PRODUCT SPECIFICATION

PRODUCT: CERAMIC DISC CAPACITOR

TYPE: LN Series (Low Dissipation Factor/DC 1kV,2kV)

(Lead free of dielectric ceramic)

CUSTOMER: _____

DOC. NO.: POE-D19-00-E-09

Ver.: 9

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,
HUANGPU DISTRICT ,GUANG ZHOU,CHINA

MAKER：PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.
NO.277,HONG MING ROAD,EASTERN SECTION,
HUANGPU DISTRICT ,GUANG ZHOU,CHINA

Record of change

Date	Version	Description	page
2015/2/28	**1**	**1. New series (LN Type/DC 1kV & 2KV/Lead free of dielectric ceramic) for low dissipation ceramic disc capacitor**	
2016/3/7	2	1. Review the Available lead code of Lead Configuration. 2. Add 9. Drawing of internal structure and material list.	5 18
2019/9/19	3	1. Review TCC of LN(Y5R) type. 2. Review the dimensions T max for the item LR202* from “5.5mm” to be “5.0mm”.	4 6
2020/12/15	4	1. Review the Item 8.1 **Caution (Rating):** Allowable conditions at high frequency	16
2021/9/9	5	1. Delete Walsin & POE logo.	1
2022/4/21	6	1. Add 8.5 List of substances that affect the insulation strength of coating	20
2024/7/10	7	1. Review the “Capacitance change rate” from “±15%(-25℃ to +85℃)” to be “±15%(-25℃ to +85℃) and + 15 ~ -30%(+85℃to+125℃)”	4,7,12
2025/4/10	8	1. Add the Part No. of “LN102271K060”	6
2025/7/11	9	1. Revise the temp.(TCC): Y5R(-25℃ to 85℃/ 85℃to 125℃) & Cap. Change(±30% /±40%) 2. Review the Packing quantity 3. Review the Drawing of Internal Structure and material list	4,7,12 8 22

Table of Contents

1. Part number for SAP system(total eighteen code)：

LN	102	471	K	070	B	20	C	5	H
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶ Material code: Low Dissipation Factor (Low DF), Operating Temperature Range: –25℃ to +125℃

Code	LN(Y5R)
Capacitance change rate	±30%（-25℃ to +85℃） ±40%（+85℃to+125℃）
D.F.	≤0.2%

***Unique feature: Lead free of dielectric ceramic**

❷ Rated voltage (Vdc)：

Voltage	1000V	2000V
Code	102	202

❸Capacitance(pF)：

Capacitors (pF)	100	470	1000
Code	101	471	102

❹Capacitance tolerance：±10%，Code is “K”

❺ Nominal body diameter dimension (Ref. to page.6 Dmax. & Tmax. Code spec.) .

❻ Code of lead type：Please refer to Item “2. Mechanical”

❼Packing mode and lead’s length (identified by 2-figure code)

Taping Code	Description
AN	Ammo / Pitch of component:12.7 mm / Lead space5.0mm
AF	Ammo / Pitch of component:15.0 mm / Lead space7.5mm
AM	Ammo / Pitch of component:25.4 mm / Lead space10.0mm

Bulk Code	Description	Bulk Code	Description
03	Lead’s length L：3.0mm	4E	Lead’s length L：4.5mm
3E	Lead’s length L：3.5mm	05	Lead’s length L：5.0mm
04	Lead’s length L：4mm	20	Lead’s length L：20mm

❽Length tolerance

Code	Description	
A	±0.5 mm(Only for short kink lead code “D / X / H”)	Short lead
B	±1.0 mm	Short lead
C	Min.	Long lead
D	Taping special purpose	Taping

❾Pitch

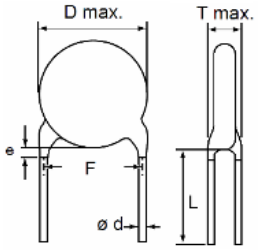
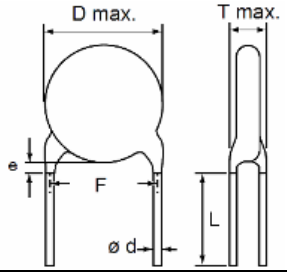
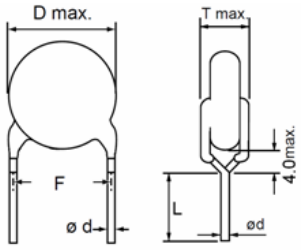
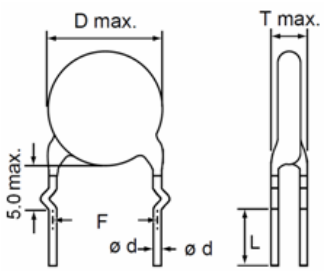
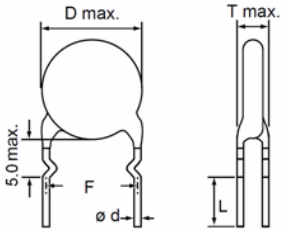
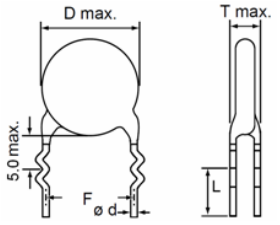
Code	Description	Code	Description
5	5.0±0.8mm (For Bulk)	7	7.5 ±1mm
5	5.0+0.8mm-0.2mm (For Taping)	0	10.0 ±1mm

