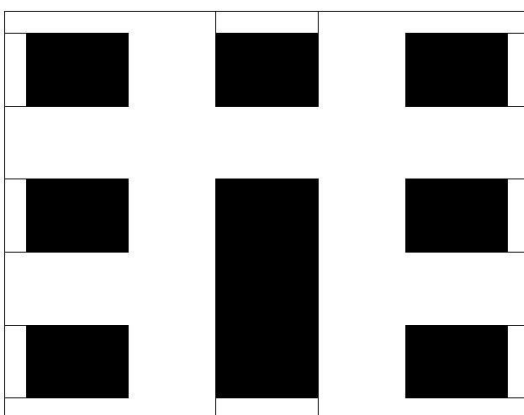
TEST ITEM	REMARK	TEST CONDITION	Duration
HTS (High Temperature Storage)	JESD22-A103	condition A +125(-10/+0)℃	1000hr
LTS (Low Temperature Storage)	JESD22-A119	condition A -40(-10/+0)℃	1000hr
uHAST (Unbiased HAST)	JESD22-A118	condition A 130±2℃, 85±5%, 33.3psi	96hr
THS (Temperature Humidity Storage)	JESD22-A101	85±2℃, 85±5% RH	1000hr
TC (Temperature Cycle)	JESD22-A104	condition B (-55℃⇔ +125℃) Soak mode 4 (30min)	500cycle
ESD(HBM)	JESD22-A114	200V, 250V, 300V	All pin 1sec 1time
ESD(MM)	JESD22-A115	100V 150V 200V	All pin 1sec 1time
ESD(CDM)	JESD22-C101	1.0KV, 1.2KV	All pin 1sec 1time
Board Level Drop Test	-	120 cm, 152 cm	12times 19times
Solder Heat Resistance	JESD22-B106C	260℃ Solder Pore Dipping	10sec
Solderability	JESD22-B102E	235℃Solder Pore Dipping	3sec
Temp Drift		-40℃ => 25℃ => 125℃	Per condition 2HR

## 8. REFLOW CONDITION

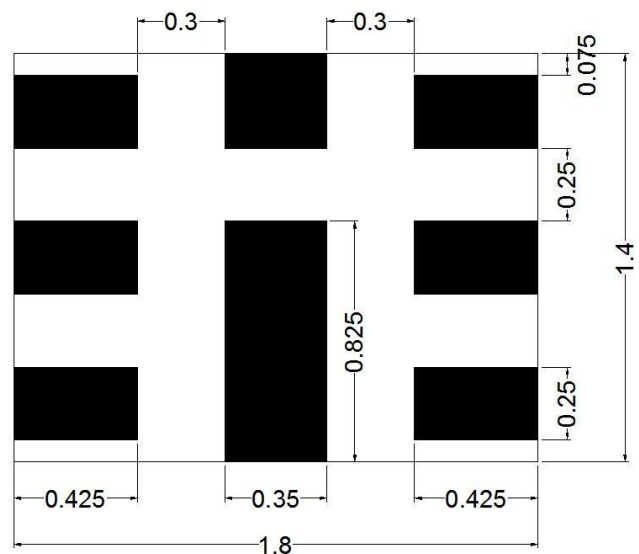


## 9. RECOMMENDED PCB DIMENSIONS

[unit : mm]



[SAW, X-ray Top view]



[PCB, X-ray Top view]



## 10. CAUTION

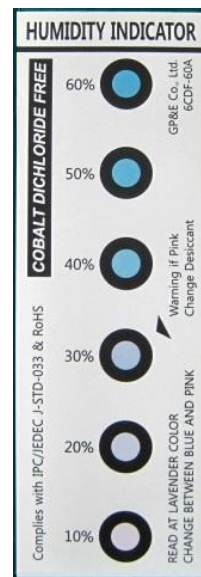
### Moisture Sensitivity Device Caution (MSL LEVEL=2a)

1. Calculated shelf life in sealed bag : 12 month at <40℃ and <90% relative Humidity(RH)
  2. Peak package body temperature : **260℃**
  3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
    - (a) Mounted within : 672 hours of factory conditions ≤30℃/60% RH, or
    - (b) Stored per J-STD-033
  4. Device require bake, before mounting, if :
    - (a) Humidity Indicator Card reads > 60% when read at 23±5℃
    - (b) 3(a) or 3(b) are not met
  5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure
- Note : Level and body temperature defined by IPC/JEDEC J-STD-020

Aluminum Pack (310mmX370mm)



HIC(Humidity Indication Card)

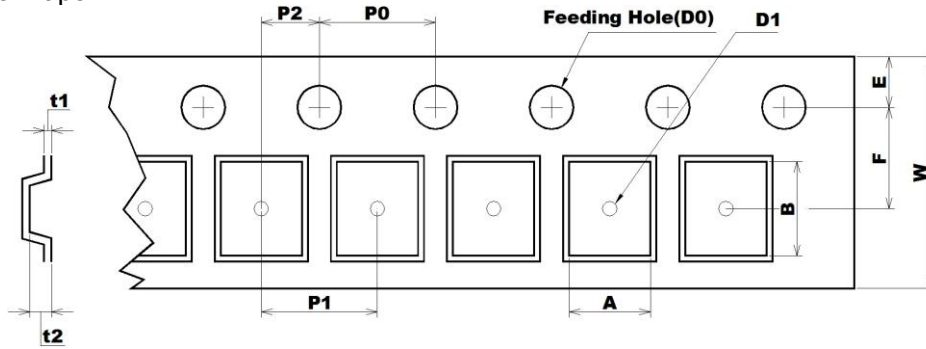


10 to 60% RH

## 11. PACKING

### 11-1. DIMENSIONS

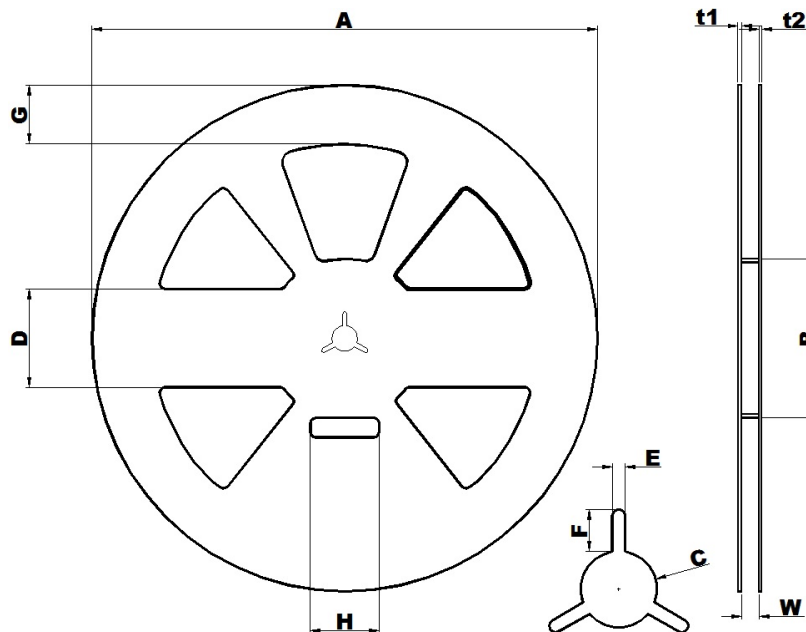
- Carrier Tape



[Unit: mm]

A	B	D0	D1	E	F	P0	P1	P2	t1	t2	W
1.60	2.00	Ø1.55	Ø1.00	1.75	3.50	4.00	4.00	2.00	0.25	0.80	8.00
0.05	0.05	0.05	MIN	0.10	0.05	0.10	0.10	0.05	0.05	0.05	0.10
-0.05	-0.05	-0.05	-	-0.10	-0.05	-0.10	-0.10	-0.05	-0.05	-0.05	-0.10

- Reel



[Unit: mm]

A	B	C	D	E	F	G	H	t1	t2	W
Ø258.0	Ø81.0	Ø13.0	50.0	2.2	7.0	30.0	35.0	1.8	1.5	9.0
+1.0	+1.0	+0.5	+0.8	+0.3	+0.5	+0.8	+1.0	+0.5	+0.5	+1.0
-0.5	-1.0	-0.5	-0.8	-0.3	-0.5	-0.8	-1.0	-0.5	-0.5	-0.5

