HF

PRODUCT SPECIFICATION

PRODUCT: Safety standard certified ceramic capacitor for Automotive

TYPE: AC SERIES (X1:440Vac / Y2: 300Vac / 1500Vdc)

CUSTOMER:

DOC. NO.: POE-D27-00-E-01

符合 RoHS&HF 及其他環保要求；金屬電鍍層不含六價鉻

RoHS &HF& Requirements of Environmental; Prohibit containing Cr+6 in the plating with metal

APPROVED BY CUSTOMER

VENDOR：

☐ **WALSIN TECHNOLOGY CORPORATION**
566-1, KAO SHI ROAD,YANG-MEI
TAO-YUAN, TAIWAN

☐ **PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.**
NO.277,HONG MING ROAD,EASTERN SECTION,
GUANG ZHOU ECONOMIC AND TECHNOLOGY
DEVELOPMENT ZONE,CHINA

☐ **DONGGUAN WALSIN TECHNOLOGY ELECTRONICS CO., LTD.**
NO.638, MEI JING WEST ROAD,XINIUPO,ADMINISTRATIVE ZONE,DALANGTOWN,DONGGUAN
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MANUFACTURE SITE：

☑ **PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.**
NO.277,HONG MING ROAD,EASTERN SECTION,
GUANG ZHOU ECONOMIC AND TECHNOLOGY
DEVELOPMENT ZONE,CHINA

Record of change

Date	Version	Description	page
2019/6/27	00	First edition.	All
2021/9/9	01	Delete Walsin & POE logo.	1

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Application

This specification is applied to following safety standard certified ceramic capacitor Type AC.

Type 7AC is Safety Standard Certified disc ceramic capacitor of Class X1, Y2, and in accordance with AEC-Q200 requirements.

Type 7AC is the capacitor which can be used for the battery charger for Electric Vehicles and Plug-in Hybrid.

Approval standard and certified No.

Safety Standard	Standard No.	Certified No.	Rated volt.
UL	ANSI/UL 60384-14 (2nd ed.)	E146544	X1:440Vac Y2: 300Vac 1500Vdc
ENEC (DEMKO)	EN 60384-14:2013/A1:2016 EN 60384-14:2013	ENEC-01962-A1	
DEMKO	EN 60384-14:2013/A1:2016 EN 60384-14:2013	D-07617	
SEV	EN 60384-14:2013 + A1:16	21.0555	
SEMKO	EN 60384-14:2013+A1	1811994	
FIMKO	EN 60384-14:2013 + A1:16	NSC FI 30460	
NEMKO	EN 60384-14:2013;A1	P18222947	
CQC	IEC60384-14:2013	CQC15001121984	

*Above Certified number may be changed on account of the revision of standards and the renewal of certification.

1. Part number for SAP system

(Ex.)	YU	7	AC	472	M	12	0	D	AF	D	7	W
	(1)	(2)-1	(2)-1	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

(1) Temperature characteristic (identified code)

CODE	Temperature characteristic	Cap. Change
YP	B (Y5P)	±10%
YU	E (Y5U)	-55% to +20%
YV	F (Y5V)	-80% ~ +30%

(2)-1 Rated voltage(identified by 1-figure code)：7 for Automotive

(2)-2 Type(identified by 2-figure code)：AC

(3) Capacitance (identified by 3-figure code)：ex.221=220pF

(4) Capacitance tolerance (identified by code)：K:±10%,M:±20%

(5) Nominal body diameter dimension (Refer to “4. Part numbering/T.C/Capacitance/ Tolerance/Diameter”)

(6) Internal code: 0--Normal, other code--Special control

(7) Lead Style：Refer to “3. Mechanical”.

(8) Packing mode and lead length (identified by 2-figure code): Refer to “3. Mechanical” & “5.Taping Format”

Taping Code	Description
AF	Ammo box and product pitch：15.0 mm
AM	Ammo box and product pitch：25.4 mm

Bulk Code	Description	Bulk Code	Description
03	Lead length： 3.0mm	04	Lead length： 4.0mm
3E	Lead length： 3.5mm	20	Lead length： 20.0mm

(9) Tolerance of lead length

Code	Description	
A	±0.5 mm	Short lead
B	±1.0 mm	Short lead
C	Min.	Long lead
D	Taping special purpose	Taping

(10) Lead space

Code	Description
7	7.5±1.0 mm
M	7.5±0.5 mm
0	10±1.0 mm
A	10±0.5 mm

(11) Epoxy resin code

Code	Description
W	Ag electrode products / Halogen and Pb free, epoxy resin.(for 85C/85% 1000HR).

2. Marking

Type Designation : 7AC

Nominal Capacitance : Identified by 3-Figure Code. Ex. 47pF→"47"，470pF→"471"

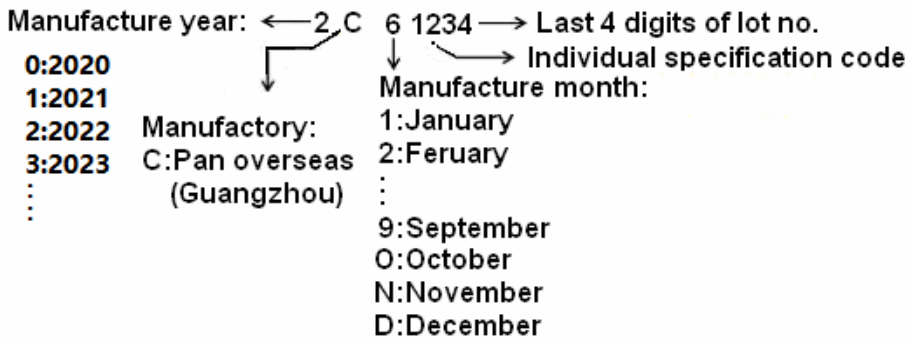
Capacitance Tolerance : K:±10%,M:±20%

Company Name Code (Trade mark) : UK

Class code & Voltage : X1: 440V~ / Y2: 300V~ /1500Vdc

Products ID:

Ex.)



