# PRODUCT SPECIFICATION

**PRODUCT: CERAMIC DISC CAPACITOR SAFETY RECOGNIZED**

**TYPE: AC SERIES（Small Size）**

**CUSTOMER:**

**DOC. NO.: POE-D21-01-E-10**

**Ver.: 10**

**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:**

□ **HITANO ENTERPRISE CORP.**
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**MAKER:**

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HITANO ENTERPRISE CORP. ®

POE Electronic POE

## Record of change

| Date | Version | Description | page |
|---|---|---|---|
| 2017/6/9 | 00 | 1. First edition. | All |
| 2019/1/18 | 01 | 1. Revised standard NO. of VDE, SEV, SEMKO, FIMKO, NEMKO and ENEC. | 9 |
| 2019/3/12 | 02 | 1. Add “0AC” code for Y2:250V~ marking type. | 4,8~9 |
| 2019/4/24 | 03 | 1. “Protrusion length”: “2.0max (Or the end of lead wire may be inside the tape.)” revised to “+0.5to-1.0 (Or the end of lead wire may be inside the tape.)” | 7 |
| 2019/8/9 | 04 | 1. Delete the lead style “N”( Vertical kink lead) | 5,7 |
| 2019/12/11 | 05 | 1. Review the Available lead code of Lead Configuration<br>2. Add “8.3 Label samples ” | 5<br>14 |
| 2021/9/9 | 06 | 1. Delete Walsin & POE logo. | 1 |
| 2022/4/21 | 07 | 1. Add Applied voltage in 9.3 Test condition for withstanding voltage.<br>2. Add 10.2 List of substances that affect the insulation strength of coating | 15~16<br>18 |
| 2023/5/26 | 08 | 1. Revised recognized No. of SEMKO and FIMKO. | 9 |
| 2024/7/10 | 09 | 1. Revised recognized No. of SEV, SEMKO and FIMKO. | 9 |
| 2025/7/6 | 10 | 1. Review the item for SL material<br>2. Review the Drawing of Internal Structure and material list | 4,6,8<br>20 |

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| | | |

## 1. Part number for SAP system

| (Ex.) | YU | 1 | AC | 472 | M | 10 | 0 | G | 3E | A | 7 | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2)-1 | (2)-2 | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |

(1) Temperature characteristic (identified code)

| CODE | Temperature characteristic | Cap. Change |
|---|---|---|
| SL | SL | -1000~+350ppm/℃ (+20℃~+85℃) |
| YP | B (Y5P) | ±10% |
| YU | E (Y5U) | -55% to +20% |

(2)-1 Rated voltage(identified by 1-figure code)：0= X1:400V~/Y2:250V~, 1=X1:440V~/Y2:300V~

(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 “3. Part numbering/T.C/Capacitance/ Tolerance/Diameter” )

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

(7) Lead Style：Refer to “2. Mechanical”.

(8) Packing mode and lead length (identified by 2-figure code): Refer to “2. Mechanical” & “4.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 |
|---|---|
| 03 | Lead length： 3.0mm |
| 3E | Lead length： 3.5mm |
| 04 | Lead length： 4.0mm |
| 05 | Lead length： 5.0mm |
| 20 | Lead length： 20mm |
| 25 | Lead length： 25mm |

(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 |

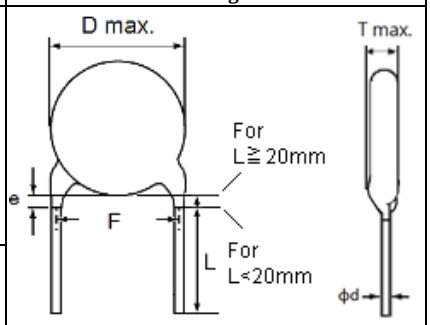
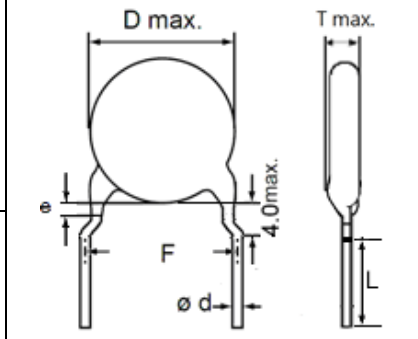
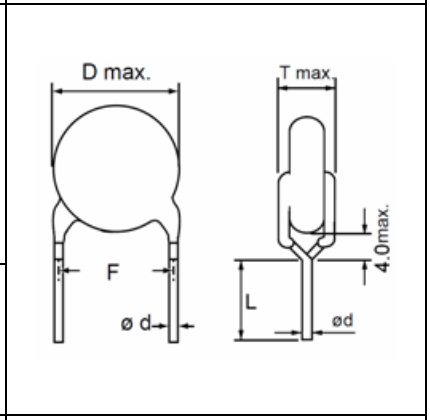
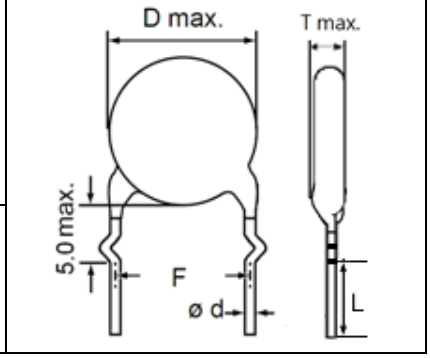
(11) Epoxy resin code

| Code | Description |
|---|---|
| T | Halogen and Pb free , epoxy resin, for Cu electrode |