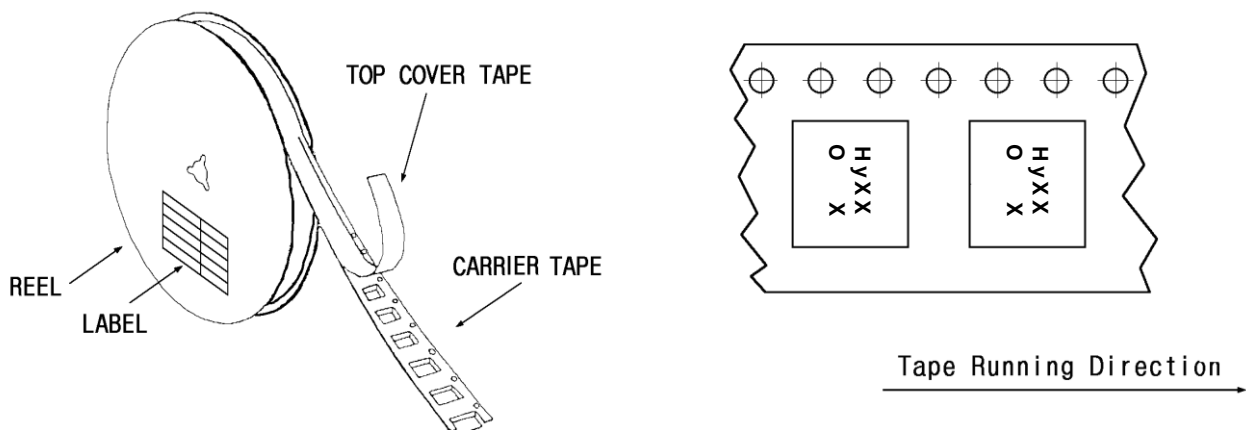
- The product shall be packed properly not to damaged during transportation and storage.

## 11-2. REELING QUANTITY

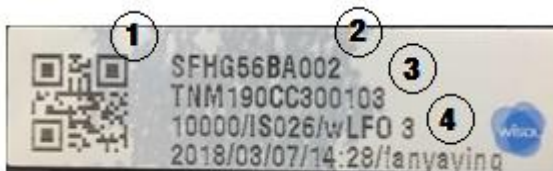
10 inch reel : 8,000 pcs/reel

## 11-3. TAPING STRUCTURE

11-3-1. The tape shall be wound around the reel in direction shown below.

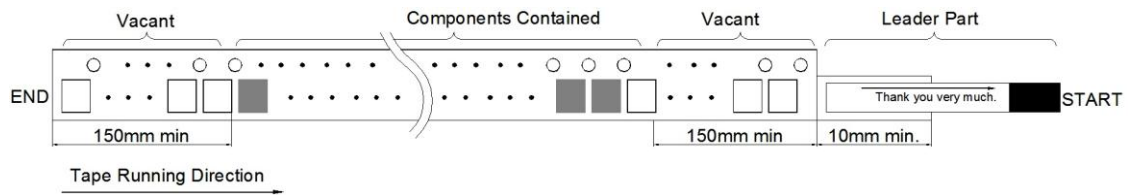


## 11-3-2. BARCODE LABEL



①	MODEL NAME BARCODE
②	Model Name
③	Reel number
④	Quantity / Marking

### 1-3-3. Leader part and vacant position specifications.



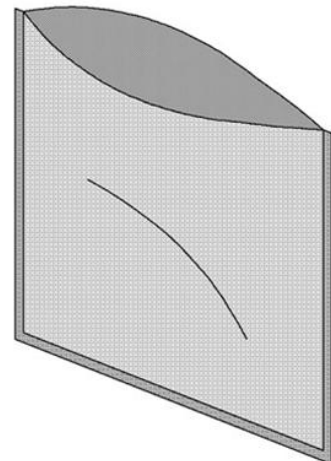
### 11-4. INNER BOX(Reel Packing) STRUCTURE

Material: Polycarbonate



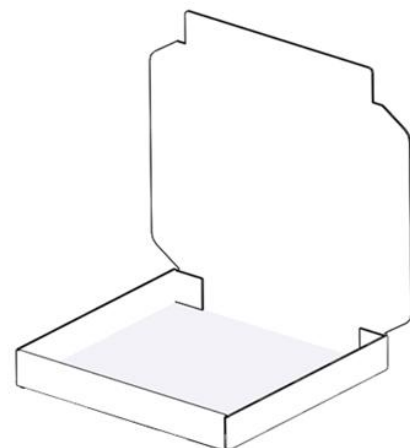
Material : Polyethylene + Aluminium

Size : 310×370mm<sup>2</sup>



Material : Paper

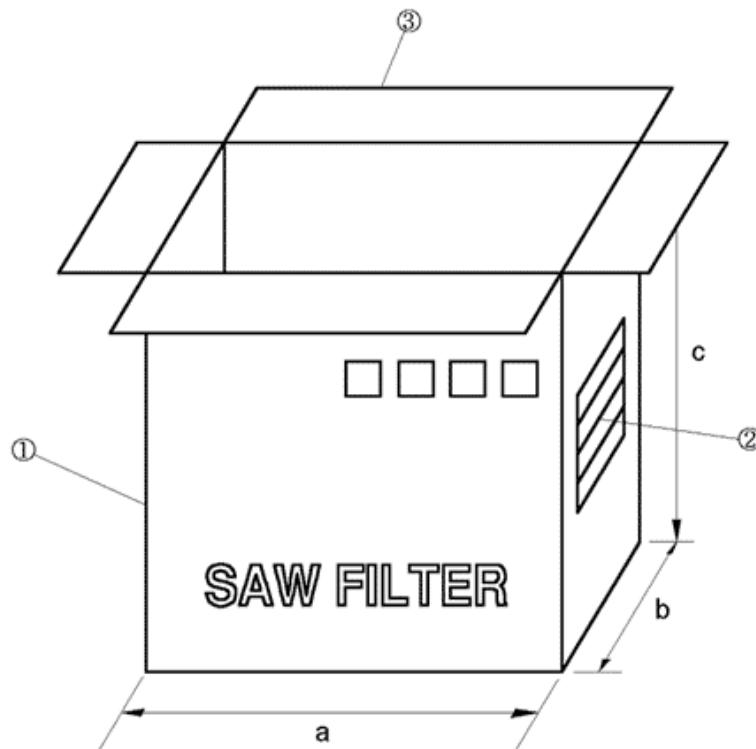
Size: (D)290×(W)290×(H)42mm3



# 11-5. OUTER BOX STRUCTURE

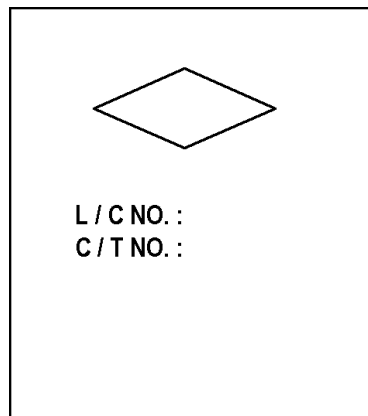
Material : Paper

TYPE	SIZE(mm)			Inner Box #
	a	b	c	
A	300	270	300	6 boxes



SIDE ①

SIDE ②



MODEL	
Q'TY	EA
USER	
DATE	. .

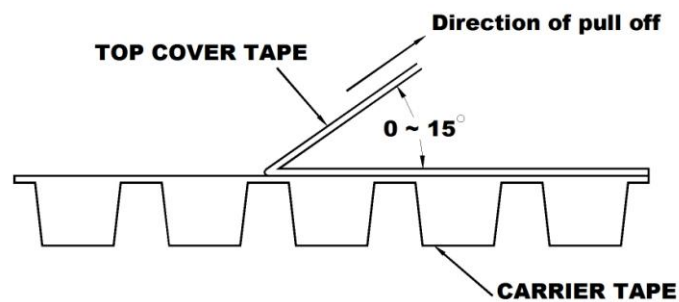
- SIDE is the same as front side.

