

## SAMXON BRAND ALUMINUM ELECTROLYTIC CAPACITORS

# PRODUCT SPECIFICATION

# 規格書

**CUSTOMER:** DATE:

**(客戶):** 志盛翔 **日期**:2020-6-29

CATEGORY (品名) : ALUMINUM ELECTROLYTIC CAPACITORS

DESCRIPTION (型号) : GT  $63V47\mu F(\phi 6.3X11)$ 

VERSION (版本) : 01

Customer P/N :

SUPPLIER :

SUPPLIER									
PREPARED (拟定)	CHECKED (审核)								
杜焕	刘渭清								

CUSTOMER									
APPROVAL	SIGNATURE								
(批准)	(签名)								

## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

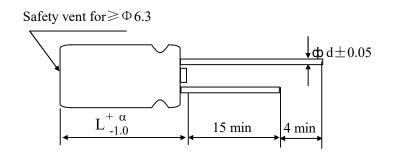
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Rev.	Date	Mark	Page	Contents	Purpose	Drafter	Approver

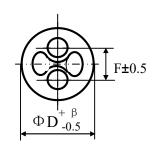
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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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## Table 1 Product Dimensions and Characteristics





Unit: mm

α	L<20 : α=1.5; L≥20 : α=2.0
β	$\Phi D < 20 : \beta = 0.5; \ \Phi D \ge 20 : \beta = 1.0$

\* If it is flat rubber, there is no bulge from the flat rubber surface.

N o.	SAMXON Part No.	WV (Vdc)	Cap. (μF)	Cap. tolerance	Temp. range( $^{\circ}\mathbb{C}$ )	tanδ (120Hz, 20℃)	Leakage Current (μΑ,2min)	Max Ripple Current at 105℃ 100kHz (mArms)	Impedance at 20°C 100kHz (Ωmax)	Load lifeti me (Hrs)		ension (mm) F	фd	Sleev
1	EGT476M1JE11RR**P	63	47	-20%~+20%	-40~105	0.09	29	115	0.96	5000	6.3X11	2.5	0.5	PET

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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## 1. Application

This specification applies to polar Aluminum electrolytic capacitor (foil type) used in electronic equipment. Designed capacitor's quality meets IEC60384.

