TOPAZCON 黄宝石 专注耐高温型长寿命电解电容
廣東黃寶石電子科技有限公司
GuangDong TOPAZ Electronic Technology Co., Ltd.

承認書

SPECIFICATION

Customer： 深圳市立創電子商務有限公司

Part Name: E-CAP

SPEC： RG Series

Part NO.： ALL

Date： 2018-3-3

CUSTOMER SIGN		

TOPAZCON	
DRAWING	RATIFY
黃峰	陳慶

TEL: 86-769-85391636 / 85391626 FAX：86-769-85325630
http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

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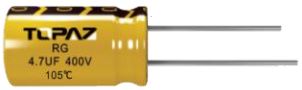
RG Series

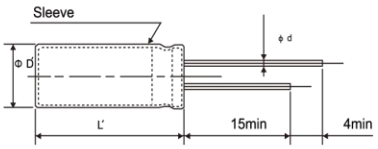


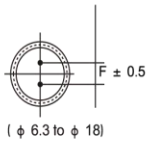
- Longer life, better performance
- life time,+130 ℃ 2,000hours,+105 ℃ 10,000hours
- suitable for electronic ballast; electronic energy saving lamp
- RoHS Compliant

SPECIFICATIONS

Item	Characteristics								
Temperature Range	−25 to +105 ℃ (160–400Vdc) −25 to +105 ℃ (450Vdc) −25 to +105 ℃ (500Vdc)								
Rated Voltage Range	160 to 500Vdc								
Capacitance Tolerance	± 20%(M)								(20 ℃ 120Hz)
Leakage Current	160 ~ 400Vdc	450–500Vdc	I:leakage current(uA),C:Nominal capacitance (UF) V:Rated voltage(V) (at 20 ℃ 120Hz)						
	1 ≤ 0.02CV +10uA	1 ≤ 0.03CV +10uA							(20 ℃ ,2minutes)
Dissipation Factor (tan §)	Rated voltage(Vdc)	160	200	250	350	400	450	500	(20 ℃ 120Hz)
	tan § (Max)	0.15	0.15	0.15	0.20	0.20	0.20	0.24	
Temperature Characteristics (Max.Impedance Ratio)	Rate Voltage(Vdc)	160	200	250	350	400	450	500	(120Hz)
	Z(−25 ℃)/Z(+20 ℃)	3	3	3	5	5	6	6	
	Z(−40 ℃)/Z(+20 ℃)	6	6	6	6	6	–	–	
Endurance	After application of the rated DC voltage at 130 ℃ 2,000 hours (WV.160 ~ 450Vdc) or application of DC voltage with rated ripple current(the voltage peak is not more than rated voltage) at 105 ℃ 10,000 hours(WV500V for 8,000 hours),measuring the parameters when the capacitors are restored to 20 ℃ , the capacitors shall meet the requirements as below								
	Capacitance change	≤ ± 20% of the initial value							
	D.F. (tan §)	≤ 200% of the initial specified value							
	Leakage current	≤ The initial specified value							
Shelf Life	The following specification shall be satisfied when the capacitor are restored to 20 ℃ after exposing them for 1,000hours at 105 ℃ without voltage application.								
	Capacitance change	≤ ± 20% of the initial value							
	D.F. (tan §)	≤ 200% of the initial specified value							
	Leakage current	≤ 200%of the initial specified value							

DIMENSIONS[MM]





Φ D	6.3	8		10	12.5	16	18
Φ d	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.5	3.5		5.0	5.0	7.5	7.5
Φ D'	Φ D+0.5max						
L'	L+2max						

RATED RIPPLE CURRENT MULTIPLIERS

Frequency correction factor for ripple current

WV(Vdc) \ Freq(Hz)	120	1K	10K	100K
160 ~ 450	0.50	0.80	0.90	1.00

TEL: 86-769-85391636 / 85391626 FAX：86-769-85325630
http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

RG Series

STANDARD RATINGS

WV (Vdc)	Cap (μ F)	Case size φ D × L(mm)	tan §	Ripple current (mArms/105 ℃ ,100kHZ)
160V(2C)	1	6.3 × 9	0.15	40
		6.3 × 12	0.15	45
	1.5	6.3 × 12	0.15	50
	1.8	6.3 × 9	0.15	50
		6.3 × 12	0.15	55
	2.2	6.3 × 9	0.15	55
		6.3 × 12	0.15	61
	2.8	6.3 × 9	0.15	70
		6.3 × 12	0.15	78
	3.3	6.3 × 9	0.15	85
		6.3 × 12	0.15	92
	4.7	6.3 × 9	0.15	92
		8 × 12	0.15	100
	5.6	8 × 9	0.15	100
		8 × 12	0.15	107
	6.8	8 × 9	0.15	107
		8 × 16	0.15	115
	8.2	8 × 9	0.15	150
		8 × 16	0.15	189
	10	8 × 9	0.15	190
		8 × 16	0.15	275
	15	8 × 20	0.15	340
		10 × 9	0.15	280
	22	10 × 16	0.15	475
	33	10 × 20	0.15	650
	47	10 × 20	0.15	750
	68	12.5 × 20	0.15	1180
	100	12.5 × 20	0.15	1350
		12.5 × 25	0.15	1420
	150	16 × 25	0.15	1890
	220	18 × 25	0.15	2370
200V(2D)	1	6.3 × 9	0.15	50
		6.3 × 12	0.15	58
	1.2	6.3 × 9	0.15	55
	1.5	6.3 × 9	0.15	60
		6.3 × 12	0.15	66
	1.8	6.3 × 9	0.15	66
		6.3 × 12	0.15	70
	2.2	6.3 × 9	0.15	72
		6.3 × 12	0.15	81
	2.8	6.3 × 9	0.15	81
		6.3 × 12	0.15	88
	3.3	6.3 × 9	0.15	105
		6.3 × 12	0.15	112
	4.7	6.3 × 12	0.15	115
		8 × 9	0.15	117
		8 × 12	0.15	120
	5.6	8 × 9	0.15	120
		8 × 12	0.15	126
	6.8	8 × 9	0.15	126
		8 × 16	0.15	140
	8.2	8 × 16	0.15	260
		10 × 9	0.15	200
	10	8 × 16	0.15	275
		10 × 9	0.15	220
	15	8 × 20	0.15	345
	22	10 × 16	0.15	475
	33	10 × 20	0.15	650
		12.5 × 16	0.15	650
	47	12.5 × 16	0.15	880
		12.5 × 20	0.15	980
	68	12.5 × 25	0.15	1300
	82	16 × 20	0.15	1380
	100	16 × 25	0.15	1494
	150	16 × 30	0.15	1989