## 12. TAPE SPECIFICATIONS

12-1. Tensile Strength of Carrier Tape: 4.4N/mm width

12-2. Top Cover Tape Adhesion (See the below figure)

- pull of angle: 0~15 degree
- speed: 300mm/min.
- force: 20~70g



### 13. RoHS DATA

#### 13-1. RAW MATERIAL(EPOXY)



#### Test Report

No. TSNEC1700799901

Date: 12 May 2017

Page 1 of 8

TIANJIN WISOL ELECTRONICS CO.,LTD

D1-1/3 INTERNATIONAL INDUSTRIAL CITY XEDA TIANJIN CHINA

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

SGS Job No. : TP17-003447 - TJ

Date of Sample Received : 08 May 2017

Testing Period : 08 May 2017 - 12 May 2017

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 Lead, Mercury, Cadmium, 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 (Tianjin) Co., Ltd.



Reabeca Zhou  
Approved Signatory



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## Test Report

No. TSNEC1700799901

Date: 12 May 2017

Page 2 of 8

### Test Results :

### Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	TSN17-007999.001	black film

### 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 :
- (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.
  - (2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.
  - (3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.
  - (4) With reference to IEC 62321-7-2:2017, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis and/or with reference to IEC 62321-5:2013, determination of Chromium by ICP-OES.
  - (5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.
  - (6) With reference to IEC 62321-8:2017, determination of phthalates by GC-MS.

Test Item(s)	Limit	Unit	MDL	001
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))	1000	mg/kg	8	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



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Test Item(s)	Limit	Unit	MDL	001
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
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
Dibutyl phthalate (DBP)	1000	mg/kg	50	ND
Butyl benzyl phthalate (BBP)	1000	mg/kg	50	ND
Bis (2-ethylhexyl) 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](http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25)
- (2) The result of Hexavalent Chromium (Cr(VI)) is "ND" as the result of Chromium (Cr) is "ND", and confirmation test of Hexavalent Chromium (Cr(VI)) is not required .
- (3) If the Chromium (Cr) content is greater than the MDL of Hexavalent Chromium (Cr(VI)), confirmation test of Hexavalent Chromium (Cr(VI)) is required.
- (4) On 4 June 2015, Commission Directive (EU) 2015/863 was published in the Official Journal of the European Union (OJEU) to include the phthalates BBP, DBP, DEHP and DIBP into ANNEX II of the Rohs Recast Directive. The new law restricts each phthalate to no more than 0.1% in each homogeneous material of an electrical product.
- (5) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.
- (6) The restriction of DEHP, BBP, DBP and DIBP shall not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021.
- (7) The restriction of DEHP, BBP and DBP shall not apply to toys which are already subject to the restriction of DEHP, BBP and DBP through entry 51 of Annex XVII to Regulation (EC) No 1907/2006.

### Halogen



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

Test Item(s)	Unit	MDL	001
Chlorine (Cl)	mg/kg	50	99
Bromine (Br)	mg/kg	50	ND

## Element(s)

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

Test Item(s)	Unit	MDL	001
Antimony (Sb)	mg/kg	10	ND
Tin (Sn)	mg/kg	5	ND



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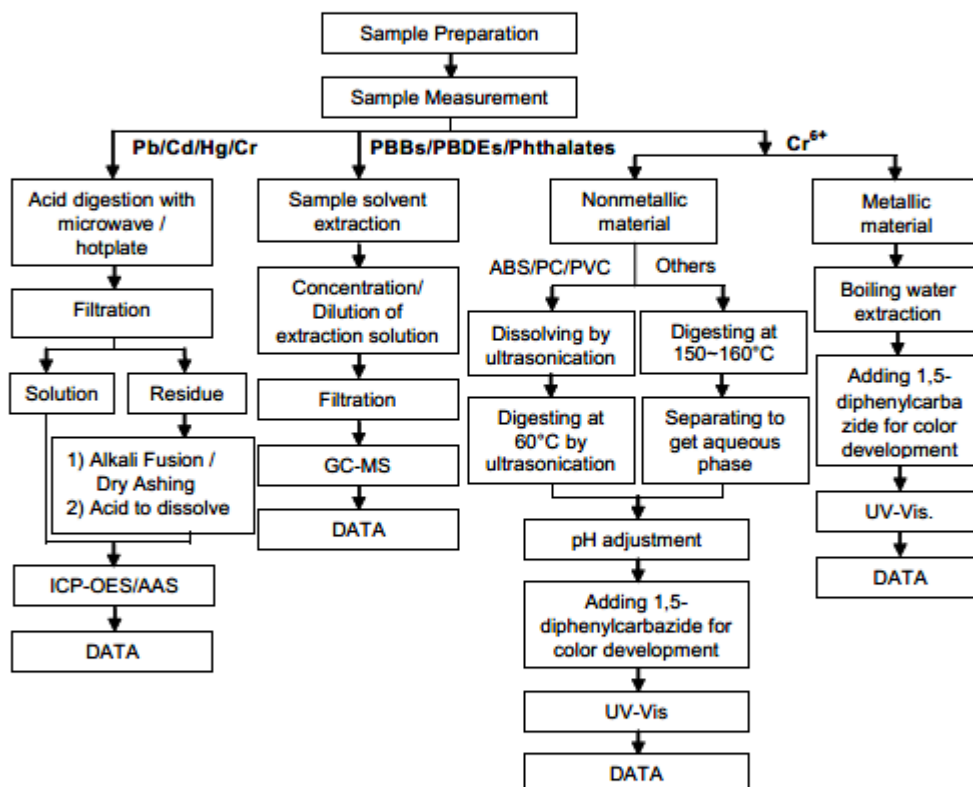
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## ATTACHMENTS

### Pb/Cd/Hg/Cr<sup>6+</sup>/PBBs/PBDEs/Phthalates Testing Flow Chart

- 1) Name of the person who made testing: Cathy Zhang/Zhanwen Liu/Ann Wang/Cyhan Chen
- 2) Name of the person in charge of testing: Aaron Wang/Rex Zhu
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart.  
(Cr<sup>6+</sup> and PBBs/PBDEs /Phthalates test method excluded)



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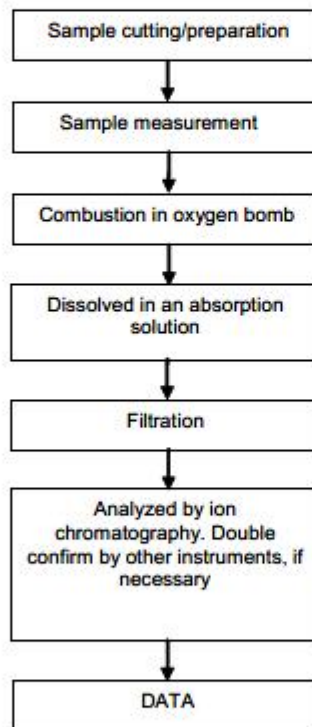
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## ATTACHMENTS

### Halogen Testing Flow Chart

- 1) Name of the person who made testing: Jin Wang
- 2) Name of the person in charge of testing: Rex Zhu



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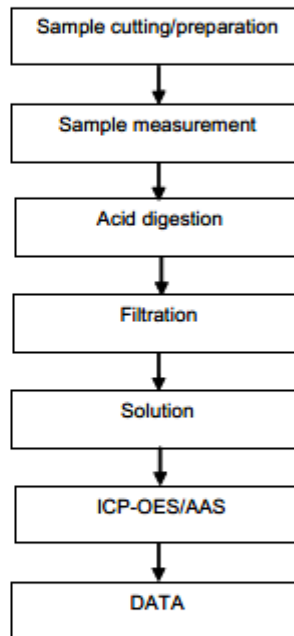
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## ATTACHMENTS

### Elementary Testing Flow Chart

- 1) Name of the person who made testing: Cathy Zhang
- 2) Name of the person in charge of testing: Aaron Wang



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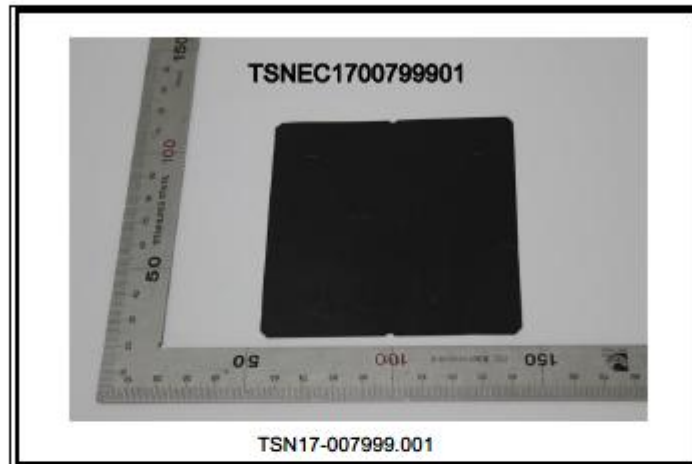
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Sample photo:



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## 13-2. RAW MATERIAL(PACKAGE)



## TEST REPORT

REPORT NO. JP/2017/111101

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KYOCERA CORPORATION

1810 TAKI-CHO SATSUMASENDAI-SHI KAGOSHIMA JAPAN

THE FOLLOWING SAMPLE(S) WAS/WERE SUBMITTED AND IDENTIFIED BY/ON BEHALF OF THE CLIENT AS:

以下のサンプルは顧客により提供され、顧客に代わって確認を行いました:

SAMPLE DESCRIPTION : 1-01-4-18 KYOCERA-CERAMIC A440

CLIENT REF.NO :

SAMPLE RECEIVED : 2017/11/24

TESTING DATE : 2017/11/24 TO 2018/01/12

TEST REQUESTED : SELECTED TEST(S) AS REQUESTED BY CLIENT.