## 2. 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<br>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 “4. Taping format” | | Tap. Ammo | |
| | BAMD7 | | | | |
| | BAMD0 | | | | |
| Lead style：G<br>Straight lead | G03B7 | 7.5 ± 1.0 | 3.0 ± 1.0 | Bulk |  |
| | G4EB7 | 7.5 ± 1.0 | 4.5 ± 1.0 | | |
| | G05B7 | 7.5 ± 1.0 | 5.0 ± 1.0 | | |
| | G03B0 | 10 ± 1.0 | 3.0 ± 1.0 | | |
| | G4EB0 | 10 ± 1.0 | 4.5 ± 1.0 | | |
| | G05B0 | 10 ± 1.0 | 5.0± 1.0 | | |
| | G20C7 | 7.5 ±1.0 | 20 min. | | |
| | G20C0 | 10 ± 1.0 | 20 min. | | |
| | GAFD7 | Refer to “4. Taping format” | | Tap. Ammo | |
| | GAMD7 | | | | |
| | GAMD0 | | | | |
| Lead style：D<br>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 | | |
| | D05A7 | 7.5 ± 1.0 | 5.0 ± 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 | | |
| | D20C7 | 7.5 ±1.0 | 20 min. | | |
| | D25C7 | 7.5 ±1.0 | 25 min. | | |
| | D20C0 | 10 ± 1.0 | 20 min. | | |
| | DAFD7 | Refer to “4. Taping format” | | Tap. Ammo | |
| | DAMD7 | | | | |
| | DAMD0 | | | | |
| Lead style：X<br>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 “4. Taping format” | | Tap. Ammo | |
| | XAMD7 | | | | |
| | XAMD0 | | | | |

* Lead diameter Φd: 0.55+0.1/-0.05mm
* e (Coating **extension** on leads): 3.0mmMax for straight lead style; Not exceed the kink for kink lead.

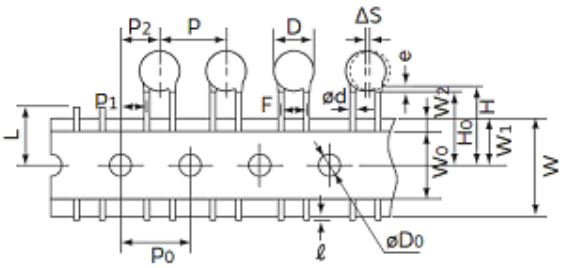
## 3. Part numbering/T.C/Capacitance/ Tolerance/Diameter：

| SAP Part. No. | T.C. | Capacitance | Tolerance | Dimensions (unit：mm) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | D (max) | T (max) | F | | φd |
| | | | | | | Bulk type | Taping type | |
| SL*AC***K060*T | SL | 10,12,15,18,20,22, 24,27,30,33, 36, 39,47,50,51(pF) | ±10% | 7.0 | 4.5 | 7.5±1, 10±1 | 7.5±1 (AFD7) (AMD7) or 10±1 (AMD0) | 0.55 +0.1/-0.05 |
| SL*AC***K070*T | | 56,62, 68,75(pF) | | 8.0 | | | | |
| SL*AC820K080*T | | 82pF | | 9.0 | | | | |
| SL*AC101K090*T | | 100pF | | 10.0 | | | | |
| YP*AC101K050*T | Y5P | 100 pF | ±10% | 6.0 | | | | |
| YP*AC151K050*T | | 150 pF | | 6.0 | | | | |
| YP*AC221K060*T | | 220 pF | | 7.0 | | | | |
| YP*AC331K050*T | | 330 pF | | 6.0 | | | | |
| YP*AC471K060*T | | 470 pF | | 7.0 | | | | |
| YP*AC561K060*T | | 560pF | | 7.0 | | | | |
| YP*AC681K060*T | | 680 pF | | 7.0 | | | | |
| YP*AC821K070*T | | 820 pF | | 8.0 | | | | |
| YP*AC102K070*T | | 1000 pF | | 8.0 | | | | |
| YU*AC102M050*T | Y5U | 1000 pF | ±20% | 6.0 | | | | |
| YU*AC152M060*T | | 1500 pF | | 7.0 | | | | |
| YU*AC222M070*T | | 2200 pF | | 8.0 | | | | |
| YU*AC332M090*T | | 3300 pF | | 10.0 | | | | |
| YU*AC392M100*T | | 3900 pF | | 11.0 | | | | |
| YU*AC472M100*T | | 4700 pF | | 11.0 | | | | |

## 4. Taping Format

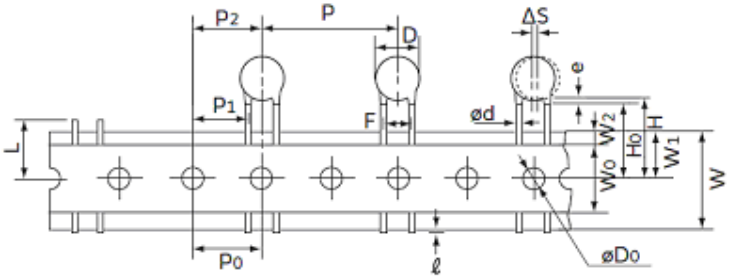
- **15 mm pitch/lead spacing 7.5mm taping**