WV (Vdc)	Cap (μ F)	Case size φ D × L(mm)	tan §	Ripple current (mArms/105 ℃ ,100kHZ)
250V(2E)	1	6.3 × 9	0.15	50
		6.3 × 12	0.15	58
	1.2	6.3 × 9	0.15	55
	1.5	6.3 × 9	0.15	60
		6.3 × 12	0.15	66
	1.8	6.3 × 9	0.15	70
		6.3 × 12	0.15	77
	2.2	6.3 × 9	0.15	72
		6.3 × 12	0.15	81
	2.8	6.3 × 9	0.15	81
		6.3 × 12	0.15	88
	3.3	6.3 × 12	0.15	112
		8 × 9	0.15	114
	4.7	8 × 9	0.15	116
		8 × 12	0.15	120
	5.6	8 × 9	0.15	120
		8 × 12	0.15	126
	6.8	8 × 9	0.15	145
		8 × 16	0.15	160
		10 × 9	0.15	150
	8.2	8 × 16	0.15	260
		10 × 9	0.15	200
	10	8 × 16	0.15	275
	15	8 × 20	0.15	378
	22	10 × 16	0.15	480
		10 × 20	0.15	500
	33	12.5 × 16	0.15	600
		12.5 × 20	0.15	660
	47	12.5 × 16	0.15	880
		12.5 × 20	0.15	980
	68	16 × 25	0.15	1320
	100	16 × 30	0.15	1500
	150	16 × 35	0.15	2000
350V(2V)	1	6.3 × 9	0.20	55
		6.3 × 12	0.20	60
	2.	6.3 × 12	0.20	60
	1.5	6.3 × 9	0.20	65
		6.3 × 12	0.20	70
	1.8	6.3 × 9	0.20	72
		6.3 × 12	0.20	80
		8 × 9	0.20	82
	2.2	8 × 9	0.20	86
		8 × 12	0.20	90
	2.8	8 × 9	0.20	88
		8 × 12	0.20	95
	3.3	8 × 9	0.20	100
		8 × 12	0.20	108
	4.7	8 × 16	0.20	128
		10 × 9	0.20	120
	5.6	8 × 16	0.20	162
		10 × 9	0.20	145
	6.8	8 × 20	0.20	215
	8.2	8 × 20	0.20	220
	10	8 × 20	0.20	260
	15	10 × 20	0.20	380
	22	12.5 × 20	0.20	525
	33	12.5 × 20	0.20	600
		16 × 20	0.20	650
	47	16 × 20	0.20	700
	68	18 × 20	0.20	780
		18 × 25	0.20	850
	82	18 × 25	0.20	1000

TEL: 86-769-85391636 / 85391626 FAX：86-769-85325630
http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

RG Series

STANDARD RATINGS

WV (Vdc)	Cap (μ F)	Case size φ D × L(mm)	tan §	Ripple current (mArms/105 ℃ ,100kHZ)
400V(2G)	1	6.3 × 9	0.20	65
		8 × 12	0.20	70
	1.2	6.3 × 12	0.20	68
	1.5	8 × 9	0.20	72
		8 × 12	0.20	76
	1.8	8 × 9	0.20	76
		8 × 12	0.20	85
	2.2	8 × 9	0.20	85
		8 × 12	0.20	90
	2.8	8 × 9	0.20	90
		8 × 16	0.20	99
	3.3	8 × 9	0.20	100
		8 × 16	0.20	108
	4.7	8 × 20	0.20	130
		10 × 9	0.20	120
	5.6	8 × 20	0.20	175
	6.8	10 × 16	0.20	215
	8.2	10 × 20	0.20	240
	10	10 × 20	0.20	275
	12	12.5 × 20	0.20	300
	15	12.5 × 16	0.20	324
		12.5 × 20	0.20	360
	22	12.5 × 25	0.20	500
		16 × 20	0.20	500
	33	16 × 25	0.20	620
	47	16 × 30	0.20	756
	56	16 × 40	0.20	800
	68	18 × 30	0.20	900
	100	18 × 40	0.20	1200
450V(2W)	1	6.3 × 9	0.20	76
		8 × 12	0.20	82
	1.2	8 × 9	0.20	80

WV (Vdc)	Cap (μ F)	Case size φ D × L(mm)	tan §	Ripple current (mArms/105 ℃ ,100kHZ)
450V(2W)	1.5	8 × 9	0.20	82
		8 × 12	0.20	85
	1.8	8 × 12	0.20	88
		10 × 9	0.20	90
	2.2	8 × 16	0.20	95
		10 × 9	0.20	92
	2.8	8 × 16	0.20	99
		10 × 9	0.20	95
	3.3	8 × 16	0.20	100
		10 × 9	0.20	98
	3.9	10 × 9	0.20	115
	4.7	10 × 16	0.20	130
	5.6	10 × 20	0.20	177
	6.8	10 × 20	0.20	215
	8.2	10 × 20	0.20	230
	10	10 × 25	0.20	300
		12.5 × 16	0.20	280
	15	12.5 × 20	0.20	410
	22	12.5 × 25	0.20	530
		16 × 20	0.20	530
	33	16 × 25	0.20	670
	47	16 × 35	0.20	850
	56	18 × 30	0.20	1080
	68	18 × 35	0.20	1300
	100	18 × 40	0.20	1530
500V(2H)	10	12.5 × 20	0.24	288
		12.5 × 25	0.24	302
	15	12.5 × 25	0.24	396
		16 × 20	0.24	396
	22	12.5 × 35	0.24	504
		16 × 25	0.24	504
	33	18 × 25	0.24	630
	47	18 × 30	0.24	792

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http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