分析項目 : 分析項目は顧客の要求によります。

TEST METHOD(S) : WITH REFERENCE TO LATEST EDITION OF IEC62321 FOR RoHS 6 SUBSTANCES.

分析方法 : OTHER CHEMICALS WERE TESTED BY EACH APPROPRIATE METHOD.

RoHS6物質の分析は最新版のIEC62321を参照しました。

それ以外の化学物質についてはそれぞれに最適な方法で分析を行いました。

TEST RESULT(S) : PLEASE REFER TO THE NEXT PAGE(S).

分析結果 : 以下のページをご参照願います。

大内 幸弘


Yukihiro Ouchi / Quality Manager  
SGS Japan Inc., Chemical Laboratory

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KYOCERA CORPORATION

1810 TAKI-CHO SATSUMASENDAI-SHI KAGOSHIMA JAPAN

**TEST RESULT(S)**

ITEM(S)	UNIT	RESULT	METHOD	INST./PLACE	MDL
CADMIUM(Cd)	mg/kg	N.D.	IEC62321-5: 2013	ICP-OES	2
LEAD(Pb)	mg/kg	N.D.	IEC62321-5: 2013	ICP-OES	2
MERCURY(Hg)	mg/kg	N.D.	IEC62321-4: 2013	ICP-OES	2
CHROMIUM VI(Cr(VI))	mg/kg	N.D.	IEC 62321-7-1: 2015	UV/VIS	2

NOTES: mg/kg = ppm, N.D. = Not Detected, INST. = INSTRUMENT, MDL = Method Detection Limit

REMARK: Test process and/or expression of test result have been specified by client.

The content of Cr(VI) has been calculated with regard to the sample weight as specified by client.

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KYOCERA CORPORATION

1810 TAKI-CHO SATSUMASENDAI-SHI KAGOSHIMA JAPAN

### 分析フローチャート MEASUREMENT FLOW CHART

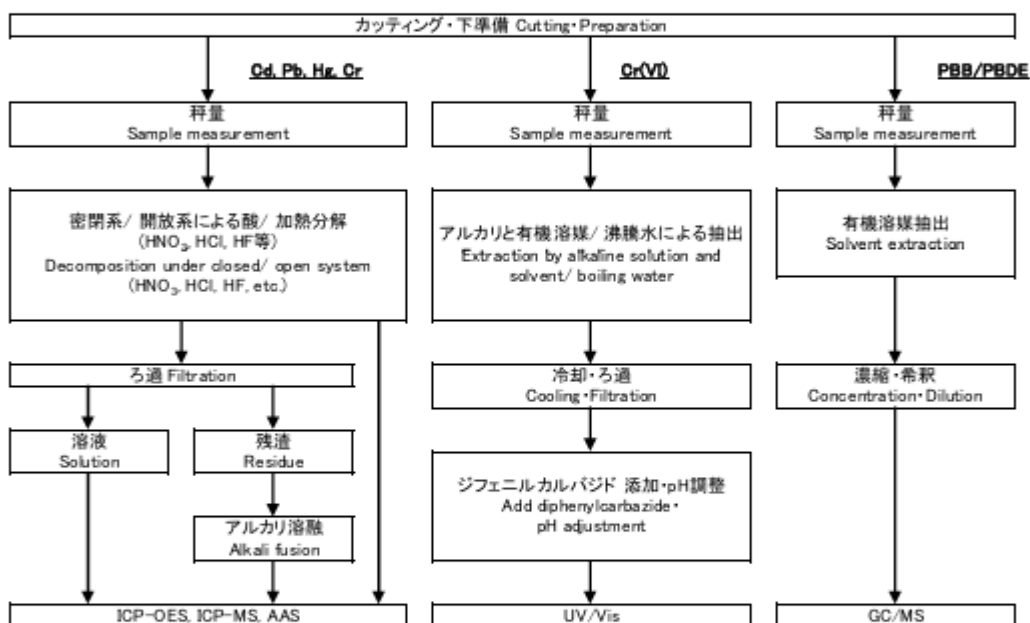
1) 酸分解前処理において試料を完全分解しています。

The sample was dissolved/ decomposed totally by acid pre-conditioning method according to below flow chart.

2) Cd, Pb, Hg, Cr, Cr(VI), PBB/PBDE

分析担当者 Name of the person in charge of measurement: 及川 聡子 Satoko Oikawa

3) 分析責任者 Name of the person responsible for measurement: 大谷 真由美 Mayumi Otani



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DATE: January 12, 2018

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KYOCERA CORPORATION

1810 TAKI-CHO SATSUMASENDAI-SHI KAGOSHIMA JAPAN

## SAMPLE IMAGE



<END>

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## 13-3. RAW MATERIAL(LT WAFER)



For Question  
Please Contact with SGS  
www.sgs.com.tw

# Test Report

No. : CE/2017/A5173

Date : 2017/11/01

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Shin-Etsu Chemical Co.,Ltd.

13-1,Isobe 2-chome, Annaka-Shi, Gunma, Japan



The following samples was/were submitted and identified by/on behalf of the applicant as :

Sample Submitted By : Shin-Etsu Chemical Co.,Ltd.  
Sample Description : BLT  
Lot No : 79399A  
Composition : Lithium Tantalate  
Sample Receiving Date : 2017/10/26  
Testing Period : 2017/10/26 TO 2017/11/01

## Test Requested

- (1) As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted sample(s).
- (2) Please refer to next pages for the other item(s).

## Test Result(s)

: Please refer to following pages.

## Conclusion

- (1) Based on the performed tests on submitted sample(s), the test results of Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP comply with the limits as set by RoHS and amending Directive (EU) 2015/863.

  
Troy Chang, Manager - Tech  
Signed for and on behalf of  
SGS TAIWAN LTD.  
Chemical Laboratory - Taipei



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## Test Report

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Shin-Etsu Chemical Co.,Ltd.

13-1,Isobe 2-chome, Annaka-Shi, Gunma, Japan



### Test Result(s)

PART NAME No.1 : WAFER

Test Item(s)	Unit	Method	MDL	Result	Limit
				No.1	
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-AES.	2	n.d.	100
Lead (Pb)	mg/kg	With reference to IEC 62321-5 (2013) and performed by ICP-AES.	2	n.d.	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4 (2013) and performed by ICP-AES.	2	n.d.	1000
Hexavalent Chromium Cr(VI)	mg/kg	With reference to IEC 62321-7-2 (2017) and performed by UV-VIS.	8	n.d.	1000
<b>Sum of PBBs</b>	mg/kg	With reference to IEC 62321-6 (2015) and performed by GC/MS.	-	n.d.	1000
Monobromobiphenyl	mg/kg		5	n.d.	-
Dibromobiphenyl	mg/kg		5	n.d.	-
Tribromobiphenyl	mg/kg		5	n.d.	-
Tetrabromobiphenyl	mg/kg		5	n.d.	-
Pentabromobiphenyl	mg/kg		5	n.d.	-
Hexabromobiphenyl	mg/kg		5	n.d.	-
Heptabromobiphenyl	mg/kg		5	n.d.	-
Octabromobiphenyl	mg/kg		5	n.d.	-
Nonabromobiphenyl	mg/kg		5	n.d.	-
Decabromobiphenyl	mg/kg		5	n.d.	-
<b>Sum of PBDEs</b>	mg/kg		-	n.d.	1000
Monobromodiphenyl ether	mg/kg		5	n.d.	-
Dibromodiphenyl ether	mg/kg		5	n.d.	-
Tribromodiphenyl ether	mg/kg		5	n.d.	-
Tetrabromodiphenyl ether	mg/kg		5	n.d.	-
Pentabromodiphenyl ether	mg/kg		5	n.d.	-
Hexabromodiphenyl ether	mg/kg		5	n.d.	-
Heptabromodiphenyl ether	mg/kg		5	n.d.	-
Octabromodiphenyl ether	mg/kg		5	n.d.	-
Nonabromodiphenyl ether	mg/kg		5	n.d.	-
Decabromodiphenyl ether	mg/kg		5	n.d.	-

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Shin-Etsu Chemical Co.,Ltd.

