This product is completed the Lead-free & RoHS2.0 & Halogen-free.

Customer: **Ozdisan**

Issued Date	**2024-10-08**
No.	**RD20241008001**

SPECIFICATION FOR APPROVAL

No.	Customer No.	Koshin Part No.	Description	ΦD x L
1		PKPH-450V470MM300	450V47μF	22X30

KOSHIN INTERNATONAL LIMITED

Headquarters

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Manufacturing Sites

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TEL：+86-755-89500370 89500371 FAX：+86-755-89500348
☑ Koshin Technology Industrial Zone South Huancheng Road,LinWu,Chenzhou,Hunan Provice,China

KOSHIN APPROVED SIGNATURE FOR KOSHIN			APPROVED SIGNATURE FOR CUSTOMER
核 准 APPROVAL	确 认 CHECK	作 成 DESIGN	承 认 APPROVED BY
R & D Oct.08.2024 Alex Shen	R & D Oct.08.2024 Li Luo	R & D Oct.08.2024 L.Q.Tang	

Please return one copy with your authorized signature when you accept these specifications.

DJS-SD-0013

Make/Revised Curriculum Vitae

Version	Date	Res.	Content	Checked
V0	2024-10-8	唐玲青	新建	罗丽

CONTENTS

1.Scope

This specification covers“KPH series” miniature single-ended aluminium electrolytic capacitors.

2. Operating Temperature Range

Operating temperature range is the range of ambient temperature at which the capacitor can be operated continuously at rated voltage.

3.Characteristics

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

Ambient temperature ：15 to 35℃

Air pressure：86kpa to 106kpa

If there may be doubt on the results, measurements shall be made within the following limits.

Ambient temperature ：20±2℃

Air pressure：86kpa to 106kpa

4. Frequency Coefficient for Ripple Current

Frequency (Hz) / Rated Voltage(V)	50	120	300	1K	10K	100K
10～50	0.95	1.00	1.03	1.05	1.08	1.08
63～100	0.92	1.00	1.07	1.13	1.19	1.20
160～250	0.81	1.00	1.17	1.32	1.45	1.50
350～450	0.77	1.00	1.16	1.30	1.41	1.43

5. Coefficient of Temperature for Ripple Current

Temperature (℃)	45	60	85	95	105
Coefficient	2.10	1.90	1.40	1.25	1.00

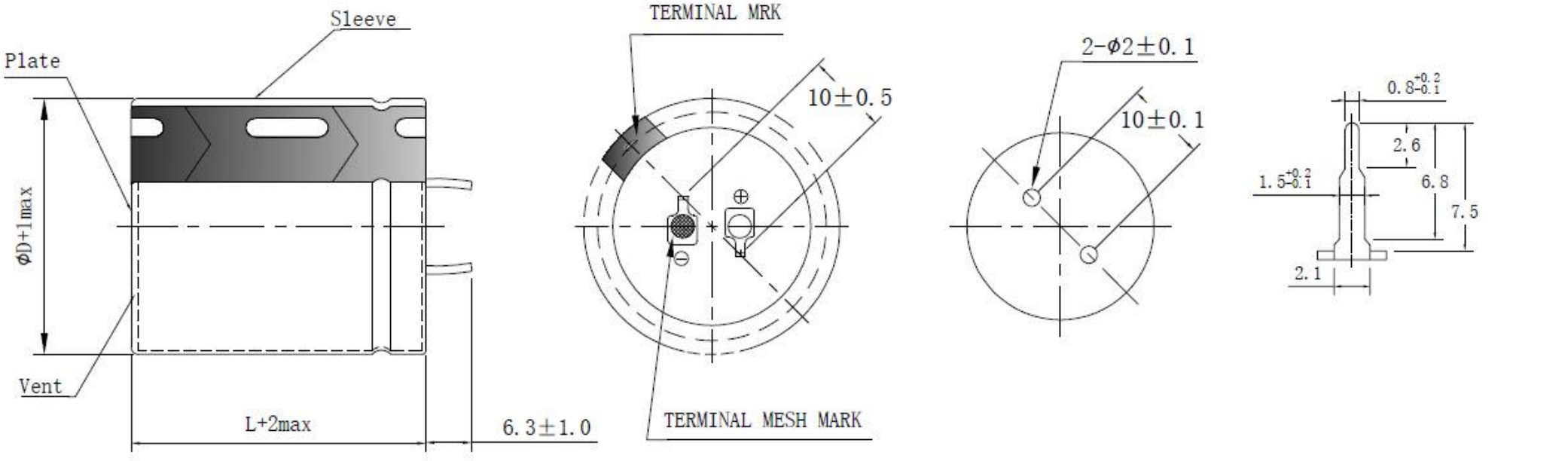
NOTE:Temperature coefficient is not used in life formula but for reference.