Lead Forming

Taping Specifications

Fig.1 Code:T1

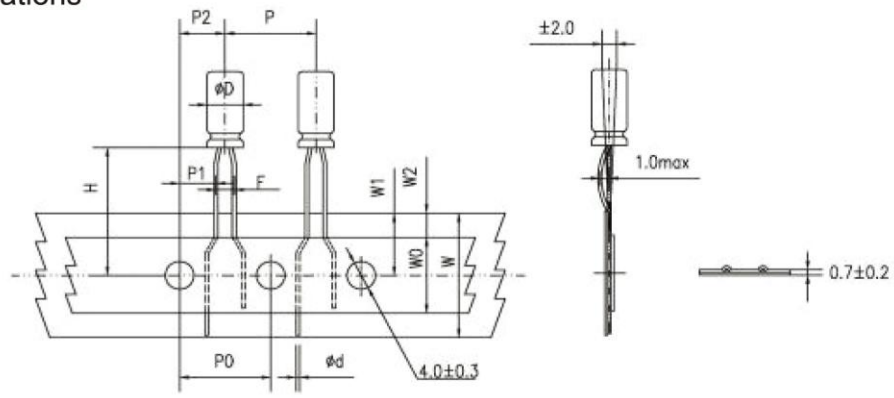


Fig.2Code:T2

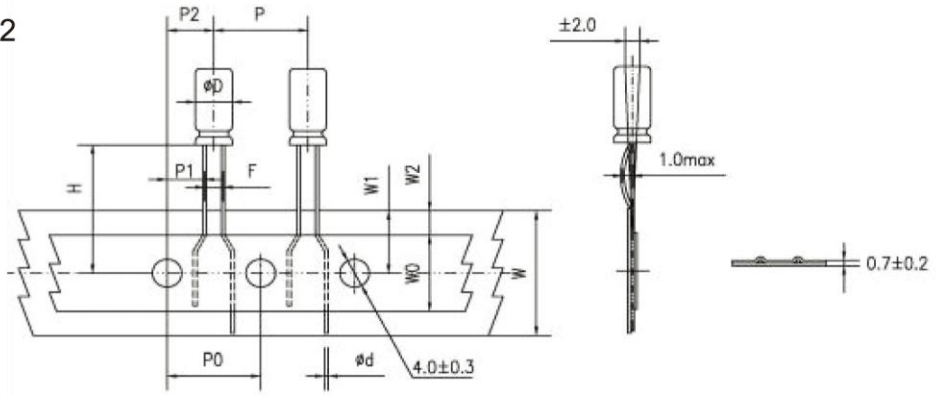


Fig.3 Code:T2

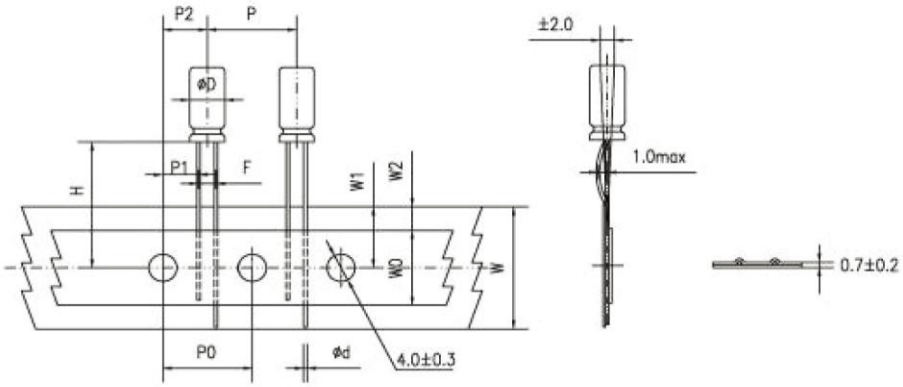
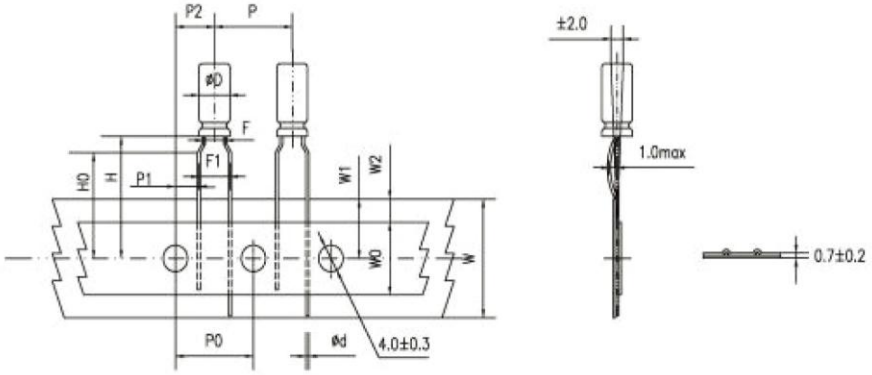


Fig.4 Code:T3



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http:www.songshengdg.com E-mail:songshengcw@163.com
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Specification Fig.1 & Fig.2 & Fig.3

Iterms	Symbol	CASE SIZE													Tolerance
		4 × 5 4 × 7		5 × 5 5 × 7		5x11		6.3x5	6.3x7 6.3x9	6.3x11 6.3x12	8x5/7 8x9/11 8x11.5 8x12	8x16 8x20	10x9/12 10x12.5 10x13/16 10x20/25		
Pin Code		T_1	T_2	T_1	T_2	T_1		T_2	T_2	T_2	T_2	T_2	T_2		
Lead wire diameter	ϕd	0.45		0.45		0.5		0.45	0.5	0.5	0.45/0.5	0.6	0.6		± 0.05
Pitch of body	P	12.7		12.7		12.7		12.7	12.7	12.7	12.7	12.7	12.7		± 1.0
Feed hole pitch	PO	12.7		12.7		12.7		12.7	12.7	12.7	12.7	12.7	12.7		± 0.2
Hole center to lead distance	P1	5.1	5.6	5.1	5.35	5.1	5.35	5.1	5.1	5.1	4.6	4.6	3.85		± 0.7
Feed hole center to body center distance	P2	6.35		6.35		6.35		6.35	6.35	6.35	6.35	6.35	6.35		± 1.0
Lead to lead distance	F	2.5	1.5	2.5	2.0	2.5	2.0	2.5	2.5	2.5	3.5	3.5	5.0		± 0.5
Height of body from tape center	H	18.5		18.5		18.5		18.5	18.5	18.5	18.5	18.5	18.5		± 0.75
Base tape width	W	18.0		18.0		18.0		18.0	18.0	18.0	18.0	18.0	18.0		± 0.5
Adhesive tape width	WO	11.0		11.0		11.0		11.0	11.0	11.0	11.0	11.0	11.0		min
Hole positron	W1	9.0		9.0		9.0		9.0	9.0	9.0	9.0	9.0	9.0		+0.75 −0.5
Hole down tape position	W2	3.0		3.0		3.0		3.0	3.0	3.0	3.0	3.0	3.0		max

Specification Fig.4

Iterms	Symbol	CASE SIZE									Tolerance
		4 × 5 4 × 7	5 × 5	5 × 7	5 × 11	6.3 × 5	6.3 × 7 6.3 × 9	6.3 × 11 6.3 × 12	8 × 5/7 8 × 9/11 8 × 11.5/12	8 × 16 8 × 20	
Pin Code		T_3	T_3	T_3	T_3	T_3	T_3	T_3	T_3	T_3	
Lead wire diameter	ϕd	0.45	0.45	0.45	0.5	0.45	0.5	0.5	0.45/0.5	0.6	± 0.05
Pitch of body	P	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	± 1.0
Feed hole pitch	PO	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	± 0.2
Hole center to lead distance	P1	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	± 0.7
Feed hole center to body center distance	P2	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	± 1.0
Lead to lead distance	F	1.5	2.0	2.0	2.0	2.5	2.5	2.5	3.5	3.5	± 0.5
Lead to lead distance	F1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	+0.8 −0.2
Height of body from tape center	H	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	± 0.75
Lead wire clinch height	HO	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	± 0.5
Base tape width	W	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	± 0.5
Adhesive tape width	WO	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	min
Hole position	W1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	+0.75 −0.5
Hole down tape position	W2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	max