Marking sample

Ex.)

* Marking by the laser.

* " • " : Individual specification code, it is added under the lot no.

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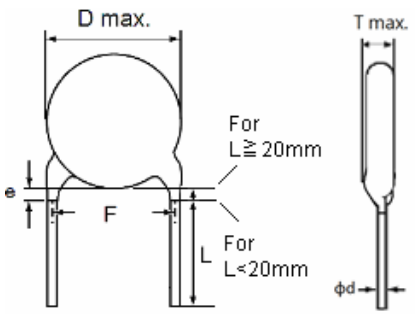
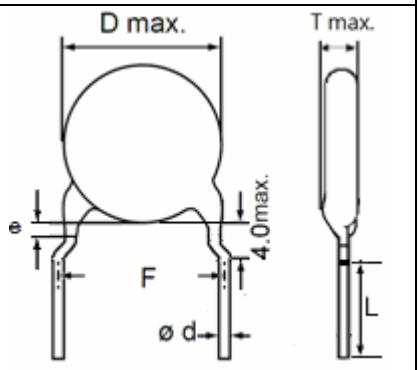
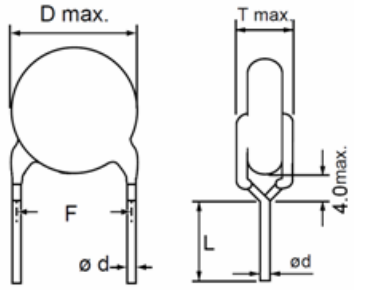
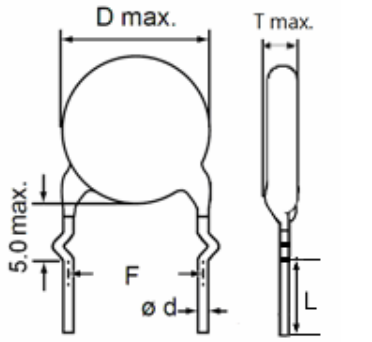
3. Mechanical

Encapsulation：Epoxy resin, flammability UL94 V-0

Available lead code(unit: mm)

Lead type	SAP P/N (13-17)digits	Lead space (F)	Lead Length (L)	Packing	Lead Configuration
Lead style：L or B Type L or B Straight lead	L03B7	7.5 ± 1.0	3.0 ± 1.0	Bulk	
	L4EB7	7.5 ± 1.0	4.5 ± 1.0		
	L05B7	7.5 ± 1.0	5.0 ± 1.0		
	L03B0	10 ± 1.0	3.0 ± 1.0		
	L4EB0	10 ± 1.0	4.5 ± 1.0		
	L05B0	10 ± 1.0	5.0± 1.0		
	L20C7	7.5 ±1.0	20 min.		
	L20C0	10 ± 1.0	20 min.		
	BAFD7	Refer to “5. Taping format”		Tap. Ammo	
	BAMD7				
	BAMD0				
Lead style：G Type G Straight lead	G03A7	7.5 ± 1.0	3.0 ± 0.5	Bulk	
	G3EA7	7.5 ± 1.0	3.5 ± 0.5		
	G04A7	7.5 ± 1.0	4.0 ± 0.5		
	G03A0	10 ± 1.0	3.0 ± 0.5		
	G3EA0	10 ± 1.0	3.5 ± 0.5		
	G04A0	10 ± 1.0	4.0 ± 0.5		
	GAFD7	7.5 ±1.0	Refer to “4. Taping format”	Tap. Ammo	
	GAMD7	7.5 ±1.0			
	GAMD0	10 ± 1.0			
Lead style：D Type D Vertical kink lead	D03A7	7.5 ± 1.0	3.0 ± 0.5	Bulk	
	D3EA7	7.5 ± 1.0	3.5 ± 0.5		
	D04A7	7.5 ± 1.0	4.0 ± 0.5		
	D03A0	10 ± 1.0	3.0 ± 0.5		
	D3EA0	10 ± 1.0	3.5 ± 0.5		
	D04A0	10 ± 1.0	4.0 ± 0.5		
	DAFD7	Refer to “5. Taping format”		Tap. Ammo	
	DAMD7				
	DAMD0				
Lead style：X Type X Outside kink lead	X03A7	7.5 ± 1.0	3.0 ± 0.5	Bulk	
	X3EA7	7.5 ± 1.0	3.5 ± 0.5		
	X04A7	7.5 ± 1.0	4.0 ± 0.5		
	X05B7	7.5 ± 1.0	5.0 ± 1.0		
	X03A0	10 ± 1.0	3.0 ± 0.5		
	X3EA0	10 ± 1.0	3.5 ± 0.5		
	X04A0	10 ± 1.0	4.0 ± 0.5		
	X05B0	10 ± 1.0	5.0 ± 1.0		
	XAFD7	Refer to “5. Taping format”		Tap. Ammo	
	XAMD7				
	XAMD0				

* Lead diameter Φd: 0.60± 0.05mm

* e (Coating **extension** on leads): 3.0mmMax for straight lead style; Not exceed the kink for kink lead.