❿Epoxy Resin Code

Code	Description
H	Halogen and Pb free , epoxy resin

2. Mechanical:

Available lead code (Epoxy resin coating) **(unit: mm)**

Lead code	SAP P/N (13-17)digits	Pitch (F)	Lead Length (L)	Packing	Lead Configuration
Lead style：B Straight long lead	B20C5	5.0±0.8	20 MIN.	Bulk	
	B20C7	7.5±1.0	20 MIN.		
	B20C0	10±1.0	20 MIN.		
	BAND5	5.0+0.8-0.2	Taping spec. (Refer to item6)	Ammo taping	
	BAFD7	7.5±1.0			
	BAMD7	7.5±1.0			
	BAMD0	10±1.0			
Lead style：L Straight short lead	L04B5	5.0±0.8	4.0 ± 1.0	Bulk	
	L04B7	7.5 ± 1.0	4.0 ± 1.0		
	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		
	L10B0	10 ± 1.0	10.0 ± 1.0		
Lead style：D Vertical kink lead	D05A5	5.0±0.8	5.0 ± 0.5	Bulk	
	D04A7	7.5 ± 1.0	4.0 ± 0.5		
	D3EA0	10 ± 1.0	3.5 ± 0.5		
	D04A0	10 ± 1.0	4.0 ± 0.5		
	D20C5	5.0±0.8	20 MIN.		
	D20C7	7.5 ± 1.0	20 MIN.		
	D20C0	10 ± 1.0	20 MIN.		
	DAND5	5.0+0.8-0.2	Taping spec. (Refer to item6)	Ammo taping	
	DAFD7	7.5 ± 1.0			
	DAMD7	7.5 ± 1.0			
	DAMD0	10 ± 1.0			
Lead style：X Outside kink lead	X04A5	5.0±0.8	4.0 ± 0.5	Bulk	
	X04A7	7.5 ± 1.0	4.0 ± 0.5		
	X05B7	7.5 ± 1.0	5.0 ± 1.0		
	X3EA0	10 ± 1.0	3.5 ± 0.5		
	X04A0	10 ± 1.0	4.0 ± 0.5		
	XAND5	5.0+0.8-0.2	Taping spec. (Refer to item6)	Ammo taping	
	XAFD7	7.5 ± 1.0			
	XAMD7	7.5 ± 1.0			
	XAMD0	10 ± 1.0			
Lead style：H Inside kink lead	H04A5	5.0±0.8	4.0 ± 0.5	Bulk	
	H04A7	7.5 ± 1.0	4.0 ± 0.5		
	H04A0	10 ± 1.0	4.0 ± 0.5		
	H4EB0	10 ± 1.0	4.5 ± 1.0		
	HAND5	5.0+0.8-0.2	Taping spec. (Refer to item6)	Ammo taping	
	HAFD7	7.5 ± 1.0			
	HAMD7	7.5 ± 1.0			
	HAMD0	10 ± 1.0			
Lead style：M Double Outside Kink Lead	M04A5	5.0±0.8	4.0 ± 0.5	Bulk	
	M04A7	7.5 ± 1.0	4.0 ± 0.5		
	M04A0	10 ± 1.0	4.0 ± 0.5		

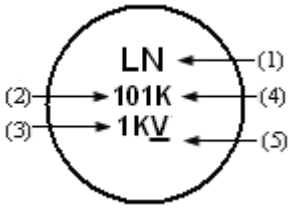
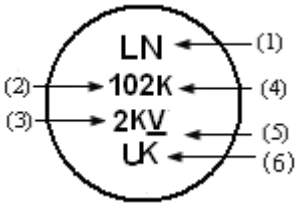
※ Lead diameter φ= 0.55+/-0.05 mm

※e (Coating extension on leads): 3.0mmMax for straight lead style, not exceed the kink for kink lead.

3. Capacitance value vs. rated voltage, product diameter:

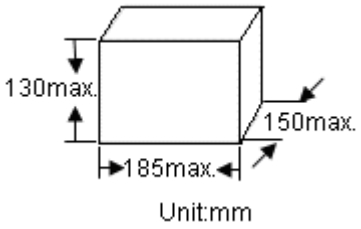
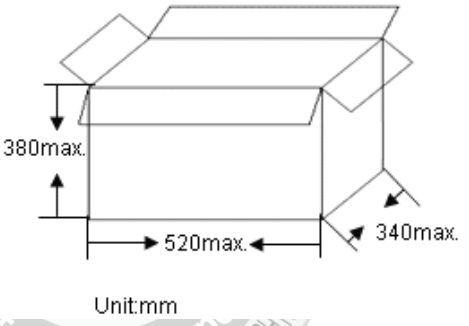
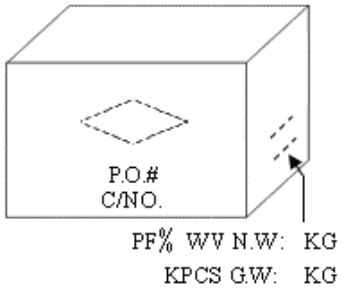
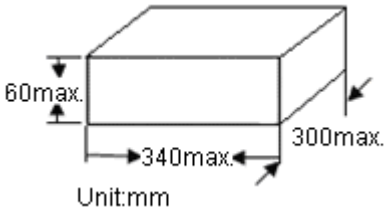
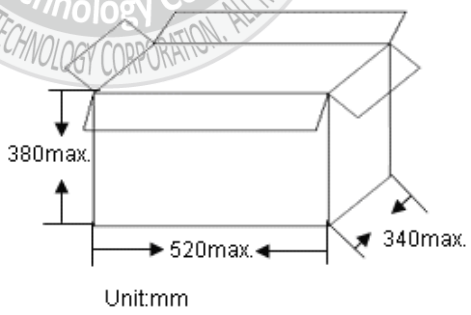
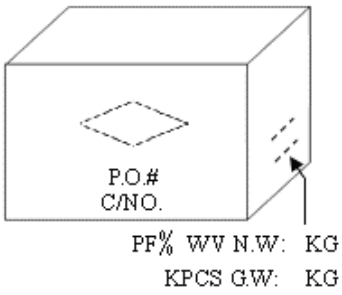
Part Number	Rated Volt.	Cap. in pF	Cap. Tol.(%)	Dimensions in mm	
				D max.	T max.
LN102101K050□□□□□	1000VDC	100	±10%	6.5	4.5
LN102151K050□□□□□	1000VDC	150	±10%	6.5	4.5
LN102221K050□□□□□	1000VDC	220	±10%	6.5	4.5
LN102241K060□□□□□	1000VDC	240	±10%	7.5	4.5
LN102271K060□□□□□	1000VDC	270	±10%	7.5	4.5
LN102331K060□□□□□	1000VDC	330	±10%	7.5	4.5
LN102471K070□□□□□	1000VDC	470	±10%	8.5	4.5
LN102681K090□□□□□	1000VDC	680	±10%	10.5	4.5
LN102821K100□□□□□	1000VDC	820	±10%	11.5	4.5
LN102102K100□□□□□	1000VDC	1000	±10%	11.5	4.5
LN202101K050□□□□□	2000VDC	100	±10%	6.5	5.0
LN202151K050□□□□□	2000VDC	150	±10%	6.5	5.0
LN202221K060□□□□□	2000VDC	220	±10%	7.5	5.0
LN202331K070□□□□□	2000VDC	330	±10%	8.5	5.0
LN202471K080□□□□□	2000VDC	470	±10%	9.5	5.0
LN202681K090□□□□□	2000VDC	680	±10%	10.5	5.0
LN202821K100□□□□□	2000VDC	820	±10%	11.5	5.0
LN202102K110□□□□□	2000VDC	1000	±10%	12.5	5.0

4. Marking:

Marking sample / Marking Items and definition	Body size≤060	Body size≧070
		
(1). Temp. char. and D.F.	Temp.char. : LN Cap. change: ±30%(-25℃ to +85℃) ±40%（+85℃to+125℃） D.F.:0.2% Max.	
(2). Nominal capacitance	Identified by 3-Figure Code. Ex. 100pF→"101"，1000 pF→"102"	
(3). Rated voltage	1KV: 1000Vdc;　2KV: 2000Vdc	
(4).Capacitance tolerance	K=±10%	
(5). Halogen and Pb free	When the epoxy resin is Halogen and Pb free, there is a "_"marking.	
(6).Manufacturer's identification	Shall be marked as "UK", but when body size≤060 shall be omitted.	