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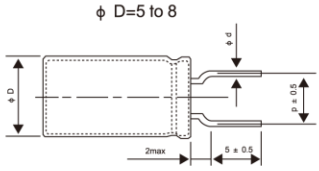
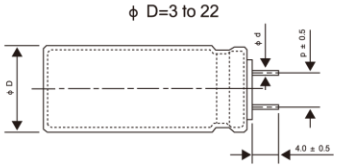
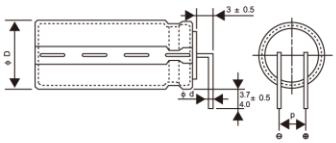
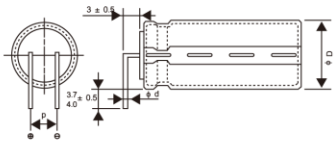
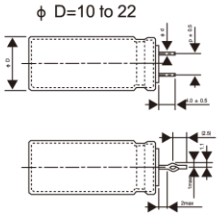
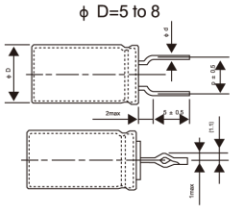
http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

Lead Forming & Cut:

● Lead comfiguration:F	● Lead comfiguration:C
ϕ D=5 to 8 	ϕ D=3 to 22 
● Lead comfiguration:R	**● Lead comfiguration:L**
ϕ D=10 to 22 	ϕ D=10 to 22 
● Lead comfiguration:M	**● Lead comfiguration:S**
ϕ D=10 to 22 	ϕ D=5 to 8 

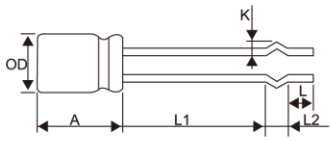
LEAD SPACING&RECOMMENDED PCB DIMENSIONS

(mm)

ϕD / Dimensionc	ϕd	p	PC Board		Lead Configuration
			Hole diame ter	Thickness	
5	0.5	5.0	0.8	1.6	F C S
6.3	0.5	5.0	0.8		
8	0.5/0.6	5.0	1.0		
10	0.6	5.0	1.0	1.6	C M R L
12.5	0.6	5.0	1.0		
16	0.8	7.5	1.2		
18	0.8	7.5	1.2		
20	0.8	7.5	1.2		
22	0.8	10.0	1.2		

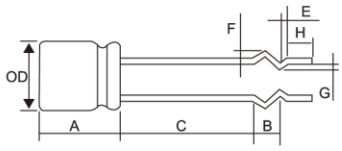
TEL: 86-769-85391636 / 85391626 FAX：86-769-85325630
http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

● **Lead comfiguration:B**



ØD	L1	L2	K	A	L
5	17.5–19.5	2.6	1.9	10.0–15.0	3.0–5.0
6.3	17.5–19.5	2.6	1.9	10.0–16.0	
8	12.0–14.0	2.5	1.3	10.0–20.0	
8	13.5–15.5	2.5	1.5		
8	13.0–15.0	3.0	1.5		
8	19.5–21.5	3.0	1.5		
8	21.0–23.0	3.0	1.5		
10	7.5–9.5	2.5	1.7	10.0–25.0	
10	17.0–19.0	2.5	1.7		
10	10.5–12.5	2.5	1.5		
10	10.0–12.0	3.0	1.5		
10	13.0–15.0	3.0	1.5		
10	18.0–20.0	3.0	1.5		
10	21.0–23.0	3.0	1.5		
	± 1.0	± 0.5	0.3	± 1.0	± 1.0

● **Lead comfiguration:K**



ØD	C	B	E	F	G	A	H
8	13.5–15.5	3	1.2	1.8	0.8	10–20	3.0–5.0
10	18.5–20.5	3	1.2	1.8	1	10–25	
10	19.0–21.0	3	1.5	1.4	0.5		
	± 1.0	± 0.5	± 0.3	± 0.3	± 0.3	± 1.0	± 1.0

TEL: 86-769-85391636 / 85391626 FAX：86-769-85325630
http:www.songshengdg.com E-mail:songshengcw@163.com
廣東省東莞市大朗鎮佛子凹村佛富路三號 郵編：523781

鋁電解電容器的使用注意事項

Guidelines For Using Aluminum Electrolytic Capacitor

爲使客戶獲得電解電容器的最佳性能和延長電解電容器的使用壽命，在使用電解電容器前，請務必閱讀本注意事項。

Upon using Aluminum Electrolytic Capacitors, please proper handling and observing to following important points will insure optimum capacitor performance and long life.

1、直流電解電容器是有極性的　DC electrolytic capacitors are polarized.

確定極性，極性標誌在電容器的基體上。以免因極性反可能引起電路短路或電容器損壞，當極性不固定或不確定的，使用雙極性電容器。注意直流電解電容器不能使用於交流。

Make sure of the polarity .The polarity is marked on the body of the capacitor .Application of the reversed voltage may cause a short circuit or damage to the capacitor. Use bipolar capacitors when the polarity is not determined or unknown. Note that DC electrolytic capacitors can not be used for AC application.

2、雙極性電容器

Bipolar capacitors

只適用於脈動電路和極性反轉電路中，不適用於純交流和高紋波電路中。

They are used only in pulse circuits as well as polarity reverse circuits. but not applicable in pure AC or high ripple current.

3、使用電壓不要大於額定電壓　DO not apply voltage greater than rated voltage .

使用電壓大於額定電壓，漏電流會增大，可能損壞電容器。建議工作電壓爲額定電壓的百分之七十～八十，電容器在建議的工作電壓下使用可延長電容器的壽命。

If a voltage exceeding the rated voltage is applied , the leakage current will increase ,which damage the capacitor. Recommended working voltage is 70 to 80 percent of rated voltage. Using capacitors at recommended working voltage prolongs capacitor life.

4、不要使過量的紋波電流通過電容器

Do not allow excessive ripple current through the capacitor.

流過電容器的紋波電流超過許可值，將會引起電容器發熱，電容量減少，損害電容器。通過電容器的紋波電流不要大於允許值，一般不超過額定值的 80%。

The flow of ripple current over permissible ripple current will cause heat of the capacitor, which may decrease the capacitance and damage the capacitor. ripple current on the capacitor must be at or bellow allowable level, generally not more than 80% of the rated current.