6. Impedance Ratio

	Rated voltage(V)		10	16	25	35	50,63	80-100	160-400	450	
Low temperature characteristics	Impedance ratio (max)	$Z_{(-25℃)}/Z_{(+20℃)}$	4	4	3	3	2	2	4	8	120Hz
		$Z_{(-40℃)}/Z_{(+20℃)}$	15	15	10	8	6	5	-	-	

7. Product Dimensions and Characteristics Table

7.1 Product Dimensions (Unit:mm)

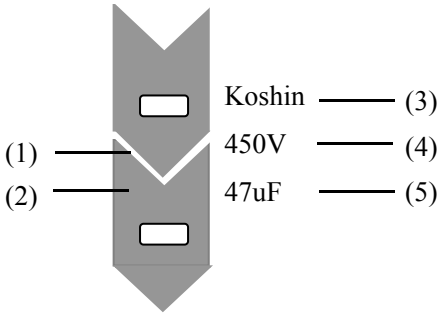


7.2 Characteristics Table

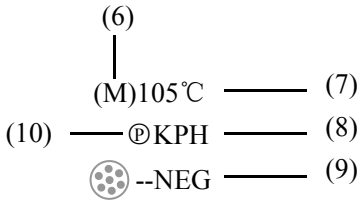
Koshin Part No.	Rated Voltege (Vdc)	Rated Capacitance (μF)	Capacitance Tolerance (120Hz ,20℃)	Temperature range(℃)	Dissipation factor (120H , 20℃)	Leakage Current (μA,5min)	Max Ripple Current at 105℃ , 120Hz (A rms)	Load life (Hrs)	Dimensions (mm)	
									ΦD	L
PKPH-450V470MM300	450	47	±20%	-25~+105	0.15	423	0.43	5000	22	30

8．Marking：

8.1 Marking on capacitors include:



Front Side



Back Side

NO.	ITEM
(1)	Direction of Current
(2)	Negative Polarity
(3)	Trade Mark
(4)	Rated Voltage
(5)	Nominal Capacitance
(6)	Capacitance Tolerance Code
(7)	Rated Temperature
(8)	Series
(9)	Polarity of the terminals
(10)	Ⓟ/ Sleeve material (PET)