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4. Part numbering/T.C/Capacitance/ Tolerance/Diameter：

SAP Part. No.	T.C.	Capacitance	Tolerance	Dimensions (unit：mm)				
				D (max)	T	F		φd
						Bulk type	Taping type	
YP7AC101K060*	Y5P	100 pF	±10%	7.5	4.0~6.0	7.5±1, 10±1	7.5±1 (AFD7) Or 10±1 (AMD0)	0.60±0.05
YP7AC151K060*		150 pF	±10%	7.5				
YP7AC221K060*		220 pF	±10%	7.5				
YP7AC331K060*		330 pF	±10%	7.5				
YP7AC471K060*		470 pF	±10%	7.5				
YP7AC561K070*		560pF	±10%	8.5				
YP7AC681K070*		680 pF	±10%	8.5				
YP7AC821K080*		820 pF	±10%	9.5				
YP7AC102K080*		1000 pF	±10%	9.5				
YU7AC102M060*	Y5U	1000 pF	±20%	7.5			7.5±1 (AFD7) Or 10±1 (AMD0)	
YU7AC152M080*		1500 pF	±20%	9.5				
YU7AC222M080*		2200 pF	±20%	9.5	4.2~6.0			
YU7AC332M100*		3300 pF	±20%	11.5				
YU7AC392M120*		3900 pF	±20%	13.5			7.5±1 (AMD7) Or 10±1 (AMD0)	
YU7AC472M120*		4700 pF	±20%	13.5				
YV7AC102M060*	Y5V	1000 pF	±20%	7.5	4.0~6.0		7.5±1 (AFD7) Or 10±1 (AMD0)	
YV7AC152M060*		1500 pF	±20%	7.5				
YV7AC222M060*		2200 pF	±20%	7.5				
YV7AC332M080*		3300 pF	±20%	9.5	4.2~6.0			
YV7AC392M100*		3900 pF	±20%	11.5				
YV7AC472M100*		4700 pF	±20%	11.5				
YV7AC682M120*		6800 pF	±20%	13.5			7.5±1 (AMD7) Or 10±1 (AMD0)	
YV7AC103M140*		10000 pF	±20%	15.5				

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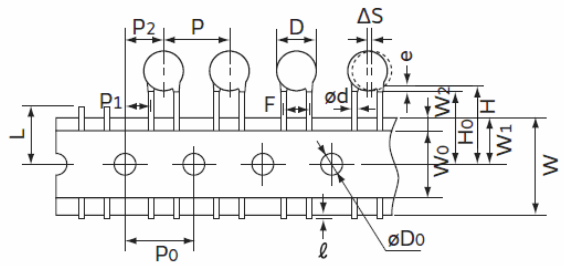
5. Taping Format

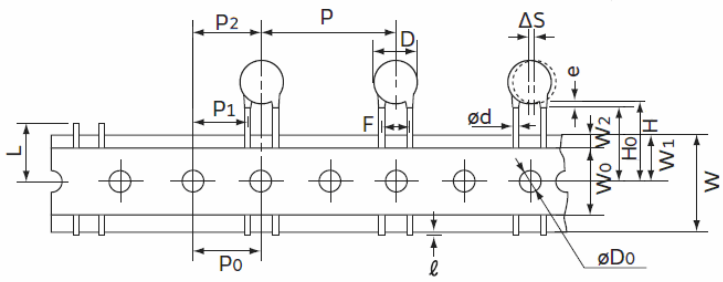
- **15 mm pitch/lead spacing 7.5mm taping**

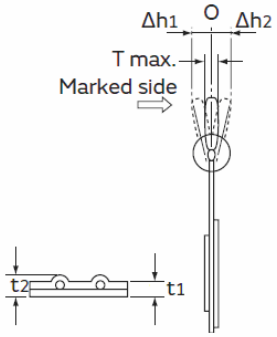
Lead Code: *BAFD7 & *DAFD7 & *XAFD7 &*GAFD7