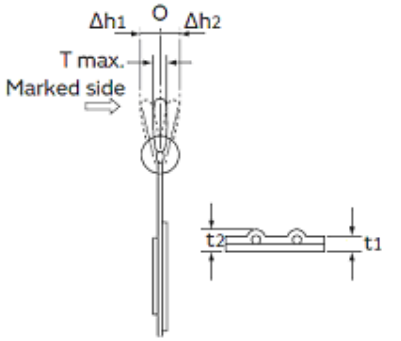
**Lead Code: *BAFD7 & *DAFD7 & *XAFD7 & *GAFD7**

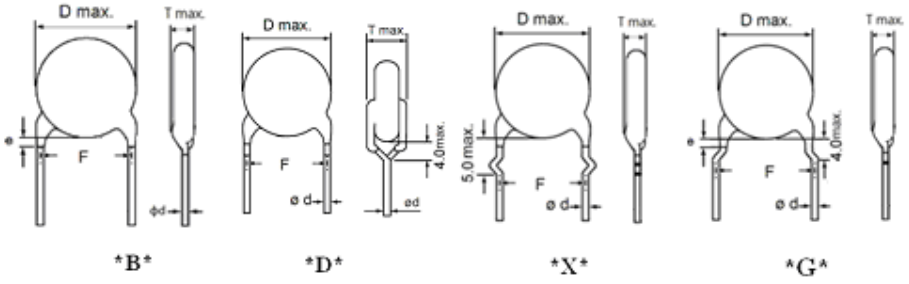



- **25.4mm pitch/lead spacing 7.5mm & 10.0mm taping**

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



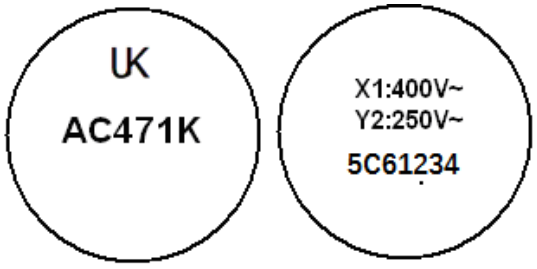

| POE Part Number | | ***BAFD7/*DAFD7/ /*GAFD7/*XAFD7** | ***BAMD7/*DAMD7/ /*GAMD7/*XAMD7** | ***BAMD0/*DAMD0/ /*GAMD0/*XAMD0** |
|---|---|---|---|---|
| Item | Symbol | Dimensions (mm) | Dimensions (mm) | Dimensions (mm) |
| Pitch of component | P | 15.0±1 | 25.4±2 | 25.4±2 |
| Pitch of sprocket | P0 | 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. Part numbering/T.C/Capacitance/ Tolerance/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/-0(For: *D* & *X* & *G* 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) | | |
| 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+0.1/-0.05 | | |
| Total tape thickness | t1 | 0.6±0.3 | | |
| Total thickness, tape and lead wire | t2 | 1.5 max. | | |
| Deviation across tape | Δ h1/Δ 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" | | |

## 5.Marking：

| | |
|---|---|
| 1.Type Designation | AC |
| 2.Nominal Capacitance | Identified by 3-Figure Code. Ex. 47pF→"47"，470pF→"471" |
| 3.Capacitance Tolerance | K:±10%,M:±20% |
| 4.Company Name Code(Trade mark) | UK |
| 5.Class code & Voltage | X1: 400V~ / Y2: 250V~<br>X1: 440V~ / Y2: 300V~ |
| 6. Products ID | Abbreviation ex.<br>Manufacture year: ← 5 C 6 1234 → Last 4 digits of lot no.<br>5:2025<br>6:2026<br>7:2027<br>⋮<br>Manufactory:<br>C:Pan overseas (Guangzhou)<br>↓ → Individual specification code<br>Manufacture month:<br>1:January<br>2:Feruary<br>⋮<br>9:September<br>O:October<br>N:November<br>D:December |

**Marking ex.**

**Two sides marking**

| **0AC**<br>(X1: 400V~ / Y2: 250V~) | **1AC**<br>(X1: 440V~ / Y2: 300V~) |
|---|---|
|  |  |

* Marking by the laser.

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

## 6. **Scope**

THIS SPECIFICATION APPLIES TO CERAMIC INSULATED CAPACITORS DISK TYPE USED IN ELECTRONIC EQUIPMENT.

1. VDE/UL/CSA recognized capacitor for Antenna coupling and AC line-by-pass.X1, Y2 Capacitor based on IEC 60384-14 “UL, CSA recognized for across-the-line, line-by-pass” and antenna-isolation.