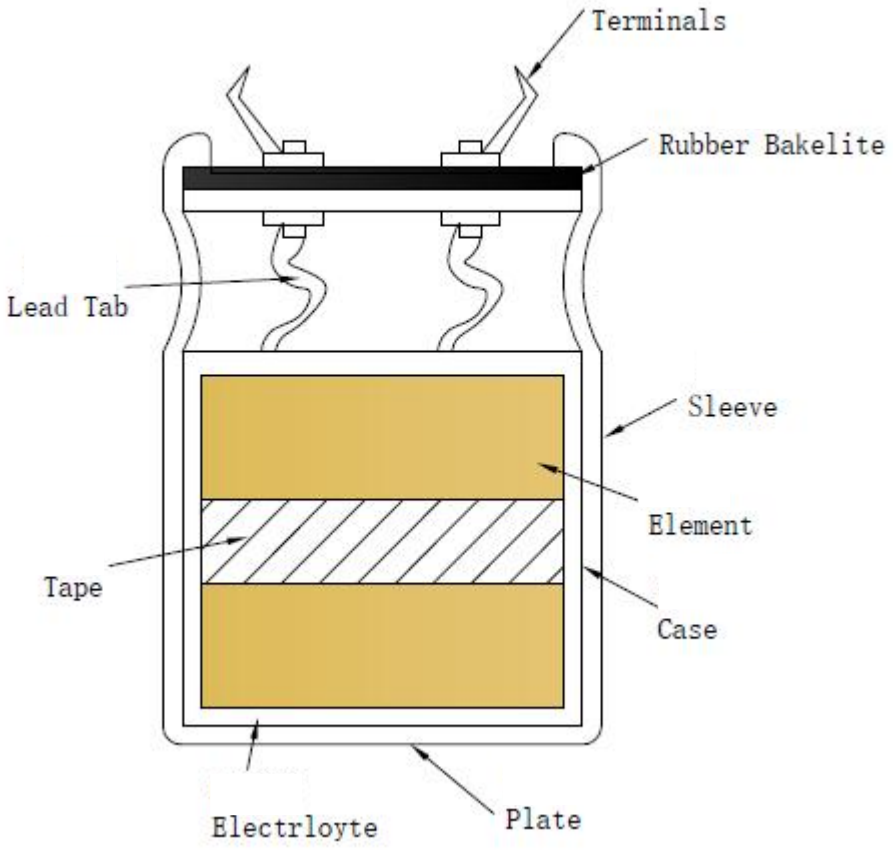
8.2 Marking color：

Sleeve color: Black PET

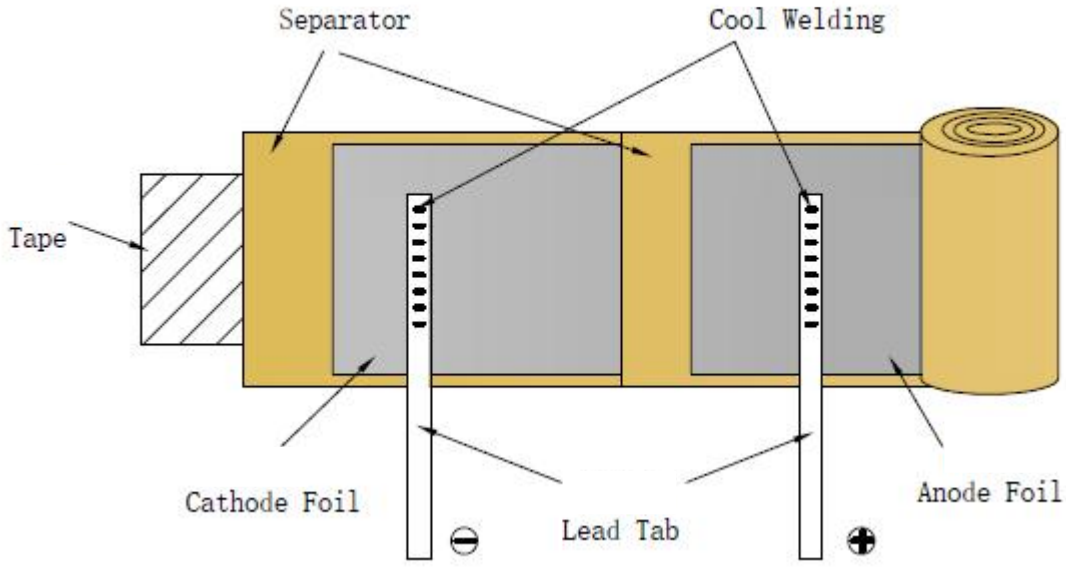
Marking color: White

9. Frame Drawing and Material Table

9.1 Frame Drawing



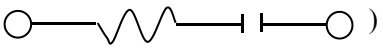
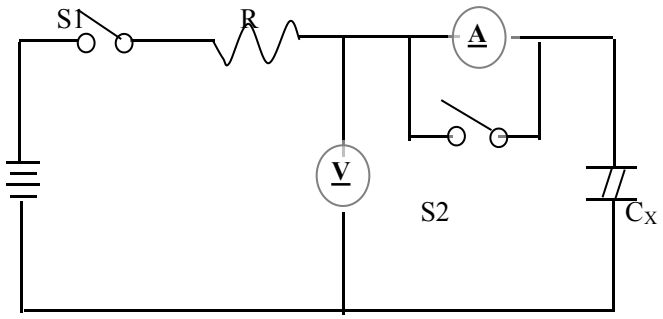
9.2 Element Drawing



9.3 Material Table

No.	Composing Part	Material
1	Anode Foil	Aluminum Foil
2	Cathode Foil	Aluminum Foil
3	Separator	Cellulose
4	Lead Tab	Aluminum
5	Electrolyte	Organic Solvent
6	Rubber Bakelite	Laminated Paper+ EPDM
7	Case	Aluminum
8	Sleeve	PET
9	Tape	PP
10	Terminals	Steel+Cu+tin
11	Plate	OPP

