

High-voltage Ceramic Capacitors (DC250V-6.3kV)



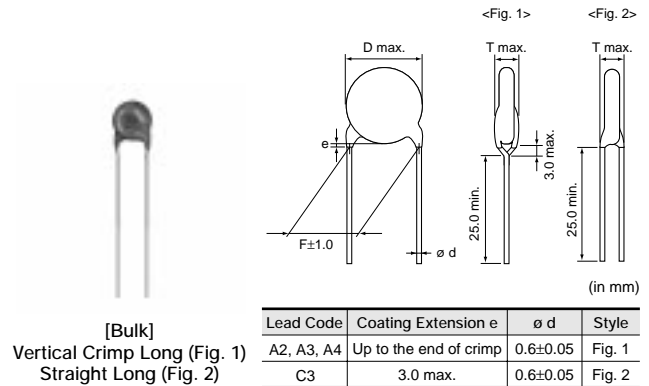
DEH Series (125 deg. C Guaranteed/Low-dissipation Factor/DC250V-3.15kV)

■ Features

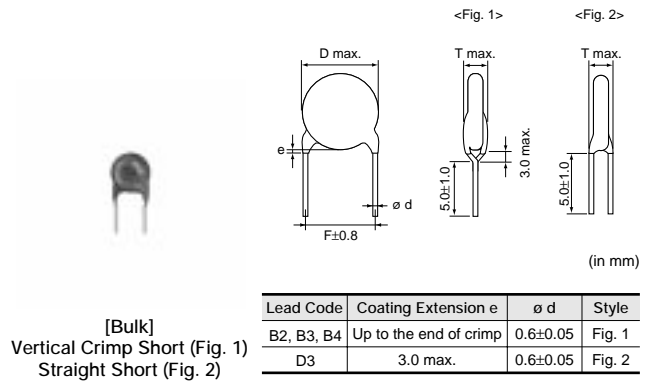
1. Reduced heat dissipation permitted due to small dielectric loss of the ceramic material.
2. Operating temperature range guaranteed up to 125 degree C.
3. Coated with flame-retardant epoxy resin. (equivalent to UL94V-0 standards)
4. We eliminated lead (Pb) from plating lead wires.
5. Taping available for automatic insertion.

■ Applications

Ideal use on high-frequency pulse circuit such as horizontal resonance circuit for CTV and snubber circuit for switching power supply.



[Bulk]
Vertical Crimp Long (Fig. 1)
Straight Long (Fig. 2)



[Bulk]
Vertical Crimp Short (Fig. 1)
Straight Short (Fig. 2)

■ Marking

| Rated Voltage | | DC250V | DC500V | DC1-3.15kV |
|----------------------------------|------------|---|---------------------|----------------------------|
| Nominal body diameter | | | | |
| Temp. Char. | | R | C | R |
| Nominal body diameter | ø6mm | HR 102 66 | HR 471 66 | — |
| | ø7-9mm | HR R 332K 250V 66 | HR C 152K 66 | HR R 102K 1KV 66 |
| | ø10-21mm | HR R 103K 250V M66 | HR C 472K M66 | HR R 272K 3KV M66 |
| High Temperature Guaranteed Code | | HR | | |
| Temperature Characteristic | | Marked with code (Omitted for nominal body diameter ø6mm) | | |
| Nominal Capacitance | | Marked with 3 figures | | |
| Capacitance Tolerance | | Marked with code (Omitted for nominal body diameter ø6mm) | | |
| Rated Voltage | DC250V | Marked with code (Marked with horizontal line over nominal capacitance for nominal body diameter ø6mm) | | |
| | DC500V | Omitted | | |
| | DC1-3.15kV | Marked with code (In case of DC3.15kV, marked with 3KV) | | |
| Manufacturer's Identification | | Marked with $\text{\textcircled{M}}$ (Omitted for nominal body diameter ø9mm and under) | | |
| Manufactured Date Code | | Abbreviation | | |