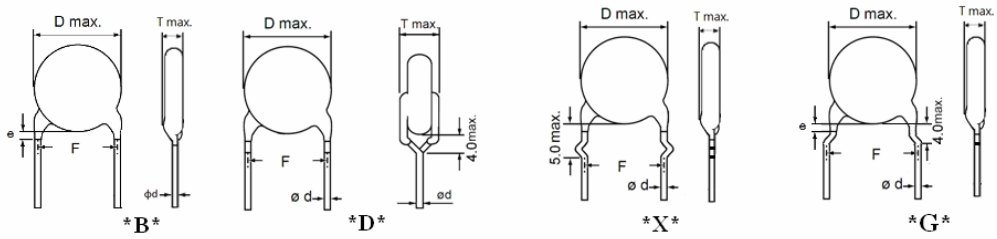


- **25.4mm pitch/lead spacing 7.5mm & 10.0mm taping**

Lead Code: *BAMD* & *DAMD* & *XAMD* &*GAMD*







POE Part Number		*BAFD7 / *DAFD7 *XAFD7 / *GAFD7	*BAMD7 / *DAMD7 *XAMD7 / *GAMD7	*BAMD0 / *DAMD0 *XAMD0 / *GAMD0
Item	Symbol	Dimensions (mm)	Dimensions (mm)	Dimensions (mm)
Pitch of component	P	15.0±1.0	25.4±2.0	25.4±2.0
Pitch of sprocket	P0	15.0±0.3	12.7±0.3	12.7±0.3
Lead spacing	F	7.5±1.0	7.5±1.0	10.0±1.0
Length from hole center to component center	P2	7.5±1.5	12.7±1.5	12.7 ± 1.5
Length from hole center to lead	P1	3.75±1.0	8.95±1.0	7.7±1.5
Body diameter	D	See the “3. Part numbering/T.C/Capacitance/ Tolerance/Diameter”		
Deviation along tape, left or right	△ S	0±2.0		
Carrier tape width	W	18.0 +1/-0.5		
Position of sprocket hole	W1	9.0±0.5		
Lead distance between the kink and center of sprocket hole	H0	18.0+2.0/-0 (For: *DAFD7 / *XAFD7/ *GAFD7)	18.0+2.0/-0 (For: *DAMD7 / *XAMD7 / *GAMD7)	18.0+2.0/-0 (For: *DAMD0 / *XAMD0 / *GAMD0)
Lead distance between the bottom of body and the center of sprocket hole	H	20.0+1.5/-1.0 (For: *BAFD7)	20.0+1.5/-1.0 (For: *BAMD7)	20.0+1.5/-1.0 (For: *BAMD0)
Length from the terminal of the lead wire to the edge of carrier tape	ℓ	+0.5 to -1.0 (Or the end of lead wire may be inside the hole-down tape.)		
Diameter of sprocket hole	D0	4.0±0.2		
Lead diameter	φd	0.55±0.05		
Total tape thickness	t1	0.6±0.3		
Total thickness, tape and lead wire	t2	1.5 max.		
Deviation across tape	△ h1/△ h2	2.0 max.		
Portion to cut in case of defect	L	11.0 max.		
Hole-down tape width	W0	8.0 min		
Hole-down tape distortion	W2	1.5±1.5		
Coating extension on leads	e	3.0 max for straight lead style; Not exceed the kink leads for kink lead.		
Body thickness	T	See the “3. Part numbering/T.C/Capacitance/ Tolerance/Diameter”		

6. Specification and test method

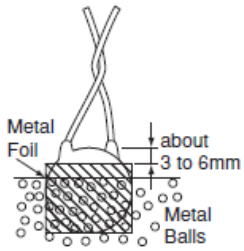
6.1 Operating Temperature Range : -40 to +125°C

6.2 Test condition:

Test and measurement shall be made at the standard condition. (temperature 15~35℃, relative humidity 45~75% and atmospheric pressure 860~1060hpa). Unless otherwise specified herein.

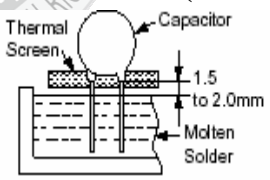
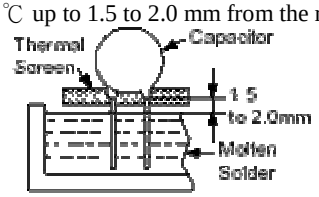
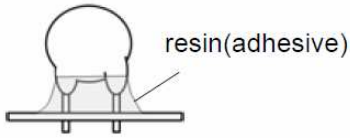
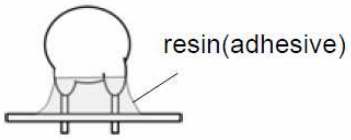
If doubt occurred on the value of measurement, and measurement was requested by customer capacitors shall be measured at the reference condition. (temperature 20±2℃or25 ± 2℃, relative humidity 60~70% and atmospheric pressure 860~1060hpa.)

6.3 Performance:

No	Item		Specification	Testing Method
1	Appearance and dimensions		No marked defect on appearance form and dimensions. Please refer to [Part number list].	The capacitor should be inspected by naked eyes for visible evidence of defect. Dimensions should be measured with slide calipers.
2	Marking		To be easily legible.	The capacitor should be inspected by naked eyes.
3	Capacitance		Within specified tolerance	The capacitance should be measured at 20°C with 1±0.2kHz and AC5V(r.m.s.) max.
4	Dissipation Factor(D.F.)		Char. / Specifications B(Y5P) E(Y5U): 2.5% max. F(Y5V): 5.0% max.	
5	Insulation Resistance(I.R.)		10000MΩ min.	The insulation resistance should be measured with DC500±50V within 60±5 s of charging. The voltage should be applied to the capacitor through a resistor of 1MΩ
6	Dielectric Strength	Between terminals	No failure.	The capacitor should not be damaged when AC2600V(r.m.s.) <50/60Hz> is applied between the lead wires for 60 s. (Charge/Discharge current ≦50mA.)
		Body Insulation	No failure.	First, the terminals of the capacitor should be connected together. Then, a metal foil should be closely wrapped around the body of the capacitor to the distance of about 3 to 6mm from each terminal. Then, the capacitor should be inserted into a container filled with metal balls of about 1mm diameter.  Finally, AC2600V (r.m.s.)<50/60Hz> is applied for 60 s between the capacitor lead wires and metal balls. (Charge/Discharge current ≤ 50mA.)
7	Temperature Characteristic		Char. / Capacitance Change B(Y5P): Within ± 10% E(Y5U): Within +20/-55% F(Y5V): Within -80~+30% (Temp. range: -25 to +85°C)	The capacitance measurement shall be made at each step specified in table. Step: 1, 2, 3, 4, 5 Temp.(℃): +20±2, -25±2, +20±2, +85±2, +20±2 •Pre-treatment Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.

※ "C" expresses nominal capacitance value (pF).

※ "room condition" temperature：15~35℃, humidity：45~75%,atmospheric pressure：86~106kPa