13-1,Isobe 2-chome, Annaka-Shi, Gunma, Japan



Test Item(s)	Unit	Method	MDL	Result No.1	Limit
BBP (Butyl Benzyl phthalate) (CAS No.: 85-68-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
DBP (Dibutyl phthalate) (CAS No.: 84-74-2)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
DEHP (Di- (2-ethylhexyl) phthalate) (CAS No.: 117-81-7)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
DIBP (Di-isobutyl phthalate) (CAS No.: 84-69-5)	mg/kg	With reference to IEC 62321-8 (2017). Analysis was performed by GC/MS.	50	n.d.	1000
Halogen-Chlorine (Cl) (CAS No.: 22537-15-1)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.	-
Halogen-Bromine (Br) (CAS No.: 10097-32-2)	mg/kg	With reference to BS EN 14582 (2016). Analysis was performed by IC.	50	n.d.	-
Antimony (Sb)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	n.d.	-
Beryllium (Be)	mg/kg	With reference to US EPA 3052 (1996). Analysis was performed by ICP-AES.	2	n.d.	-

### Note :

1. mg/kg = ppm ; 0.1wt% = 1000ppm
2. MDL = Method Detection Limit
3. n.d. = Not Detected = less than MDL
4. " - " = Not Regulated

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Shin-Etsu Chemical Co., Ltd.

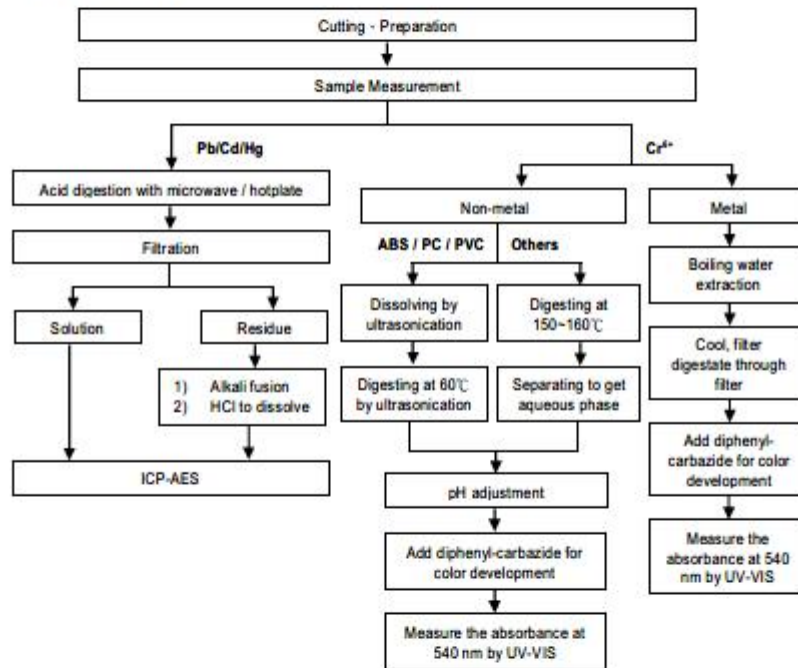
13-1, Isobe 2-chome, Annaka-Shi, Gunma, Japan



### Analytical flow chart of Heavy Metal

These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> test method excluded)

- Technician : JR Wang
- Supervisor: Troy Chang



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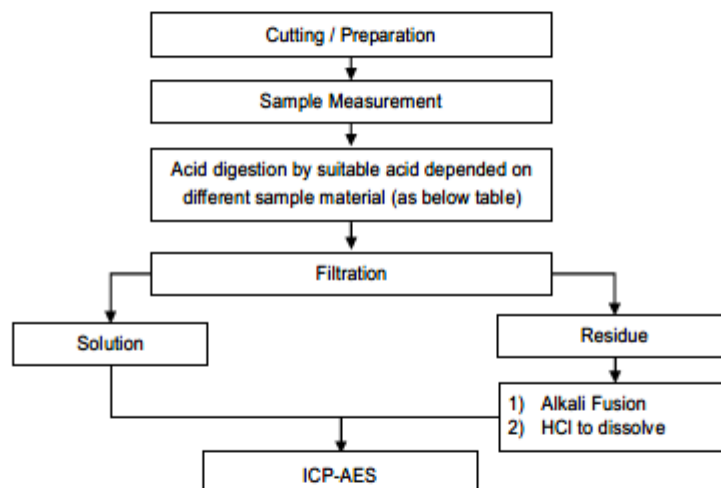
13-1, Isobe 2-chome, Annaka-Shi, Gunma, Japan



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

- Technician: JR Wang
- Supervisor: Troy Chang

### Flow Chart of digestion for the elements analysis performed by ICP-AES



Steel, copper, aluminum, solder	Aqua regia, HNO <sub>3</sub> , HCl, HF, H <sub>2</sub> O <sub>2</sub>
Glass	HNO <sub>3</sub> /HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO <sub>3</sub>
Plastic	H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O <sub>2</sub> , HNO <sub>3</sub> , HCl
Others	Added appropriate reagent to total digestion

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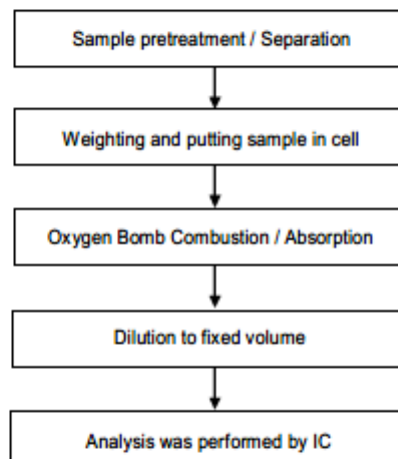
Shin-Etsu Chemical Co.,Ltd.

13-1,Isobe 2-chome, Annaka-Shi, Gunma, Japan



### Analytical flow chart - Halogen

- Technician: Rita Chen
- Supervisor: Troy Chang



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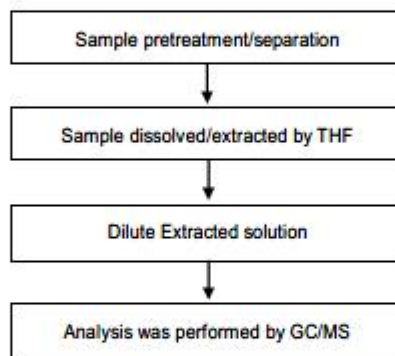
13-1,Isobe 2-chome, Annaka-Shi, Gunma, Japan



### Analytical flow chart - Phthalate

- Technician: Andy Hsu
- Supervisor: Troy Chang

【Test method: IEC 62321-8】



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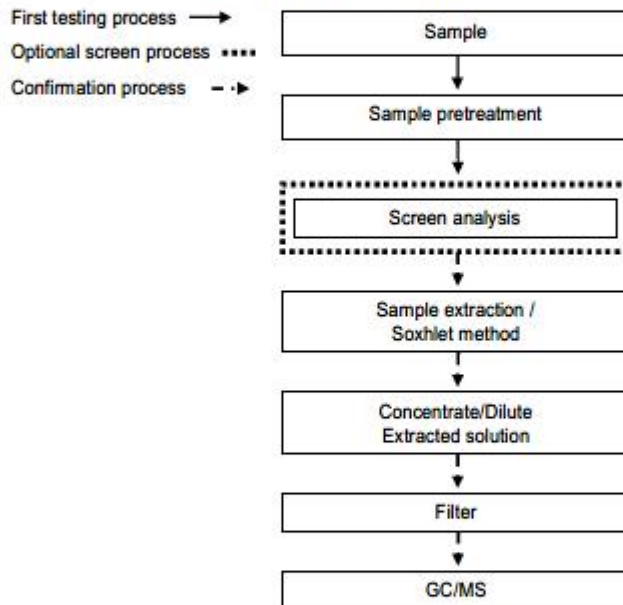
Shin-Etsu Chemical Co., Ltd.