2. Approval Standard and Recognized No.

| **Safety Standard** | **Standard No.** | **Subclass** | **w.v.** | **Recognized No.** |
|---|---|---|---|---|
| UL | ANSI/UL 60384-14:2013 | X1 | 400VAC or 440VAC | E146544 |
| | | Y2 | 250VAC or 300VAC | |
| CSA | CAN/CSA E60384-14:2009 | X1 | 400VAC or 440VAC | 2347969 |
| | | Y2 | 250VAC or 300VAC | |
| VDE (ENEC) | EN 60384-14:2013/A1:2016<br>IEC 6.384-14:2013<br>IEC 6.384-14:2013/AMD1:2016 | X1 | 400VAC or 440VAC | 40001829 |
| | | Y2 | 250VAC or 300VAC | |
| SEV | EN 60384-14:2013 + A1:16 | X1 | 400VAC or 440VAC | 24.0417 |
| | | Y2 | 250VAC or 300VAC | |
| | | Y2 | 250VAC or 300VAC | |
| NEMKO | EN 60384-14:2013;A1 | X1 | 400VAC or 440VAC | P18222947 |
| | | Y2 | 250VAC or 300VAC | |
| ENEC (Demko) | EN 60384-14:2013/ A1:2016,<br>EN 60384-14:2013 | X1 | 400VAC or 440VAC | ENEC-01962-A1 |
| | | Y2 | 250VAC or 300VAC | |
| DEMKO | EN 60384-14:2013/A1:2016<br>EN 60384-14:2013 | X1 | 400VAC or 440VAC | D-07617 |
| | | Y2 | 250VAC or 300VAC | |
| CQC | GB/T6346.14-2015 | X1:400VAC /Y2:250VAC | | CQC08001026519 |
| | IEC60384-14:2013 | X1: 440VAC /Y2:300VAC | | CQC15001121984 |
| KTL | KC60384-1(2015-09) ;<br>KC60384-14(2015-09) | X1 | 400VAC | SU03065-14004A |
| | | X1 | 440VAC | SU03065-14001A |
| | | Y2 | 250VAC | SU03065-14002A |
| | IEC 60384-14(ed.3) | Y2 | 300VAC | SU03065-14003A |

## 7. Specification and test method

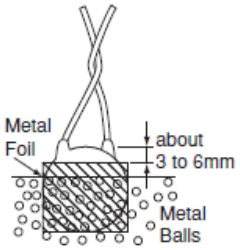
### 7.1 Operating Temperature Range : -40 to +125°C

### 7.2 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.

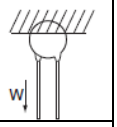
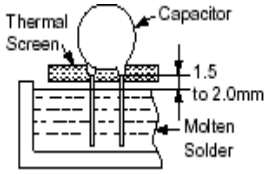
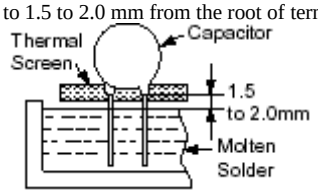
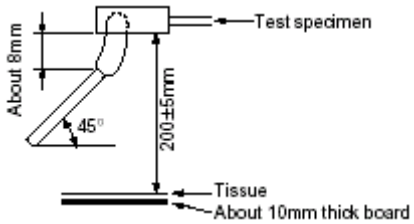
If doubt occurred on the value of measurement, and measurement was requested by customer capacitors shall be measured at the reference condition. (temperature 20±2℃or25 ± 2℃, relative humidity 60~70% and atmospheric pressure 860~1060hpa.)

### 7.3 Performance:

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td>1</td><td colspan="2">Appearance and dimensions</td><td>No marked defect on appearance form and dimensions.<br>Please refer to [Part number list].</td><td>The capacitor should be inspected by naked eyes for visible evidence of defect.<br>Dimensions should be measured with slide calipers.</td></tr>
<tr><td>2</td><td colspan="2">Marking</td><td>To be easily legible.</td><td>The capacitor should be inspected by naked eyes.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Dielectric Strength</td><td>Between terminals</td><td>No failure.</td><td>The capacitor should not be damaged when AC2600V(r.m.s.) <50/60Hz> is applied between the lead wires for 60 s.<br>(Charge/Discharge current ≦50mA.)<br><br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.</td></tr>
<tr><td>Body Insulation</td><td>No failure.</td><td>First, the terminals of the capacitor should be connected together.<br>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.<br><br><br>Finally, AC2600V (r.m.s.)<50/60Hz> is applied for 60 s between the capacitor lead wires and metal balls. (Charge/Discharge current ≦ 50mA.)<br><br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.</td></tr>
<tr><td>4</td><td colspan="2">Insulation Resistance(I.R.)</td><td>10000MΩ min.</td><td>The insulation resistance should be measured with DC500±50V within 60± 5 s of charging.<br>The voltage should be applied to the capacitor through a resistor of 1MΩ<br><br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.</td></tr>
<tr><td>5</td><td colspan="2">Capacitance</td><td>Within specified tolerance</td><td rowspan="2">Y5P&Y5U: The capacitance shall be measured at 20±2℃ with 1kHz±20% and1.0Vrms.<br>SL: The capacitance shall be measured at 25℃ with 1MHz±20% and1.0Vrms<br><br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.</td></tr>
<tr><td>6</td><td colspan="2">Dissipation Factor(D.F.)<br>Q</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B(Y5P)<br>E(Y5U)</td><td>2.5% max.</td></tr><tr><td>SL</td><td>Q≧400+20C*1(C<30pF)<br>Q≧1000 (C≧30pF)</td></tr></table></td></tr>
<tr><td>7</td><td colspan="2">Temperature Characteristic</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 +20/-55%</td></tr></table>(Temp. range: -25 to +85°C)<br><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>SL</td><td>-1000~+350 ppm/℃</td></tr></table>(Temp. range: +20 to +85°C)</td><td>The capacitance measurement shall be made at each step specified in table<table><tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>Temp.(℃)</td><td>+20±2</td><td>-25±2</td><td>+20±2</td><td>+85±2</td><td>+20±2</td></tr></table>Pr-treatment：<br>Capacitor shall be stored at 125±2℃ for 1 hour. Then placed at room condition*2 for 24±2 hours before measurement</td></tr>
</table>