10. Electrical Characteristics :

<table>
<tr><th>NO.</th><th>ITEM</th><th>TEST METHOD</th><th>SPECIFICATION</th></tr>
<tr><td>10.1</td><td>Rated voltage</td><td>Voltage: DC voltage + peak ripple voltage≤Rated voltage</td><td rowspan="3">Voltage range、capacitance range 、Dissipation factor, leakage current ,see characteristics table.</td></tr>
<tr><td>10.2</td><td>Capacitance</td><td>1. Measuring frequency:120Hz±12Hz
2. Measuring voltage:≤0.5Vrms+0.5VDC~2.0VDC
3. Measuring circuit: ()</td></tr>
<tr><td>10.3</td><td>Dissipation factor</td></tr>
<tr><td>10.4</td><td>Leakage current</td><td>DC leakage current shall be measured after 1~2minutes application of the DC rated working voltage through the 1000 Ω resistor at 20℃
 

R: 1000Ω S1:Switch
A: DC current meter S2:Switch for protect of current mete
V: DC voltage meter Cx: Testing capacitor</td><td>10V-450V:
Less than 0.02CV or 3mA, whichever is smaller
（at 20℃, after 5 minutes).

I：Leakage current(μA)
C：Capacitance(μF)
V：Rated voltage (V)</td></tr>
<tr><td>10.5</td><td>Temperature characteristics</td><td>
<table>
<tr><th>STEP</th><th>TEMPERATURE</th><th>STORAGE TIME</th></tr>
<tr><td>1</td><td>20℃±2℃</td><td>30minutes</td></tr>
<tr><td>2</td><td>-40℃±3℃ -25℃±3℃</td><td>2hours</td></tr>
<tr><td>3</td><td>20℃±2℃</td><td>30minutes</td></tr>
<tr><td>4</td><td>105℃±2℃</td><td>2hours</td></tr>
</table>
Step1.Measure the capacitance and impedance.
(|Z| , 20℃,120Hz±2Hz)
Step2. Measure the impedance at thermal balance after 2 hours.
(|Z| , -40℃ -25℃ 120Hz±2Hz)
Step4.Measure the leakage current at thermal balance after 2 hours</td><td>Step2.
Low temperature impedance stability
Less than specified value.

Step4.
Capacitance change:
within ± 10% of the initial measured value.
Dissipation factor:
Less than specified value.</td></tr>
</table>

<table>
<tr><th>NO.</th><th>ITEM</th><th>TEST METHOD</th><th>SPECIFICATION</th></tr>
<tr><td>10.6</td><td>Surge test</td><td>Rated surge voltage shall be applied (switch on)for 30±5 second and then shall be applied (switch off) with discharge for 5.5min at room temperature. This cycle shall be repeated for 1000 cycles. Duration of one cycle is 6±0.5 minutes.

Surge voltage:
<table>
<tr><td>Working voltage (V)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>80</td><td>100</td></tr>
<tr><td>Surge voltage (V)</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td><td>79</td><td>100</td><td>125</td></tr>
</table>
<table>
<tr><td>Working voltage (V)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr>
<tr><td>Surge voltage (V)</td><td>200</td><td>250</td><td>300</td><td>400</td><td>450</td><td>500</td></tr>
</table></td><td>Capacitance change:
within±15% of the initial specified value.

Dissipation factor:
Less than specified value.

Leakage current:
Within initial specified value.</td></tr>
</table>

11. Mechanical Characteristics：

<table>
<tr><th>NO.</th><th>ITEM</th><th>TEST METHOD</th><th>SPECIFICATION</th></tr>
<tr><td>11.1</td><td>Lead strength</td><td>(A)Tensile strength：
Wire lead terminal：
<table>
<tr><td>d(mm)</td><td>≤0.5</td><td>0.5<d≤0.8</td><td>0.8＜d≤1.25</td></tr>
<tr><td>load(kg)</td><td>0.5</td><td>1.0</td><td>2.0</td></tr>
</table>
The capacitor shall withstand the constant tensile force specified between the body and each lead for 10seconds without damage either mechanical or electrical.