No	Item		Specification	Testing Method
8	Solderability		Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.	Should be placed into steam aging for 8 h 15min. After the steam aging, the lead wire of a capacitor should be dipped into a ethanol solution of 25% rosin and then into molten solder for 5+0/-0.5 sec. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires. Temp. of solder: Lead Free Solder(Sn-3Ag-0.5Cu) 245 5°C H63 Eutectic Solder 235 5°C
9	Soldering Effect (Non-Preheat)	Appearance	No marked defect	As shown in figure, the lead wires should be immersed in solder of 350 ± 10 ℃ or 260 ± 5 ℃ up to 1.5 to 2.0mm from the root of Terminal for 3.5 ± 0.5 sec (10 ± 1 sec for 260± 5 ℃)  •Pre-treatment Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements. •Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.
		I.R.	1000MΩ min.	
		Dielectric Strength	Per Item 6.	
		Capacitance Change	Within ±10%	
10	Soldering Effect (On-Preheat)	Appearance	No marked defect.	First the capacitor should be stored at 120 + 0 / -5 ℃ for 60 + 0 / -5sec. Then, as in figure , the lead wires should be immersed solder of 260 + / -5 ℃ up to 1.5 to 2.0 mm from the root of terminal for 7.5 +0 / -1 sec.  •Pre-treatment Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements. •Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.
		I.R.	1000MΩ min.	
		Dielectric Strength	Per Item 6.	
		Capacitance Change	Within ±10%	
11	Vibration	Appearance	No marked defect.	Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin(adhesive).  The capacitor should be firmly soldered to the supporting lead wire, 1.5mm in total amplitude, with about 20 minutes rate of vibration change from 10Hz to 2000Hz and back to 10Hz. This motion should be applied for 12 times in each 3 mutually perpendicular directions (total of 36 times). The acceleration is 5g max..
		Capacitance	Within the specified tolerance.	
		D.F.	Char. / Specifications B(Y5P) E(Y5U): 2.5% max. F(Y5V): 5.0% max.	
12	Mechanical Shock	Appearance	No marked defect.	Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin(adhesive).  Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s.
		Capacitance	Within the specified tolerance.	
		D.F.	Char. / Specifications B(Y5P) E(Y5U): 5.0% max. F(Y5V): 7.5% max.	
		I.R.	10000MΩ min.	

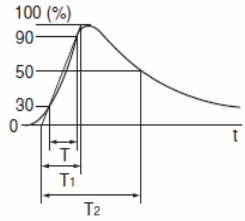
※ "room condition" temperature：15~35℃, humidity：45~75%,atmospheric pressure：86~106kPa
※ "C" expresses nominal capacitance value (pF).

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Humidity
(Under Steady State)</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Set the capacitor for 1000±12 h at 85±3 ℃ in 80 to 85% relative humidity.

•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.

•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B(Y5P)： Within ±10%
E(Y5U)： Within ±15%
F(Y5V)： Within ±30%</td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B(Y5P)
E(Y5U)</td><td>5.0% max.</td></tr><tr><td>F(Y5V)</td><td>7.5% max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric strength</td><td>Per Item 6</td></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Apply the rated voltage for 1000±12 h at85±3℃, in 80 to 85% humidity.

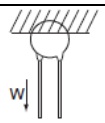
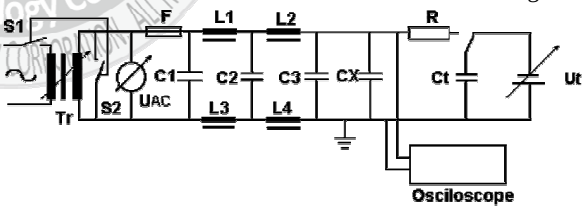
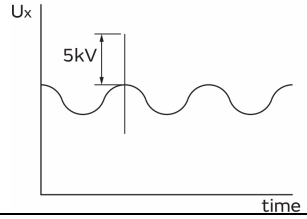
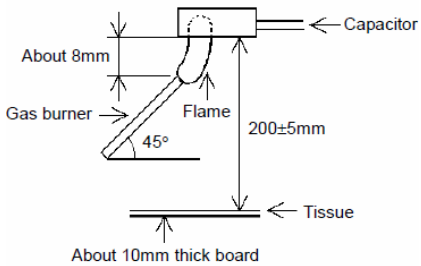
•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.

•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B(Y5P)： Within ±10%
E(Y5U)： Within ±15%
F(Y5V)： Within ±30%</td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B(Y5P)
E(Y5U)</td><td>5.0% max.</td></tr><tr><td>F(Y5V)</td><td>7.5% max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric strength</td><td>Per Item 6.</td></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="4">Impulse Voltage:
Each individual capacitor shall be subjected to 5kv impulses for three times. Then the capacitors are applied to life test.
The waveform will be determined by the test circuit parameters.
Details of the test circuit are given in IEC 60384-14 Annex A.
 

Front time (T1) =1.2μs=1.67T
Time to half-value (T2) =50μs

The capacitors are placed in a circulating air oven for a period of 1000 h.
The air in the oven is maintained at a temperature of 125+2/-0℃, and relative humidity of 50% max..
Throughout the test, the capacitors are subjected to a AC510V(r.m.s.) <50/60Hz> alternating voltage of mains frequency.
•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.
•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±20%</td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
</table>

※ “room condition” temperature：15~35℃, humidity：45~75%,atmospheric pressure：86~106kPa
※ "C" expresses nominal capacitance value (pF).

No	Item		Specification	Testing Method
16	Robustness of terminations	Tensile	Lead wire shall not cut off capacitor shall not be broken.	As shown in the figure at right, fix the body of the capacitor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N and keep it for 10±1 sec. 
		Bending		Each lead wire should be subjected to 5N of weight and bent 90° at the point of egress, in one direction, then returned to its original position, and bent 90° in the opposite direction at the rate of one bend in 2 to 3 s.
17	Active Flammability		The cheese-cloth shall not be on fire.	The capacitors shall be individually wrapped in at least one, but more then two, complete layers of cheese-cloth. The capacitors shall be subjected to 20 discharges. The interval between successive discharges shall be 5sec. The Uac shall be maintained for 2 min. after the last discharge.  C1,2：1μF±10% C3：0.033μF±5% 10KV L1-4：1.5mH±20% 16A Rod core choke R ：100Ω±2% Ct：3μF±5% 10KV Uac：Ur±5% Ur：Rated working voltage Cx ：Capacitor under test F ：Fuse, Rated 10A Ut ：Voltage applied to Ct 
18	Passive Flammability		The burning time shall not be exceeded the time 30 sec. The tissue paper shall not ignite.	The capacitor under test shall be held in the flame in the position, which best promotes burning. Each specimen shall only be exposed once to the flame. Time of exposure to flame：30 sec Length of flame：12±1 mm Gas burner：Length 35 mm min. Inside Dia.：0.5±0.1 mm Outside Dia.：0.9 mm max. Gas ：Butane gas Purity 95% min. 