5. Packing Baggage：

5.1 Packing size:

Type	Box	Carton
Bulk		 
Ammo taping		 

5.2 Packing quantity:

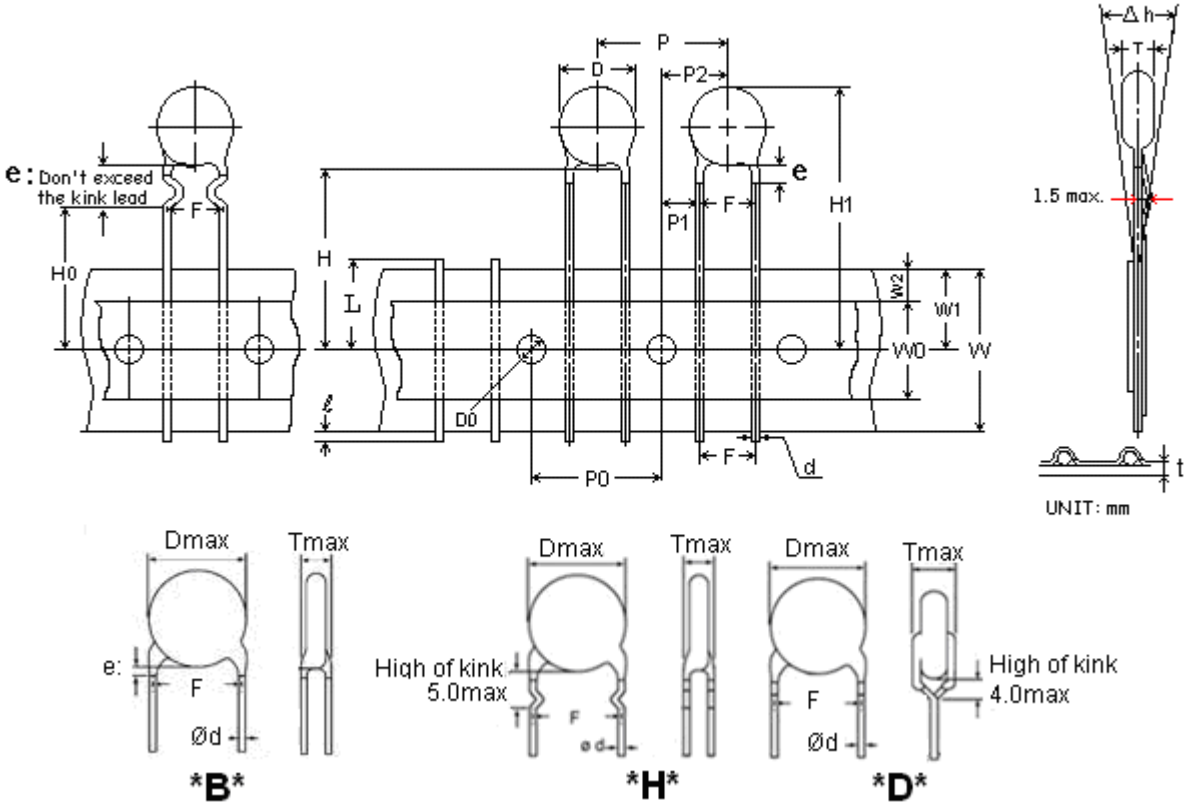
Packing Type	The code of 14th to15th in SAP P/N	MPQ (Kpcs/Box)
Taping	AN	1.5
	AF	1
	AM (The size code≦11)	1
	AM (The size code≧12)	0.5

Packing Type	Lead length	Size code of 10th to 12th in SAP P/N	MPQ (Kpcs/Bag)	Kpcs/Box
Bulk	Long lead (L≧16mm)	050~100	1	2
		110	0.5	1.5
	Short lead (L＜16mm)	050~060	1	6
		070~080	1	4
		090~100	1	3
		110	1	2

6. Taping specifications:

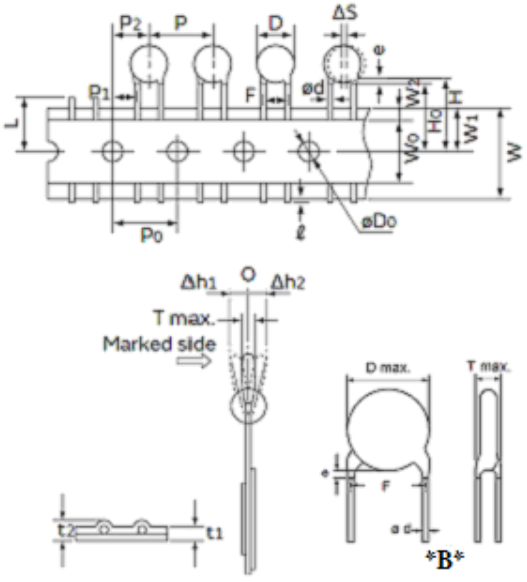
- **12.7mm pitch/lead spacing 5.0mm taping**

Lead code: *BAND5 & *DAND5 & *HAND5

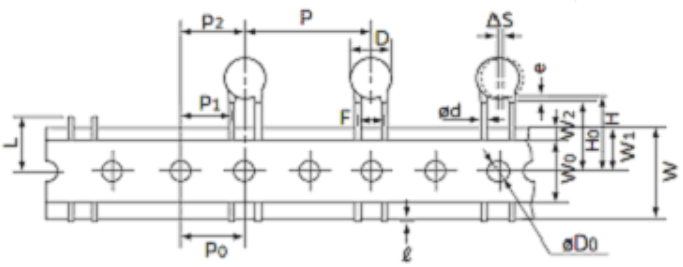


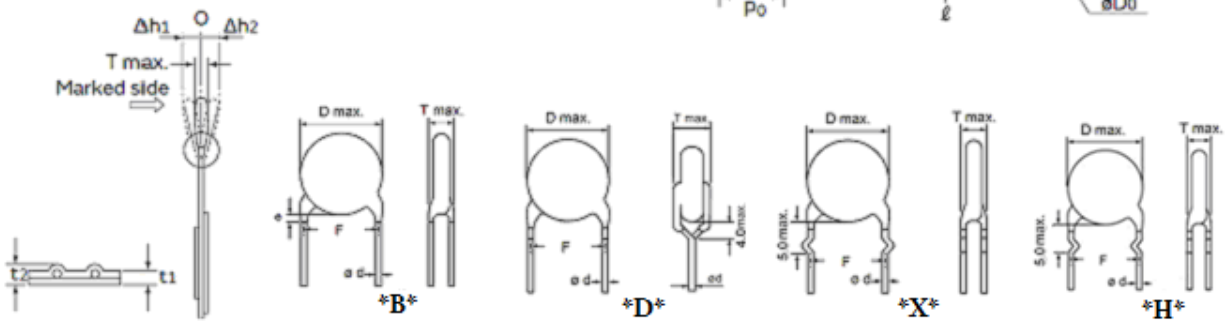
Item		Symbol	Specification		Remarks
			Value	Tolerance	
Body diameter		D	*	max.	See Section“3. Capacitance value vs. rated voltage, product diameter”.
Body thickness		T	*	max.	
Lead-wire diameter		d	0.55	±0.05	
Pitch of component		P	12.7	±1.0	
Feed hole pitch		P0	12.7	±0.3	Cumulative pitch erroe:1.0mm/20 pitch
Feed hole center to lead		P1	3.85	±0.7	To be measured at bottom of clinch
Hole center to component center		P2	6.35	±1.3	
Lead-to-lead distance		F	5.0	+0.8,-0.2	
Component alignment, F-R		Δ h	0	±2.0	
Tape width		W	18.0	+1.0,-0.5	
Hole-down tape width		W0	8.0	min.	
Hole position		W1	9.0	+0.75,-0.5	
Hole-down tape position		W2	3.0	max.	
Height of component form tape center	For straight lead type	H	20.0	+1.0 -0.5	
	For kinked lead type	H0	16.0	±0.5	
Component height		H1	32.25	max.	
Lead-wire protrusion		ℓ	2.0	max.	Or the end of lead wire may be inside the tape.
Food hole diameter		D0	4.0	±0.2	
Total tape thickness		t	0.7	±0.2	Ground paper:0.5±0.1mm
Length of sniped lead		L	11.0	max.	
Coating rundown on leads		e	Please refer to page 6 “e(Coating extension on leads)”.		

