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SAMXON BRAND ALUMINUM ELECTROLYTIC CAPACITORS

PRODUCT SPECIFICATION

規格書

CUSTOMER : (客戶):	DATE : (日期):
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CATEGORY (品名)	: ALUMINUM ELECTROLYTIC CAPACITORS
DESCRIPTION (型号)	: KM SERIES 105°C
VERSION (版本)	: 01
Customer P/N	:
SUPPLIER	:

SUPPLIER	
PREPARED (拟定)	CHECKED (审核)
郭梦玉	王国华

CUSTOMER	
APPROVAL (批准)	SIGNATURE (签名)

MAN YUE ELECTRONICS COMPANY LIMITED	<i>ELECTROLYTIC CAPACITOR SPECIFICATION KM SERIES</i>	SAMXON

SPECIFICATION					ALTERNATION HISTORY RECORDS		
KM SERIES							
Rev.	Date	Mark	Page	Contents	Purpose	Drafter	Approver

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STANDARD MANUAL							

MAN YUE ELECTRONICS COMPANY LIMITED	<i>ELECTROLYTIC CAPACITOR SPECIFICATION KM SERIES</i>	SAMXON	

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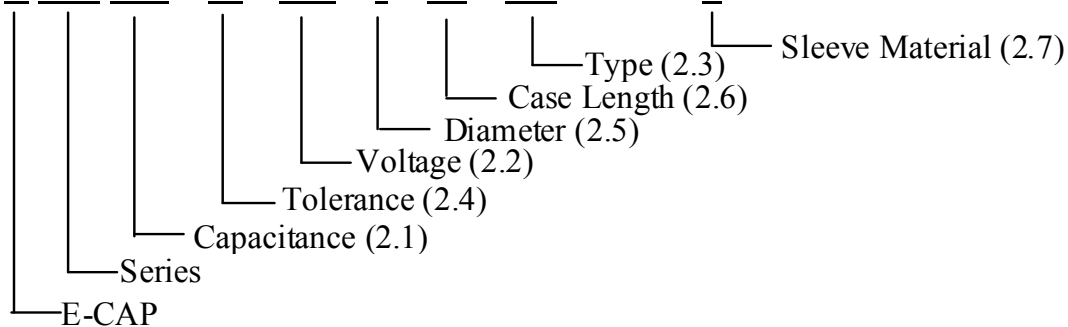
1. Application

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

2. Part Number System

E KM 106 M 2W I 15 CB □□

E KM 106 M 2W I 15 CB □□ P



2.1 Capacitance code

Code	474	475	476	477	478
Capacitance (μF)	0.47	4.7	47	470	4700

2.2 Rated voltage code

Code	0J	1A	1C	1E	1V	1H	1J	2A
Rate Voltage (V.DC)	6.3	10	16	25	35	50	63	100

Code	2C	2D	2N	2E	2V	2G	2M	2W
Rate Voltage (V.DC)	160	200	220	250	350	400	420	450

2.3 Type

Code	RR	TU	TV	TC	TE	TQ	CB	CY	KD	FD
Reference	Bulk	Taping Spec.				Forming Spec.				

2.4 Capacitance tolerance

"M" stands for -20% ~ +20%

2.5 Size

Code	D	E	F	G	I	J	K	L
Diameter	5	6.3	8	10	12.5	13	16	18

2.6 Length

"11"= 11mm "12"= 12mm "1B"= 12.5mm "15"= 15mm
 "16"= 16mm "20"= 20mm "25"= 25mm "30"= 30mm

2.7 Sleeve material

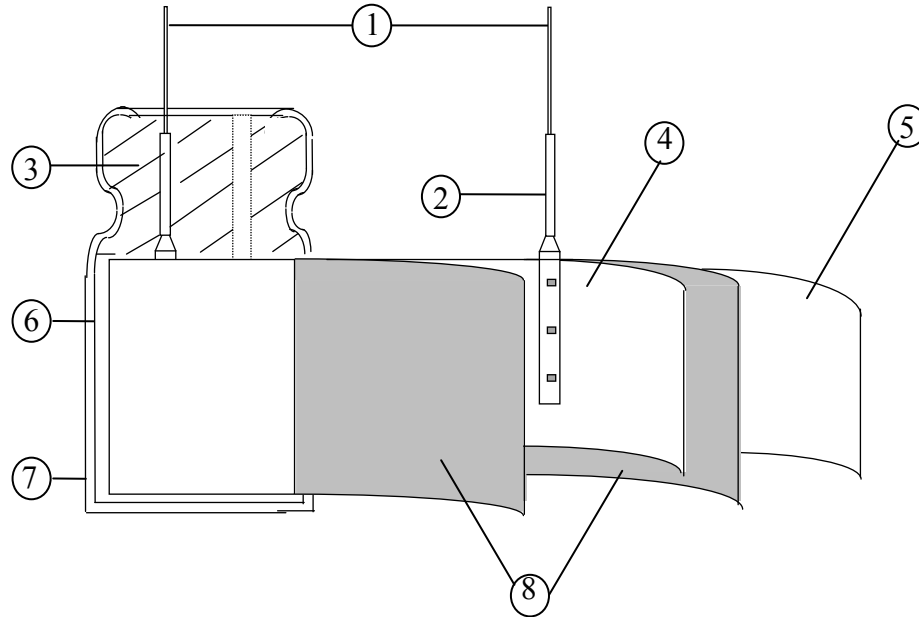
Code	P	Blank
Sleeve material	PET	PVC

Remark: The "□" in fifteenth and sixteenth digits is used for the product lines, and the "□" in the seventeenth digit is used to indicate that the sleeve is the PVC material.

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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.



No	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	PVC/PET
8	Separator	Electrolyte paper

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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°C ± 2°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 is -40°C to 105°C(6.3~100WV), -25°C to 105°C(160~450WV).

As to the detailed information, please refer to table 1

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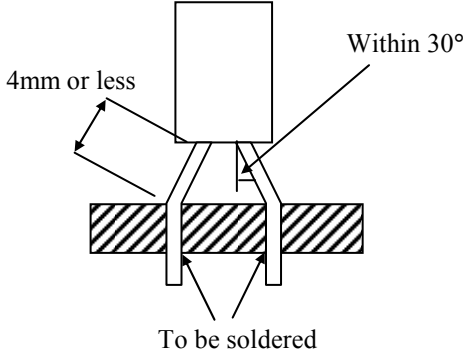
Table 1