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="4">20</td><td rowspan="4">Temperature Cycle</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">The capacitor should be subjected to 1000 temperature cycles,
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min)</th></tr><tr><td>1</td><td>-55+0/-3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>3</td></tr><tr><td>3</td><td>125+3/-0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>3</td></tr></table>•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.
•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
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F(Y5V)</td><td>7.5% max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td rowspan="4">21</td><td rowspan="4">High Temperature Exposure (Storage)</td><td>Dielectric strength</td><td>Per Item 6</td></tr>
<tr><td>Capacitance Change</td><td>Within ±20%</td><td rowspan="4">Sit the capacitor for 1,000±12 h at 150±3°C.
•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.
•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B(Y5P)</td><td>5.0% max.</td></tr><tr><td>E(Y5U)
F(Y5V)</td><td>7.5% max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td rowspan="4">22</td><td rowspan="4">Thermal Shock</td><td>Appearance</td><td>No marked defect except color change of outer coating.</td><td rowspan="4">The capacitor should be subjected to 300 cycles.
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min)</th></tr><tr><td>1</td><td>-55+0/-3</td><td>30</td></tr><tr><td>2</td><td>125+3/-0</td><td>30</td></tr></table>•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.
•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
<tr><td>Capacitance change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B(Y5P)</td><td>Within ± 10%</td></tr><tr><td>E(Y5U)
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F(Y5V)</td><td>7.5% max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td rowspan="4">23</td><td rowspan="4">Resistance to Solvents</td><td>Appearance</td><td>No marked defect.</td><td rowspan="4">Per MIL-STD-202 Method 215
Solvent 1 : 1 part (by volume) of isopropyl alcohol
3 parts (by volume) of mineral spirits
Solvent 2 : Terpene defluxer
Solvent 3 : 42 parts (by volume) of water
1part (by volume) of propylene glycol monomethyl ether
1 part (by volume) of monoethanolamine</td></tr>
<tr><td>Capacitance change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B(Y5P)</td><td>Within ± 10%</td></tr><tr><td>E(Y5U)
F(Y5V)</td><td>Within ± 20%</td></tr></table></td></tr>
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F(Y5V)</td><td>7.5% max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td rowspan="4">24</td><td rowspan="4">Biased Humidity</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Apply the rated voltage and DC1.3+0.2/-0 V (add 100kΩ resistor) at 85±3°C and 80 to 85% humidity for 1,000±12 h.
•Pre-treatment
Capacitor should be stored at 125±2 ℃ for 1 h, then placed at *room condition for 24±2 h before initial measurements.
•Post-treatment
Capacitor should be stored for 1 to 2 h at *room condition.</td></tr>
<tr><td>Capacitance change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B(Y5P)</td><td>Within ± 10%</td></tr><tr><td>E(Y5U)</td><td>Within ± 15%</td></tr><tr><td>F(Y5V)</td><td>Within ± 20%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B(Y5P)</td><td>5.0% max.</td></tr><tr><td>E(Y5U)
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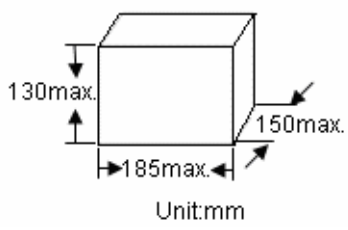
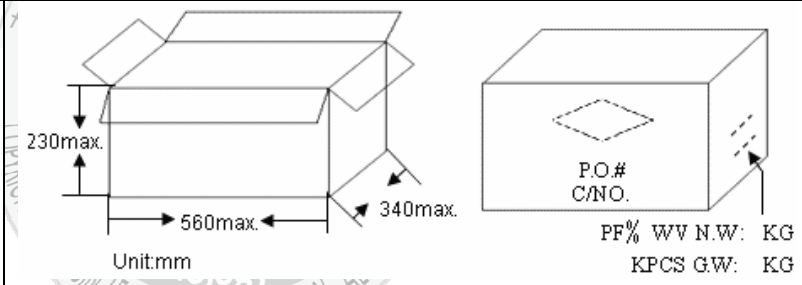
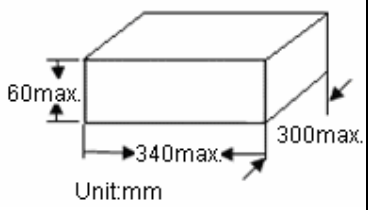
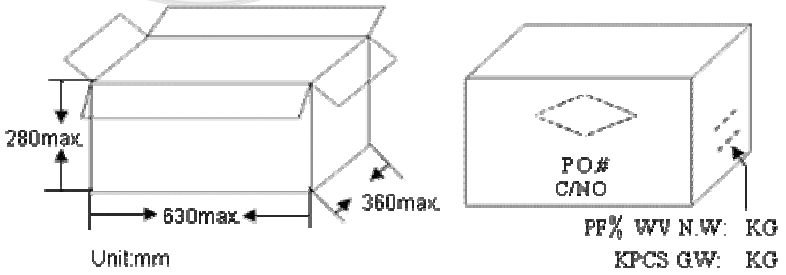
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
</table>

※ "room condition" temperature：15~35℃, humidity：45~75%,atmospheric pressure：86~106kPa
※ "C" expresses nominal capacitance value (pF).