13-1, Isobe 2-chome, Annaka-Shi, Gunma, Japan



### Analytical flow chart – PBB / PBDE

- Technician : Yaling Tu
- Supervisor: Troy Chang



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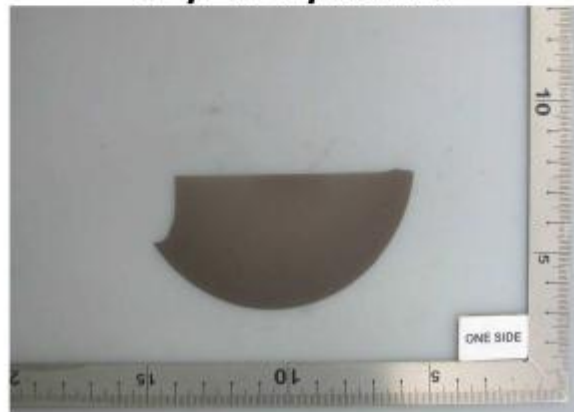
Shin-Etsu Chemical Co.,Ltd.

13-1,Isobe 2-chome, Annaka-Shi, Gunma, Japan

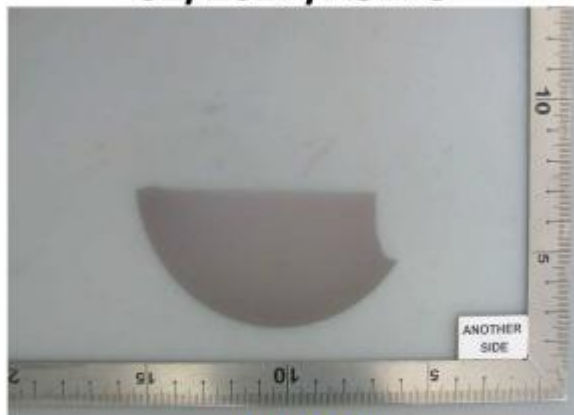


\* The tested sample / part is marked by an arrow if it's shown on the photo. \*

**CE/2017/A5173**



**CE/2017/A5173**



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

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### 13-4. RAW MATERIAL(GOLD WIRE)



#### Test Report

No. SHAEC1818655211

Date: 24 Aug 2018

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TANAKA ELECTRONICS (HANGZHOU) CO.,LTD.

F1 AREA, WEST NO.19 STREET, NORTH NO.10 STREET, HANGZHOU ECONOMIC&amp;TECHNOLOGICAL DEVELOPMENT ZONE,HANGZHOU

The following sample(s) was/were submitted and identified on behalf of the clients as : Au Bonding Wire

SGS Job No. : SP18-028471 - SH

Date of Sample Received : 17 Aug 2018

Testing Period : 17 Aug 2018 - 23 Aug 2018

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.

When tested as specified, Dimethyl fumarate(DMF) content of the submitted sample comply with Commission Regulation (EU) No 412/2012 and Entry 61 of Annex XVII of REACH Regulation (EC) No 1907/2006

Signed for and on behalf of  
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.



Jenny Yao  
Approved Signatory



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Attention: To check the authenticity of testing inspection report & certificate, please contact us at telephone: (86-755) 8307 9443, or email: [Ch.Booschack@sgs.com](mailto:Ch.Booschack@sgs.com)

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**Test Report**

No. SHAEC1818655211

Date: 24 Aug 2018

Page 2 of 23

**Test Results :**
**Test Part Description :**

Specimen No.	SGS Sample ID	Description
SN1	SHA18-186552.005	Golden metal wire

**Remarks :**

- (1) 1 mg/kg = 1 ppm = 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)	Limit	Unit	MDL	005
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/cm <sup>2</sup>	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 Item(s)	Limit	Unit	MDL	005
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](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/cm<sup>2</sup>.  
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/cm<sup>2</sup>). The coating is considered a non-CrVI based coating  
c. The result between 0.10 µg/cm<sup>2</sup> and 0.13 µg/cm<sup>2</sup> 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.

## Element(s)

Test Method : With reference to US EPA Method 3050B:1996, analysis was performed by ICP-OES.

Test Item(s)	CAS NO.	Unit	MDL	005
Beryllium (Be)		mg/kg	5	ND
Beryllium oxide (BeO) *		mg/kg	15	ND
Antimony (Sb)		mg/kg	10	ND
Antimony trioxide (Sb <sub>2</sub> O <sub>3</sub> ) *		mg/kg	12	ND
Arsenic (As)		mg/kg	10	ND
Diarsenic trioxide (As <sub>2</sub> O <sub>3</sub> ) *	1327-53-3	mg/kg	10	ND
Diarsenic pentaoxide (As <sub>2</sub> O <sub>5</sub> ) *	1303-28-2	mg/kg	10	ND

## Notes :

- (1) \* Calculated concentration of BeO is based on the identified Be



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Calculated concentration of Sb<sub>2</sub>O<sub>3</sub> is based on the identified Sb  
Calculated concentration of diarsenic pentaoxide and diarsenic trioxide are based on the identified arsenic and lead

**Halogen**

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

Test Item(s)	Unit	MDL	005
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

**Organic-tin compounds**

Test Method : With reference to ISO 17353: 2004 with carbamate, analysis was performed by GC-MS.

Test Item(s)	Unit	MDL	005
Tributyl tin (TBT)	mg/kg	0.02	ND
Dibutyl tin (DBT)	mg/kg	0.02	ND
Diocetyl tin (DOT)	mg/kg	0.02	ND
Tripropyltin (TPT)	mg/kg	0.02	ND
Bis(tributyltin) oxide (TBTO) *	mg/kg	0.02	ND

**Notes :**

(1) \*Calculated concentration of TBTO is based on the identified TBT.

**Polychlorinated Naphthalenes (PCNs)**

Test Method : With reference to US EPA 8081B: 2007, analysis was performed by GC-MS

Test Item(s)	Unit	MDL	005
2-Chlorinated Naphthalene	mg/kg	5	ND
1,4-Dichlorinated Naphthalene	mg/kg	5	ND
1,5-Dichlorinated Naphthalene	mg/kg	5	ND
1,2-Dichlorinated Naphthalene	mg/kg	5	ND
1,8-Dichlorinated Naphthalene	mg/kg	5	ND
1,2,3-Trichlorinated Naphthalene	mg/kg	5	ND


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Test Item(s)	Unit	MDL	005
1,2,3,4-Tetrachlorinated Naphthalene	mg/kg	5	ND
1,2,3,4,6-Pentachlorinated Naphthalene	mg/kg	5	ND
Octa-chlorinated Naphthalene	mg/kg	5	ND
1-Chlorinated Naphthalene	mg/kg	5	ND

### Short-chain Chlorinated Paraffin (SCCP) and Medium-chain Chlorinated Paraffin (MCCP)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by GC-ECD / GC-NCI-MS

Test Item(s)	Unit	MDL	005
Short-chain Chlorinated Paraffin (SCCP) (C <sub>10</sub> -C <sub>13</sub> )	mg/kg	50	ND
Medium-chain Chlorinated Paraffin (MCCP) (C <sub>14</sub> -C <sub>17</sub> )	mg/kg	50	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)	Unit	MDL	005
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)	Unit	MDL	005
Tetrabromobisphenol A (TBBP-A)	mg/kg	10	ND



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**PVC (Polyvinyl chloride)**

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

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
PVC	9002-86-2	-	-	Negative

Notes :

(1) Negative=Undetectable,Positive=Detectable

**Commission Regulation (EU) No 412/2012 and Entry 61 of Annex XVII of REACH Regulation (EC) No 1907/2006 - Dimethyl fumarate(DMF)**

Test Method : Solvent extraction, analysis was performed by GC-MS.