5、快速的充放電電路中，使用專門設計的電容器

Use specially designed capacitors for the circuits where charge and discharge are frequency repeated.

在經受快速的週期性充放電電路中，電容器可能受損害，它的壽命因容量下降、溫升等原因而縮短，在這種電路中，一定要使用專門設計的電容器。

In the circuit subjected to rapid charge and discharge cycles, capacitors may be damaged, its life may be shortened by capacitance decrease, heat rise, ect. Be sure and use special capacitors in these applications.

6、工作溫度範圍　Operating temperature range.

電容器的特性隨工作溫度而變化，在溫度較高的情況下，容量、漏電流增大，tgδ減少；在低溫情況下，容量和漏電流下降，tgδ增大。電容器在較低的溫度下使用會確保延長壽命。

The characteristics of capacitors change with the operating temperature. The capacitance and leakage current increase and tgδ decrease at higher temperatures. The capacitance and leakage current decrease and tgδ increase at lower temperature. Usage at lower temperature will ensure longer life.

7、使用溫度與壽命的關係　Relationship between temperature and life.

電容器的壽命與其使用的溫度有關，一般來說，使用溫度降低 10℃，其壽命是額定溫度下的 2 倍，計算公式如下：

Life of capacitors has relationship with its used temperature .Generally, if the used temperature is reduced 10℃,life is prolonged twice at rated temperature. Here is calculating format:

$$LS = LO \times 2^{\frac{To - Tx}{10}} \times 2^{\frac{\Delta T\,m - \Delta T\,m\left(\frac{Ix}{Io}\right)^2}{10}}$$

LO: Useful life when applied ripple current Istd at maximal operating temperature TO,H
TO: Maximum Operating Temperature .
Tx: Actual Operating Temperature.
△Tm: 5℃
Ix: Actual Ripple Current
IO: Rated Ripple Current.

8、核對工作頻率　Check operating frequency.

電解電容器的電容量通常是在 100Hz 或 120Hz 下測得的。然而要記住容量隨頻率的升高而下降，tgδ隨頻率的升高而增大，並使周圍溫度升高。

The capacitance of electrolytic capacitors is usually measured at 100Hz or 120Hz. However , remember that capacitance decrease and tgδ increase as the applied frequency becomes higher whereas the ambient temperature becomes higher.

9、長時間存放的電容器，在使用前加額定直流電壓處理　Apply rated DC voltage treatment to the capacitors which have been stored for a long time.

長時間的存放，實際對電容器的容量和 tgδ沒有多大的影響，然而往往會使漏電流增大，耐壓降低。

長時間存放後的電容器處理，首先逐漸施加直流電壓至額定電壓，然後再使用。

Long periods of storage have virtually no effect no a capacitor’s capacitance and tgδ. Such periods tend, however, to increase leakage current and decrease withstand voltage.

After removing capacitors from long-duration storage, First apply a gradually increasing DC voltage to rated voltage and then use them.

10、電容器外殼與陰極端是不絕緣的　The capacitor case is not insulated from the cathode terminal.

電容器的外殼與陰極端是通過電解液連接的，如果電容器的外殼必須與線路絕緣，則電容器的安裝位置處，一定要採取絕緣措施。

The capacitor’s case and cathode terminal connect through the electrolyte. If the case is to be completely insulated, that insulation must be at the capacitor’s mounting point.

11、電容器的端子或引線不要施加過大的力

Do not apply excessive force to the terminals and leads.

過大的力施加到端子或引線上，可能引起引線的斷裂或端子分裂，轉而會引起內部連接的破壞。

The excessive strong force applied to the terminals and lead wires may cause leads to break or terminals to separate and, in turn, cause the internal contact to fail.

12、如電容器需彎腳成臥式狀態。彎腳處應與電容器成體保持 2mm 的安全間距，否則可能造成電容器內部結構損傷。

Such as capacitor to bend feet into horizontal state. Bending feet should maintain with capacitor adult 2mm safe spacing, otherwise may cause the internal of capacitor structural damage

13、浸焊料後，線路板的清洗　Cleaning of the circuit board after solder dipping.

清洗線路板以去除焊劑或其它附著物。爲了保護塑膠套管，印刷標誌以及封口材料不被破壞，電容器不能用鹵化物或類似溶劑作爲電容器清洗用，如三氯乙烯，二甲苯或酮類等。建議使用的清洗溶劑爲：甲醇，異丙醇，乙醇，異丁醇，石油醚，丙醇和一般的洗滌劑。

Cleaning circuit boards to remove flux or other extraneous matter. To ensure protection for sleeve, marking and sealing materials on capacitor body, capacitor should never be washed or cleaned by halogens agents or solvents such as trichlorethylene, xylem or acetone etc. Recommended cleaning solvents. Methanol, isopropanol ethanol, isobutanol, petroleumethe, propane and/or commercial detergents.

14、焊接時注意溫度和持續的時間　Be cautious of the temperature and duration when soldering.

烙鐵應與電容器的塑膠絕緣套管保持一定的距離。當電容器浸于焊料槽時，建議溫度在 260℃以內，時間不要超過 10 秒鐘，以避免電容器元件受損。

Soldering irons should be kept away from the vinyl insulated sleeves of capacitor. When the capacitor dipped in solder bath, recommendable within 260℃and 10 seconds to avoid damage of capacitor unit.

15、印刷線路板上孔的佈局

Hole positions on the circuit board.

設計印刷線路板時，安裝孔距應等於引線間距，當孔距大於或小於引線間距時，安裝電容器時，將有應力作用到引線上，可能引起短路，電路損壞，漏電流增大。

另外，焊料可能通過所打的孔及後加工零件的引線孔濺落到塑膠套管上，造成損傷，所以要認真考慮孔的佈局。

When designing a circuit board, space the position holes equally to the space between lead wires. When the spacing is either greater than or less than the capacitor’s leads, mounting the capacitor will apply to the leads, causing short circuits, broken circuits, and increased current.

Otherwise, through-holes on the circuit board as well as lead holes of post-process parts can result in solder splashing onto the vinyl sleeve , causing damage. Consider hole positions carefully.