ITEM		PERFORMANCE																																
4.1	Rated voltage (WV)	WV (V.DC)	6.3	10	16	25	35	50	63	100																								
		SV (V.DC)	8	13	20	32	44	63	79	125																								
	Surge voltage (SV)	WV (V.DC)	160	200	220	250	350	400	420	450																								
		SV (V.DC)	200	250	270	300	400	450	470	500																								
4.2	Nominal capacitance (Tolerance)	<p><Condition> Measuring Frequency : 120Hz±12Hz Measuring Voltage : Not more than 0.5Vrms Measuring Temperature : 20±2°C</p> <p><Criteria> Shall be within the specified capacitance tolerance.</p>																																
4.3	Leakage current	<p><Condition> Connecting the capacitor with a protective resistor (1kΩ±10Ω) in series for 2 minutes, and then, measure Leakage Current.</p> <p><Criteria> (6.3~100WV): I (μA) ≤ 0.01 CV or 3 (μA) whichever is greater. (160~450WV): I (μA) ≤ 0.03CV+40 (μA)</p> <p>I: Leakage current(μA) C: Capacitance (μF) V: Rated DC Working Voltage (V)</p>																																
4.4	tan δ	<p><Condition> See 4.2, Norm Capacitance, for measuring frequency, voltage and temperature.</p> <p><Criteria></p> <table border="1"> <tr> <td>Working voltage (v)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> </tr> <tr> <td>tan δ (max.)</td> <td>0.26</td> <td>0.22</td> <td>0.18</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> </tr> </table> <table border="1"> <tr> <td>Working voltage (v)</td> <td>100</td> <td>160~250</td> <td>350~450</td> </tr> <tr> <td>tan δ (max.)</td> <td>0.08</td> <td>0.20</td> <td>0.24</td> </tr> </table> <p>For capacitance value >1000 μF, add 0.02 per another 1000 μF.</p>									Working voltage (v)	6.3	10	16	25	35	50	63	tan δ (max.)	0.26	0.22	0.18	0.16	0.14	0.12	0.10	Working voltage (v)	100	160~250	350~450	tan δ (max.)	0.08	0.20	0.24
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4.5	Terminal strength	<p><Condition> Tensile Strength of Terminals Fixed the capacitor, applied force to the terminal in lead out direction for 10 ± 1 seconds. Bending Strength of Terminals. Fixed the capacitor, applied force to bent the terminal (1~4 mm from the rubber) for 90° within 2~3 seconds, and then bent it for 90° to its original position within 2~3 seconds.</p> <table border="1" data-bbox="518 631 1369 781"> <thead> <tr> <th>Diameter of lead wire</th> <th>Tensile force N (kgf)</th> <th>Bending force N (kgf)</th> </tr> </thead> <tbody> <tr> <td>0.5mm and less</td> <td>5 (0.51)</td> <td>2.5 (0.25)</td> </tr> <tr> <td>Over 0.5mm to 0.8mm</td> <td>10 (1.0)</td> <td>5 (0.51)</td> </tr> </tbody> </table> <p><Criteria> No noticeable changes shall be found, no breakage or looseness at the terminal.</p>	Diameter of lead wire	Tensile force N (kgf)	Bending force N (kgf)	0.5mm and less	5 (0.51)	2.5 (0.25)	Over 0.5mm to 0.8mm	10 (1.0)	5 (0.51)									
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4.6	Temperature characteristics	<p><Condition></p> <table border="1" data-bbox="534 1055 1406 1285"> <thead> <tr> <th>STEP</th> <th>Testing Temperature(°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20 ± 2</td> <td>Time to reach thermal equilibrium</td> </tr> <tr> <td>2</td> <td>$-40(-25) \pm 3$</td> <td>Time to reach thermal equilibrium</td> </tr> <tr> <td>3</td> <td>20 ± 2</td> <td>Time to reach thermal equilibrium</td> </tr> <tr> <td>4</td> <td>105 ± 2</td> <td>Time to reach thermal equilibrium</td> </tr> <tr> <td>5</td> <td>20 ± 2</td> <td>Time to reach thermal equilibrium</td> </tr> </tbody> </table> <p><Criteria> a. At $+105^\circ\text{C}$, capacitance measured shall be within $\pm 20\%$ of its original value at $+20^\circ\text{C}$. $\tan \delta$ shall be within the limit of Item 4.4 The leakage current measured shall not more than 8 times of its specified value. b. In step 5, $\tan \delta$ shall be within the limit of Item 4.4 The leakage current shall not more than the specified value.</p>	STEP	Testing Temperature(°C)	Time	1	20 ± 2	Time to reach thermal equilibrium	2	$-40(-25) \pm 3$	Time to reach thermal equilibrium	3	20 ± 2	Time to reach thermal equilibrium	4	105 ± 2	Time to reach thermal equilibrium	5	20 ± 2	Time to reach thermal equilibrium
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4.6		<p>c. At-40°C (-25°C), impedance (z) ratio shall not exceed the value of the following table.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tr> <td style="text-align: center;">Working Voltage (V)</td> <td style="text-align: center;">6.3</td> <td style="text-align: center;">10</td> <td style="text-align: center;">16</td> <td style="text-align: center;">25</td> <td style="text-align: center;">35</td> <td style="text-align: center;">50</td> <td style="text-align: center;">63</td> </tr> <tr> <td style="text-align: center;">Z-25°C/Z+20°C</td> <td style="text-align: center;">5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">Z-40°C/Z+20°C</td> <td style="text-align: center;">10</td> <td style="text-align: center;">8</td> <td style="text-align: center;">6</td> <td style="text-align: center;">4</td> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tr> <td style="text-align: center;">Working Voltage (V)</td> <td style="text-align: center;">100</td> <td style="text-align: center;">160~220</td> <td style="text-align: center;">250~350</td> <td style="text-align: center;">400~420</td> <td style="text-align: center;">450</td> </tr> <tr> <td style="text-align: center;">Z-25°C/Z+20°C</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">6</td> <td style="text-align: center;">15</td> </tr> <tr> <td style="text-align: center;">Z-40°C/Z+20°C</td> <td style="text-align: center;">3</td> <td style="text-align: center;">---</td> <td style="text-align: center;">---</td> <td style="text-align: center;">---</td> <td style="text-align: center;">---</td> </tr> </table> <p style="text-align: center;">For capacitance value > 1000 μ F, Add 0.5 per another 1000 μ F for Z-25°C/Z+20°C, Add 1.0 per another 1000 μ F for Z-40°C/Z+20°C.</p> <p style="text-align: center;">Capacitance, tan δ , and impedance shall be measured at 120Hz.</p>	Working Voltage (V)	6.3	10	16	25	35	50	63	Z-25°C/Z+20°C	5	4	3	2	2	2	2	Z-40°C/Z+20°C	10	8	6	4	3	3	3	Working Voltage (V)	100	160~220	250~350	400~420	450	Z-25°C/Z+20°C	2	3	4	6	15	Z-40°C/Z+20°C	3	---	---	---	---
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Z-40°C/Z+20°C	3	---	---	---	---																																							
4.7	Load life test	<p><Condition> According to IEC60384-4No.4.13 methods, The capacitor is stored at a temperature of 105°C ± 2 with DC bias voltage plus the rated ripple current for 2000 +48/0 hours. (The sum of DC and ripple peak voltage shall not exceed the rated working voltage) Then the product should be tested after 16 hours recovering time at atmospheric conditions. The result should meet the following table:</p> <p><Criteria> The characteristic shall meet the following requirements.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tr> <td style="text-align: center;">Leakage current</td> <td style="text-align: center;">Value in 4.3 shall be satisfied</td> </tr> <tr> <td style="text-align: center;">Capacitance Change</td> <td style="text-align: center;">Within ±20% of initial value.</td> </tr> <tr> <td style="text-align: center;">tan δ</td> <td style="text-align: center;">Not more than 200% of the specified value.</td> </tr> <tr> <td style="text-align: center;">Appearance</td> <td style="text-align: center;">There shall be no leakage of electrolyte.</td> </tr> </table>	Leakage current	Value in 4.3 shall be satisfied	Capacitance Change	Within ±20% of initial value.	tan δ	Not more than 200% of the specified value.	Appearance	There shall be no leakage of electrolyte.																																		
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4.8	Shelf life test	<p><Condition> The capacitors are then stored with no voltage applied at a temperature of 105 ± 2°C for 1000+48/0 hours. Following this period the capacitors shall be removed from the test chamber and be allowed to stabilized at room temperature for 4~8 hours. Next they shall be connected to a series limiting resistor(1k ± 100 Ω) with D.C. rated voltage applied for 30min. After which the capacitors shall be discharged, and then, tested the characteristics.</p> <p><Criteria> The characteristic shall meet the following requirements.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <tr> <td style="text-align: center;">Leakage current</td> <td style="text-align: center;">Value in 4.3 shall be satisfied</td> </tr> <tr> <td style="text-align: center;">Capacitance Change</td> <td style="text-align: center;">Within ±20% of initial value.</td> </tr> <tr> <td style="text-align: center;">tan δ</td> <td style="text-align: center;">Not more than 200%of the specified value.</td> </tr> <tr> <td style="text-align: center;">Appearance</td> <td style="text-align: center;">There shall be no leakage of electrolyte.</td> </tr> </table> <p style="text-align: center;">Remark: If the capacitors are stored more than 1 year, the leakage current may increase. Please apply voltage through about 1 kΩ resistor, if necessary.</p>	Leakage current	Value in 4.3 shall be satisfied	Capacitance Change	Within ±20% of initial value.	tan δ	Not more than 200%of the specified value.	Appearance	There shall be no leakage of electrolyte.																																		
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4.9	Surge test	<p><Condition> Applied a surge voltage to the capacitor connected with a $(100 \pm 50)/C_R$ (kΩ) resistor. The capacitor shall be submitted to 1000 cycles, each consisting of charge of 30 \pm5s, followed discharge of 5 min 30s. The test temperature shall be 15~35°C. C_R :Nominal Capacitance (μ F)</p> <p><Criteria></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Leakage current</td> <td>Not more than the specified value.</td> </tr> <tr> <td>Capacitance Change</td> <td>Within $\pm 15\%$ of initial value.</td> </tr> <tr> <td>$\tan \delta$</td> <td>Not more than the specified value.</td> </tr> <tr> <td>Appearance</td> <td>There shall be no leakage of electrolyte.</td> </tr> </table> <p>Attention: This test simulates over voltage at abnormal situation only. It is not applicable to such over voltage as often applied.</p>	Leakage current	Not more than the specified value.	Capacitance Change	Within $\pm 15\%$ of initial value.	$\tan \delta$	Not more than the specified value.	Appearance	There shall be no leakage of electrolyte.
Leakage current	Not more than the specified value.									
Capacitance Change	Within $\pm 15\%$ of initial value.									
$\tan \delta$	Not more than the specified value.									
Appearance	There shall be no leakage of electrolyte.									
4.10	Vibration test	<p><Condition> The following conditions shall be applied for 2 hours in each 3 mutually perpendicular directions.</p> <p>Vibration frequency range : 10Hz ~ 55Hz Peak to peak amplitude : 1.5mm Sweep rate : 10Hz ~ 55Hz ~ 10Hz in about 1 minute</p> <p>Mounting method: The capacitor with diameter greater than 12.5mm or longer than 25mm must be fixed in place with a bracket.</p> <div style="text-align: center;">  </div>								