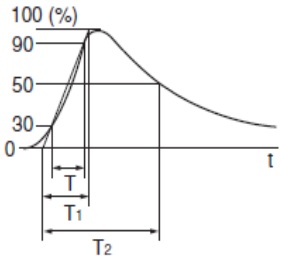
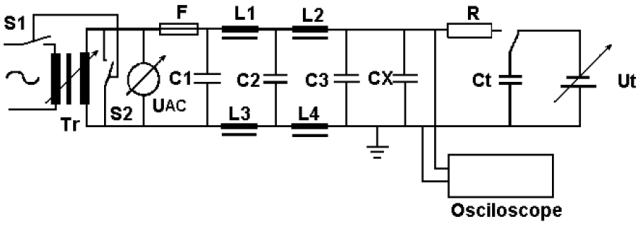
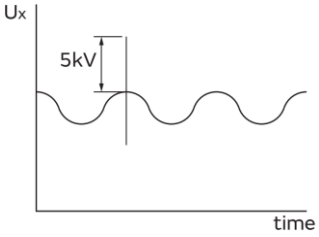
※ "C" expresses nominal capacitance value (pF).

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

| No | Item | | Specification | Testing Method |
|---|---|---|---|---|
| 8 | 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 | Lead wire shall not cut off capacitor shall not be broken. | With the termination in its normal position, the specimen is held by its body in such a manner that the axis of the termination is vertical; a mass applying a force of 5N is then suspended from the end of the termination. The body of the specimen is then inclined, within a period of 2 to 3sec, through an angle of approximately 90° in the vertical plane and then returned to its initial position over the same period of time; this operation constitutes one bend. One bend immediately followed by a second bend in the opposite direction. |
| 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 shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements. Post-treatment: Capacitor shall be stored for 1 to 2hours at ※1room condition. |
| | | I.R. | 1000MΩ min. | |
| | | Dielectric Strength | Per Item 3. | |
| | | Capacitance Change | B(Y5P),E(Y5U)：Within ±10%<br>SL：Within±2.5% or ±0.25pF,Whichever is large. | |
| 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 shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements. Post-treatment: Capacitor shall be stored for 1 to 2hours at ※1room condition. |
| | | I.R. | 1000MΩ min. | |
| | | Dielectric Strength | Per Item 3. | |
| | | Capacitance Change | B(Y5P),E(Y5U)：Within ±10%<br>SL：Within±2.5% or ±0.25pF, Whichever is large. | |
| 11 | Solderability of leads | | Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction. | The lead wire of capacitor should be dipped into molten solder for 5 ± 0.5 sec. The depth of immersion is up to about 1.5 to 2.0 mm from the root of lead wires. Temp. of solder ：Lead free solder (Sn97 -Cu3) 245 ± 5 ℃ |
| 12 | 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. Fig.   |

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

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

| No | Item | | Specification | Testing Method |
|---|---|---|---|---|
| 13 | Life | Appearance | No marked defect. | Impulse Voltage:<br>Each individual capacitor shall be subjected to a 5kv impulses for three times. After the capacitors are applied to life test.<br>The waveform will be determined by the test circuit parameters. Details of the test circuit are given in IEC 60384-14 Annex A.<br><br><br>Front time (T1) =1.2μs=1.67T<br>Time to half-value (T2) =50μs<br>The specimen capacitors are placed in a circulating air oven for a period of 1000 hrs. The air in the oven is maintained at a temperature of 125±2℃. Throughout the test. The capacitors are subjected to an AC510Vrms.(for 1AC type) alternating voltage of mains frequency<br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.<br>Post-treatment: Capacitor shall be stored for 1 to 2hours at ※1room condition. |
| | | Capacitance Change | B(Y5P),E(Y5U)：Within ±20%<br>SL：Within±3% or ±0.3pF,<br>Whichever is large. | |
| | | I.R. | B(Y5P),E(Y5U)：3000MΩ min.<br>SL： 1000MΩ min. | |
| | | Dielectric Strength | Per Item 3. | |
| 14 | Active Flammability | | The cheesecloth shall not be on fire. | The specimens shall be individually wrapped in at least one but more then two complete layers of cheesecloth. The specimens 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.<br><br><br>C1,2：1uF±10% C3：0.033uF±5% 10KV<br>L1-4：1.5mH±20% 16A Rod core choke<br>R ：100Ω±2% Ct：3uF±5% 10KV<br>Uac：Ur±5% Ur：Rated working voltage<br>Cx ：Capacitor F ：Fuse, Rated 10A<br>Ut ：Voltage applied to Ct<br><br> |