• 15 mm pitch/lead spacing 7.5mm taping
Lead Code: *BAFD7 & *DAFD7 & *XAFD7



• 25.4mm pitch/lead spacing 7.5mm & 10.0mm taping
Lead Code: *BAMD* & *DAMD* & *XAMD*





POE Part Number		*BAFD7 *DAFD7 *HAFD7 *XAFD7	*BAMD7 *DAMD7 *HAMD7 *XAMD7	*BAMD0 *DAMD0 *HAMD0 *XAMD0
Item	Symbol	Dimensions (mm)	Dimensions (mm)	Dimensions (mm)
Pitch of component	P	15.0±1.0	25.4±2	25.4±2
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. Capacitance value vs. Rate voltage, product diameter"		
Deviation along tape, left or right	Δ 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 (For: *D* & *X* & *H* lead type)		
Lead distance between the bottom of body and the center of sprocket hole	H	20.0+1.5/-1.0 (only for straight lead *B* style)		
Lead-Wire Protrusion length	ℓ	2.0Max (Or the end of lead wire may be inside the 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	8.0min		
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. Capacitance value vs. Rate voltage, product diameter"		

7. Specification and test method:

7.1 Scope: This specification applies to Low Dissipation Ceramic Disc Capacitor.

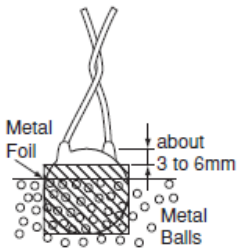
7.2 Test Conditions:

Unless otherwise specified, all tests shall be operated at the standard test conditions of temperature 5℃ to 35℃ and relative humidity 45% to 85%.
When fails a test, retest be operated at the conditions of temperature 25℃ ± 2℃, relative humidity of 60% to 70% and barometric pressure 860 to 1060 mbar.

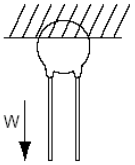
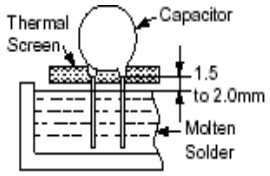
7.3 Handle procedure: to avoid unexpected testing results from occurring, the tested capacitor must be kept at room condition for at least 30 minutes and completely discharged.

7.4 Applications：Ideal for use on high frequency pulse circuits such as a horizontal resonance circuit for CTV and snubber circuits for switching power supplies.

7.5 Test items:

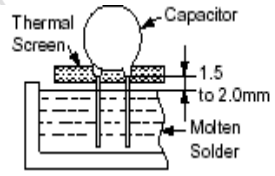
ITEM	POST-TEST REQUIREMENTS	TESTING PROCEDURE
Operating Temperature Range	-25 To +125℃ (Including capacitor's self-heating temperature 20℃Max)	
Appearance and Dimensions	No visible defect, and dimensions are within specified range.	The capacitor should be visually inspected for evidence of defect. Dimensions should be measured with slide calipers.
Marking	To be easily legible.	The capacitor should be visually inspected.
Dielectric Strength	Between Lead Wire：No failure	The capacitor should not be damaged when DC voltage of 200% of the rated voltage (DC1 to 2KV) is applied between the lead wires for 1 to 5 sec. (Charge/Discharge current ≦50mA.) Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements.
	Body Insulation：No failure	First, the terminals of the capacitor should be connected together. Then, as shown in figure at right, 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, AC1250Vrms <50/60Hz> is applied for 1 to 5 sec. between the capacitor lead wires and metal balls. (Charge/Discharge current ≦50mA.) Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements.
Insulation Resistance	10000 M Ω min.	Insulation resistance should be measured at 60±5 seconds after applied voltage ((DC500V) Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements.
Capacitance	Within specified tolerance	The capacitance shall be measured at 25±2℃ with 1kHz±20% and 1.0Vrms. Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements.
Dissipation Factor (D.F.)	0.2% Max.	

"room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

<table>
<tr><th>Item</th><th colspan="2">Post-Test Requirements</th><th>Testing Procedure</th></tr>
<tr><td>Temperature Characteristic</td><td colspan="2">Temp. Char: LN(Y5R)
±30%(-25℃to+85℃)
±40%（+85℃to+125℃）</td><td>According to step 1 to 5 in order, measured capacitance when temperature reaches balance and CAP. change shall be calculated on the following formula:
CAP. change =(C2-C1)×100%/C1
<table>
<tr><td>Step</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>LN Temp.
(℃)</td><td>25±2</td><td>-25±3</td><td>25±2</td><td>85±2</td><td>25±2</td></tr>
</table>
Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements.</td></tr>
<tr><td rowspan="2">Strength of Lead</td><td>Tensile</td><td rowspan="2">Lead wire should not be cut off.
Capacitor should not be broken.</td><td>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 (5N for lead diameter 0.5mm), and keep it for 10±1 sec.
 