GUANGDONG TOPAZ ELECTRONIC TECHNOLOGY CO.,LTD

3 INDUSTRY FACTORY,FU ZI AO VILLAGE FU FU ROAD,DALANG TOWN,DONGGUAN,CHINA
DONGGUAN SONGSHENG ELECTRONICS CO.,LTD.
3 INDUSTRY FACTORY,FU ZI AO VILLAGE FU FU ROAD,DALANG TOWN,DONGGUAN,CHINA

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

SGS Job No. :	RP17-002586 - SZ
Date of Sample Received :	31 Mar 2017
Testing Period :	31 Mar 2017 - 06 Apr 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 selected part of submitted sample(s), the results of Cadmium, Lead, Mercury, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) do not exceed 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 Co., Ltd. Shenzhen Branch

Sunny Nie
Approved Signatory

SGS Bldg, No.3, Jianghao Industrial Park, No.430, Jihua Road, Bantian, Longgang District, Shenzhen, China 518129 t (86-755) 25328888 f (86-755) 83106190 www.sgsgroup.com.cn
中国·深圳·龙岗区坂田吉华路430号江灏工业园3栋SGS大楼 邮编: 518129 t (86-755) 25328888 f (86-755) 83106190 e sgs.china@sgs.com

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	SZX17-002534.001	Lt-yellow liquid(semi-product)
SN2	SZX17-002534.002	Transparent adhesive plastic tape(semi-product)
SN3	SZX17-002534.003	Silvery metal pin(semi-product)
SN4	SZX17-002534.004	Grey metal sheet 4#(semi-product)
SN5	SZX17-002534.005	Silvery metal(semi-product)
SN6	SZX17-002534.006	Black plastic(semi-product)
SN7	SZX17-002534.007	Yellow plastic w/ black printing(semi-product)
SN8	SZX17-002534.008	Lt-brown paper(semi-product)
SN9	SZX17-002534.009	Grey metal sheet 9#(semi-product)

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 : (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 62321:2008, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
(5)With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.
(6)With reference to IEC 62321-8:2013 (111/321/CD) , determination of phthalates by GC-MS.

Test Item(s)	Limit	Unit	MDL	*001*	*002*	*006*
Cadmium (Cd)	100	mg/kg	2	ND	ND	ND
Lead (Pb)	1,000	mg/kg	2	ND	ND	ND
Mercury (Hg)	1,000	mg/kg	2	ND	ND	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND	ND	ND
Sum of PBBs	1,000	mg/kg	-	ND	ND	ND
Monobromobiphenyl	-	mg/kg	5	ND	ND	ND
Dibromobiphenyl	-	mg/kg	5	ND	ND	ND
Tribromobiphenyl	-	mg/kg	5	ND	ND	ND

Test Item(s)	Limit	Unit	MDL	001	002	006
Tetrabromobiphenyl	-	mg/kg	5	ND	ND	ND
Pentabromobiphenyl	-	mg/kg	5	ND	ND	ND
Hexabromobiphenyl	-	mg/kg	5	ND	ND	ND
Heptabromobiphenyl	-	mg/kg	5	ND	ND	ND
Octabromobiphenyl	-	mg/kg	5	ND	ND	ND
Nonabromobiphenyl	-	mg/kg	5	ND	ND	ND
Decabromobiphenyl	-	mg/kg	5	ND	ND	ND
Sum of PBDEs	1,000	mg/kg	-	ND	ND	ND
Monobromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Dibromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Tribromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Octabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND	ND	ND
Decabromodiphenyl ether	-	mg/kg	5	ND	ND	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

Test Item(s)	Limit	Unit	MDL	007	008
Cadmium (Cd)	100	mg/kg	2	ND	ND
Lead (Pb)	1,000	mg/kg	2	ND	ND
Mercury (Hg)	1,000	mg/kg	2	ND	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND	ND
Sum of PBBs	1,000	mg/kg	-	ND	ND
Monobromobiphenyl	-	mg/kg	5	ND	ND
Dibromobiphenyl	-	mg/kg	5	ND	ND
Tribromobiphenyl	-	mg/kg	5	ND	ND
Tetrabromobiphenyl	-	mg/kg	5	ND	ND
Pentabromobiphenyl	-	mg/kg	5	ND	ND
Hexabromobiphenyl	-	mg/kg	5	ND	ND
Heptabromobiphenyl	-	mg/kg	5	ND	ND
Octabromobiphenyl	-	mg/kg	5	ND	ND
Nonabromobiphenyl	-	mg/kg	5	ND	ND
Decabromobiphenyl	-	mg/kg	5	ND	ND

SGS Bldg, No.3, Jianghao Industrial Park, No.430, Jihua Road, Bantian, Longgang District, Shenzhen, China 518129 t (86-755) 25328888 f (86-755) 83106190 www.sgsgroup.com.cn
中国·深圳·龙岗区坂田吉华路430号江灏工业园3栋SGS大楼 邮编: 518129 t (86-755) 25328888 f (86-755) 83106190 e sgs.china@sgs.com

Test Item(s)	Limit	Unit	MDL	*007*	*008*
Sum of PBDEs	1,000	mg/kg	-	ND	ND
Monobromodiphenyl ether	-	mg/kg	5	ND	ND
Dibromodiphenyl ether	-	mg/kg	5	ND	ND
Tribromodiphenyl ether	-	mg/kg	5	ND	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND	ND
Octabromodiphenyl ether	-	mg/kg	5	ND	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND	ND
Decabromodiphenyl ether	-	mg/kg	5	ND	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.
(2) 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.
(3) 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.
(4) 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.
(5) 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.'

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 62321-7-1:2015 , determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.

Test Item(s)	Limit	Unit	MDL	*003*	*004*	*005*
Cadmium (Cd)	100	mg/kg	2	ND	ND	ND
Lead (Pb)	1,000	mg/kg	2	ND	ND	ND
Mercury (Hg)	1,000	mg/kg	2	ND	ND	ND
Hexavalent Chromium (Cr(VI))▾	-	µg/cm²	0.10	ND	ND	ND

Test Item(s)	Limit	Unit	MDL	*009*
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	ND
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))▾	-	µg/cm²	0.10	ND

Notes :

(1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.

(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.