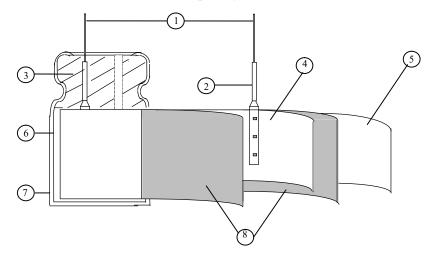
SMM EKF EKF EKS EKS EKS EKS EKS EKG		Code 104 224 334 474 105 225 335 475 106 226 336 476	_		Voltage (W.V.)  2 2.5 4 6.3 8 10 12.5 16 20 25 30 32 35 40 42 50 57 63 71 75	Code OD OE OG OJ OK 1A 1B 1C 1D 1E 11 13 1V 1G 1M 1H 1L 1J 1S 1T	Case Size    Case Size   Case Size	Feature (Radial bulk Ammo Tap 2.0mm Pitch 3.5mm Pitch Lead Cut &	TT TV TC	SAMXON SAMXON PRODUCT LINE M  SAMXON Product L For internal use only (The product lines we have H.A.B.C.D, E,M or 0,1,2,3,4,5,9)  Sleeve Material PET	ine
eries Can SM SKF SS SS SKKM SKG SKG SKKM SZS SF	0.1 0.22 0.33 0.47 1 2.2 3.3 4.7 10 22 33 47	Code 104 224 334 474 105 225 335 475 106 226 336	#10 #15 #20 #30 -40 0 -20 +10 -20 +40	Code J K L M N V A	Voltage (W.V.)  2 2.5 4 6.3 8 10 12.5 16 20 25 30 32 35 40 42 50 57 63 71 75	0D 0E 0G 0J 0K 1A 1B 1C 1D 1E 11 13 1V 1G 1M 1H 1L 1J	Case Size Diameter(s) Cod 3 B 3.5 1 4 C 5 D 6.3 E 8 F 10 G 12.5 1 13.5 J 13.5 J 14.5 A 16.5 7 18.5 8 20 M	Feature (Radial bulk Ammo Tap 2.0mm Pitch 3.5mm Pitch Lead Cut &	TT TU TC Form	SAMXON Product L For internal use only (The product lines we have H,A,B,C,D, E,M or 0,1,2,3,4,5,9)	ine
ESMM ESKF ESS EKS EKS EGS EKM EZM EZM EZM EZM EZS EGF EGT EGK EGR EGR EGR EGR ERR ERR ERR ERR ERR ERR	0.1 0.22 0.33 0.47 1 2.2 3.3 4.7 10 22 33 47	104 224 334 474 105 225 335 475 106 226 336	±5 ±10 ±15 ±20 ±30 -40 0 -20 0 -20 +10 -20 +40	K L M N W A C	2 2.5 4 6.3 8 10 12.5 16 20 25 30 32 35 40 42 50 57 63 71	0D 0E 0G 0J 0K 1A 1B 1C 1D 1E 11 13 1V 1G 1M 1H 1L 1J	Disartent(s)   Cool	Radial bulk Ammo Tap 2.0mm Pitch 2.5mm Pitch 3.5mm Pitch 5.0mm Pitch Lead Cut &	RR ing TU TV TC Form CB	For internal use only (The product lines we have H,A,B,C,D, E,M or 0,1,2,3,4,5,9)	Code
EKF ESS ESS EKS EKS EKS EKS EKS EKM EXM EXM EXM EXM EXM EXM EXM EXM EXM EX	0.22 0.33 0.47 1 2.2 3.3 4.7 10 22 33 47	224 334 474 105 225 335 475 106 226 336	±10 ±15 ±20 ±30 -40 0 -20 0 -10 +10 -20 +40	K L M N C	2.5 4 6.3 8 10 12.5 16 20 25 30 32 35 40 42 50 57 63 71 75	0E 0G 0J 0K 1A 1B 1C 1D 1E 11 13 1V 1G 1M 1H 1H 1J 1S	3 B 3.5 C 5 D 6.3 E 8 F 10 C 12.5 C 13.5 V 14 4 14.6 K 16.5 T 18.5 B 20 M	Radial bulk  Ammo Tap  2.0mm Pitch  2.5mm Pitch  3.5mm Pitch  5.0mm Pitch  Lead Cut &	TT TU TV TC Form CB	(The product lines we have H,A,B,C,D, E,M or 0,1,2,3,4,5,9)	Code
EKS EGS EKM EKG EKG EXM EZM EZZS EGF ESF EGF EGF EGC EGC EGC EGC ERS ERF ERT	0.33 0.47 1 2.2 3.3 4.7 10 22 33 47	334 474 105 225 335 475 106 226 336	±15  ±20  ±30  -40 0  -20 0  -20 +10  -20 +40	L M N W A	6.3 8 10 12.5 16 20 25 30 32 35 40 42 50 57 63 71 75	0J 0K 1A 1B 1C 1D 1E 1I 13 1V 1G 1M 1H 1L 1J	4 C C C C C C C C C C C C C C C C C C C	Ammo Tap  2.0mm Pitch  2.5mm Pitch  3.5mm Pitch  5.0mm Pitch  Lead Cut &	TT TU TV TC CB	E,M or 0,1,2,3,4,5,9)	Code
EKG EOM EZM EZS EZS EGF ESF EGG EGC EGC ERS ERF ERF ERF ERT ERR ERD ERA ERB ERC ERA ERB ERC ERA ERB ERC	0.47 1 2.2 3.3 4.7 10 22 33 47	474 105 225 335 475 106 226 336	±15  ±20  ±30  -40 0  -20 0  -20 +10  -20 +40	L M N W A	8 10 12.5 16 20 25 30 32 35 40 42 50 57 63 71	0K 1A 1B 1C 1D 1E 11 13 1V 1G 1M 1H 1L 1J	8 F 10 G 12.5 1 13 J 13.5 V 14 4 14.5 A 16.5 7 18 L 18.5 8 20 M	2.0mm Pitch 2.5mm Pitch 3.5mm Pitch 5.0mm Pitch Lead Cut &	TU TV TC Form	Sleeve Material	Code
EZM EZS EZS EGF EGF EGF EGF EGT EGK EGE EGD ERS ERF ERF ERL ERR ERR ERR ERR ERB ERD ERH ERB ERA ERB ERG ERB ERG ERG ERB ERG ERC	1 2.2 3.3 4.7 10 22 33 47	105 225 335 475 106 226 336	±20 ±30 -40 0 -20 0 -20 +10 -20 +40	M N W A	12.5 16 20 25 30 32 35 40 42 50 57 63 71	1B 1C 1D 1E 11 13 1V 1G 1M 1H 1L 1J	12.5 13 J 13.5 V 14 4 14.5 A 16 K 16.5 7 18 L 18.5 8 20 M 22 N	2.5mm Pitch 3.5mm Pitch 5.0mm Pitch Lead Cut &	TV TC Form		
EGF ESF EGT EGK EGE EGD ERS ERF ERF ERI ERR ERR ERB ERB ERB ERB ERB ERB ERB ERC ERB ERB ERC ERB ERB ERC ERC ERB ERC	1 2.2 3.3 4.7 10 22 33 47	105 225 335 475 106 226 336	±30 -40 0 -20 0 -20 +10 -20 +40	N W A C	20 25 30 32 35 40 42 50 57 63 71	1D 1E 11 13 1V 1G 1M 1H 1L 1J	13.5 V 14 4 14.5 A 16 K 16.5 7 18 L 18.5 8 20 M 22 N	3.5mm Pitch 5.0mm Pitch Lead Cut &	TV TC Form		
EGT EGK EGE EGE EGC ERS ERF ERL ERR ERR ERB ERH EBD ERH EBD ERA ERB ERA ERB ERA ERB ERA ERB ERC EFFA ENP	2.2 3.3 4.7 10 22 33 47	225 335 475 106 226 336	±30 -40 0 -20 0 -20 +10 -20 +40	N W A C	25 30 32 35 40 42 50 57 63 71	1E 11 13 1V 1G 1M 1H 1L 1J	16 K 16.5 7 18 L 18.5 8 20 M 22 N	5.0mm Pitch Lead Cut &	TC Form CB		
EGE EGD EGC ERS ERF ERL ERF ERL ERE ERD ERA ERB ERA ERB ERA ERB ERA ERB ERC EFA ENP ERV ERY ERY ERY ERP	3.3 4.7 10 22 33 47	335 475 106 226 336	-40 0 -20 0 -20 +10 -20 +40	W A C	32 35 40 42 50 57 63 71 75	13 1V 1G 1M 1H 1L 1J	18 L 18.5 8 20 M 22 N	Lead Cut &	Form	PET	Р
ERS ERF ERF ERL ERR ERT ERE ERD ERH EBD ERH EBD ERA ERB ERC EFA ENP ENP ENP ENP ENP ERW ERY	4.7 10 22 33 47	475 106 226 336	-20 0 -20 +10 -20 +40	A C	35 40 42 50 57 63 71 75	1V 1G 1M 1H 1L 1J 1S	20 M 22 N 25 O 30 P 34 W 35 Q 40 R	CB-Type	СВ		
RL ERR ERT ERE ERD ERH ERD ERA ERB ERC EFA ENP ENH ERW ERY ELP EQP EDP ETP	10 22 33 47	106 226 336	-20 0 -20 +10 -20 +40	A C	42 50 57 63 71 75	1M 1H 1L 1J 1S	25 O 30 P 34 W 35 Q 40 R	CB-Type	$\vdash$		
ERT ERE ERD ERH ERH ERD ERA ERB ERC EFA ENP ENH ERW ERY ELP EAP EQP EDP ETP	10 22 33 47	106 226 336	-20 +10 -20 +40	С	57 63 71 75	1L 1J 1S	34 W 35 Q 40 R	CE-Type	CE		
ERD ERH EBD ERA ERB ERB ERC EFA ENP ENP ENP ERW ERY ELP EAP EQP EDP ETP EHP	22 33 47	226 336	-20 +40	$\vdash$	63 71 75	1J 1S	40 R				
ERA ERB ERC EFA ENP ENP ENH ERW ERY ELP EAP EQP EDP ETP ETP	33 47	336	-20 +40	x	75		42 4 45 6	HE-Type			
ERC EFA ENP ENP ENH ERW ERY ELP EAP EQP EDP ETP ETP EHP	47	-		×			51 S	HE-Type	HE		
ENP ENH ERW ERY ELP EAP EQP EDP ETP EHP		476	-20		80	1K	76 U	KD-Type	KD		
ERW ERY ELP EAP EQP EDP ETP EHP	100		+50	s	85 90	1R 19	90 X 100 Z	FD-Type	FD		
EAP EQP EDP ETP EHP	100	107	-10 0	В	100 120	2A 2O	4.5 45	EH-Type	EН		
EDP ETP EHP			-10	$\vdash$	125	2B	4.5 45 5 05 5.4 54 7 07 7.7 77	PCB Term	nial		
EHP	220	227	+20	_ <u> </u>	150 160	2Z 2C	10.2   T2		sw		
	330	337	-10 +30	Q	180	2P	11.5 1/	dl .	Н		
EKP EEP	470	477	-10 +50		200 215	2D 22	12 12 12.5 1E 13 13	Snap-in	sx		
	2200	228		╁	220	2N 23	13.5 10		sz		
GP WR 22	22000	229	-5 +10	E	250	2E	20 20 25 25 29.5 2.	Lug	sg		
EWU			-5 +15	F	275 300	2T 2I	30 30 31.5 3/ 35 35 35.5 3E		05		
EWX S	33000	339	-5 +20	G	310 315	2R 2F	35.5 3E		06		
EWS 47	47000	479	0	R	330	2U	50 50 80 80 100 11	.]]	Н		
100	00000	10T	+20	$\vdash$	350 360	2V 2X	105 1k	Screw	T5		
VNS VKS	50000	15T	+30	0	375 385	2Q 2Y	120 1N 130 1F 140 10	7	Т6		
VKM VRL 220	20000	22T	+50	1	400	2G	150 1F 155 1E		D5		
VNH			+5 <b>+</b> 15	z	420 450	2M 2W	160 18 165 1F		D6		
	30000	33T	+5 +20	D	500	2H	170 11 180 1U 190 1\	П			
100	000000	10M	+10 +50	Y	550 600	25 26	200 2L	-			
150	500000	15M	+10	н	630	2J	210 2N 220 2N				
220	200000	22M	+30				210 2M 220 2N 240 20 250 2F 260 2S 270 21				
330	300000	33M					270 21	H			

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#### 3. Construction

Single ended type to be produced to fix the terminals to anode and cathode foil, and wind together with paper, and then wound element to be impregnated with electrolyte will be enclosed in an aluminum case. Finally sealed up tightly with end seal rubber, then finished by putting on the vinyl sleeve.