</td></tr>
<tr><td>Bending</td><td>Each lead wire should be subjected to 5N (2.5N for lead diameter 0.5mm) 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 sec.</td></tr>
<tr><td rowspan="3">Vibration Resistance</td><td colspan="2">Appearance:
No abnormalities</td><td rowspan="3">The capacitor should be firmly soldered to the supporting lead wire and vibrated at a frequency range of 10 to 55Hz, 1.5mm in total amplitude, with about a 1minute rate of vibration change from 10Hz to 55Hz and back to 10Hz. apply for a total of 6 hrs., 2hrs. each in 3 mutually perpendicular directions.</td></tr>
<tr><td colspan="2">Capacitance:
Within specified tolerance.</td></tr>
<tr><td colspan="2">D.F.：0.2% Max.</td></tr>
<tr><td>Solder ability Of Leads</td><td colspan="2">Lead wire should be soldered with uniform coating on the axial direction over 75％ of the circumferential direction.</td><td>The lead wire of a capacitor should be dipped into a ethanol solution of 25wt% rosin and then into molten solder of 245±5℃ for 5±0.5 sec. In both cases the depth of dipping is up to about 1.5 to 2mm from the root of lead wires.</td></tr>
<tr><td rowspan="3">Soldering Effect (On-Preheat)</td><td colspan="2">Appearance：No marked defect.</td><td rowspan="3">The lead wire should be immersed up to 2.0 mm form the root of lead wires.
(A) Body Dia.≦6.0mm: Into the molten solder of which temperature: 260(+5/-0)℃ for 3.0±0.5 seconds.
(B) Body Dia.＞6.0mm: Into the molten solder of which temperature 260(+5/-0)℃ for 5~10 seconds.
 

Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements.
Post-treatment: Capacitor should be stored for 24±2 hrs. at *room condition.</td></tr>
<tr><td colspan="2">Capacitance Change：
Within ±10%</td></tr>
<tr><td colspan="2">Dielectric Strength (between Lead Wires)：Per. Item Dielectric Strength</td></tr>
</table>

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

Item	Post-Test Requirements	Testing Procedure
Soldering Effect	Appearance：No marked defect. Capacitance Change： Within ±10% Dielectric Strength (between Lead Wires)：Per. Item Dielectric Strength	※When soldering capacitor with a soldering iron, it should be performed in following conditions. Temperature of iron-tip: 350~400 ℃ Soldering iron wattage : 50w max. Soldering time : 3.5 sec. Max.  Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *room condition for 24±2 hrs. before initial measurements. Post-treatment: Capacitor should be stored for 24±2 hrs. at *room condition. Measurement order: Dielectric strength -> Pre-treatment -> Capacitance -> Soldering effect test -> Post-treatment -> Capacitance
Temperature Cycle	Appearance: No Abnormalities Cap. Change: Within ±10% D.F.： 0.6% max. Insulation Resistance: 1000MΩ Min.	The capacitor should be subjected to 5 temperature cycles. <Temperature cycle> Step / Temperature(℃) / Time (min) 1 / -25±3 / 30 2 / 25±2 / 3 3 / 125±3 / 30 4 / 25±2 / 3 Pre-treatment: Capacitor should be stored at 125±2℃ for 1 hr., then placed at *1room condition for 24±2 hrs. before initial measurements. Post-treatment: Capacitor should be stored for 24±2 hrs. at *room condition. Measurement order: I.R. • Dielectric strength -> Pre-treatment -> Capacitance • D.F. -> Temperature cycle test -> Post-treatment -> Capacitance • D.F. • I.R. • Dielectric strength。
Humidity (Under Steady State)	Appearance: No Abnormalities Cap. Change: Within ±10% D.F.： 0.6% max. Insulation Resistance: 1000MΩ Min.	Set the capacitor for 500 +24/-0 hrs. at 40±2℃ in 90 to 95% relative humidity. Pre-treatment: Capacitor should be stored at 125±3℃ for 1 hr., then placed at *1room condition for 24±2 hrs. before initial measurements. Post-treatment: Capacitor should be stored for 1 to 2 hrs. at *room condition. Measurement order: I.R. -> Pre-treatment -> Capacitance • D.F. -> Humidity test ->Post-treatment -> Capacitance • D.F. • I.R.

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

Item	Post-Test Requirements	Testing Procedure
Humidity Loading	Appearance: No Abnormalities Cap. Change: Within ±10% D.F.： 0.6% max. Insulation Resistance: 500MΩ Min.	Apply the rated voltage for 500 +24/-0 hrs. at 40±2℃ in 90 to 95% relative humidity. (Charge/Discharge current<50mA.) Pre-treatment: Capacitor should be stored at 125±3℃ for 1 hr., then placed at *1room condition for 24±2 hrs. before initial measurements. Post-treatment: Capacitor should be stored at 125±3℃ for 1 hr., then placed at *1 room condition for 24±2 hrs. Measurement order: I.R. -> Pre-treatment -> Capacitance • D.F. ->Humidity loading test -> *2 I.R. -> Post-treatment ->Capacitance • D.F.
Life	Appearance: No Abnormalities Cap. Change: Within ±10% D.F.： 0.6% max. Insulation Resistance: 2000MΩ Min.	Apply a DC voltage of 150% of the rated voltage for 1000 +48/-0 hrs. at 125±2℃ with a relative humidity of 50% max. (Charge/Discharge currentV50mA.) Pre-treatment: Capacitor should be stored at 125±3℃ for 1 hr., then placed at *1room condition for 24±2 hrs. before initial measurements. Post-treatment : Capacitor should be stored at 125±3℃ for 1 hr., then placed at *1room condition for 24±2 hrs. Measurement order: I.R. -> Pre-treatment -> Capacitance • D.F. -> Life test ->*3 I.R. -> Post-treatment -> Capacitance • D.F.

*1 "room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

*2 The measurement of I.R. will be held in 1 to 2 hrs. after Humidity loading test.

*3 The measurement of I.R. will be held in 12 to 24 hrs. after Life test.

8. Notices:

※Application: DC or Low frequency High Voltage circuits.

As coupling and decoupling capacitors for such application where higher losses and a reduced capacitance stability are required.

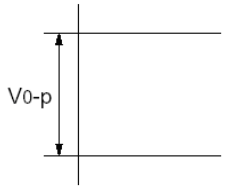
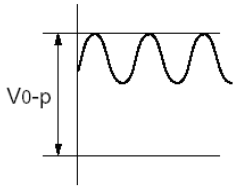
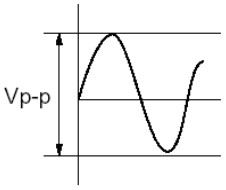
8.1 Caution (Rating)

I. 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 applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

When using the low-dissipation (LN Char.) series in a high-frequency and high-voltage circuit, be sure to read the instructions in item 4.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage
Positional measurement			

II. 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. When the capacitor is used in a high frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. The frequency of the applied sine wave voltage should be less than 300khz., the applied voltage load should be such that the capacitor's self-generated heat is within20℃ at an atmosphere temperature of 25℃. When measuring, use a thermocouple of small thermal capacity-k of ø0.1mm in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations.

Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. otherwise, accurate measurement cannot be ensured.)

III. Fail-Safe

When capacitor is 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.

IV. Load Reduction and Self-generated Heat During

Application of High-frequency and High-voltage

Due to the low self-heating characteristics of low dissipation capacitors, the allowable electric power of these capacitors is generally much higher than that of R(Y5R) characteristic capacitors. However, in case the self heating temperature is 20℃ under a high-frequency voltage whose peak-to-peak value equals the capacitor's rated voltage, the capacitor's power consumption may exceed it's allowable electric power.