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

Halogen

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

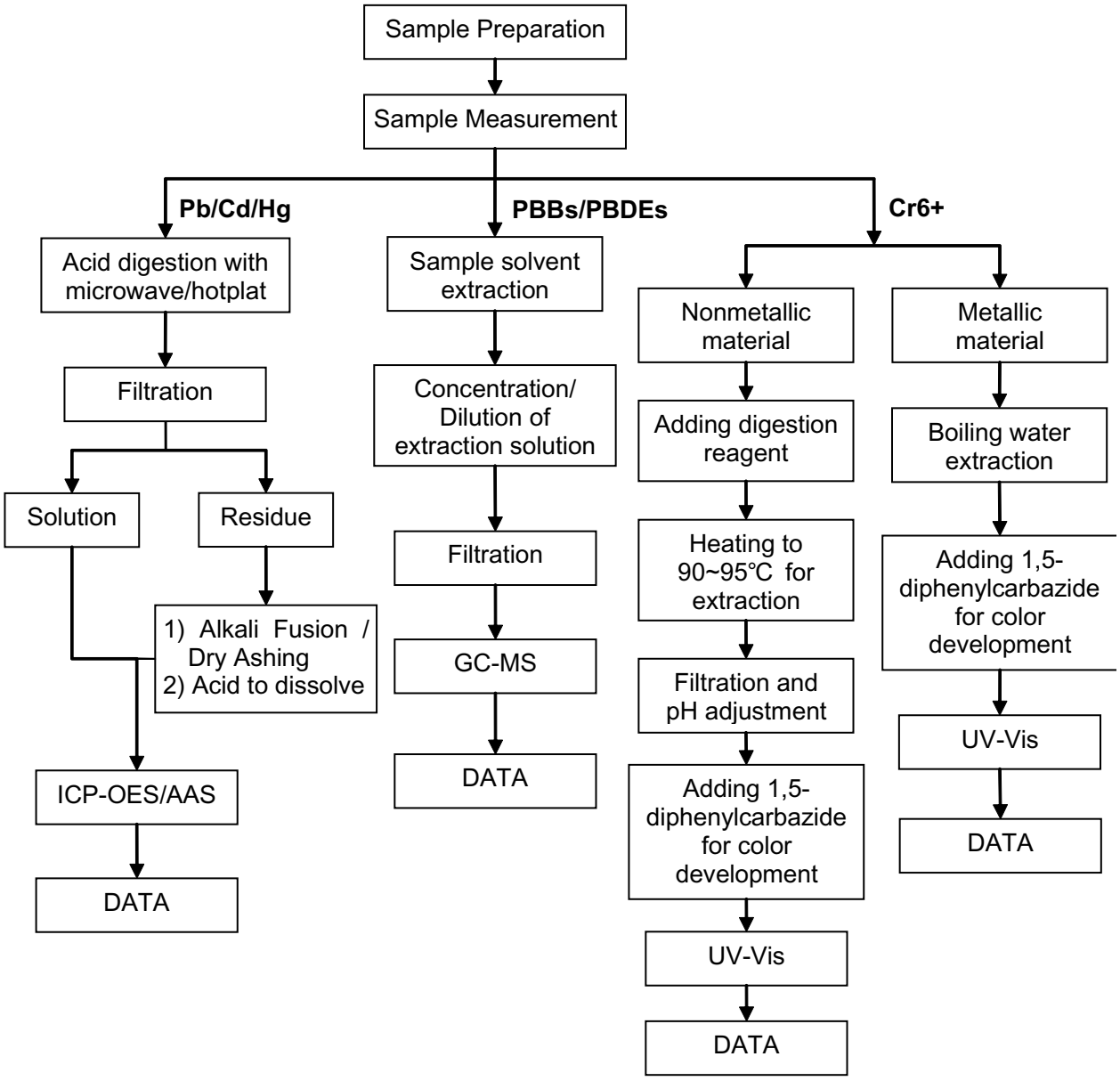
Test Item(s)	Unit	MDL	*006*	*007*
Fluorine (F)	mg/kg	50	215	ND
Chlorine (Cl)	mg/kg	50	111	ND
Bromine (Br)	mg/kg	50	ND	ND
Iodine (I)	mg/kg	50	ND	ND

Remark: The result(s) of 001 shown is/are of the total weight of wet sample.

ATTACHMENTS

Pb/Cd/Hg/Cr^{6+}/PBBs/PBDEs Testing Flow Chart

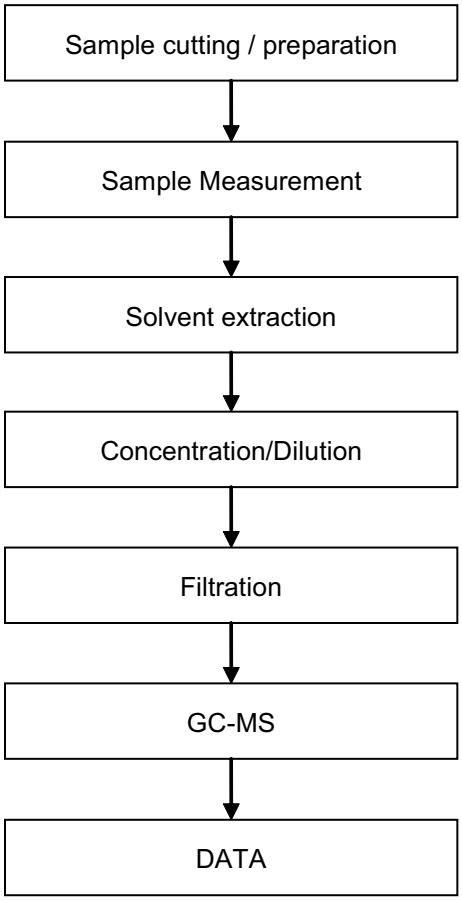
1) Name of the person who made testing: Winsen Deng / David Mai / Truly Ren
2) Name of the person in charge of testing: Zoe Luo / Laurel Li / Muky Tong /
3) These samples were dissolved totally by pre-conditioning method according to below flow chart (Cr^{6+} and PBBs/PBDEs test method excluded).



ATTACHMENTS

Phthalates Testing Flow Chart

1) Name of the person who made testing: David Mai
2) Name of the person in charge of testing: Laurel Li



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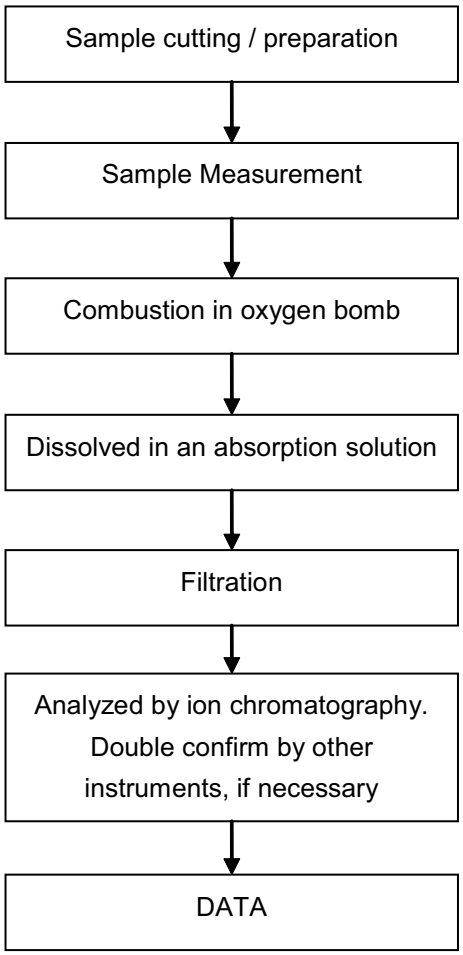
ATTACHMENTS

Halogen Testing Flow Chart

1) Name of the person who made testing: Abel Li
2) Name of the person in charge of testing: Roje Zhou



Sample photo:

SZX17-002534.001

SZX17-002534.002

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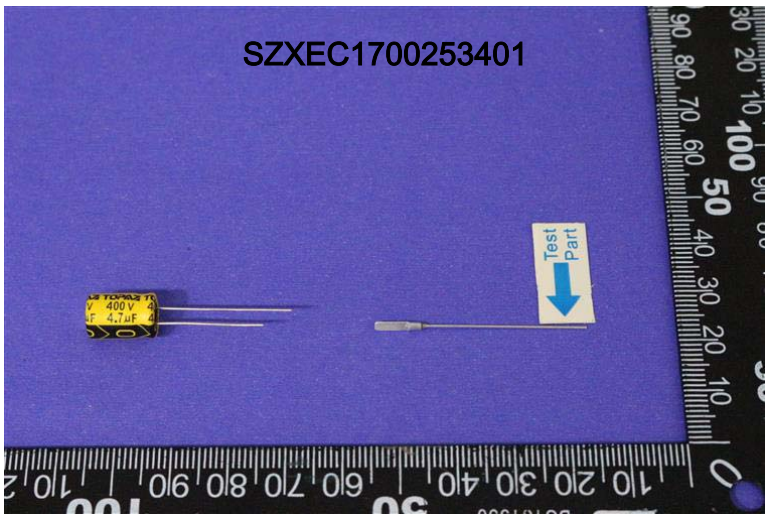

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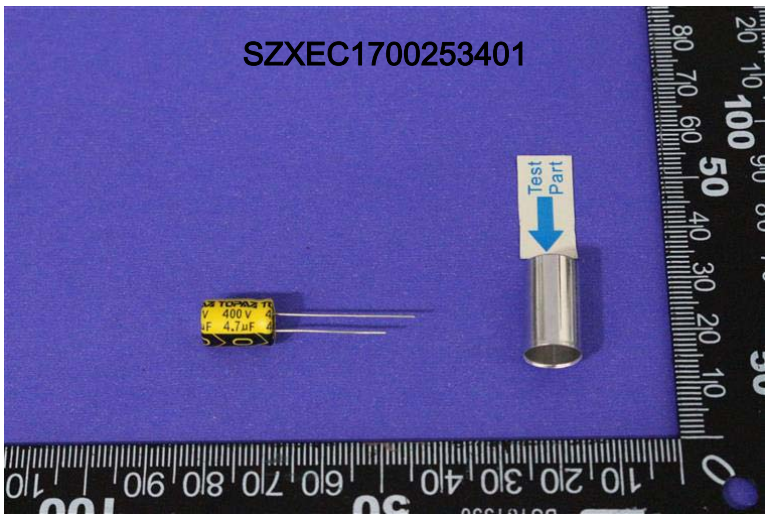

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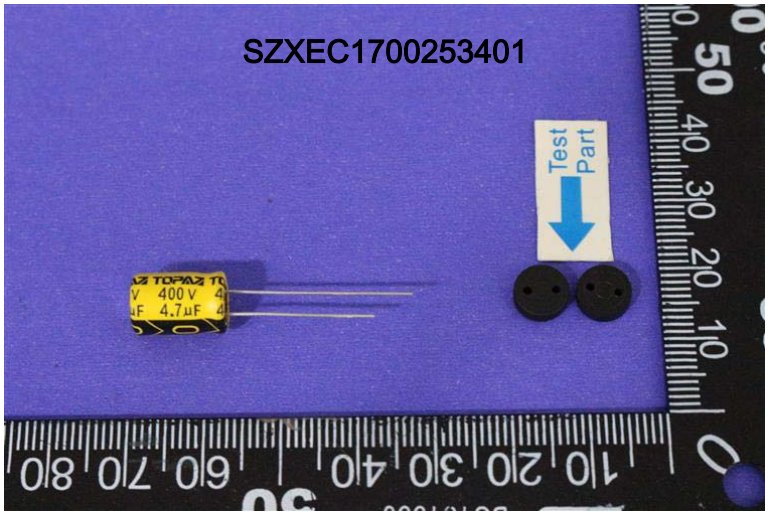

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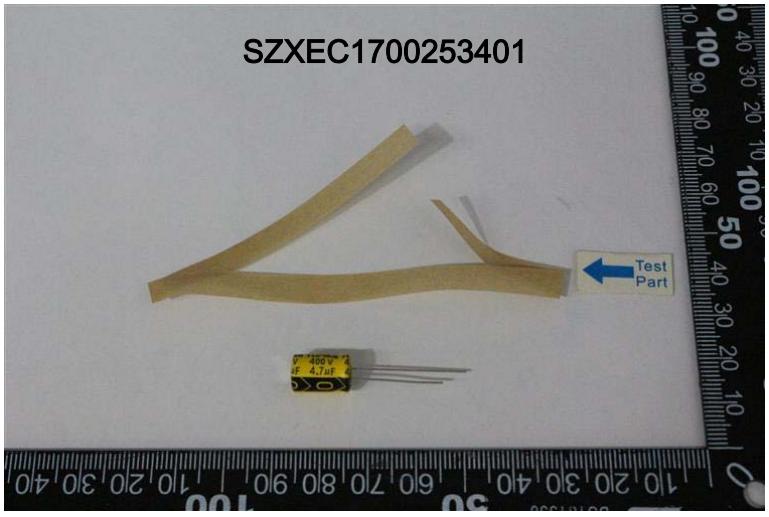

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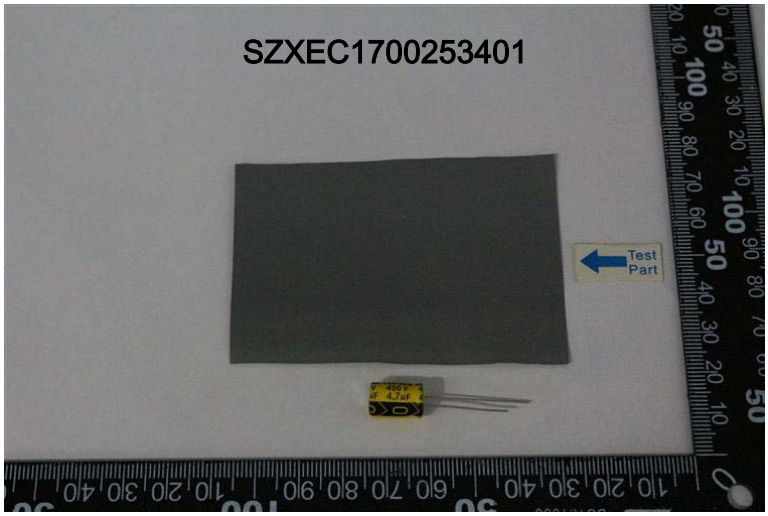

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