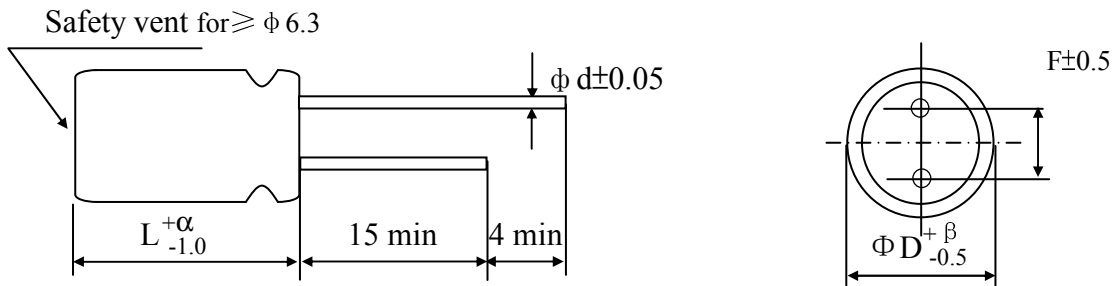
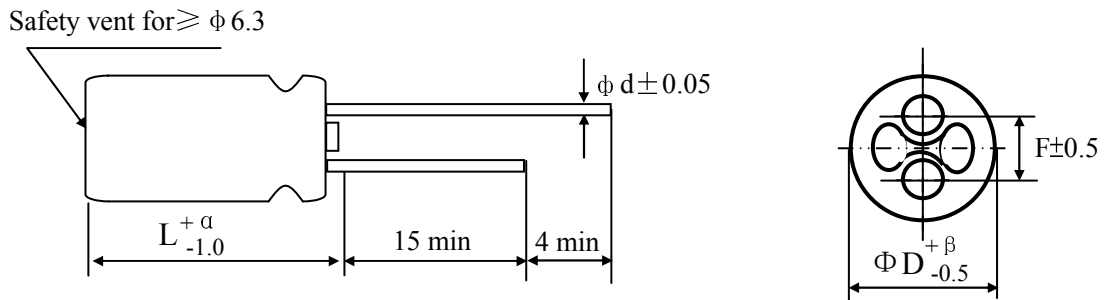
		<p><Criteria> After the test, the following items shall be tested:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Inner construction</td> <td>No intermittent contacts, open or short circuiting. No damage of tab terminals or electrodes.</td> </tr> <tr> <td>Appearance</td> <td>No mechanical damage in terminal. No leakage of electrolyte or swelling of the case. The markings shall be legible.</td> </tr> </table>	Inner construction	No intermittent contacts, open or short circuiting. No damage of tab terminals or electrodes.	Appearance	No mechanical damage in terminal. No leakage of electrolyte or swelling of the case. The markings shall be legible.				
Inner construction	No intermittent contacts, open or short circuiting. No damage of tab terminals or electrodes.									
Appearance	No mechanical damage in terminal. No leakage of electrolyte or swelling of the case. The markings shall be legible.									
4.11	Solderability test	<p><Condition> The capacitor shall be tested under the following conditions: Soldering temperature : 245±3°C Dipping depth : 2mm Dipping speed : 25±2.5mm/s Dipping time : 3±0.5s</p> <p><Criteria></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Coating quality</td> <td>A minimum of 95% of the surface being immersed</td> </tr> </table>	Coating quality	A minimum of 95% of the surface being immersed						
Coating quality	A minimum of 95% of the surface being immersed									
4.12	Resistance to solder heat test	<p><Condition> Terminals of the capacitor shall be immersed into solder bath at 260±5°C for 10±1 seconds or 400±10°C for 3⁺¹₋₀ seconds to 1.5~2.0mm from the body of capacitor .</p> <p>Then the capacitor shall be left under the normal temperature and normal humidity for 1~2 hours before measurement.</p> <p><Criteria></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Leakage current</td> <td>Not more than the specified value.</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±10% of initial value.</td> </tr> <tr> <td>tan δ</td> <td>Not more than the specified value.</td> </tr> <tr> <td>Appearance</td> <td>There shall be no leakage of electrolyte.</td> </tr> </table>	Leakage current	Not more than the specified value.	Capacitance Change	Within ±10% of initial value.	tan δ	Not more than the specified value.	Appearance	There shall be no leakage of electrolyte.
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tan δ	Not more than the specified value.									
Appearance	There shall be no leakage of electrolyte.									