DC250V, R Characteristics

| Part Number | DC Rated Voltage (Vdc) | Capacitance (pF) | Body Dia. D (mm) | Lead Spacing F (mm) | Body Thickness T (mm) | Lead Package Long Bulk | Lead Package Short Bulk | Lead Package Taping |
|----------------|------------------------|------------------|------------------|---------------------|-----------------------|------------------------|-------------------------|---------------------|
| DEHR32E221K□□□ | 250 | 220 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E331K□□□ | 250 | 330 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E471K□□□ | 250 | 470 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E681K□□□ | 250 | 680 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E102K□□□ | 250 | 1000 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E152K□□□ | 250 | 1500 +10,-10% | 7 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E222K□□□ | 250 | 2200 +10,-10% | 8 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E332K□□□ | 250 | 3300 +10,-10% | 9 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E472K□□□ | 250 | 4700 +10,-10% | 10 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E682K□□□ | 250 | 6800 +10,-10% | 12 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHR32E103K□□□ | 250 | 10000 +10,-10% | 12 | 5.0 | 4.0 | A2B | B2B | N2A |

Three blank columns are filled with the lead and packaging codes. Please refer to each code which is shown in the right end.

DC500V, C Characteristics

| Part Number | DC Rated Voltage (Vdc) | Capacitance (pF) | Body Dia. D (mm) | Lead Spacing F (mm) | Body Thickness T (mm) | Lead Package Long Bulk | Lead Package Short Bulk | Lead Package Taping |
|----------------|------------------------|------------------|------------------|---------------------|-----------------------|------------------------|-------------------------|---------------------|
| DEHC32H331K□□□ | 500 | 330 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H471K□□□ | 500 | 470 +10,-10% | 6 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H681K□□□ | 500 | 680 +10,-10% | 7 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H102K□□□ | 500 | 1000 +10,-10% | 8 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H152K□□□ | 500 | 1500 +10,-10% | 9 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H222K□□□ | 500 | 2200 +10,-10% | 10 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H332K□□□ | 500 | 3300 +10,-10% | 12 | 5.0 | 4.0 | A2B | B2B | N2A |
| DEHC32H472K□□□ | 500 | 4700 +10,-10% | 14 | 10.0 | 4.0 | A4B | B4B | - |

Three blank columns are filled with the lead and packaging codes. Please refer to each code which is shown in the right end.

DC1-3.15kV, R Characteristics

| Part Number | DC Rated Voltage (Vdc) | Capacitance (pF) | Body Dia. D (mm) | Lead Spacing F (mm) | Body Thickness T (mm) | Lead Package Long Bulk | Lead Package Short Bulk | Lead Package Taping |
|----------------|------------------------|------------------|------------------|---------------------|-----------------------|------------------------|-------------------------|---------------------|
| DEHR33A221K□□□ | 1000 | 220 +10,-10% | 7 | 5.0 | 4.5 | A2B | B2B | N2A |
| DEHR33A331K□□□ | 1000 | 330 +10,-10% | 7 | 5.0 | 4.5 | A2B | B2B | N2A |
| DEHR33A471K□□□ | 1000 | 470 +10,-10% | 7 | 5.0 | 4.5 | A2B | B2B | N2A |
| DEHR33A681K□□□ | 1000 | 680 +10,-10% | 8 | 5.0 | 4.5 | A2B | B2B | N2A |
| DEHR33A102K□□□ | 1000 | 1000 +10,-10% | 9 | 5.0 | 4.5 | A2B | B2B | N2A |
| DEHR33A152K□□□ | 1000 | 1500 +10,-10% | 11 | 5.0 | 4.5 | A2B | B2B | N2A |
| DEHR33A222K□□□ | 1000 | 2200 +10,-10% | 13 | 7.5 | 4.5 | A3B | B3B | N3A |
| DEHR33A332K□□□ | 1000 | 3300 +10,-10% | 15 | 7.5 | 4.5 | A3B | B3B | N7A |
| DEHR33A472K□□□ | 1000 | 4700 +10,-10% | 17 | 7.5 | 4.5 | A3B | B3B | N7A |
| DEHR33D221K□□□ | 2000 | 220 +10,-10% | 7 | 7.5 | 5.0 | C3B | D3B | P3A |
| DEHR33D271K□□□ | 2000 | 270 +10,-10% | 7 | 7.5 | 5.0 | C3B | D3B | P3A |
| DEHR33D331K□□□ | 2000 | 330 +10,-10% | 8 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D391K□□□ | 2000 | 390 +10,-10% | 8 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D471K□□□ | 2000 | 470 +10,-10% | 9 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D561K□□□ | 2000 | 560 +10,-10% | 9 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D681K□□□ | 2000 | 680 +10,-10% | 10 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D821K□□□ | 2000 | 820 +10,-10% | 11 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D102K□□□ | 2000 | 1000 +10,-10% | 12 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D122K□□□ | 2000 | 1200 +10,-10% | 12 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D152K□□□ | 2000 | 1500 +10,-10% | 12 | 7.5 | 5.0 | A3B | B3B | N3A |
| DEHR33D182K□□□ | 2000 | 1800 +10,-10% | 14 | 7.5 | 5.0 | A3B | B3B | N7A |