Therefore, when using the low-dissipation capacitors in a high-frequency and high-voltage circuit with a frequency of 1kHz or higher, make sure that the Vp-p values including the DC bias, do not exceed the applied voltage value specified in Table 1. Also make sure that the self-heating temperature (the difference between the capacitor's surface temperature and the capacitor's ambient temperature) at an ambient temperature of 25℃ does not exceed the value specified in Table 1.

As shown in Fig. 2, the self-heating temperature depends on the ambient temperature. Therefore, if you are not able to set the ambient temperature to approximately 25℃, please contact our sales representatives or product engineers.

[Table 1] Allowable conditions at high frequency

DC rated voltage	Allowable conditions at High-frequency *3		Capacitor's ambient temp. *2
	Applied voltage (Max.)	Self-heating temp. (25℃ ambient temp.)*1	
1KV	800Vp-p	20℃	-25 ~ +85℃
	1000Vp-p	5℃	
2KV	1400Vp-p	20℃	
	2000Vp-p	5℃	

*1 Fig. 1 shows the relationship between the applied voltage and the allowable self-heating temperature regarding 1 to 2KV rated voltage of the low-dissipation LN series R characteristic.

*2 Fig. 2 When the ambient temperature is 85 to 125℃, the applied voltage needs to be further reduced. If the low-dissipation capacitors needs o be used at an ambient temperature of 85 to 125℃, please contact our sales representatives or product engineers.

*3 Fig. 3 shows reference data on the allowable voltage-frequency characteristic for a sine wave voltage when the ambient temperature is 85℃.

Failure to follow the above cautions (items 1to 4) may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

Fig 1：Relationship Between Applied Voltage and Self-heating Temperature (Allowable Self-heating Temp. at 25˚C Ambient Temp.)

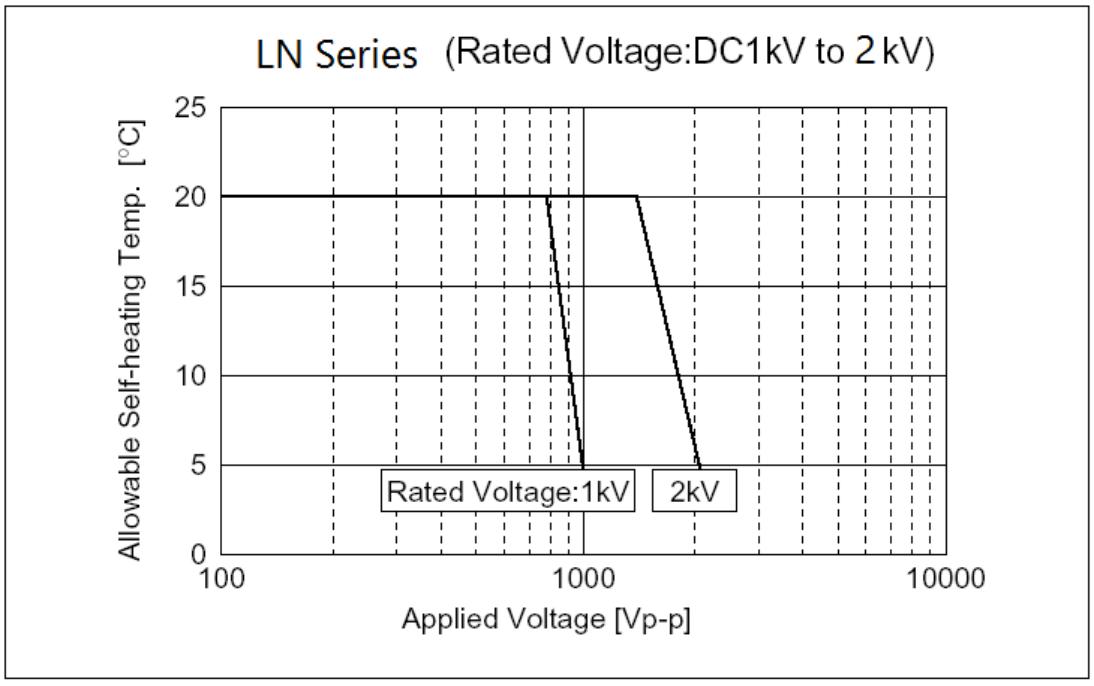


Fig 2：Dependence of Self-heating Temperature on Ambient Temperature.