4.13	Change of temperature test	<p><Condition> Temperature Cycle: According to IEC60384-4No.4.7methods, capacitor shall be placed in an oven, the condition according as below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 70%;">Temperature</th> <th style="width: 30%;">Time</th> </tr> </thead> <tbody> <tr> <td>(1)+20℃</td> <td>≤3 Minutes</td> </tr> <tr> <td>(2)Rated low temperature (-40℃) (-25℃)</td> <td>30±2 Minutes</td> </tr> <tr> <td>(3)Rated high temperature (+105℃)</td> <td>30±2 Minutes</td> </tr> <tr> <td colspan="2">(1) to (3)=1 cycle, total 5 cycle</td> </tr> </tbody> </table> <p><Criteria> The characteristic shall meet the following requirement</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 40%;">Leakage current</td> <td>Not more than the specified value.</td> </tr> <tr> <td>tan δ</td> <td>Not more than the specified value.</td> </tr> <tr> <td>Appearance</td> <td>There shall be no leakage of electrolyte.</td> </tr> </tbody> </table>	Temperature	Time	(1)+20℃	≤3 Minutes	(2)Rated low temperature (-40℃) (-25℃)	30±2 Minutes	(3)Rated high temperature (+105℃)	30±2 Minutes	(1) to (3)=1 cycle, total 5 cycle		Leakage current	Not more than the specified value.	tan δ	Not more than the specified value.	Appearance	There shall be no leakage of electrolyte.
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(1) to (3)=1 cycle, total 5 cycle																		
Leakage current	Not more than the specified value.																	
tan δ	Not more than the specified value.																	
Appearance	There shall be no leakage of electrolyte.																	
4.14	Damp heat test	<p><Condition> Humidity Test: According to IEC60384-4No.4.12 methods, capacitor shall be exposed for 500±8 hours in an atmosphere of 90~95%R H .at 40±2℃, the characteristic change shall meet the following requirement.</p> <p><Criteria></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 40%;">Leakage current</td> <td>Not more than the specified value.</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±20% of initial value.</td> </tr> <tr> <td>tan δ</td> <td>Not more than 120% of the specified value.</td> </tr> <tr> <td>Appearance</td> <td>There shall be no leakage of electrolyte.</td> </tr> </tbody> </table>	Leakage current	Not more than the specified value.	Capacitance Change	Within ±20% of initial value.	tan δ	Not more than 120% of the specified value.	Appearance	There shall be no leakage of electrolyte.								
Leakage current	Not more than the specified value.																	
Capacitance Change	Within ±20% of initial value.																	
tan δ	Not more than 120% of the specified value.																	
Appearance	There shall be no leakage of electrolyte.																	

4.15	Vent test	<p><Condition> The following test only apply to those products with vent products at diameter $\geq \varnothing 6.3$ with vent. D.C. test The capacitor is connected with its polarity reversed to a DC power source. Then a current selected from Table 2 is applied.</p> <p><Table 2></p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Diameter (mm)</th> <th style="text-align: center;">DC Current (A)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">22.4 or less</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">Over 22.4</td> <td style="text-align: center;">10</td> </tr> </tbody> </table> <p><Criteria> The vent shall operate with no dangerous conditions such as flames or dispersion of pieces of the capacitor and/or case.</p>	Diameter (mm)	DC Current (A)	22.4 or less	1	Over 22.4	10																																														
Diameter (mm)	DC Current (A)																																																					
22.4 or less	1																																																					
Over 22.4	10																																																					
4.16	Maximum permissible ripple current	<p><Condition> The maximum permissible ripple current is the maximum A.C current at 120Hz and can be applied at maximum operating temperature Table-3 The combined value of D.C voltage and the peak A.C voltage shall not exceed the rated voltage and shall not reverse voltage.</p> <p>Frequency Multipliers:</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Rated Voltage (V)</th> <th rowspan="2" style="text-align: center;">Coefficient Cap.(μF)</th> <th colspan="5" style="text-align: center;">Freq. (Hz)</th> </tr> <tr> <th style="text-align: center;">50</th> <th style="text-align: center;">120</th> <th style="text-align: center;">300</th> <th style="text-align: center;">1k</th> <th style="text-align: center;">10k~</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center;">6.3~100</td> <td style="text-align: center;">~47</td> <td style="text-align: center;">0.75</td> <td style="text-align: center;">1.00</td> <td style="text-align: center;">1.35</td> <td style="text-align: center;">1.57</td> <td style="text-align: center;">2.00</td> </tr> <tr> <td style="text-align: center;">68~470</td> <td style="text-align: center;">0.80</td> <td style="text-align: center;">1.00</td> <td style="text-align: center;">1.23</td> <td style="text-align: center;">1.34</td> <td style="text-align: center;">1.50</td> </tr> <tr> <td style="text-align: center;">≥ 560</td> <td style="text-align: center;">0.85</td> <td style="text-align: center;">1.00</td> <td style="text-align: center;">1.10</td> <td style="text-align: center;">1.13</td> <td style="text-align: center;">1.15</td> </tr> <tr> <td rowspan="2" style="text-align: center;">160~450</td> <td style="text-align: center;">0.47~220</td> <td style="text-align: center;">0.80</td> <td style="text-align: center;">1.00</td> <td style="text-align: center;">1.25</td> <td style="text-align: center;">1.40</td> <td style="text-align: center;">1.60</td> </tr> <tr> <td style="text-align: center;">≥ 270</td> <td style="text-align: center;">0.90</td> <td style="text-align: center;">1.00</td> <td style="text-align: center;">1.10</td> <td style="text-align: center;">1.13</td> <td style="text-align: center;">1.15</td> </tr> </tbody> </table> <p>Temperature Coefficient:</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Temperature ($^{\circ}$C)</th> <th style="text-align: center;">85</th> <th style="text-align: center;">95</th> <th style="text-align: center;">105</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Factor</td> <td style="text-align: center;">1.73</td> <td style="text-align: center;">1.41</td> <td style="text-align: center;">1.00</td> </tr> </tbody> </table>	Rated Voltage (V)	Coefficient Cap.(μ F)	Freq. (Hz)					50	120	300	1k	10k~	6.3~100	~47	0.75	1.00	1.35	1.57	2.00	68~470	0.80	1.00	1.23	1.34	1.50	≥ 560	0.85	1.00	1.10	1.13	1.15	160~450	0.47~220	0.80	1.00	1.25	1.40	1.60	≥ 270	0.90	1.00	1.10	1.13	1.15	Temperature ($^{\circ}$ C)	85	95	105	Factor	1.73	1.41	1.00
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5. Product Dimensions & Maximum Permissible Ripple Current