	Component	Material
1	Lead line	Tinned CP wire (Pb Free)
2	Terminal	Aluminum wire
3	Sealing Material	Rubber
4	Al-Foil (+)	Formed aluminum foil
5	Al-Foil (-)	Etched aluminum foil or formed aluminum foil
6	Case	Aluminum case
7	Sleeve	PET
8	Separator	Electrolyte paper

#### 4. Characteristics

#### Standard atmospheric conditions

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests are as follows:

Ambient temperature :15°C to 35°C
Relative humidity : 45% to 85%
Air Pressure : 86kPa to 106kPa

If there is any doubt about the results, measurement shall be made within the following conditions:

Ambient temperature  $: 20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ Relative humidity : 60% to 70%Air Pressure : 86kPa to 106kPa

#### Operating temperature range

The ambient temperature range at which the capacitor can be operated continuously at rated voltage See table 1 temperature range.

As to the detailed information, please refer to table 2.

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	ITEM				PE	RFOR	MANC	Е					
	Rated voltage	WV (V.DC)	6.3	10	1	6	25	35	50	63	100		
4.1	(WV)	SV (V.DC)	8	13	2	0	32	44	63	79	125		
1.1	Surge	WV (V.DC)	160	200	220	250	350	400	420	450			
	voltage (SV)	SV (V.DC)	200	250	270	300	400	450	470	500			
4.2	Nominal capacitance (Tolerance)	<b>Condition&gt;</b> Measuring Frequency : 120Hz±12Hz Measuring Voltage : Not more than 0.5Vrms Measuring Temperature : 20±2°C <b>Criteria&gt;</b> Shall be within the specified capacitance tolerance.											
4.3	Leakage current	<b><condition></condition></b> Connecting the capacitor with a protective resistor $(1k \Omega \pm 10 \Omega)$ in series for 2 minutes, and then, measure Leakage Current. <b><criteria></criteria></b> Refer to Table 1											
		<condition> See 4.2, Norm Capacitance, for measuring frequency, voltage and temperature.  <criteria> Refer to Table 1</criteria></condition>											
4.4	tan δ		e 1					•		1	rature.		