7.Packing Baggage：

7.1 Packing size:

Type	Box	Carton
Bulk		
Ammo taping		

7.2 Packing quantity:

Packing type	The code of 14th to15th in SAP P/N	MPQ(Kpcs/Box)
Taping	AF	1
	AM (The size code≦11)	1
	AM (The size code≧12)	0.5

Packing type	Lead length	Size code of 10th to 11th in SAP P/N	MPQ (Kpcs/Bag)	Kpcs/Box
Bulk	Long lead (L≧20mm)	06~12	0.5	1.5
		13-14	0.5	1
	Short lead (L＜20mm)	06~14	0.5	2

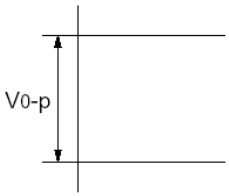
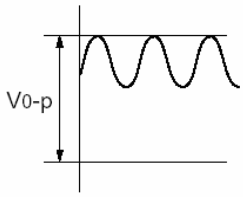
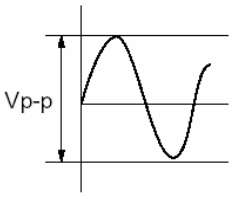
7.3 Label samples:

8. Caution:

8.1 Operating voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the Vo-p which contains DC bias within the rated voltage range.

When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use a capacitor within rated voltage containing these irregular voltage.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage
Positional measurement			

8.2 Operating temperature and self-generated heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself.

8.3 Test condition for withstanding voltage

(1) Test equipment

Test equipment for AC withstanding voltage should be used with the performance of the wave similar to 50/60 Hz sine wave.

If the distorted sine wave or over load exceeding the specified voltage value is applied, the defective may be caused.

(2) Voltage applied method

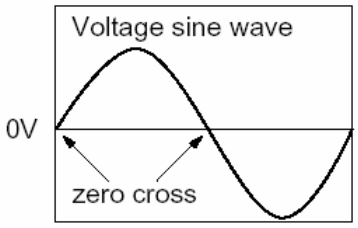
When the withstanding voltage is applied, capacitor's lead or terminal should be firmly connected to the out-put of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, test voltage should be applied with the *zero cross. At the end of the test time, the test voltage should be reduced to near zero, and then capacitor's lead or terminal should be taken off the out-put of the withstanding voltage test equipment.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, the surge voltage may arise, and therefore, the defective may be caused.

*ZERO CROSS is the point where voltage sine wave pass 0V.

- See the right figure –



8.4 Fail-Safe

When capacitor would be broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure would follow an electric shock, fire or fume.

8.5 Vibration and impact

Do not expose a capacitor or its leads to excessive shock or vibration during use. Excessive shock or vibration may cause to fatigue destruction of lead wires mounted on the circuit board. Please take measures to hold a capacitor on the circuit boards by adhesive, molding resin or coating and other.

Please confirm there is no influence of holding measures on the product with a intended equipment.

8.6 Soldering

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

When soldering capacitor with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip : 400 ℃ max.

Soldering iron wattage : 50W max.

Soldering time : 3.5s max.

8.7 Bonding, resin molding and coating

In case of bonding, molding or coating this product, verify that these processes do not affect the quality of capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.

In case of the amount of applications, dryness / hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit.

The variation in thickness of adhesive, molding resin or coating may cause an outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

8.8 Treatment after bonding, resin molding and coating

When the outer coating is hot (over 100 ℃) after soldering, it becomes soft and fragile.

So please be careful not to give it mechanical stress.

Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

8.9 Operating and storage environment

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 ℃ and 15 to 85%.

Use capacitors within 6 months after delivered. Check the solderability after 6 months or more.

8.10 Limitation of applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

1. Aircraft equipment
2. Aerospace equipment
3. Undersea equipment
4. Power plant control equipment
5. Medical equipment
6. Transportation equipment (vehicles, trains, ships, etc.)
7. Traffic signal equipment
8. Disaster prevention / crime prevention equipment
9. Data-processing equipment exerting influence on public
10. Application of similar complexity and/or reliability requirements to the applications listed in the above.

9. Notices:

9.1 Cleaning (ultrasonic cleaning):

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity : Output of 20 watts per liter or less.

Rinsing time : 5 min maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

9.2 Capacitance change of capacitors

Class 2 and 3 capacitors

Class 2 and 3 capacitors like temperature characteristic B, E and F have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor leaves for a long time. Moreover, capacitance might change greatly depending on a surrounding temperature or an applied voltage. So, it is not likely to be able to use for the time constant circuit.

Please contact us if you need a detail information.

9.3 Performance check by equipment

Before using a capacitor, check that there is no problem in the equipment's performance and the specifications.

Generally speaking, CLASS 2 ceramic capacitors have voltage dependence characteristics and temperature dependence characteristics in capacitance. So, the capacitance value may change depending on the operating condition in a equipment. Therefore, be sure to confirm the apparatus performance of receiving influence in a capacitance value change of a capacitor, such as leakage current and noise suppression characteristic.

Moreover, check the surge-proof ability of a capacitor in the equipment, if needed, because the surge voltage may exceed specific value by the inductance of the circuit.