Unit: mm



ΦD	5	6.3	8	10	12.5	16	18	22	25
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
φd	0.5			0.6		0.8			1.0
α	L < 20 : α = 1.5;					L ≥ 20 : α = 2.0			
β	ΦD < 20 : β = 0.5;					ΦD ≥ 20 : β = 1.0			

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Table-3

Voltage (Code)		6.3V (0J)		10V (1A)		16V (1C)		25V (1E)		35V (1V)	
Cap (μ F)	Code	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current
4.7	475							5x11	26	5x11	28
10	106					5x11	35	5x11	38	5x11	41
22	226			5x11	49	5x11	54	5x11	57	5x11	67
33	336	5x11	54	5x11	60	5x11	64	5x11	75	5x11	80
47	476	5x11	65	5x11	70	5x11	80	5x11	84	5x11	101
68	86	5x11	70	5x11	75	5x11	90	5x11	92	---	---
100	107	5x11	95	5x11	105	5x11	125	5X11	140		
								6.3x11	159	6.3x11	168
220	227	5x11	153	5x11	170	6.3x11	213	6.3X11	239	8x12	294
								8x12	285		
330	337	6.3x11	216	6.3x11	239	8x12	315	8x12	340	10x12.5	419
470	477	6.3x11	258	6.3x11	285	8x12	366	10x12.5	471	10x16	547
680	687	8x12	365	8x12	408	10x12.5	480	10x16	620	10x20	682
1000	108	8x12	443	10x12.5	571	10x16	680	10X16	744	12.5x20	1023
								10x20	821		
1500	158	10x16	697								
2200	228	10x16	740	10x20	886	10x20	977	12.5x20	1176	16x25	1497
						12.5x20	1108				
3300	338	10x20	1032	10x25	1175	12.5x25	1389	16x25	1646	16x30	1808
				12.5x20	1205						
4700	478	12.5x20	1280	12.5x25	1492	16x25	1740	16x30	2012	18x35	2335
6800	688	12.5x25	1554	16x25	1824	16x30	2081	16x35	2308	18x40	2400
10000	109	16x25	1897	16x30	1980	16x35	2379	18x35	2500		
15000	159	16x30	2188	16x40	2180	18x35	2600				
22000	229	18x35	2400	18x40	2407						
33000	339	18x40	2555								

Maximum Allowable Ripple Current (m A rms) at 105°C,120Hz

Case Size φ D x L (mm)

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Voltage (Code)		50V (1H)		63V (1J)	
Cap(μ F)	Code	Case Size	Ripple Current	Case Size	Ripple Current
1	105	5x11	13		
2.2	225	5x11	20		
3.3	335	5x11	30		
4.7	475	5x11	37	5x11	40
10	106	5x11	54	5x11	59
22	226	5x11	79	5x11	79
33	336	5x11	101	6.3x11	122
47	476	6.3x11	133	6.3x11	146
68	686	6.3X11	160	8x12	155
100	107	8x12	229	10x12.5	251
180	187	----	----	----	----
220	227	10X12.5	458	10x20	504
		10x16	509		
330	337	10x16	589	12.5x20	688
470	477	10x20	707	12.5x20	810
680	687	12.5x20	923	12.5x25	1160
1000	108	12.5x25	1287	16x25	1448
2200	228	16X30	1759	18x35	1781
		16x35	1884		
3300	338	18x35	2167		

Maximum Allowable Ripple Current (m A rms) at 105°C,120Hz
Case Size ϕ D x L (mm)

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Voltage (Code)		100V (2A)		160V (2C)		200V (2D)	
Cap(μ F)	Code	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current
1	105	5x11	16				
2.2	225	5x11	23				
3.3	335	5x11	34			6.3x11	30
4.7	475	5x11	40	6.3x11	41	6.3x11	40
10	106	6.3x11	61	8x12	60	10x12.5	72
22	226	6.3x11	92	10x16	110	10x16	113
33	336	8x12	144	10x20	156	10x20	165
47	476	10x12.5	199	10x20	195	10x20	194
68	686	10x16	240	12.5x20	250	12.5x25	250
82	826			12.5x25	310	10x30	320
100	107	10x16	316	12.5x25	360	16x25	386
		10x20	349				
150	157			12.5x30	380	16x25	525
180	187	----	----	12.5x35	420	12.5x35	560
220	227	12.5x25	662	16x30	680	16x30	643
270	277			16x30	728	18x30	740
330	337	12.5x25	800	18x35	830	18x30	808
390	397			18x35	850	18x35	904
470	477	16x25	990	18x40	880	18X35	957
						18x40	1016
560	567			18x45	925	18x45	1112
680	687	16x30	1289				
1000	108	18x40	2020				

Maximum Allowable Ripple Current (m A rms) at 105°C,120Hz

Case Size ϕ D x L (mm)

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Voltage (Code)		220 (2N)		250 (2E)		350 (2V)		400 (2G)		420 (2M)		450 (2W)	
Cap(μF)	Code	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current	Case Size	Ripple Current
0.47	474			6.3x11	8	6.3x11	8						
1	105			6.3x11	17	6.3x11	18	6.3x11	19	6.3x11	15	6.3x11	16
2.2	225			6.3x11	27	6.3x11	25	8x12	30	8x12	29	8x12	24
3.3	335	6.3x11	30	6.3x11	35	8x12	40	8x12	35	8x12	35	8x12	29
4.7	475	8x12	40	8x12	45	8x12	43	8x12	40	10x16	52	10x16	42
10	106	10x12.5	70	10x12.5	75	10x16	73	10X13.5	72	10x20	85	12.5x20	84
								10x16	78				
18	186	----	----	----	----	12.5x20	100	12.5x20	105	12.5x25	124	10x30	108
22	226	10x20	125	10x20	130	12.5x20	150	12.5x20	148	12.5x25	140	12.5X20	118
												12.5x25	131
27	276	----	----	----	----	12.5x25	177	10x30	192	12.5x25	170	12.5x30	164
33	336	12.5x20	165	12.5x20	184	16x25	200	12.5x25	193	16x25	200	16x25	237
39	396	----	----	----	----	16x25	258	16x25	251	12.5x30	248	12.5x35	256
47	476	12.5x20	220	12.5X20	215	16x25	265	12.5x30	266	12.5x35	288	16x30	305
				12.5x25	238								
56	566	----	----	----	----	16x30	280	12.5x35	336	12.5x40	344	16x30	352
68	686	12.5x25	245	16x20	246	16x30	288	16x30	396	16x30	408	18x30	366
82	828	12.5x30	280	16x25	351	18x30	372	18x30	443	16x35	456	18x30	440
100	107	16x25	335	16x25	390	18x35	460	18x30	489	18x35	488	18x35	490
120	127	----	----	----	----	----	----	18x35	570	18x40	528	18x40	592
150	157	16x30	365	18x30	440			18x40	616	18x45	568	18x45	640
180	187	16x35	500	18x35	469			18x50	704				