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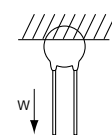
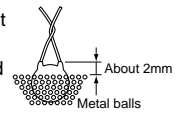
↳ Continued from the preceding page.

| Part Number | DC Rated Voltage (Vdc) | Capacitance (pF) | Body Dia. D (mm) | Lead Spacing F (mm) | Body Thickness T (mm) | Lead Package Long Bulk | Lead Package Short Bulk | Lead Package Taping |
|----------------|------------------------|------------------|------------------|---------------------|-----------------------|------------------------|-------------------------|---------------------|
| DEHR33D222K□□□ | 2000 | 2200 +10,-10% | 15 | 7.5 | 5.0 | A3B | B3B | N7A |
| DEHR33D272K□□□ | 2000 | 2700 +10,-10% | 17 | 7.5 | 5.0 | A3B | B3B | N7A |
| DEHR33D332K□□□ | 2000 | 3300 +10,-10% | 19 | 10.0 | 5.0 | A4B | B4B | - |
| DEHR33D392K□□□ | 2000 | 3900 +10,-10% | 20 | 10.0 | 5.0 | A4B | B4B | - |
| DEHR33D472K□□□ | 2000 | 4700 +10,-10% | 21 | 10.0 | 5.0 | A4B | B4B | - |
| DEHR33F151K□□□ | 3150 | 150 +10,-10% | 7 | 7.5 | 6.0 | C3B | D3B | P3A |
| DEHR33F181K□□□ | 3150 | 180 +10,-10% | 7 | 7.5 | 6.0 | C3B | D3B | P3A |
| DEHR33F221K□□□ | 3150 | 220 +10,-10% | 7 | 7.5 | 6.0 | C3B | D3B | P3A |
| DEHR33F271K□□□ | 3150 | 270 +10,-10% | 7 | 7.5 | 6.0 | C3B | D3B | P3A |
| DEHR33F331K□□□ | 3150 | 330 +10,-10% | 8 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F391K□□□ | 3150 | 390 +10,-10% | 9 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F471K□□□ | 3150 | 470 +10,-10% | 10 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F561K□□□ | 3150 | 560 +10,-10% | 10 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F681K□□□ | 3150 | 680 +10,-10% | 11 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F821K□□□ | 3150 | 820 +10,-10% | 12 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F102K□□□ | 3150 | 1000 +10,-10% | 13 | 7.5 | 6.0 | A3B | B3B | N3A |
| DEHR33F122K□□□ | 3150 | 1200 +10,-10% | 14 | 7.5 | 6.0 | A3B | B3B | N7A |
| DEHR33F152K□□□ | 3150 | 1500 +10,-10% | 15 | 7.5 | 6.0 | A3B | B3B | N7A |
| DEHR33F182K□□□ | 3150 | 1800 +10,-10% | 16 | 7.5 | 6.0 | A3B | B3B | N7A |
| DEHR33F222K□□□ | 3150 | 2200 +10,-10% | 17 | 7.5 | 6.0 | A3B | B3B | N7A |
| DEHR33F272K□□□ | 3150 | 2700 +10,-10% | 19 | 10.0 | 6.0 | A4B | B4B | - |

Three blank columns are filled with the lead and packaging codes. Please refer to each code which is shown in the right end.