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

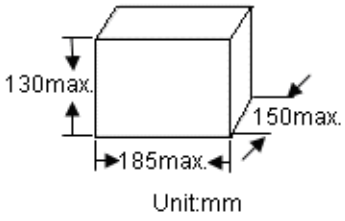
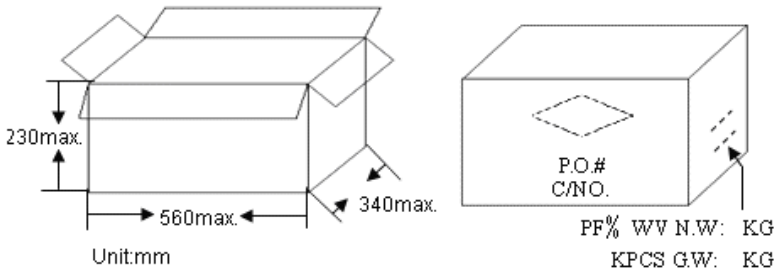
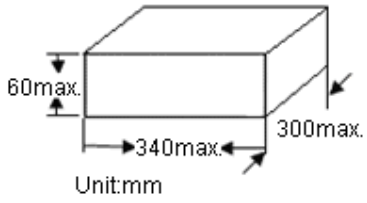
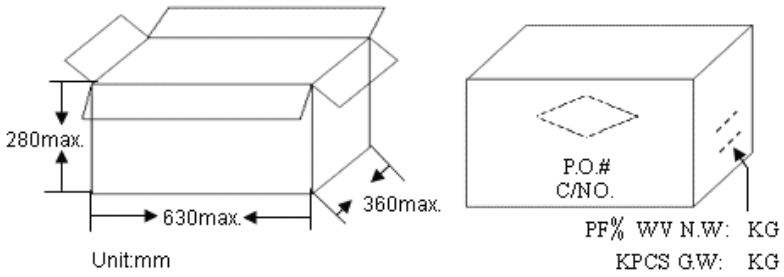
※ "C" expresses nominal capacitance value (pF).

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">15</td><td rowspan="5">Humidity (Under Steady State)</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Set the capacitor for 500±12 hours at 40±2℃, in 90 to 95% humidity.<br><br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.<br>Post-treatment: Capacitor shall be stored for 1 to 2hours at ※1room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B(Y5P)： Within ±10%<br>E(Y5U)： Within ±20%<br>SL：Within±2.5% or ±0.25pF,<br>Whichever is large.</td></tr>
<tr><td>D.F.<br>Q</td><td><table><tr><td>Char.</td><td>Specifications</td></tr><tr><td>B(Y5P)<br>E(Y5U)</td><td>5.0% max.</td></tr><tr><td>SL</td><td>Q≧100+10×C/3※2(C<30pF)<br>Q≧ 200 (C≧30pF)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>B(Y5P),E(Y5U)：3000MΩ min.<br>SL： 1000MΩ min.</td></tr>
<tr><td>Dielectric strength</td><td>Per Item 3</td></tr>
<tr><td rowspan="5">16</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Apply the rated voltage for 500±12 hours at 40±2℃, in 90 to 95% humidity.<br><br>Pre-treatment: Capacitor shall be stored at 125±2℃ for 1hour.then placed at ※1room condition for 24±2hours before initial measurements.<br>Post-treatment: Capacitor shall be stored for 1 to 2hours at ※1room condition.</td></tr>
<tr><td>Capacitance Change</td><td>B(Y5P)： Within ±10%<br>E(Y5U)： Within ±20%<br>SL：Within±2.5% or ±0.25pF,<br>Whichever is large.</td></tr>
<tr><td>D.F.<br>Q</td><td><table><tr><td>Char.</td><td>Specifications</td></tr><tr><td>B(Y5P)<br>E(Y5U)</td><td>5.0% max.</td></tr><tr><td>SL</td><td>Q≧100+10×C/3※2(C<30pF)<br>Q≧ 200 (C≧30pF)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>B,E：3000MΩ min.<br>SL： 1000MΩ min.</td></tr>
<tr><td>Dielectric strength</td><td>Per Item 3</td></tr>
<tr><td rowspan="5">17</td><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">The capacitor should be subjected to 100 temperature cycles,<br><Temperature Cycle time: 100 cycles><br><table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min)</th></tr><tr><td>1</td><td>-40+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><br>Pre-treatment:<br>Capacitor shall be stored at 125±2℃ for 1hour.then placed at※1room condition for 24±2hours.<br>Post-treatment:<br>Capacitor shall be stored for 1 to 2hours at ※1room condition.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><td>Char.</td><td>Capacitance Change</td></tr><tr><td>B(Y5P)</td><td>Within ± 10%</td></tr><tr><td>E(Y5U)</td><td>Within ± 20%</td></tr><tr><td>SL</td><td>Within ± 10%</td></tr></table></td></tr>
<tr><td>D.F.<br>Q</td><td><table><tr><td>Char.</td><td>Specifications</td></tr><tr><td>B(Y5P)</td><td>5.0% max.</td></tr><tr><td>E(Y5U)</td><td>7.5% max.</td></tr><tr><td>SL</td><td>Q≧275+5/2C ※2 (C<30pF)<br>Q≧350 (C≧30pF)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric strength</td><td>Per Item 3</td></tr>
</table>

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

## 8.Packing Baggage：

### 8.1 Packing size:

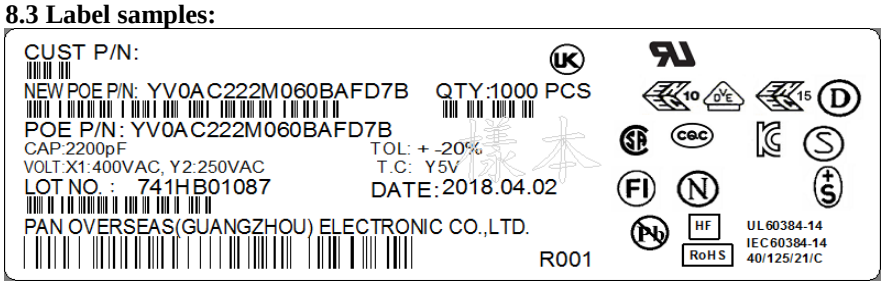
| Type | Box | Carton |
|---|---|---|
| Bulk |  |  |
| Ammo taping |  |  |