<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Dimethyl fumarate(DMF)	0.1	mg/kg	0.1	ND

**Bisphenol-A**

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by HPLC-DAD-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Bisphenol-A	mg/kg	1	ND

**Polychlorinated Terphenyls (PCTs)**

Test Method : With reference to US EPA 8082A: 2007, analysis was performed by GC-MS

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>005</u>
Aroclor 5432	mg/kg	5	ND
Aroclor 5442	mg/kg	5	ND

**Hexabromocyclododecane (HBCDD)**

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



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Test Item(s)	Unit	MDL	005
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

### Polychlorinated Biphenyls (PCBs)

Test Method : With reference to US EPA 8082A: 2007, analysis was performed by GC-MS

Test Item(s)	CAS NO.	Unit	MDL	005
2,4,4'-Trichlorobiphenyl (PCB 28)	7012-37-5	mg/kg	0.5	ND
2,2',5,5'-Tetrachloro-biphenyl (PCB 52)	35693-99-3	mg/kg	0.5	ND
2,2',4,5,5'-Pentachloro-biphenyl (PCB 101)	37680-73-2	mg/kg	0.5	ND
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	31508-00-6	mg/kg	0.5	ND
2,2',3,4,4',5'-Hexachloro-biphenyl (PCB 138)	35065-28-2	mg/kg	0.5	ND
2,2',4,4',5,5'-Hexachloro-biphenyl (PCB 153)	35065-27-1	mg/kg	0.5	ND
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	35065-29-3	mg/kg	0.5	ND

### Phthalates Content

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

Test Item(s)	CAS NO.	Unit	MDL	005
Diisononyl Phthalate (DINP)	28553-12-0	mg/kg	50	ND
	/68515-48-0			
Di-n-pentyl Phthalates (DnPP)	131-18-0	mg/kg	50	ND
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			
Dihexyl Phthalates (DnHP)	84-75-3	mg/kg	50	ND
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters(DHNUP)	68515-42-4	mg/kg	50	ND
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	mg/kg	50	ND
Diisooctyl phthalate (DIHP)	71888-89-6	mg/kg	50	ND

### PFOS (Perfluorooctane Sulfonates) and Perfluorooctanoic Acid (PFQA)

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



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>Q05</u>
Perfluorooctane Sulfonates (PFOS) <sup>^</sup>	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 850/2004.
- (2) <sup>^</sup> PFOS refer to Perfluorooctanesulfonic acid and its derivatives including Perfluorooctanesulfonic acid, Perfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamide, N-Ethylperfluorooctane sulfonamide, N-Methylperfluorooctane sulfonamidoethanol and N-Ethylperfluorooctane sulfonamidoethanol.



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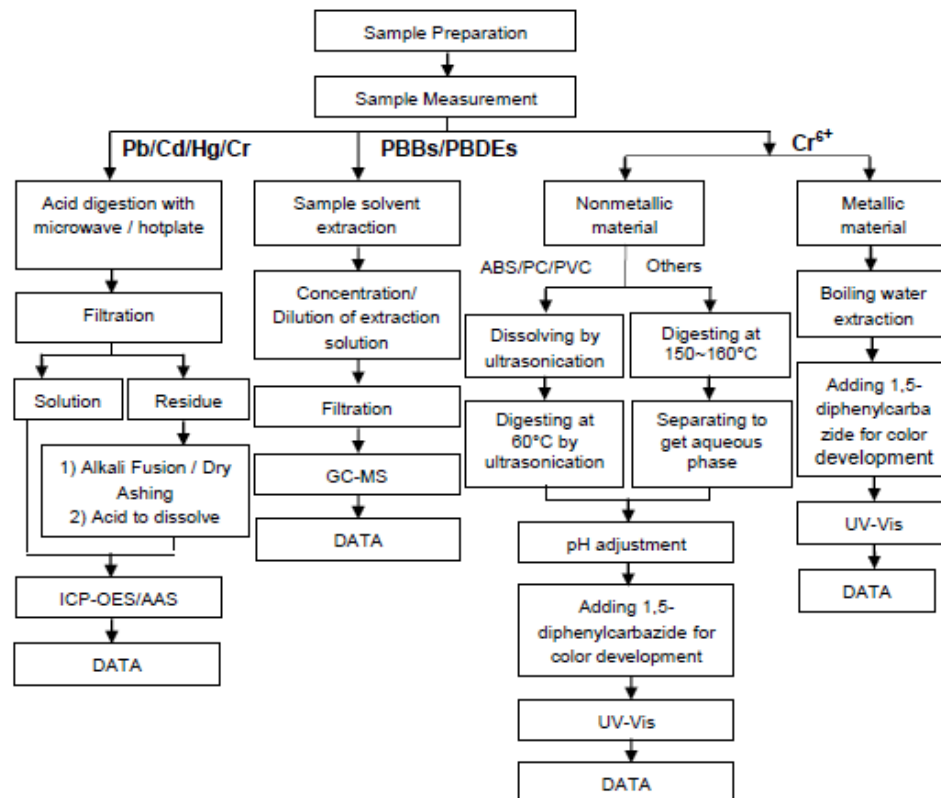
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## ATTACHMENTS

### Pb/Cd/Hg/Cr<sup>6+</sup>/PBBs/PBDEs Testing Flow Chart

- 1) Name of the person who made testing: Meria Jin/Gary Xu/ Xiaolong Yang/Sielina Song
- 2) Name of the person in charge of testing: Jan Shi/Myra Ma/Luna Xu/Shara Wang
- 3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)



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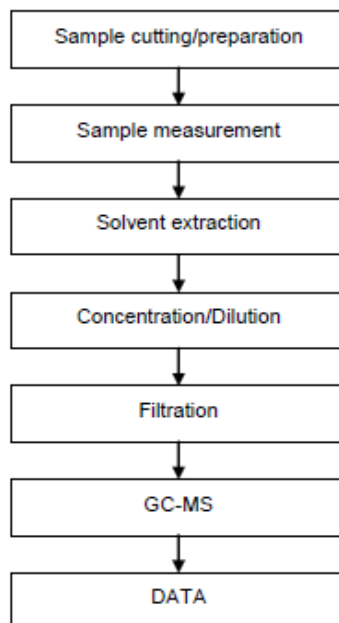
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## ATTACHMENTS

### Phthalates Testing Flow Chart

1) Name of the person who made testing: Sherlock Gao

2) Name of the person in charge of testing: Jessy Huang



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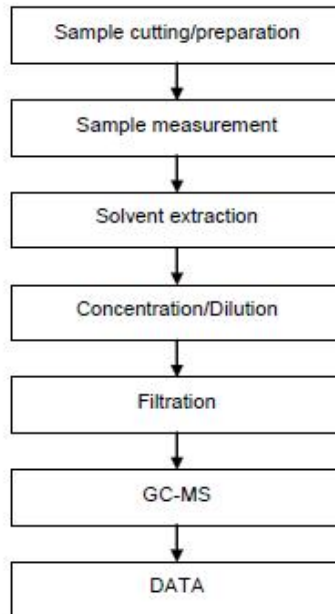
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## ATTACHMENTS

### HBCDD Testing Flow Chart

- 1) Name of the person who made testing: Gary Xu
- 2) Name of the person in charge of testing: Myra ma



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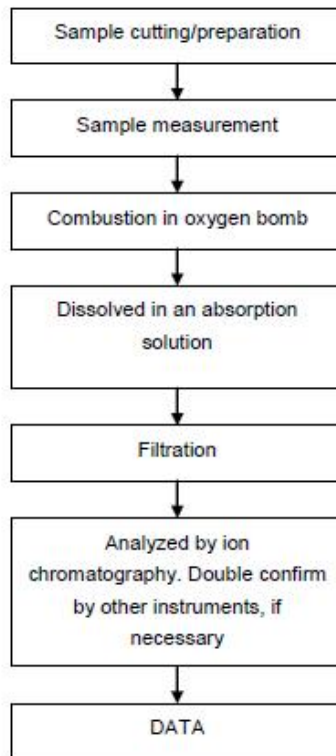
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## ATTACHMENTS

### Halogen Testing (oxygen bomb) Flow Chart

- 1) Name of the person who made testing: Kevin Xu
- 2) Name of the person in charge of testing: Anne Huang