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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STEP   Testing Temperature(C)   Time			<condition></condition>			L				
2			STEP Te	sting Tempe	erature(°C)		Time			
3   20±2   Time to reach thermal equilibri			1	20±2			equilibriu	ım		
3   20±2   Time to reach thermal equilibri		2	-40(-25)	±3	Time	to reach	thermal e	equilibrii	ım	
4   105±2   Time to reach thermal equilibri   5   20±2   2   2   2   2   2   2   2   2   2			3	` ′		_				
Criteria> a. tan δ shall be within the limit of Item 4.4The leakage current measured somer than 8 times of its specified value.   b. In step 5, tan δ shall be within the limit of Item 4.4The leakage current more than the specified value.   c. At-40°C (-25°C), impedance (z) ratio shall not exceed the value of the foil table.   Working Voltage (V) 6.3 10 16 25 35 50 2-25°C/Z+20°C 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2						_			•	
Criteria> a. tan δ shall be within the limit of Item 4.4The leakage current measured s more than 8 times of its specified value.   Load   Load   Iife   test						_				
a. tan δ shall be within the limit of Item 4.4The leakage current measured somer than 8 times of its specified value.  b. In step 5, tan δ shall be within the limit of Item 4.4The leakage current more than 8 times of its specified value.  c. At-40°C (-25°C), impedance (z) ratio shall not exceed the value of the foliable.  Working Voltage (V) 6.3 10 16 25 35 50  Z-25°C/Z+20°C 4 3 2 2 2 2  Z-40°C/Z+20°C 3  For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-40°C/Z-Capacitance, tan δ, and impedance shall be measured at 120Hz.  **Condition**  According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions thould meet the following table:  **Criteria**  The characteristic shall meet the following requirements.  Leakage current				20 1		Tillic	to reacii	ilici iliai (	-quinorii	1111
Temperature characteristics  6. In step 5, tan δ shall be within the limit of Item 4.4The leakage current more than the specified value.  6. In step 5, tan δ shall be within the limit of Item 4.4The leakage current more than the specified value.  6. At-40°C (-25°C), impedance (z) ratio shall not exceed the value of the foliable.  Working Voltage (V) 6.3 10 16 25 35 50 Z-25°C/Z+20°C 4 3 2 2 2 2 Z-40°C/Z+20°C 8 6 4 3 3 3 3 3  Working Voltage (V) 100 Z-25°C/Z+20°C 2 Z-40°C/Z+20°C 3  For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-40°C/Z Capacitance, tan δ , and impedance shall be measured at 120Hz.  Condition>  According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ± 2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions test is shall be expecited value.  Load life test  Load life The characteristic shall meet the following requirements.  Leakage current Value in 4.3 shall be satisfied Capacitance Change Within ±25% of initial value.  Lan δ Not more than 200% of the specified value.  Appearance There shall be no leakage of electrolyte.  Condition>  The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed fro chamber and be allowed to stabilized at room temperature for 4~8 hours. shall be connected to a series limiting resistor(1k±100.9) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,				zithin the lim	it of Itam	1 /The 1	ankaga cu	rrant ma	ocurad c	hall not
b. In step 5, tan δ shall be within the limit of Item 4.4The leakage current more than the specified value.  c. At-40°C (-25°C), impedance (z) ratio shall not exceed the value of the fol table.  Working Voltage (V) 6.3 10 16 25 35 50  Z-25°C/Z+20°C 4 3 2 2 2 2 2  Z-40°C/Z+20°C 3  For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-40°C/Z-20°C  Capacitance, tan δ , and impedance shall be measured at 120Hz.  **Condition**  According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ± 2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditines test  Load life test  **Load**  Load**  At Pine leakage current working voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditines test should meet the following table:  **Criteria**  The characteristic shall meet the following requirements.*  Leakage current value in 4.3 shall be satisfied Capacitance Change Within ±25% of initial value.  In δ Not more than 200% of the specified value.  Appearance There shall be no leakage of electrolyte.  **Condition**  The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed fro chamber and be allowed to stabilized at room temperature for 4-8 hours. shall be connected to a series limiting resistor(1k±100.9) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then, shall be connected to a series limiting resistor(1k±100.9) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,						7.7111C IV	Jakage et	iiiciit iiic	asurcu s	nan not
Characteristic   Cs   Cs   Cs   Cs   Cs   Cs   Cs   C		Temperature				it of Iter	n 4 4The	leakage	current	shall not
c. At-40°C (-25°C), impedance (z) ratio shall not exceed the value of the foliable.  Working Voltage (V) 6.3 10 16 25 35 50  Z-25°C/Z+20°C 4 3 2 2 2 2 2  Z-40°C/Z+20°C 8 6 4 3 3 3 3 3  Working Voltage (V) 100  Z-25°C/Z+20°C 2  Z-40°C/Z+20°C 3  For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25′C/Z+20°C Capacitance, tan δ , and impedance shall be measured at 120Hz.  Condition> According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (TDC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditine test Load life test Load life test Coriteria> The characteristic shall meet the following requirements. Leakage current Value in 4.3 shall be satisfied Capacitance Change Within ±25% of initial value. Lan δ Not more than 200% of the specified value. Appearance There shall be no leakage of electrolyte. Condition> The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed fro chamber and be allowed to stabilized at room temperature for 4~8 hours. I shall be connected to a series limiting resistor(1k±100Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,		characteristi				it of ite	n i. i i inc	reakage	Cultelle	siidii iiot
table.  Working Voltage (V) 6.3 10 16 25 35 50  Z-25°C/Z+20°C 4 3 2 2 2 2  Z-40°C/Z+20°C 8 6 4 3 3 3 3  Working Voltage (V) 100  Z-25°C/Z+20°C 2  Z-40°C/Z+20°C 3  For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-26°C/Z Capacitance, tan δ , and impedance shall be measured at 120Hz.  Condition> According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions test the following table:  Coriteria> The characteristic shall meet the following requirements. Leakage current Value in 4.3 shall be satisfied Capacitance Change Within ±25% of initial value. Appearance There shall be no leakage of electrolyte. Condition> The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. I shall be connected to a series limiting resistor(1k±100Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,	4.6	cs	-		e (z) ratio s	hall not	exceed th	e value o	of the fol	lowing
Working Voltage (V)   6.3   10   16   25   35   50     Z-25°C/Z+20°C   4   3   2   2   2   2     Z-40°C/Z+20°C   8   6   4   3   3   3   3     Working Voltage (V)   100     Z-25°C/Z+20°C   2     Z-40°C/Z+20°C   3     For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+ Add 1.0 per another 1000 μ F for Z-240°C/Z-20°C     Capacitance, tan δ , and impedance shall be measured at 120Hz.     Condition   According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric condit result should meet the following table:     Criteria   The characteristic shall meet the following requirements.     Leakage current   Value in 4.3 shall be satisfied     Capacitance Change   Within ±25% of initial value.     tan δ   Not more than 200% of the specified value.     Appearance   There shall be no leakage of electrolyte.     Condition   The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed fro chamber and be allowed to stabilized at room temperature for 4~8 hours.     Shelf   life   Shelf   life   shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,				), impedance	(Z) radio b	ildii ilot	onecca in	o varao (	or <b>uno</b> 101	ie wing
Vorking Voltage (V)   100				7) 6.3	10	16	25	35	50	63
Z-40°C/Z+20°C   8   6   4   3   3   3										2
Working Voltage (V)   100   Z-25°C/Z+20°C   2   Z-40°C/Z+20°C   3     For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+ Add 1.0 per another 1000 μ F for Z-26/Z+ Add 1.0 per another 1000 μ F for Z-40°C/Z     Capacitance, tan δ , and impedance shall be measured at 120Hz.     Condition>					_					3
C-25°C/Z+20°C   2   Z-40°C/Z+20°C   3     For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+Add 1.0 per another 1000 μ F for Z-40°C/Z     Capacitance, tan δ, and impedance shall be measured at 120Hz.     Condition   According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (TDC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions test the standard product should meet the following table:   Criteria   Capacitance Change   Within ±25% of initial value.     Leakage current   Value in 4.3 shall be satisfied     Capacitance Change   Within ±25% of initial value.     Appearance   There shall be no leakage of electrolyte.     Condition   The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from the capacitors shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,			Z-40 C/Z+20 C	0	0					<u> </u>
Z-40°C/Z+20°C   3     For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+ Add 1.0 per another 1000 μ F for Z-40°C/Z Capacitance, tan δ , and impedance shall be measured at 120Hz.    Condition   According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (TDC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions test should meet the following table:   Criteria   The characteristic shall meet the following requirements.   Leakage current   Value in 4.3 shall be satisfied   Capacitance Change   Within ±25% of initial value.     Lan δ   Not more than 200% of the specified value.   Appearance   There shall be no leakage of electrolyte.     Condition   The capacitors are then stored with no voltage applied at a temperature of 105   1000+48/0 hours. Following this period the capacitors shall be removed frow chamber and be allowed to stabilized at room temperature for 4~8 hours. Shall be connected to a series limiting resistor(1k±100Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,			Working Voltage (V	7) 100						
For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25/Z+  Add 1.0 per another 1000 μ F for Z-40°C/Z  Capacitance, tan δ , and impedance shall be measured at 120Hz.   **Condition**  According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions result should meet the following table:  **Criteria**  The characteristic shall meet the following requirements.  Leakage current			Z-25°C/Z+20°C	2						
Add 1.0 per another 1000 μ F for Z-40°C/2 Capacitance, tan δ , and impedance shall be measured at 120Hz.			Z-40°C/Z+20°C	3						
Add 1.0 per another 1000 μ F for Z-40°C/2 Capacitance, tan δ , and impedance shall be measured at 120Hz.										
Condition>			•			-				
Condition   According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp   105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric condition result should meet the following table:    Criteria   The characteristic shall meet the following requirements.    Leakage current   Value in 4.3 shall be satisfied     Capacitance Change   Within ±25% of initial value.     tan δ   Not more than 200% of the specified value.     Appearance   There shall be no leakage of electrolyte.     Condition   The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. It is shall be connected to a series limiting resistor(1k±100Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,		1	Capacitance, $\tan \delta$ ,	and impeda		-				
According to IEC60384-4No.4.13 methods, The capacitor is stored at a temp 105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (TDC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions test the should meet the following table:    Criteria										
105°C ±2 with DC bias voltage plus the rated ripple current for Table 1. (T DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric condit result should meet the following table:			<condition></condition>							
DC and ripple peak voltage shall not exceed the rated working voltage) product should be tested after 16 hours recovering time at atmospheric conditions result should meet the following table:  Criteria> The characteristic shall meet the following requirements.  Leakage current Value in 4.3 shall be satisfied Capacitance Change Within ±25% of initial value.  Lan δ Not more than 200% of the specified value.  Appearance There shall be no leakage of electrolyte.  Condition> The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. Shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,				0384-4No.4.			nacitor is	s stored a	nt a temp	erature o