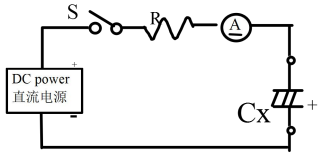
（B）Bending strength：
wire lead terminal：
<table>
<tr><td>d(mm)</td><td>≤0.5</td><td>0.5<d≤0.8</td><td>0.8＜d≤1.25</td></tr>
<tr><td>load(kg)</td><td>0.5</td><td>0.5</td><td>1.0</td></tr>
</table>
With the capacitor in a vertical position apply the load specified axially to each lead. The capacitor shall be rotated slowly from the vertical to the horizontal position, back to the vertical position. The 90° in the opposite direction and back the original position. Performance of capacitor shall not have change and leads shall be undamaged.</td><td>When the capacitance is measured, there shall be no intermittent contacts, or open-or short-circuiting.

There shall be no such mechanical damage as terminal damage etc.</td></tr>
</table>

NO.	ITEM	TEST METHOD	SPECIFICATION
11.2	Vibration resistance	The frequency of the vibration shall vary uniformly within the range 10 to 55 Hz with the amplitude of 0.75mm, completing the cycle in the internal of one minute. The capacitor shall be securely mounted by its leads with hold the body of capacitor. The capacitor shall be vibrated in three mutually perpendicular directions for a period of 2 hours in each direction.	Capacitance: no unsteady. Appearance: no abnormal. Capacitance change: within ± 5% of initial measured value.
11.3	Solder -ability	The leads are dipped in the solder bath of Sn at 235℃±5℃for 2±0.5 seconds. The dipping depth should be set at 1.5~2.0 mm.	The solder alloy shall cover the 95% or more of dipped lead's area.

12. Reliability :

NO.	ITEM	TEST METHOD	SPECIFICATION
12.1	Soldering heat resistance	The leads immerse in the solder bath of Sn at 260℃±5℃ for 10±1seconds until a distance of 1.5~2.0mm from the case.	No visible damage or leakage of electrolyte. Capacitance change: Within ± 5% of the initial measured value Tan δ : Less than specified value. Leakage current: Less than specified value
12.2	Moisture Resistance	Subject the capacitor to 40℃ ± 2℃ and 90% to 95% relative humidity for 504 hours.	Capacitance change: Within ± 20% of the initial measured value Tan δ : Less than 1.2 specified value. Leakage current: Less than specified value

NO.	ITEM	TEST METHOD	SPECIFICATION
12.3	Load life	After 5000 hours continuous application of DC rated working voltage and rated ripple current at 105℃±2℃, Measurements shall be performed after 16 hours exposed at room temperature.	Capacitance change: within±20% of the initial specified value. Dissipation factor: Less than 200% of the initial specified value. Leakage current: Within initial specified value.
12.4	Shelf life	After storage for 1000 hours at 105℃±2℃ without voltage application ,Measurements shall be performed after exposed for 16 hrs at room temperature after application of Testing	Capacitance change: within±20% of the initial specified value. Dissipation factor: Less than 200% of the initial specified value. Leakage current: Less than 200% of the initial specified value.
12.5	Storage at low temperature	The capacitor shall be stored at temperature of -40℃±3℃ for 16 hours, during which time be subjected to standard atmospheric conditions for 16 hours or more. After which measurements shall be made.	Capacitance change: Within ± 10% of the initial value. Tan δ :less than specified value Leakage current: Less than specified value. Appearance :no Abnormal.
12.6	Pressure relief	DC test: Send the following electricity while applying the inverse voltage. Where case size: D≤22.4mm:1 A d.c.max D > 22.4mm:10 A d.c.max Note: 1.This requirement applies to capacitors with a diameter of 6 mm or more. 2. When the pressure relief device does not open even 30 minutes after commencement of test, the test may be ended.	DC test circuit  S : Switch 开关 Ⓐ: DC current meter Cx: testing capacitor The pressure relief device shall open in such a way as to avoid any damage of fire or explosion of capacitor elements(terminal and metal foil etc.) or cover.

13. Koshin Part No.

Part Number System

PKPH-450V 470 M M 300

① ② ③ ④ ⑤ ⑥

(1) Series

KC3	K3S	K3N	KCL	KR2	KRJ	KRN	KLS	KZL	KSH	KSJ	KLJ	KR1	KLP	KRM	KHP	KZM	KRB	KZB	KBP	KRL	KLL	KAG	KJH
KLH	KZH	KRH	KLF	KRF	K2A	K3A	KA3	KBD	KPO	KL5	K3J	K4L	K4H	KPG	KPH	KNR	KNT	KLT	KMT	KPX			

(2) Voltage(WV)

Voltage(WV)	4	6.3	10	16	25	35	50	63	80	100	110	115
Code	004	6R3	010	016	025	035	050	063	080	100	110	115