Maximum Allowable Ripple Current (m A rms) at 105°C,120Hz Case Size φ D x L (mm)

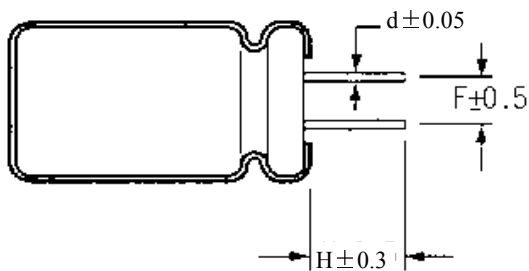
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6. Forming Dimension

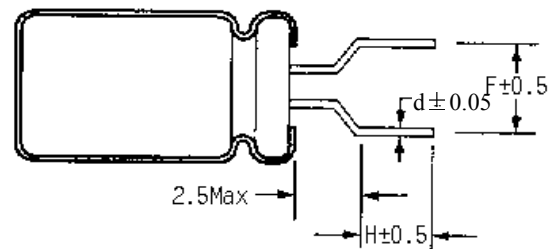
Unit: mm

Shape Code	φ D	φ 5	φ 6.3	φ 8	φ 10	φ 12.5	φ 16	φ 18
CB	F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
	H	3.4	3.4	3.4	3.4	3.4	3.4	3.4
	d	0.5	0.5	0.5	0.6	0.6	0.8	0.8
HE	F	5.0	5.0	5.0	-----	-----	-----	-----
	H	5.0	5.0	5.0	-----	-----	-----	-----
	d	0.5	0.5	0.5	-----	-----	-----	-----
FD	F	5.0	5.0	5.0	-----	-----	-----	-----
	H1	4.5	4.5	4.5	-----	-----	-----	-----
	H2	2.0	2.0	2.0	-----	-----	-----	-----
	d	0.5	0.5	0.5	-----	-----	-----	-----
KD	F	-----	-----	-----	5.0	5.0	7.5	7.5
	H1	-----	-----	-----	4.5	4.5	4.5	4.5
	H2	-----	-----	-----	2.0	2.0	2.0	2.0
	d	-----	-----	-----	0.6	0.6	0.8	0.8

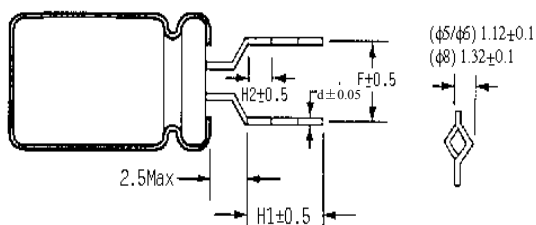
CBType



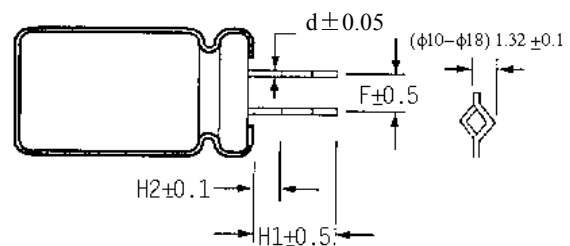
HE Type



FD Type



KD Type



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7. Taping Specification

Fig-1 $\Phi 5$ F=2.5mm(TU) ;

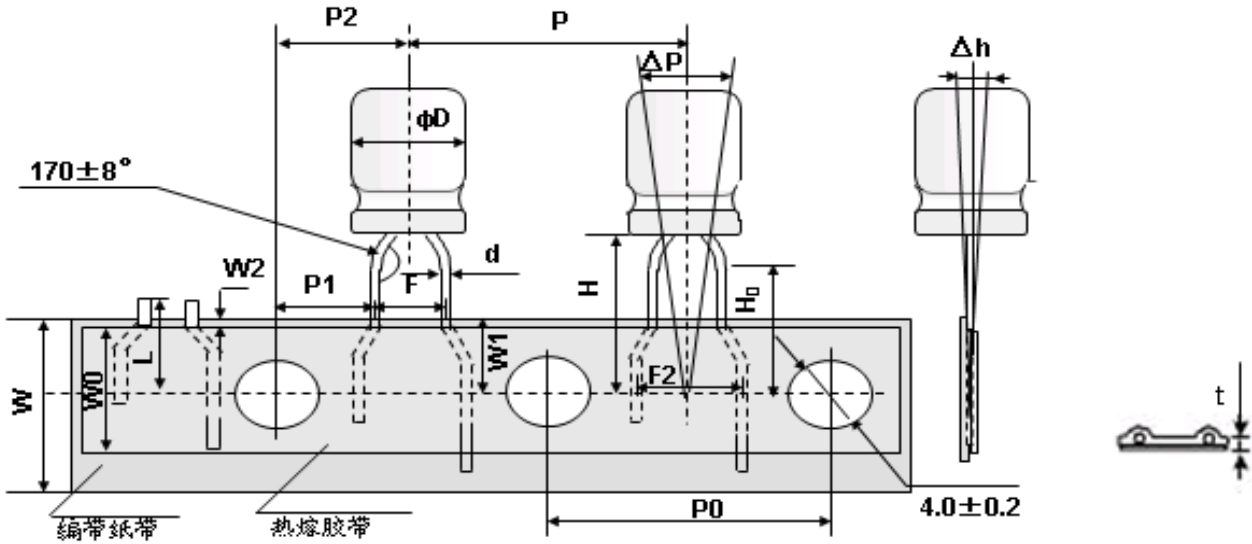
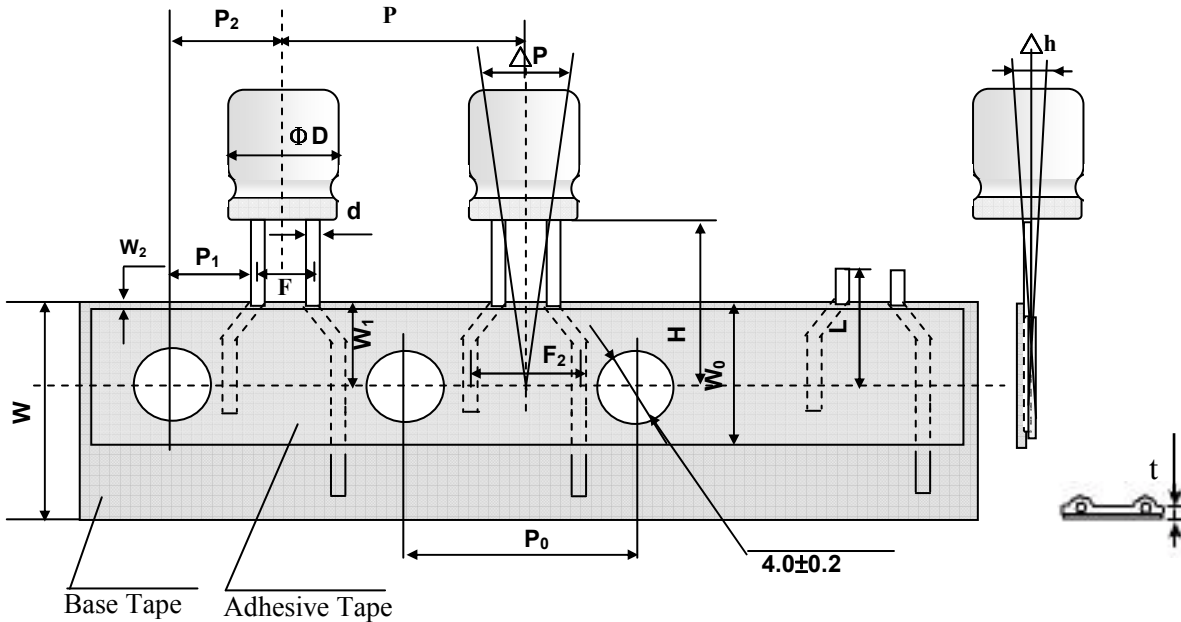