Load   life test   Load   life test   Load   life test   Criteria >   The characteristic shall meet the following requirements.   Leakage current   Value in 4.3 shall be satisfied   Capacitance Change   Within ±25% of initial value.   Appearance   There shall be no leakage of electrolyte.			According to IEC60		13 method	s, The ca	-		-	
Load life test   Criteria>   The characteristic shall meet the following requirements.   Leakage current   Value in 4.3 shall be satisfied   Capacitance Change   Within ±25% of initial value.   tan δ   Not more than 200% of the specified value.   Appearance   There shall be no leakage of electrolyte.			According to IEC60 $105^{\circ}\text{C} \pm 2 \text{ with DC}$	bias voltage	13 method	s, The ca	le current	for Tab	ole 1. (T	ne sum o
<ul> <li>4.7 life test</li> <li>Criteria&gt;         The characteristic shall meet the following requirements.             Leakage current</li></ul>			According to IEC60 $105^{\circ}\text{C} \pm 2$ with DC DC and ripple pea	C bias voltage sk voltage sl	13 method e plus the ra hall not ex	s, The ca	le current e rated w	for Tab	ole 1. (Ti voltage)	ne sum of Then the
The characteristic shall meet the following requirements.  Leakage current  Value in 4.3 shall be satisfied  Capacitance Change  Within ±25% of initial value.  tan δ  Not more than 200% of the specified value.  Appearance  There shall be no leakage of electrolyte.   Condition>  The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from the chamber and be allowed to stabilized at room temperature for 4~8 hours. Shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,		Load	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to	C bias voltage k voltage sl ested after 1	13 method e plus the ra hall not ex 6 hours rec	s, The ca	le current e rated w	for Tab	ole 1. (Ti voltage)	ne sum of Then the
Leakage current   Value in 4.3 shall be satisfied	4.7		According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to	C bias voltage k voltage sl ested after 1	13 method e plus the ra hall not ex 6 hours rec	s, The ca	le current e rated w	for Tab	ole 1. (Ti voltage)	ne sum of Then the
$\frac{\tan \delta}{\text{Appearance}} \qquad \text{Not more than 200\% of the specified value.} \\ \frac{\text{Appearance}}{\text{Appearance}} \qquad \text{There shall be no leakage of electrolyte.} \\ \frac{\text{Condition}}{\text{The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from the capacitors shall be removed from the capacitor of the capacitor of 4~8 hours.} \\ \frac{\text{Shelf}}{\text{Shelf}} \qquad \text{Shelf} \qquad S$	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to <criteria></criteria>	C bias voltage k voltage sl ested after 10 the following	13 method e plus the ra hall not ex 6 hours rec g table:	s, The canted ripp ceed the overing	le current e rated w time at at	for Tab	ole 1. (Ti voltage)	ne sum of Then the
Appearance   There shall be no leakage of electrolyte.	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to <b>Criteria&gt;</b> The characteristic s	C bias voltage slaw voltage slested after 10 the following shall meet the	13 method e plus the ra hall not ex 6 hours rec g table: e following	s, The canted ripp ceed the overing	le current e rated w time at at ements.	t for Tab orking v mospher	ole 1. (Ti voltage)	ne sum of Then the
Appearance   There shall be no leakage of electrolyte.     Condition>   The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. Shall be connected to a series limiting resistor(1k±100 \Omega) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to <criteria> The characteristic so Leakage cur</criteria>	C bias voltage slaw voltage sleested after 10 the following shall meet the rent	13 method e plus the ra hall not ex 6 hours rec g table: e following	s, The canted ripp ceed the overing grequire 4.3 shall	le current e rated w time at at ments.	t for Tab orking v mospher	ole 1. (Ti voltage)	ne sum of Then the
<ul> <li>Condition&gt;         The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. It shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,     </li> </ul>	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to <criteria> The characteristic so Leakage cur Capacitance</criteria>	C bias voltage slaw voltage sleested after 10 the following shall meet the rent	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4	s, The canted ripp ceed the overing g require 4.3 shall 25% of	le currente rated witime at at at ments.  be satisfi initial va	t for Tab rorking v mospher ed llue.	ole 1. (Ti voltage) ic condit	ne sum of Then the
The capacitors are then stored with no voltage applied at a temperature of 105 1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. Shelf  Shelf shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to <criteria> The characteristic so Leakage cur Capacitance tan δ</criteria>	C bias voltage slaw voltage sleested after 10 the following shall meet the rent	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more	s, The canted ripp ceed the overing g require 4.3 shall 25% of than 20	le current e rated watime at at ements. be satisfi initial va	ed	ole 1. (Ti voltage) ic condit	ne sum of Then the
1000+48/0 hours. Following this period the capacitors shall be removed from chamber and be allowed to stabilized at room temperature for 4~8 hours. Shelf  Shelf shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to <criteria> The characteristic so Leakage cur Capacitance tan δ</criteria>	C bias voltage slaw voltage sleested after 10 the following shall meet the rent	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more	s, The canted ripp ceed the overing g require 4.3 shall 25% of than 20	le current e rated watime at at ements. be satisfi initial va	ed	ole 1. (Ti voltage) ic condit	ne sum of Then the
chamber and be allowed to stabilized at room temperature for 4~8 hours. In shall be connected to a series limiting resistor(1k±100 Ω) with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so Leakage cur Capacitance tan δ Appearance	C bias voltage slaw voltage sleested after 10 the following shall meet the rent	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more	s, The canted ripp ceed the overing g require 4.3 shall 25% of than 20	le current e rated watime at at ements. be satisfi initial va	ed	ole 1. (Ti voltage) ic condit	ne sum of Then the
Shelf shall be connected to a series limiting resistor $(1k\pm 100 \Omega)$ with D.C. rate applied for 30min. After which the capacitors shall be discharged, and then,	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be tresult should meet to <criteria> The characteristic so Leakage cur Capacitance tan δ Appearance  <condition></condition></criteria>	E bias voltage sk voltage si ested after 10 the following shall meet th rent Change	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha	s, The canted ripp ceed the overing grequire 4.3 shall 25% of than 200 ll be no	le current e rated w time at at ments. be satisfi initial va 0% of the leakage o	ed conting was a specifie of electron	ole 1. (Ti voltage) ic condit	ne sum of Then the ions. The
4.8 life applied for 30min. After which the capacitors shall be discharged, and then,	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so  Leakage cur Capacitance tan δ  Appearance  < <b>Condition&gt;</b> The capacitors are the	c bias voltage slested after 10 the following shall meet the rent Change	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha	s, The canted rippose overing required 4.3 shall 25% of than 200 ll be no	e rated watime at at at a tell water the satisficial various of the leakage of the ded at a tell water the satisfication of the satisfi	ed alue. especifie of electro	ole 1. (The voltage) ic condite and value. The voltage of 105	the sum of the the ions. The the ions. The the ions.
"FF" 8-", "",	4.7	life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so  Leakage cur Capacitance tan δ Appearance	c bias voltage ak voltage st ested after 1 the following shall meet th rent Change	13 method e plus the ra hall not ex 6 hours rec g table:  e following Value in 4 Within ± Not more There sha	s, The canted rippose ceed the overing grequire 4.3 shall 25% of than 200 ll be no	e rated we time at at	ed alue. especifie of electro	ole 1. (The voltage) ic condited value. The of 105 coved from the coverage of 105 co	the sum of then the ions. The the ions. The the ions the tes
test characteristics.	4.7	life test	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so  Leakage cur  Capacitance  tan δ  Appearance <b>Condition&gt;</b> The capacitors are the 1000+48/0 hours. If chamber and be all	c bias voltage k voltage si ested after 10 the following shall meet th rent Change  een stored wi Following th lowed to sta	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha ith no volta is period th bilized at r	s, The canted ripp ceed the overing grequire 4.3 shall 25% of than 200 ll be no ge applicate capacitoom ten	e rated we time at at the ments.  be satisficinitial various of the leakage of th	ed llue. especifie presented be remore for 4~8	ole 1. (The voltage) ic conditions and value.  The of 105 oved from hours. It	±2°C form the tess
		life test	According to IEC60 105°C ±2 with DC DC and ripple pea product should be tresult should meet to <criteria> The characteristic so Leakage cur Capacitance tan δ Appearance  <condition> The capacitors are the 1000+48/0 hours. For chamber and be all shall be connected</condition></criteria>	c bias voltage slested after 10 the following shall meet the rent Change  The stored with the following the stored with the following the lowed to state to a series	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha ith no volta is period the bilized at ra limiting re	s, The canted ripp ceed the overing grequire 4.3 shall 25% of than 200 ll be no ge applied a capacito oom tensistor(1).	e rated water at attempt at a terminate at a termi	ed llue. especifie of electro mperatur be rema for 4~8	ed value.  lyde of 105  re of 105  re oved from hours. It of the condition is the condition in the condition	±2°C form the tess Next they d voltage
		life test Shelf life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so  Leakage cur Capacitance tan δ  Appearance <b>Condition&gt;</b> The capacitors are the 1000+48/0 hours. In the characteristic so the capacitors are the characteristic so the capacitors are t	c bias voltage slested after 10 the following shall meet the rent Change  The stored with the following the stored with the following the lowed to state to a series	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha ith no volta is period the bilized at ra limiting re	s, The canted ripp ceed the overing grequire 4.3 shall 25% of than 200 ll be no ge applied a capacito oom tensistor(1).	e rated water at attempt at a terminate at a termi	ed llue. especifie of electro mperatur be rema for 4~8	ed value.  lyde of 105  re of 105  re oved from hours. It of the condition is the condition in the condition	±2°C form the tess Next they d voltage
		life test Shelf life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so  Leakage cur Capacitance tan δ  Appearance <b>Condition&gt;</b> The capacitors are the 1000+48/0 hours. In the characteristic so the capacitors are the characteristic so the capacitors are t	c bias voltage slested after 10 the following shall meet the rent Change  The stored with the following the stored with the following the lowed to state to a series	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha ith no volta is period the bilized at ra limiting re	s, The canted ripp ceed the overing grequire 4.3 shall 25% of than 200 ll be no ge applied a capacito oom tensistor(1).	e rated water at attempt at a terminate at a termi	ed llue. especifie of electro mperatur be rema for 4~8	ed value.  lyde of 105  re of 105  re oved from hours. It of the condition is the condition in the condition	±2°C form the tes
		life test Shelf life	According to IEC60 105°C ±2 with DC DC and ripple pea product should be to result should meet to < <b>Criteria&gt;</b> The characteristic so  Leakage cur Capacitance tan δ  Appearance <b>Condition&gt;</b> The capacitors are the 1000+48/0 hours. In the characteristic so the capacitors are the characteristic so the capacitors are t	c bias voltage slested after 10 the following shall meet the rent Change  The stored with the following the stored with the following the lowed to state to a series	13 method e plus the ra hall not ex 6 hours rec g table: e following Value in 4 Within ± Not more There sha ith no volta is period the bilized at ra limiting re	s, The canted ripp ceed the overing grequire 4.3 shall 25% of than 200 ll be no ge applied a capacito oom tensistor(1).	e rated water at attempt at a terminate at a termi	ed llue. especifie of electro mperatur be rema for 4~8	ed value.  lyde of 105  re of 105  re oved from hours. It of the condition is the condition in the condition	±2°C form the tes

## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

		<criteria></criteria>					
		The characteristic shall meet the					
		Leakage current	Value in 4.3 shall be satisfied				
	Shelf	Capacitance Change	Within $\pm 25\%$ of initial value.				
4.8	life	tan $\delta$	Not more than 200% of the specified value.				
	test	Appearance	There shall be no leakage of electrolyte.				
		Remark: If the capacitors are s	stored more than 1 year, the leakage current may				
		increase. Please apply voltage	through about 1 k $\Omega$ resistor, if necessary.				
		11 0 0	capacitor connected with a $(100 \pm 50)/C_R$ (k $\Omega$ ) resistor. The ded to 1000 cycles, each consisting of charge of $30 \pm 5s$ ,				
		followed discharge of 5 min 3					
		The test temperature shall be					
		C <sub>R</sub> :Nominal Capacitance ( µ	1 F)				
	C	<criteria></criteria>					
4.9	Surge test	Leakage current	Not more than the specified value.				
	test	Capacitance Change	Within $\pm 15\%$ of initial value.				
		tan δ	Not more than the specified value.				
		Appearance	There shall be no leakage of electrolyte.				
		Attention:					
		This test simulates over voltage at abnormal situation only. It is not applicable to such					
		over voltage as often applied.					
4.10	Vibration test	perpendicular directions.  Vibration frequency rar  Peak to peak amplitude  Sweep rate  Mounting method:	: 1.5mm : $10\text{Hz} \sim 55\text{Hz} \sim 10\text{Hz}$ in about 1 minute reater than 12.5mm or longer than 25mm must be fixed Within 30°				
		After the test, the following it  Inner construction N N Appearance 0	ems shall be tested: To intermittent contacts, open or short circuiting. To damage of tab terminals or electrodes. To mechanical damage in terminal. No leakage of electrolyte or swelling of the case. The markings shall be legible.				

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

		<condition></condition>					
		The capacitor shall be tes	sted under the following	conditions:			
		Soldering temperature	_	conditions.			
		Dipping depth	: 2 <del>4</del> 3±3 C				
	Solderability	Dipping speed	: 25±2.5mr	1/9			
4.11	test	Dipping speed Dipping time	: 3±0.5s	II S			
		<a href="#">Criteria&gt;</a>	. 5±0.58				
		Coating quality	A minimu immersed	m of 95% of the surface bein	ng		
		<condition></condition>					
		Terminals of the capacito	or shall be immersed in	to solder bath at $260\pm5^{\circ}\mathrm{C}\mathrm{f}$	for10∃		
		1 seconds or $400 \pm 10^{\circ}$ C for	or $3^{+1}_{-0}$ seconds to 1.5~2.0	mm from the body of capac	citor.		
		Then the capacitor shall be	be left under the normal	temperature and normal hur	midity		
	Resistance to	for 1~2 hours before mea	surement.				
4.12	solder heat	<c<u>riteria&gt;</c<u>					
	test	Leakage current		the specified value.			
		Capacitance Change	Within ±10%	of initial value.			
		tan $\delta$	Not more than	the specified value.			
		Appearance	There shall be	no leakage of electrolyte.			
		<condition></condition>					
		Temperature Cycle: According to IEC60384-4No.4.7methods, capacitor					
		placed in an oven, the con	ndition according as bel				
		T	emperature	Time			
		(1)+20°C		≤ 3 Minutes			
	Change of	(2)Rated low temperature (-40°C) (-23		30±2 Minutes			
4.13	temperature	(3)Rated high tempe	rature (+105°C)	30±2 Minutes			
	test	(1) to (3)=1 cycle, to	otal 5 cycle				
		<criteria></criteria>	•				
		The characteristic shall m	neet the following requir	rement			
		Leakage current	Not more than the	specified value.			
		tan δ	Not more than the	specified value.			
		Appearance	There shall be no l	eakage of electrolyte.			
		<condition></condition>					
		Humidity Test:					
		_	-	citor shall be exposed for 50			
				$^{\circ}\mathbb{C}$ , the characteristic change	e shall		
		meet the following requirement.					
		<criteria></criteria>		100 1			
4.14	Damp heat	Leakage current	Not more than the spe				
	test	Capacitance Change	Within $\pm 20\%$ of init				
4.14		tan δ	Not more than 120%				
4.14							
4.14		Appearance	There shall be no leak	age of electrolyte.			
4.14		Appearance	There shall be no leak	age of electrolyte.			
4.14		Appearance	There shall be no leak	age of electrolyte.			