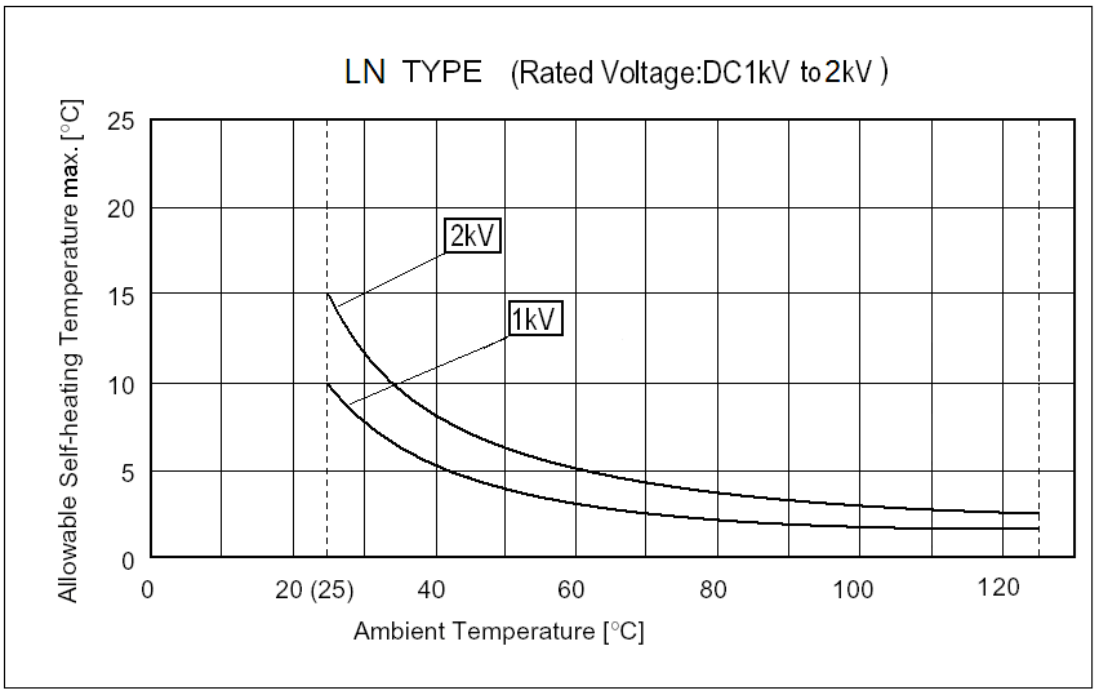
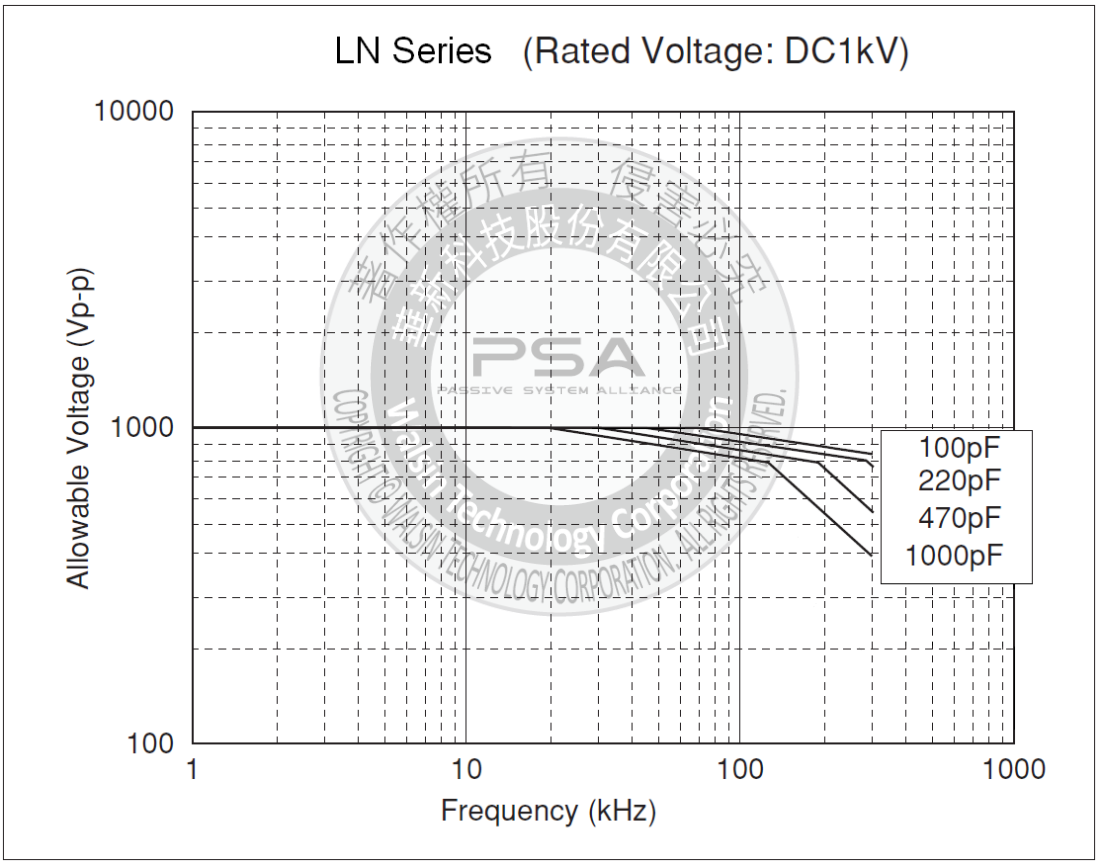


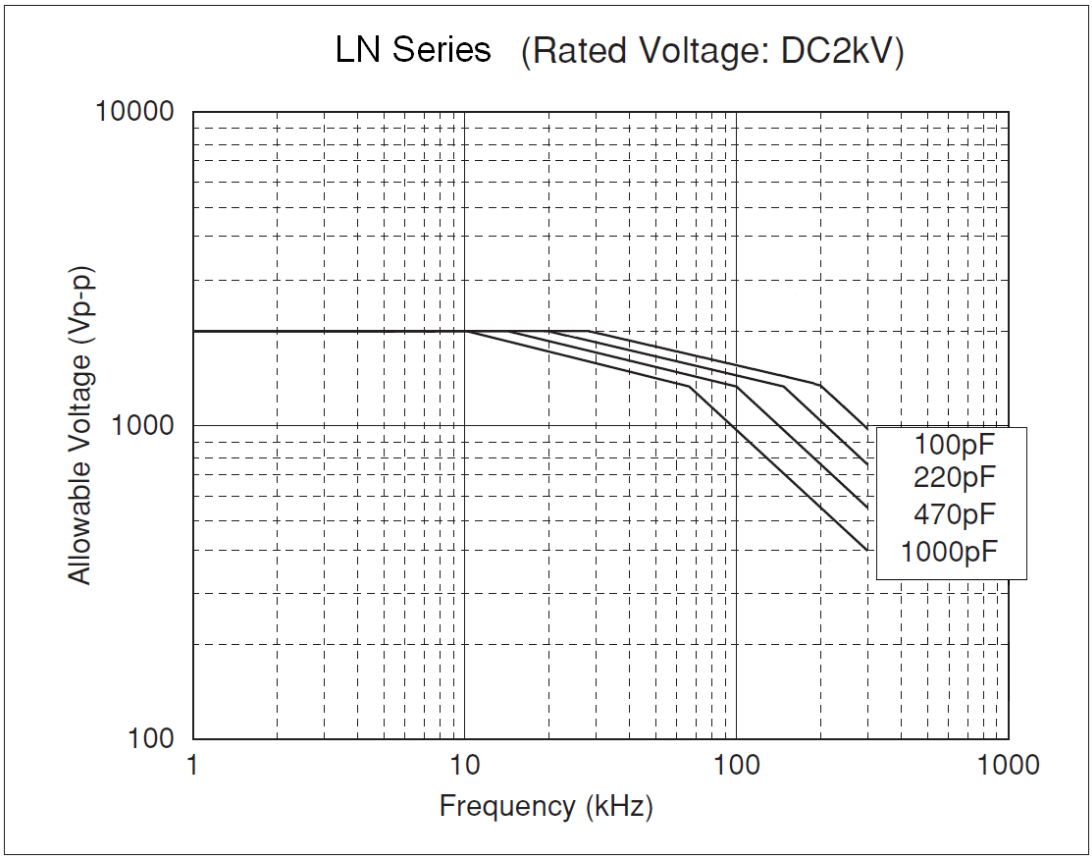
Fig 3：Allowable Voltage (Sine Wave Voltage) – Frequency Characteristics(At Ambient Temperature of 85℃ or less)

Because of influence of harmonics, when the applied voltage is a rectangular wave or pulse wave voltage (instead of a sine wave voltage), the heat generated by the capacitor is higher than the value obtained by application of the sine wave with the same fundamental frequency.

Roughly calculated for reference, the allowable voltage for a rectangular wave or pulse wave corresponds approximately to the allowable voltage for a sine wave whose fundamental frequency is twice as large as that of the rectangular wave or pulse wave. This allowable voltage, however, varies depending on the voltage and current waveforms.

Therefore, you are requested to make sure that the self-heating temperature is not higher than the value specified in Table 1.





8.2 Storage and Operating Condition:

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 degrees centigrade and 15 to 85 % for 6 months maximum and use within the period after receiving the capacitors.

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.