Fig-2 for $\Phi 5$ F=2.0(TT) ; $\Phi 6.3$ F=2.5(TU); $\Phi 8 \times 5$ F=2.5(TU); $\Phi 8 \times 7 \sim 20$ F=3.5mm(TV)



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Fig-3 for $\Phi 10$ F=5.0(TC) ; $\Phi 12.5$ F=5.0(TC);

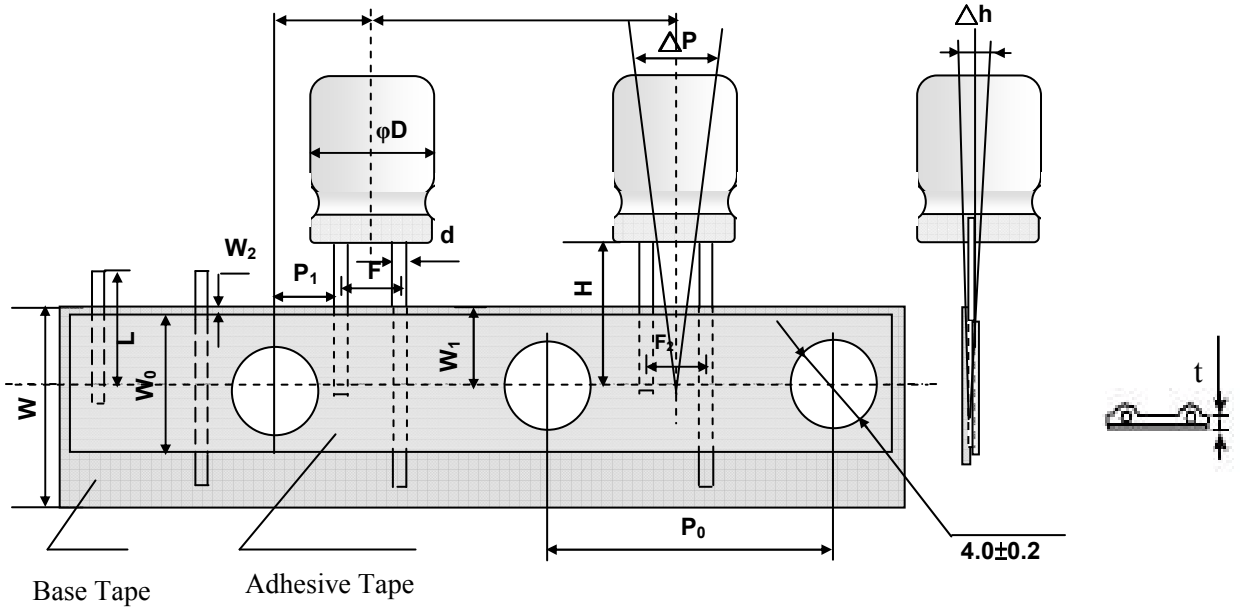


Fig-4 for $\Phi 5\sim 8$ F=5.0(TC) ; $\Phi 8$ F=5.0(TE);