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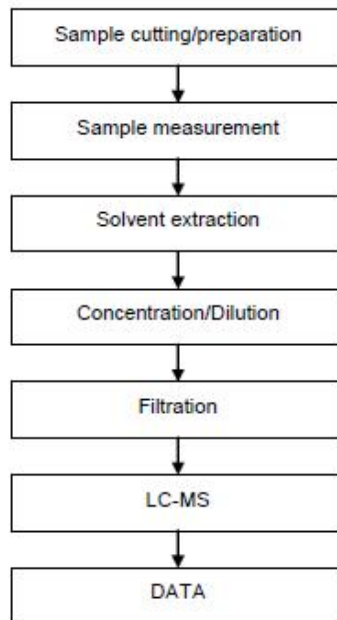
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## ATTACHMENTS

### PFOS/PFOA Testing Flow Chart

1) Name of the person who made testing: Richer Yu

2) Name of the person in charge of testing: Jessy Huang



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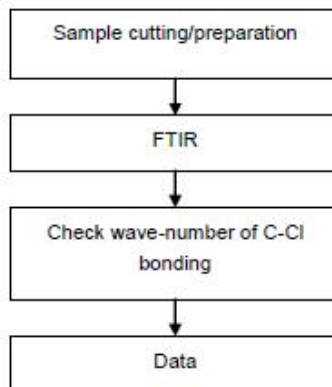
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## ATTACHMENTS

### PVC Testing Flow Chart

- 1) Name of the person who made testing: Sally Liang
- 2) Name of the person in charge of testing: Grace Chen



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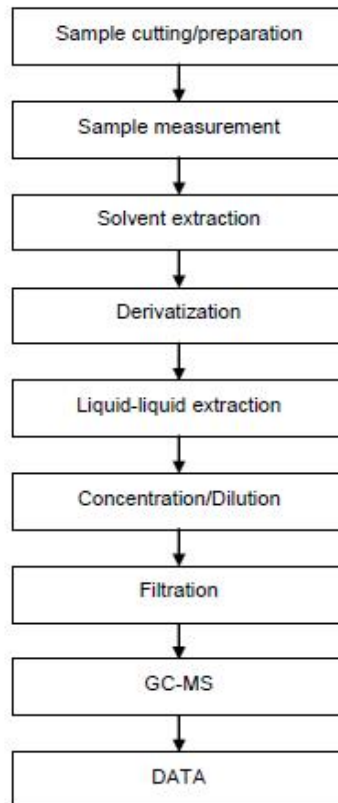
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## ATTACHMENTS

### Organotin Testing Flow Chart

- 1) Name of the person who made testing: Alex Deng
- 2) Name of the person in charge of testing: Myra ma



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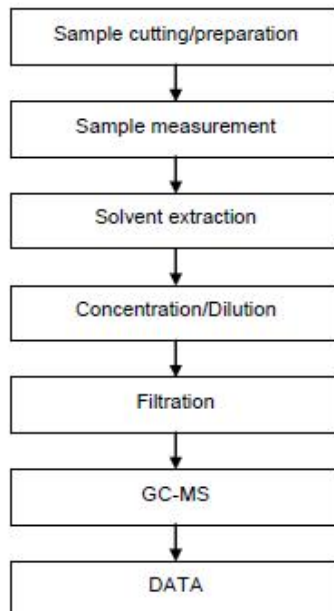
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## ATTACHMENTS

### PCB/ PCT/ PCN Testing Flow Chart

- 1) Name of the person who made testing: Jenny Zhang
- 2) Name of the person in charge of testing: Brin Feng



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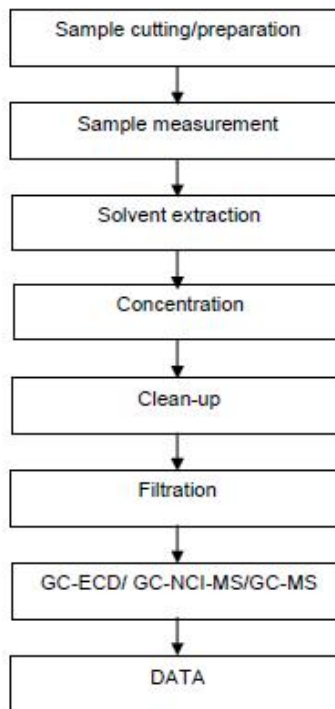
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## ATTACHMENTS

### SCCP/MCCP Testing Flow Chart

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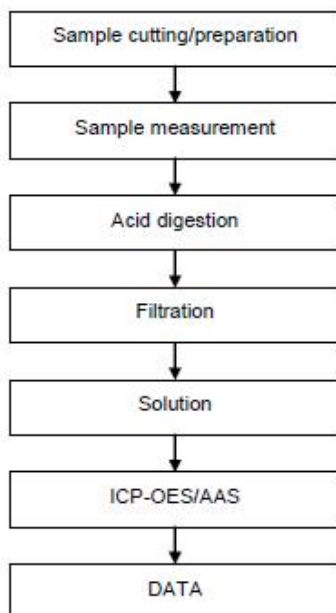
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## ATTACHMENTS

### Elements Testing Flow Chart

- 1) Name of the person who made testing: Meria Jin/Sielina Song
- 2) Name of the person in charge of testing: Luna Xu/Jan Shi



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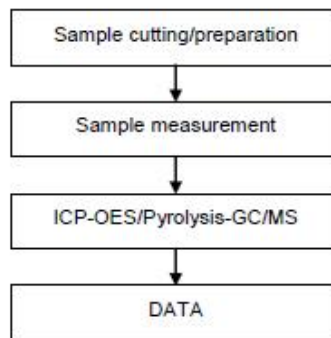
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## ATTACHMENTS

### Red Phosphorus Testing Flow Chart

- 1) Name of the person who made testing: Sally Liang
- 2) Name of the person in charge of testing: Grace Chen



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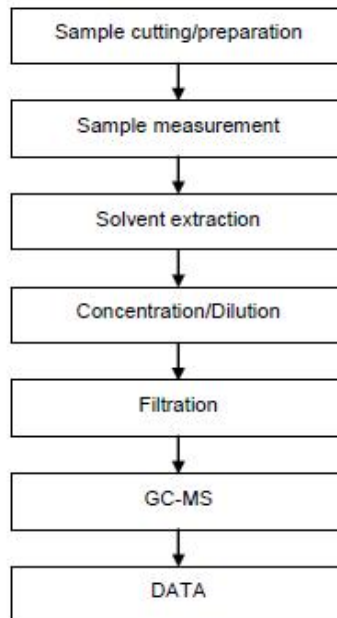
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## ATTACHMENTS

### DMF (Dimethyl fumarate) Testing Flow Chart

- 1) Name of the person who made testing: Alex Deng
- 2) Name of the person in charge of testing: Myra ma



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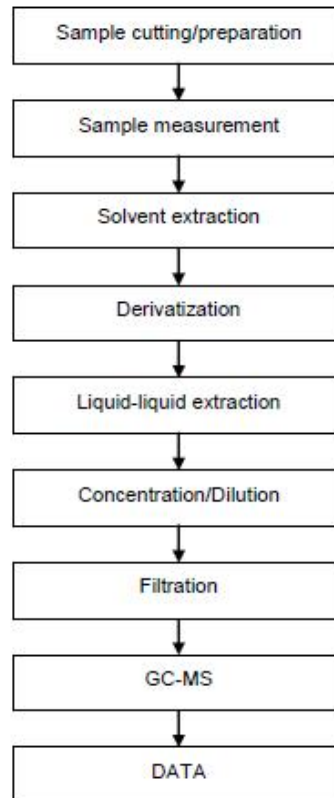
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## ATTACHMENTS

### TBBP-A Testing Flow Chart

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- 2) Name of the person in charge of testing: Myra ma



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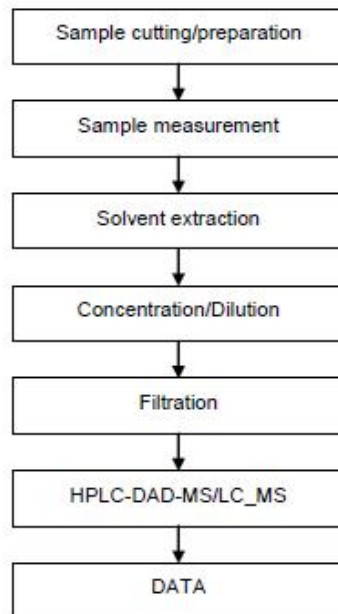
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## ATTACHMENTS

### BPA Testing Flow Chart

- 1) Name of the person who made testing: Richer Yu
- 2) Name of the person in charge of testing: Jessy Huang



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