Voltage(WV)	125	160	165	200	220	250	330	350	400	450	500	550
Code	125	160	165	200	220	250	330	350	400	450	500	550

(3) Capacitance

Capacitance is show in microfarads (μ F)

μ F	0.1	0.47	1	2.2	22	220	2200	22000	21～25(KLT)
Code	0R1	R47	010	2R2	220	221	222	223	21T25

(4) Capacitance tolerance

Tolerance%	±5	±10	±15	±20	-0 to +100	-0 to +20	-10 to +20	-10 to +100
Code	J	K	L	M	P	R	V	W

Tolerance%	-15 to +20	-20 to +40	-20 to +80	-20 to +5	+5 to +20	-10 to +5	-30 to +20	-15 to +5
Code	N	X	E	A	B	C	D	F

(5) Case（D：mm）

Diameter	3	4	5	6	6.3	7	8	10	12.5	13	16	18	20	22	25	30	34
Code	A	B	C	D	E	2E	F	G	H	I	J	K	L	M	N	O	P

Diameter	35	36.5	40	42	45	46	50	51	52.3	55	60	63.5	65.5	76	90	100
Code	Q	R	S	T	U	V	W	X	Y	Z	1A	1B	1C	1D	1E	1F

Part Number System

(6) Case（L：mm）

Description	5	7	11	12.5	25	35.5	40	100	110	111	120	130	140	150	220	250
Code	050	070	110	125	250	355	400	A00	A10	A11	A20	A30	A40	A50	B20	B50

(7) Terminal Dummy code

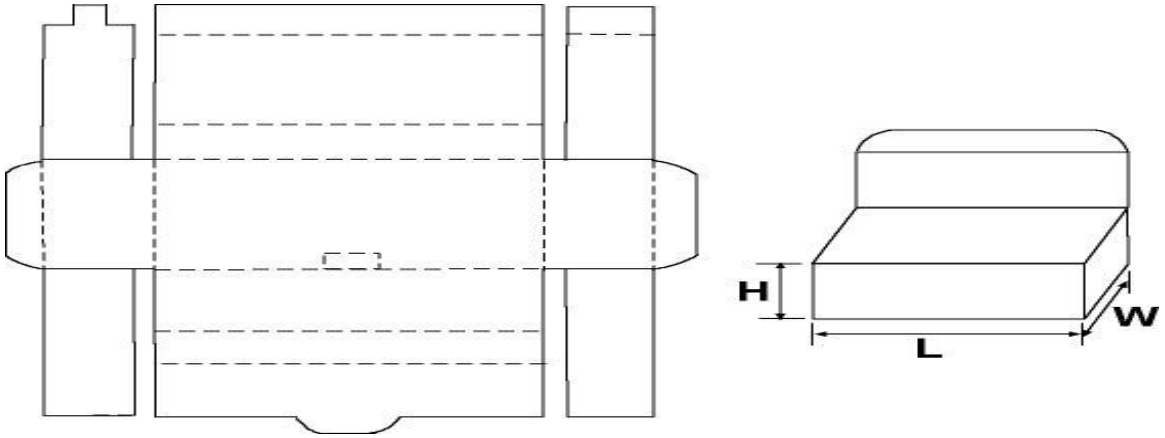
Description	4.0±0.5mm
Code	Z5

Note： PET sleeve capacitors adding "Ⓟ" in Part No. System before.

14.Packing

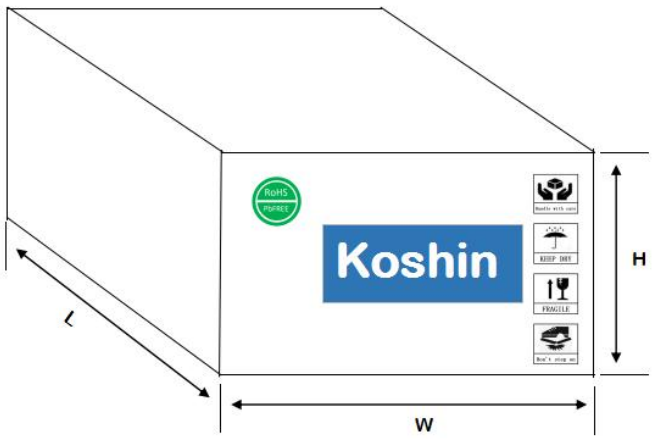
Packing Standards: standards of the Snap-in products carton.