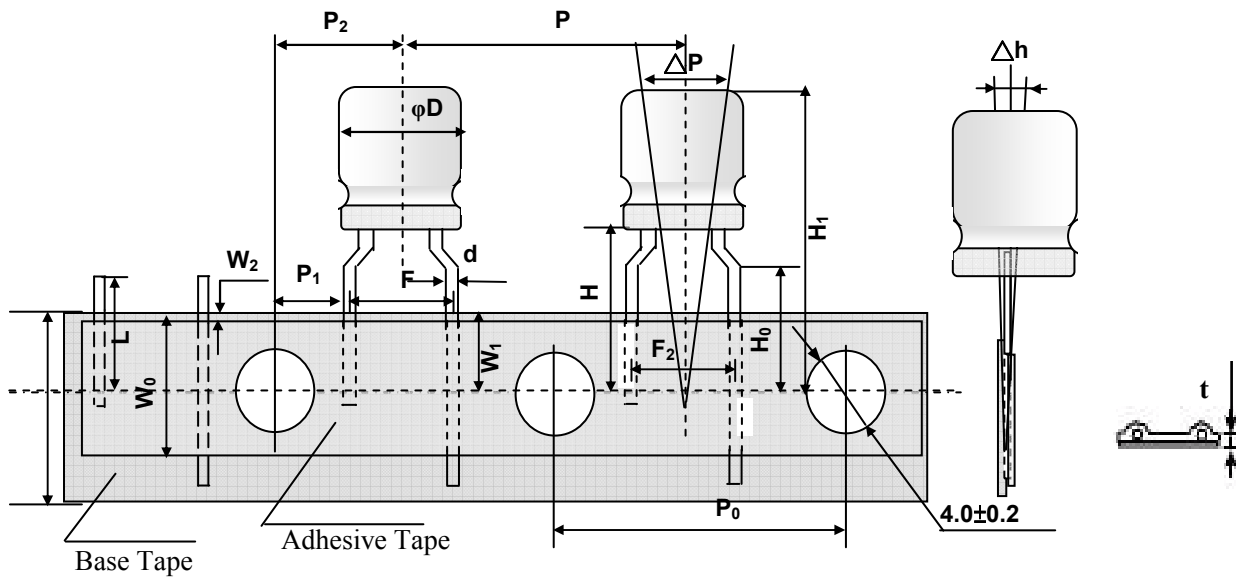
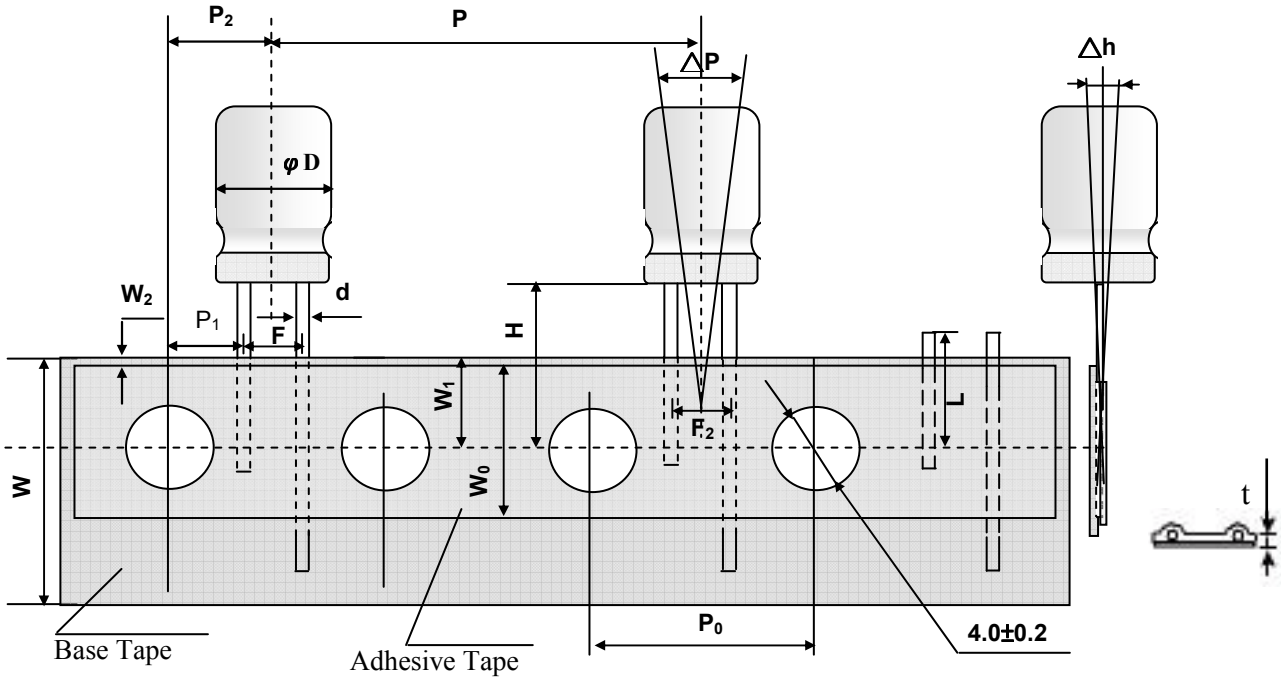


Fig-5 for $\Phi 16\sim 18$ F=7.5(TQ) ;



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Remark: Maximum Taping Dimension: 18mm Diameter										Unit: mm		
Item	Code	TT	TU			TV	TC				TE	TQ
			5	6.3	8		5 / 6.3	8	10	12.5		
Diameter	D	5	5	6.3	8	5 / 6.3	8	10	12.5	8	16/18	
Height	A	5~15	9~15	9~15	10~20	9~15	10~20	9~30	15~35	10~20	15~40	
Lead Diameter	d±0.05	0.45/0.5	0.5	0.5	0.5	0.5	0.5/0.6	0.6	0.6	0.5/0.6	0.8	
Component Spacing	P±1.0	12.7	12.7	12.7	12.7	12.7	12.7	12.7	15	12.7	30	
Pitch of sprocket holes	P ₀ ±0.2	12.7	12.7	12.7	12.7	12.7	12.7	12.7	15	12.7	15	
Distance between centers of terminal	P ₁ ±0.5	5.1	5.1	5.1	4.6	3.85	3.85	3.85	5.0	3.85	3.75	
Feed hole center to component center	P ₂ ±1.0	6.35							7.5	6.35	7.5	
Distance between centers of component leads	F ^{+0.8} _{-0.5}	2.0	2.5	2.5	3.5	5.0	5.0	5.0	5.0	5.0	7.5	
Distance between centers of component leads Adhesive Tape cover	F ₂ ^{+0.8} _{-0.5}	3.5	2.5	3.5	5.0	5.0	5.0	5.0	5.0	5.0	7.5	
Carrier tape width	W ⁺¹ _{-0.5}	18	18	18	18	18	18	18	18	18	18	
Hold down tape width	W ₀	7min							12min	7min	12min	
Distance between the center of upper edge of carrier tape and sprocket hole	W ₁ ±0.5	9										
Distance between the upper edges of the carrier tape and the hold down tape	W ₂	3max										
Distance between the abscissa and the bottom of the components body	H ^{+0.75} _{-0.5}	18.5	18.5	18.5	18.5	18.5	20.0	18.5	18.5	18.5	18.5	
Distance between the abscissa and the reference plane of the components with crimped leads	H ₀ ±0.5	----	----	----	----	16	16	----	----	16	----	
Cut off position of defectives	L	11 max										
Max. lateral deviation of the component body vertical to the tape plane	△h	2 max										
Max. deviation of the component body in the tape plane	△P	1.3 max										

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8. It refers to the latest document of “Environment-related Substances standard”(WI-HSPM-QA-072).

Substances	
Heavy metals	Cadmium and cadmium compounds
	Lead and lead compounds
	Mercury and mercury compounds
	Hexavalent chromium compounds
Chloinated organic compounds	Polychlorinated biphenyls (PCB)
	Polychlorinated naphthalenes (PCN)
	Polychlorinated terphenyls (PCT)
	Short-chain chlorinated paraffins(SCCP)
	Other chlorinated organic compounds
Brominated organic compounds	Polybrominated biphenyls (PBB)
	Polybrominated diphenylethers(PBDE) (including decabromodiphenyl ether[DecaBDE])
	Other brominated organic compounds
Tributyltin compounds(TBT)	
Triphenyltin compounds(TPT)	
Asbestos	
Specific azo compounds	
Formaldehyde	
Beryllium oxide	
Beryllium copper	
Specific phthalates (DEHP,DBP,BBP,DINP,DIDP,DNOP,DNHP)	
Hydrofluorocarbon (HFC), Perfluorocarbon (PFC)	
Perfluorooctane sulfonates (PFOS)	
Specific Benzotriazole	

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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 $\tan \delta$ 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.

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(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.

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(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.

ϕ 6.3~ ϕ 16mm:2mm minimum, ϕ 18~ ϕ 35mm:3mm minimum, ϕ 40mm 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.

(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.

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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 1k Ω .
- (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 1k Ω .
- (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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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 to 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.

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- * (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 from 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 mouth, 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 Ω ,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

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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