10. Note

10.1 Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

10.2 You are requested not to use our product deviating from this specification.

11. Soldering Recommendation：

11.1 Wave Soldering Profile:

- Temperature conditions of the flow is recommended as shown in the chart
- Must implement the pre-heat
- Maximum peak flow temperature is recommended 265℃
- Time " T " implement in the chart recommended within 20 sec. it temperature exceed 200℃
- Take care with the flow solder not to touch the capacitor body directly at mounting

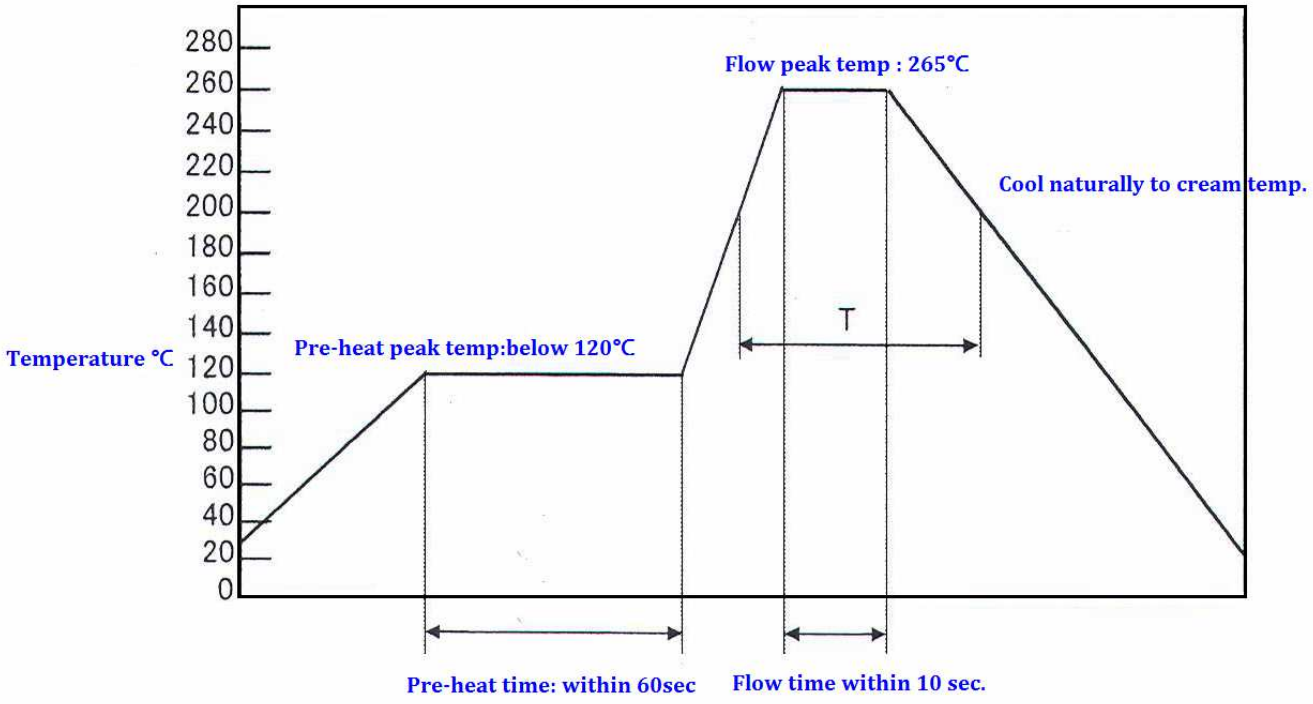


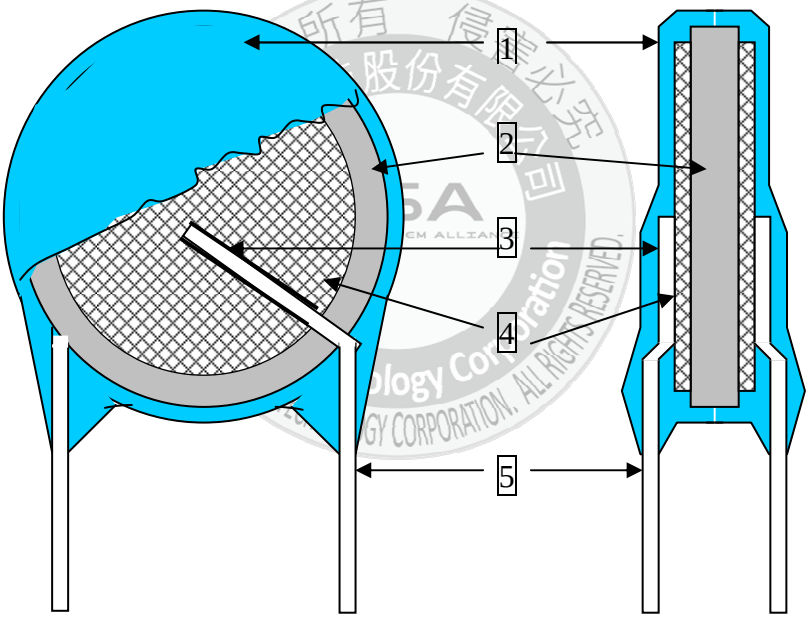
Chart to show flow recommended temp

11.2 Recommended Reworking Conditions with Soldering Iron：

- Temperature of iron-tip: 400 degrees C. max.
- Soldering iron wattage: 50W max.
- Soldering time: 3.5 sec. max.
- Distance from coating body: 2 mm (min.)

11.3 Reflow-Soldering：Lead Ceramic Cap. should not be soldered by reflow-soldering.

12. Drawing of internal structure and material list：



Remarks：

No.	Part name	Material	Component
1	Insulation Coating	Epoxy polymer	Epoxy resin、Pigment (Blue / UL 94 V-0)
2	Dielectric Element	Ceramic	Y5P: BaTiO3/Bi2O3/SnO2/CeO2 Y5U: BaTiO3/ZrO2/ CaCO3 Y5V: BaTiO3/ WO3/ CeO2
3	Solder	Tin-silver	Sn96.5-Ag3-Cu0.5
4	Electrodes	Ag	Confidentiality
5	Leads wire	Tinned copper clad steel wire	Sn2.5 [Surface plating: Sn 100%(3~7μm)]、 Cu5 & Fe92.5 [Substrate metal]

***Constituent structure chart of lead**