### 8.2 Packing quantity:

| Packing type | The code of 14th to15th in SAP P/N | MPQ (Kpcs/Box) |
|---|---|---|
| Taping | AF | 1 |
| | AM | 0.5 |

| Packing type | Lead length | The code of 14th to15th in SAP P/N | MPQ | |
|---|---|---|---|---|
| | | | Kpcs / Bag | Kpcs / Box |
| Bulk | Long lead (L≧20mm) | 05~11 | 0.5 | 1.5 |
| | Short lead (L＜20mm) | 05~11 | 0.5 | 2 |

### 8.3 Label samples:

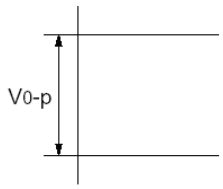
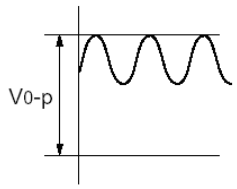
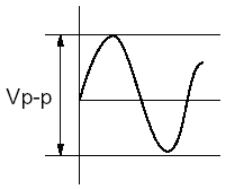


# 9. Caution:

## 9.1 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 |  |  |  |

## 9.2 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.

## 9.3 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**

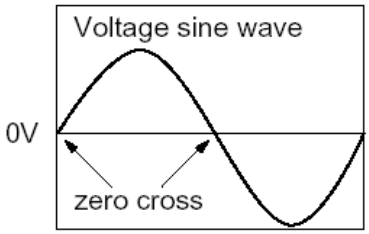
When the withstanding voltage is applied, capacitor's lead or terminal should be firmly connected to the out-put of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage.

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 –




**(3) Applied voltage**

The voltages of Table shall be applied between the respective measuring points of 1 min for qualification approval and periodic testing and for a period of not less than 1 s for lot-by-lot quality conformance testing, a voltage proof test such as Test C shall be carried out only for qualification approval tests and periodic tests;

**Attention is drawn to the fact that repetition of the voltage proof test by the user may damage the capacitor. If repetition of the voltage proof test is made by the user, the applied voltage should not be greater than 66 % of the test voltage specified in Table .**

**Table –Voltage proof**

| Class | Range of rated voltages | Test A | Test B or Test C |
|---|---|---|---|
| X1 | ≤1 000 V | 4,3 UR (d.c.) c | 2 UR + 1 500 V (a.c.) with a minimum of 2 000 V (a.c.) a |
| Y2 | ≥150 V ≤500 V | UR + 1 200 V (a.c.) with a minimum of 1 500 V (a.c.) b | 2 UR + 1 500 V (a.c.) with a minimum of 2 000 V (a.c.) b |

a For Delta and T-connected capacitor units according to Figures 5b and 5c, the test voltage for terminals to case shall be the appropriate test voltage for the Y-capacitors.

b For lot-by-lot tests of Class Y2 capacitors, the a.c. test voltage may be replaced by a d.c. voltage of 1,5 times the prescribed a.c. voltage.

c The $U_R$ in this d.c. test is the rated a.c.voltage value.

Note:

Test A – Between terminations

Test B – Internal insulation

Test C – External insulation (applicable only to insulated capacitors in nonmetallic case or in insulated metal case)

Figure 5b – Delta by-pass capacitor (in metallic housing)

Figure 5c – Example of a T-connected by-pass capacitor (in non-metallic housing)

Figure 5b

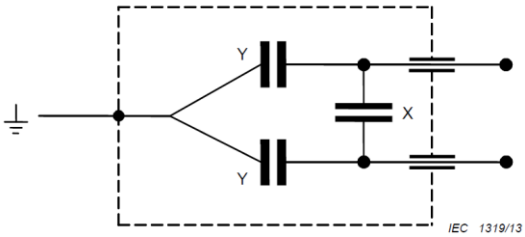
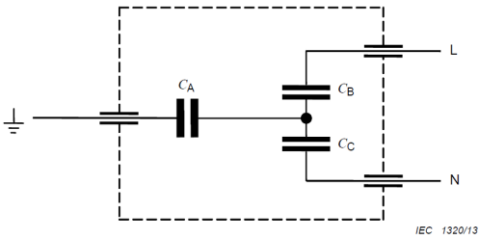



Figure 5c




*For capacitors with non-metallic housings, the earth connection is brought out as a separate termination as is shown in Figure 5c.

## 9.4 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.

## 9.5 Vibration and impact

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

## 9.6 Soldering

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification ofthe 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.

### 9.7 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 a outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

### 9.8 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.

### 9.9 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.

### 9.10 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.

## 10. Notices:

### 10.1 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.

### 10.2 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 product**

### 10.3 Capacitance change of capacitors

**Class 1 capacitors**

Capacitance might change a little depending on a surrounding temperature or an applied voltage.

Please contact us if you use for the strict time constant circuit.

**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.

### 10.4 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.

## 11. Note

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

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

11.3 Do not use these products in any Automotive Power train or Safety equipment including Battery charger for Electric Vehicles and Plug-in Hybrid.