1. Standards of the inner box .



Specification	Size±2 (mm) L×W×H	Textures	Quantity(PCS)
HR-300A	300×195×45	H5A	100

2. Standards of the outer box .



Specification	Size±2 (mm) L×W×H	Textures	Quantity(PCS)
HW-318A	318×218×450	K=A	900

3．Label:

Series	Size(mm)	Sample
Label	90×40	As follows

Koshin Electrolytic Capacitors

OPN: ××××　②　③　⑧

Type:　⑤⑥⑦　Qty:　⑨ pcs

CPN:　④　Date:

①　⑩

KS2020011302460

①Customer name

② /

③Koshin Part No.

④Customer Part No.

⑤Series

⑥Voltage

⑦Capacity

⑧Size

⑨Quantity

⑩Work order number

Cautions for Using Aluminum Electrolytic Capacitors

1.When reverse voltage is applied on DC aluminum electrolytic capacitor ,the circuit will be short out and the capacitor will be damaged due to abnormal current flows through the capacitor.Please use non- polar types of capacitors when the positive voltage is applied on the cathode terminal.

2. When capacitor is used at higher voltage than the rated voltage, leakage current increased,characteristics drastically deteriorated and damaged in a short period may occur as a result.Please take extra caution that the peak voltage should not exceed the rated voltage.

3. Sudden charge and discharge

When aluminum electrolytic capacitors for general purpose-use are employed in rapid charge and discharge application, its life expectancy may be shortened resulted from capacitance decrease, heat rise, etc.

4. Storage of the capacitor

①We recommend the following conditions for storage:

Ambient temperature：5~35℃ ,Ambient humidity：<75%RH;

a) Storage life: ≤ 12 months;

b) If storage life >12 months，the products need to be charged again before using;

c) If Storage time >three years, the products need to be discarded;

d) Expiry Date: calculating from the date marked on the sleeve;

e) Please keep capacitors in the original package;

f) Avoid storing the capacitors under such circumstances:

※ With water and oil or damp &dewing location.

※ With gas and oil.

※ With toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, bromine and methane.

※ With direct sunlight, Ozone, ultraviolet rays or radiation.

5. If excessive ripple current is applied on the capacitor, excessive heat will be generated inside,the capacitance will be reduced and capacitor's life shall be shortened. Rated voltage has been marked on the capacitor; therefore, the peak value of the ripple voltage should be less than the rated voltage.

6. Ambient temperature

Life of aluminum electrolytic capacitor is affected by the ambient temperature. It is generally known that the life doubles for each 10℃ decrease in temperature.

7. Tensile strength of lead wire

When a strong force is applied to the lead wires or terminals, stress is put on the internal connections, which may result in short circuit, open circuit or increased leakage current. So it is not advisable to bend or handle a capacitor after it has been soldered to the PC board.

8. Heat resistance at the soldering process

During soldering process, secondary shrinkage or sleeve crack may occur when soldering temperature is too high or soldering time is too long.

9. Hole pitch and position of PC board

When designig a PC board , its hole pitch should be designed to coincide with the lead pitch(lead spacing) of the capacitor specified in the catalog or specifications.When a capacitor is forcibly inserted into an unmatched hole pitch,a force will put on the leads and which could result in a short circuit or increased leakage current.

10. Cleaning after soldering

① The aluminum electrolyte capacitors should be fee halogenated solvents during board cleaning after soldering. Use solvent proof capacitors when halogenated solvents are used.

② After cleaned with the solvent which should proof the quality of capacitors, the capacitors should not be kept in solvent environments of non-ventilated places. Let the capacitors after cleaning dry with hot blast fully above 10mins and the temperature of hot blast should not be over than specified upper limit of capacitors.

11. Adhesives、fixative and coating materials(coating agent)

① Do not use halogenated adhesives and coating materials to fix aluminum electrolytic capacitors.

②Do not cover up all the sealing area of capacitors with adhesives 、 fixative or coating materials(coating agent), make coverage only partial

12. Certificates

① ISO 9001:2015 Certificate

② ISO 14001:2015 Certificate

③ ISO/IATF16949:2016 Certificate

④ OHSAS 45001:2016 Certificate

※ RoHS2.0 compliance

Accord with the latest standard of RoHS2.0 , if customers have any special requirments, according to the relevant agreements which signed by both parts.