8.3 Soldering and Mounting:

I. Vibration And Impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

II. 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: 3.5 sec. Max.

Ⅲ Bonding, Resin Molding and Coating

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

When the amount of applications, dryness/hardeningconditions 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 outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

Ⅳ Treatment after Bonding, Resin Molding and Coating When the outer coating is hot (over 100 degrees C.) after soldering, it becomes soft and fragile.

Therefore, 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.

8.4 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.

8.5 List of substances that affect the insulation strength of coating：

Epoxy resin solvent

Category	Model		
Ketone	Acetone	Butanone	Cyclohexanone
Esters	Ethyl acetate	Dibutyl phthalate	
Chlorinated hydrocarbons	Dichloromethane		

Epoxy resin thinner

Category		Model	
Reactive diluentactivated thinner	Simple function group	HK-66 (Alkyl glycidyl ether)	
		501 (Butyl glycidyl ether)	
		690 (Phenyl Glycidyl Ether)	
		AGE (C12-14Aliphatic Polyalcohol Glycidyl Ether)	
		692 (Benzyl Glycidyl Ether)	
	Two functional groups	D-678（Neopentyl glycol diglycidyl ether）	
		622 (1,4-Butanediol diglycidyl ether)	
		669 (Ethylene glycol diglycidyl ether)	
		X-632 (Polypropylene glycol diglycidyl ether)	
		X-652 (1,6-Hexadiol diglycidyl ether)	
		D-691Epoxypropane o-methylphenyl ether	
Non-activated thinner		Anhydrous ethanol	Toluene
		Ethyl acetate	Dimethylbenzene
		Dimethyl formamide	Butyl acetate
		Acetone	Styrene
		Polyol	Benzyl alcohol

Note: The above substances should not contact the coating of the product body, otherwise it will affect the insulation strength of the produc

8.6 Caution (Handling)

Vibration And Impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

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.

9. Soldering Recommendation：

9.1 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

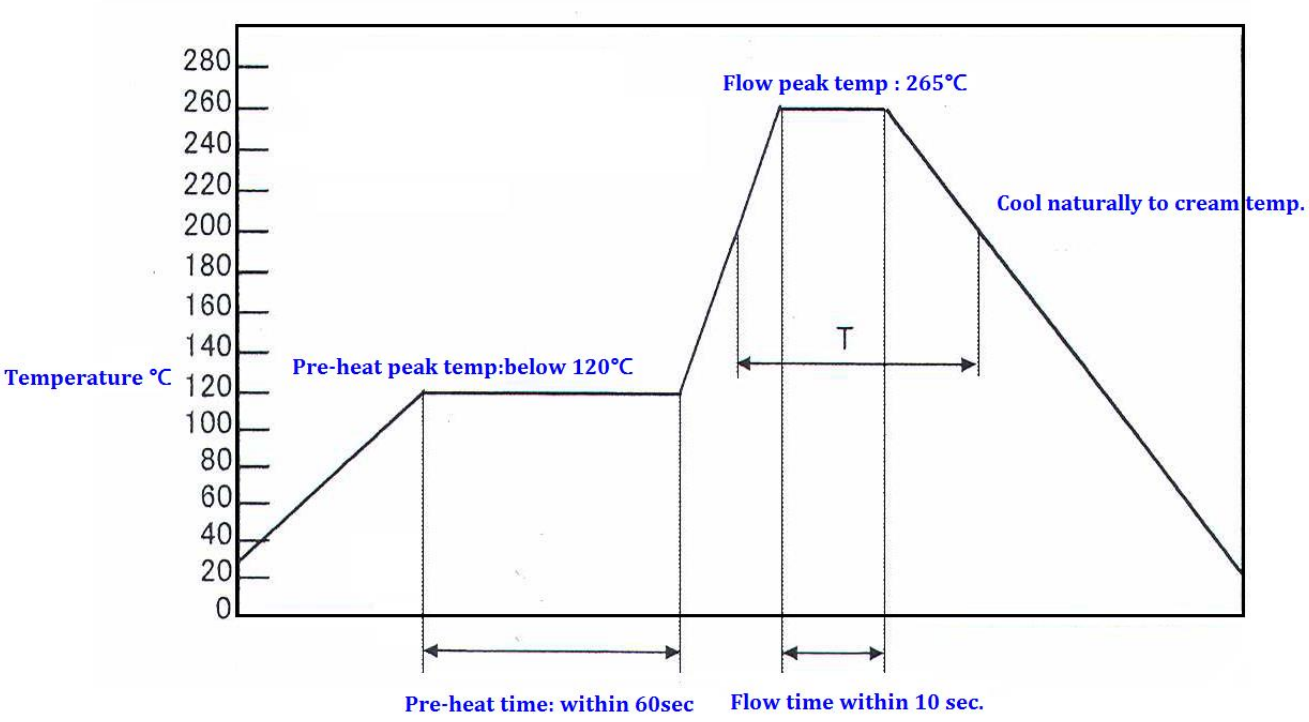


Chart to show flow recommended temp

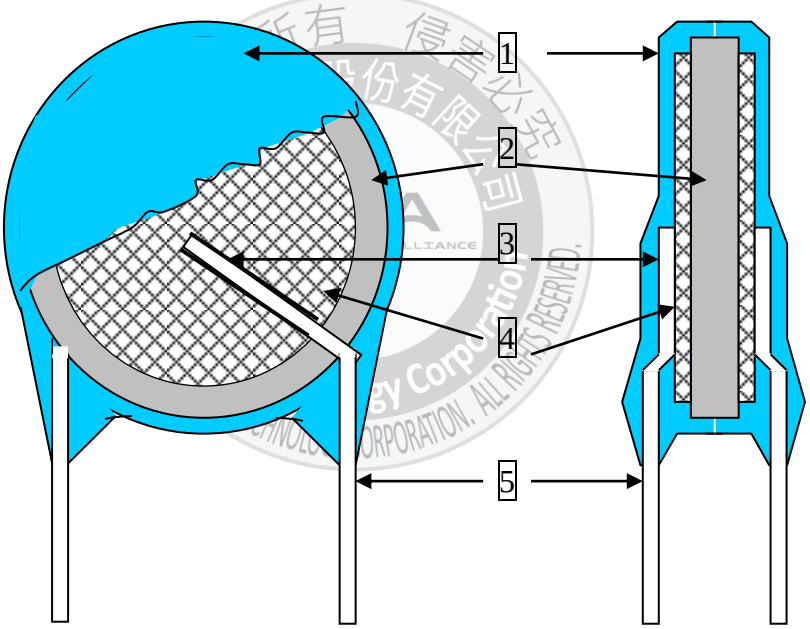
9.2 Recommended Reworking Conditions with Soldering Iron：

- 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.)

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

10.Drawing of internal structure and material list：

產 品 結 構 圖



Remarks：

No.	Material	Description
1	Insulation Coating	Epoxy resins
2	Dielectric Element	Ceramic
3	Solder	Tin-Silver alloy
4	Electrodes	Silver [Ag]
5	Leads wire	Solder coated CP wire (Solder : Tin-Silver alloy)