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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5. It refers to the latest document of "Environment-related Substances standard" (WI-HSPM-QA-072).

	Substances				
	Cadmium and cadmium compounds				
Heavy metals	Lead and lead compounds				
Ticavy metais	Mercury and mercury compounds				
	Hexavalent chromium compounds				
	Polychlorinated biphenyls (PCB)				
Chloinated	Polychlorinated naphthalenes (PCN)				
organic	Polychlorinated terphenyls (PCT)				
compounds	Short-chain chlorinated paraffins(SCCP)				
	Other chlorinated organic compounds				
D 1	Polybrominated biphenyls (PBB)				
Brominated .	Polybrominated diphenylethers(PBDE) (including				
organic	decabromodiphenyl ether[DecaBDE])				
compounds	Other brominated organic compounds				
Tributyltin compo	ounds(TBT)				
Triphenyltin com	pounds(TPT)				
Asbestos					
Specific azo comp	pounds				
Formaldehyde					
Beryllium oxide					
Beryllium coppe	er en				
Specific phthalate	es (DEHP,DBP,BBP,DINP,DIDP,DNOP,DNHP)				
Hydrofluorocarbo	on (HFC), Perfluorocarbon (PFC)				
Perfluorooctane s	ulfonates (PFOS)				
Specific Benzotri	azole				

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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#### **Attachment: Application Guidelines**

#### 1.Circuit Design

#### 1.1 Operating Temperature and Frequency

Electrolytic capacitor electrical parameters are normally specified at 20°C temperature and 120Hz frequency. These parameters vary with changes in temperature and frequency. Circuit designers should take these changes into consideration.

- (1) Effects of operating temperature on electrical parameters
  - a) At higher temperatures, leakage current and capacitance increase while equivalent series resistance (ESR) decreases.
  - b) At lower temperatures, leakage current and capacitance decrease while equivalent series resistance (ESR) increases.
- (2) Effects of frequency on electrical parameters
  - a) At higher frequencies capacitance and impedance decrease while tanδ increases.
  - b) At lower frequencies, ripple current generated heat will rise due to an increase in equivalent series resistance (ESR).

#### 1.2 Operating Temperature and Life Expectancy

See the file: Life calculation of aluminum electrolytic capacitor

#### 1.3 Common Application Conditions to Avoid

The following misapplication load conditions will cause rapid deterioration to capacitor electrical parameters. In addition, rapid heating and gas generation within the capacitor can occur causing the pressure relief vent to operate and resultant leakage of electrolyte. Under Leaking electrolyte is combustible and electrically conductive.

#### (1) Reverse Voltage

DC capacitors have polarity. Verify correct polarity before insertion. For circuits with changing or uncertain polarity, use DC bipolar capacitors. DC bipolar capacitors are not suitable for use in AC circuits.

#### (2) Charge / Discharge Applications

Standard capacitors are not suitable for use in repeating charge / discharge applications. For charge / discharge applications consult us and advise actual conditions.

#### (3) Over voltage

Do not apply voltages exceeding the maximum specified rated voltage. Voltages up to the surge voltage rating are acceptable for short periods of time. Ensure that the sum of the DC voltage and the superimposed AC ripple voltage does not exceed the rated voltage.

#### (4) Ripple Current

Do not apply ripple currents exceeding the maximum specified value. For high ripple current applications, use a capacitor designed for high ripple currents or contact us with your requirements. Ensure that allowable ripple currents superimposed on low DC bias voltages do not cause reverse voltage conditions.

#### 1.4 Using Two or More Capacitors in Series or Parallel

#### (1) Capacitors Connected in Parallel

The circuit resistance can closely approximate the series resistance of the capacitor causing an imbalance of ripple current loads within the capacitors. Careful design of wiring methods can minimize the possibility of excessive ripple currents applied to a capacitor.

#### (2) Capacitors Connected in Series

Normal DC leakage current differences among capacitors can cause voltage imbalances. The use of voltage divider shunt resistors with consideration to leakage current can prevent capacitor voltage imbalances.

#### 1.5 Capacitor Mounting Considerations

#### (1) Double Sided Circuit Boards

Avoid wiring pattern runs, which pass between the mounted capacitor and the circuit board.

When dipping into a solder bath, excess solder may collect under the capacitor by capillary action and short circuit the anode and cathode terminals.

#### (2) Circuit Board Hole Positioning

The vinyl sleeve of the capacitor can be damaged if solder passes through a lead hole for subsequently processed parts. Special care when locating hole positions in proximity to capacitors is recommended.

#### (3)Circuit Board Hole Spacing

The circuit board holes spacing should match the capacitor lead wire spacing within the specified tolerances. Incorrect spacing can cause excessive lead wire stress during the insertion process. This may result in premature capacitor failure due to short or open circuit, increased leakage current, or electrolyte leakage.

#### (4) Clearance for Case Mounted Pressure Relief vents

Capacitors with case mounted pressure relief vents require sufficient clearance to allow for proper vent operation. The minimum clearances are dependent on capacitor diameters as proper vent operation. The minimum clearances are dependent on capacitor diameters as follows.

φ6.3~φ16mm:2mm minimum, φ18~φ35mm:3mm minimum, φ40mm or greater:5mm minimum.

#### (5) Clearance for Seal Mounted Pressure Relief Vents

A hole in the circuit board directly under the seal vent location is required to allow proper release of pressure.

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#### (6) Wiring Near the Pressure Relief Vent

Avoid locating high voltage or high current wiring or circuit board paths above the pressure relief vent. Flammable, high temperature gas exceeding 100°C may be released which could dissolve the wire insulation and ignite.

(7) Circuit Board patterns Under the Capacitor

Avoid circuit board runs under the capacitor as electrolyte leakage could cause an electrical short.

(8) Screw Terminal Capacitor Mounting

Do not orient the capacitor with the screw terminal side of the capacitor facing downwards.

Tighten the terminal and mounting bracket screws within the torque range specified in the specification.

#### 1.6 Electrical Isolation of the Capacitor

Completely isolate the capacitor as follows.

- (1) Between the cathode and the case (except for axially leaded B types) and between the anode terminal and other circuit paths
- (2) Between the extra mounting terminals (on T types) and the anode terminal, cathode terminal, and other circuit paths.
- 1.7 The Product endurance should take the sample as the standard.
- 1.8 If conduct the load or shelf life test, must be collect date code within 6 months products of sampling.

#### 1.9 Capacitor Sleeve

The vinyl sleeve or laminate coating is intended for marking and identification purposes and is not meant to electrically insulate the capacitor.

The sleeve may split or crack if immersed into solvents such as toluene or xylene, and then exposed to high temperatures.

#### CAUTION!

Always consider safety when designing equipment and circuits. Plan for worst case failure modes such as short circuits and open circuits which could occur during use.