## 12. Soldering Recommendation：

### 12.1 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

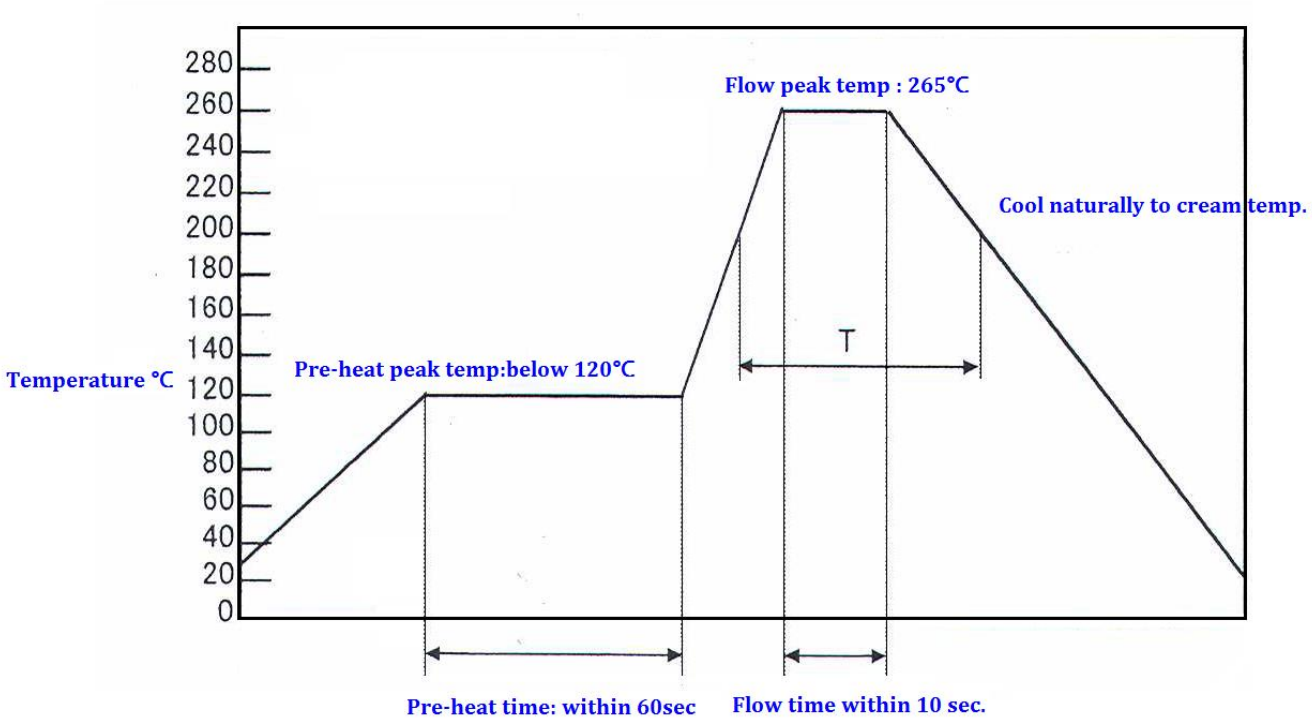


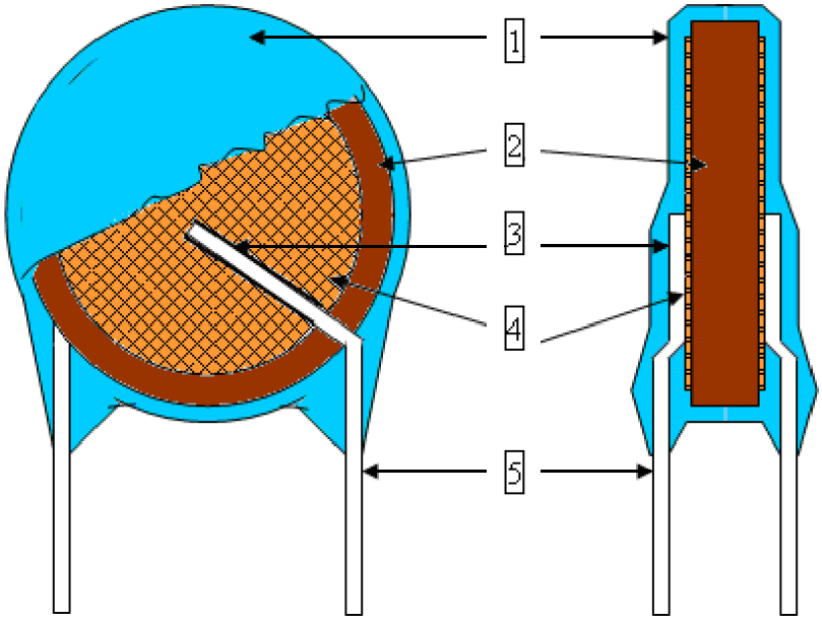

Chart to show flow recommended temp

### 12.2 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.)

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

## 13. Drawing of internal structure and material list：




**Remarks：**

| No. | Material | Description |
|---|---|---|
| 1 | Insulation Coating | Epoxy resins<br>(Conforming to UL94V-0 standard)<br>Type No.: confidential |
| 2 | Dielectric Element | Ceramic |
| 3 | Solder | Tin-Copper alloy |
| 4 | Electrodes | Copper [Cu] |
| 5 | Leads wire | Solder coated CP wire<br>(Solder : Tin-Copper alloy) |

***Constituent structure chart of lead**