- (1) Provide protection circuits and protection devices to allow safe failure modes.
- (2) Design redundant or secondary circuits where possible to assure continued operation in case of main circuit failure.

#### 2. Capacitor Handling Techniques

- 2.1 Considerations Before Using
- (1) Capacitors have a finite life. Do not reuse or recycle capacitors from used equipment.
- (2) Transient recovery voltage may be generated in the capacitor due to dielectric absorption. If required, this voltage can be discharged with a resistor with a value of about 1kΩ.
- (3) Capacitors stored for long periods of time may exhibit an increase in leakage current. This can be corrected by gradually applying rated voltage in series with a resistor of approximately 1kΩ.
- (4) If capacitors are dropped, they can be damaged mechanically or electrically. Avoid using dropped capacitors.
- (5) Dented or crushed capacitors should not be used. The seal integrity can be compromised and loss of electrolyte / shortened life can result.

#### 2.2 Capacitor Insertion

- (1) Verify the correct capacitance and rated voltage of the capacitor.
- (2) Verify the correct polarity of the capacitor before inserting.
- (3) Verify the correct hole spacing before insertion (land pattern size on chip type) to avoid stress on the terminals.
- (4) Ensure that the auto insertion equipment lead clinching operation does not stress the capacitor leads where they enter the seal of the capacitor.

For chip type capacitors, excessive mounting pressure can cause high leakage current, short circuit, or disconnection.

#### 2.3 Manual Soldering

- (1) Observe temperature and time soldering specifications or do not exceed temperatures of 400 °C for 3 seconds or less.
- (2) If lead wires must be formed to meet terminal board hole spacing, avoid stress on the lead wire where it enters the capacitor seal.
- (3) If a soldered capacitor must be removed and reinserted, avoid excessive stress to the capacitor leads.
- (4) Avoid touching the tip of the soldering iron to the capacitor, to prevent melting of the vinyl sleeve.

### 2.4 Flow Soldering

- (1) Do not immerse the capacitor body into the solder bath as excessive internal pressure could result.
- (2) Observe proper soldering conditions (temperature, time, etc.) Do not exceed the specified limits.
- (3) Do not allow other parts or components to touch the capacitor during soldering.

#### 2.5 Other Soldering Considerations

Rapid temperature rises during the preheat operation and resin bonding operation can cause cracking of the capacitor vinyl sleeve. For heat curing, do not exceed 150°C for a maximum time of 2 minutes.

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## ELECTROLYTIC CAPACITOR SPECIFICATION GT SERIES

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- 2.6 Capacitor Handling after Solder
- (1). Avoid movement of the capacitor after soldering to prevent excessive stress on the lead wires where they enter the seal.
- (2). Do not use capacitor as a handle when moving the circuit board assembly.
- (3). Avoid striking the capacitor after assembly to prevent failure due to excessive shock.

#### 2.7 Circuit Board Cleaning

- (1) Circuit boards can be immersed or ultrasonically cleaned using suitable cleaning solvents for up 5 minutes and up to 60°C maximum temperatures. The boards should be thoroughly rinsed and dried. The use of ozone depleting cleaning agents is not recommended in the interest of protecting the environment.
- (2) Avoid using the following solvent groups unless specifically allowed for in the specification;

Halogenated cleaning solvents: except for solvent resistant capacitor types, halogenated solvents can permeate the seal and cause internal capacitor corrosion and failure. For solvent resistant capacitors, carefully follow the temperature and time requirements of the specification. 1-1-1 trichloroethane should never be used on any aluminum electrolytic capacitor.

Alkali solvents : could attack and dissolve the aluminum case.

Petroleum based solvents: deterioration of the rubber seal could result.

Xylene : deterioration of the rubber seal could result.

Acetone : removal of the ink markings on the vinyl sleeve could result.

- (3) A thorough drying after cleaning is required to remove residual cleaning solvents which may be trapped between the capacitor and the circuit board. Avoid drying temperatures, which exceed the maximum rated temperature of the capacitor.
- (4) Monitor the contamination levels of the cleaning solvents during use by electrical conductivity, pH, specific gravity, or water content. Chlorine levels can rise with contamination and adversely affect the performance of the capacitor. Please consult us for additional information about acceptable cleaning solvents or cleaning methods.

#### 2.8 Mounting Adhesives and Coating Agents

When using mounting adhesives or coating agents to control humidity, avoid using materials containing halogenated solvents. Also, avoid the use of chloroprene based polymers. After applying adhesives or coatings, dry thoroughly to prevent residual solvents from being trapped between the capacitor and the circuit board.

#### 3. Precautions for using capacitors

3.1 Environmental Conditions

Capacitors should not be stored or used in the following environments.

- (1) Temperature exposure above the maximum rated or below the minimum rated temperature of the capacitor.
- (2) Direct contact with water, salt water, or oil.
- (3) High humidity conditions where water could condense on the capacitor.
- (4) Exposure to toxic gases such as hydrogen sulfide, sulfuric acid, nitric acid chlorine, or ammonia.
- (5) Exposure to ozone, radiation, or ultraviolet rays.
- (6) Vibration and shock conditions exceeding specified requirements.

#### 3.2 Electrical Precautions

- (1) Avoid touching the terminals of the capacitor as possible electric shock could result. The exposed aluminum case is not insulated and could also cause electric shock if touched.
- (2) Avoid short circuit the area between the capacitor terminals with conductive materials including liquids such as acids or alkaline solutions.

#### 4. Emergency Procedures

- (1) If the pressure relief vent of the capacitor operates, immediately turn off the equipment and disconnect form the power source. This will minimize additional damage caused by the vaporizing electrolyte.
- (2) Avoid contact with the escaping electrolyte gas which can exceed 100°C temperatures.

If electrolyte or gas enters the eye, immediately flush the eyes with large amounts of water.

If electrolyte or gas is ingested by month, gargle with water.

If electrolyte contacts the skin, wash with soap and water.

#### 5. Long Term Storage

Leakage current of a capacitor increases with long storage times. The aluminum oxide film deteriorates as a function of temperature and time. If used without reconditioning, an abnormally high current will be required to restore the oxide film. This current surge could cause the circuit or the capacitor to fail. After one year, a capacitor should be reconditioned by applying rated voltage in series with a  $1000\Omega$ , current limiting resistor for a time period of 30 minutes . If the expired date of products date code is over eighteen months, the products should be return to confirmation.

#### 5.1 Environmental Conditions

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The capacitor shall be not use in the following condition:

- (1) Temperature exposure above the maximum rated or below the minimum rated temperature of the capacitor.
- (2) Direct contact with water, salt water, or oil.
- (3) High humidity conditions where water could condense on the capacitor.
- (4) Exposure to toxic gases such as hydrogen sulfide, sulfuric acid, nitric acid, chlorine, or ammonia.
- (5) Exposure to ozone, radiation, or ultraviolet rays.
- (6) Vibration and shock conditions exceeding specified requirements.

#### 6. Capacitor Disposal

When disposing of capacitors, use one of the following methods.

Incinerate after crushing the capacitor or puncturing the can wall (to prevent explosion due to internal pressure rise). Capacitors should be incinerated at high temperatures to prevent the release of toxic gases such as chlorine from the polyvinyl chloride sleeve, etc.

Dispose of as solid waste.

NOTE: Local laws may have specific disposal requirements, which must be followed.

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