Specifications and Test Methods

| No. | Item | Specification | Testing Method | | | | | | | | | | | |
|--|------------------------------|---|---|-------------|------|--------------|---------------|---|-------------|-----------------|-------|-------------|--|------|
| 1 | Operating Temperature Range | -25 to +125°C | | | | | | | | | | | | |
| 2 | Appearance and Dimensions | No marked defect on appearance form and dimensions are within specified range. | The capacitor shall be inspected by naked eyes for visible evidence of defect. Dimensions shall be measured with slide calipers. | | | | | | | | | | | |
| 3 | Marking | To be easily legible. | The capacitor shall be inspected by naked eyes. | | | | | | | | | | | |
| 4 | Dielectric Strength | Between Lead Wires | No failure. The capacitor shall not be damage when DC voltage of 200% of the rated voltage (In case of rated voltage: DC1 to 3.15kV) or DC voltage of 250% of the rated voltage (In case of rated voltage: DC250V, DC500V) are applied between the lead wires for 1 to 5 s. (Charge/Discharge current ≤ 50mA.) | | | | | | | | | | | |
| | | Body Insulation | No failure. The capacitor is placed in the container with metal balls of diameter 1mm so that each lead wire, shortcircuited, is kept about 2mm off the balls as shown in the figure, and AC1250V (r.m.s.)<50/60Hz> is applied for 1 to 5 s between capacitor lead wires and small metals. (Charge/Discharge current ≤ 50mA.) | | | | | | | | | | | |
| 5 | Insulation Resistance (I.R.) | Between Lead Wires Char. R[DC1 to 3.15kV], Char. C : 10000MΩ min. Char. R[DC250V] : 1000MΩ min. | The insulation resistance shall be measured with DC500±50V (Char. R[DC 250V]: DC100±15V) within 60±5 s of charging. | | | | | | | | | | | |
| 6 | Capacitance | Within specified tolerance. | The capacitance shall be measured at 20°C with 1±0.2kHz and AC5V(r.m.s.) max.. | | | | | | | | | | | |
| 7 | Dissipation Factor (D.F.) | Char. R[DC250V]: 0.4% max. Char. R[DC1 to 3.15kV] : 0.2% max. Char. C : 0.3% max. | The dissipation factor shall be measured at 20°C with 1±0.2kHz and AC5V(r.m.s.) max.. | | | | | | | | | | | |
| 8 | Temperature Characteristic | <table border="1"> <thead> <tr> <th rowspan="2">T. C.</th> <th colspan="2">Temp. char.</th> </tr> <tr> <th>-25 to +85°C</th> <th>+85 to +125°C</th> </tr> </thead> <tbody> <tr> <td>R</td> <td>Within ±15%</td> <td rowspan="2">Within +15/-30%</td> </tr> <tr> <td>C</td> <td>Within ±20%</td> </tr> </tbody> </table> | T. C. | Temp. char. | | -25 to +85°C | +85 to +125°C | R | Within ±15% | Within +15/-30% | C | Within ±20% | The capacitance measurement shall be made at each step specified in Table. | |
| | | T. C. | | Temp. char. | | | | | | | | | | |
| -25 to +85°C | +85 to +125°C | | | | | | | | | | | | | |
| R | Within ±15% | Within +15/-30% | | | | | | | | | | | | |
| C | Within ±20% | | | | | | | | | | | | | |
| Pre-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1 room condition for 24±2 h before measurements. <table border="1"> <thead> <tr> <th>Step</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td>Temp.(°C)</td> <td>20±2</td> <td>-25±3</td> <td>20±2</td> <td>125±2</td> <td>20±2</td> </tr> </tbody> </table> | | | Step | 1 | 2 | 3 | 4 | 5 | Temp.(°C) | 20±2 | -25±3 | 20±2 | 125±2 | 20±2 |
| Step | 1 | 2 | 3 | 4 | 5 | | | | | | | | | |
| Temp.(°C) | 20±2 | -25±3 | 20±2 | 125±2 | 20±2 | | | | | | | | | |
| 9 | Strength of Lead | Pull | Lead wire shall not cut off. Capacitor shall not be broken. | | | | | | | | | | | |
| | | Bending | As a figure, fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N (5N for lead diameter ø0.5mm), and keep it for 10±1 s. Each lead wire shall be subjected to 5N (2.5N for lead diameter ø0.5mm) weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s. | | | | | | | | | | | |
| 10 | Vibration Resistance | Appearance | No marked defect. | | | | | | | | | | | |
| | | Capacitance | Within specified tolerance. | | | | | | | | | | | |
| | | D.F. | Char. R[DC250V] : 0.4% max. Char. R[DC1 to 3.15kV] : 0.2% max. Char. C : 0.3% max. | | | | | | | | | | | |
| 11 | Solderability of Leads | Lead wire shall be soldered with uniformly coated on the axial direction over 3/4 of the circumferential direction. | The lead wire of a capacitor shall be dipped into a ethanol solution of 25wt% rosin and then into molten solder of 235±5°C for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2mm from the root of lead wires. | | | | | | | | | | | |
| 12 | Soldering Effect | Appearance | No marked defect. | | | | | | | | | | | |
| | | Capacitance Change | Within ±10% | | | | | | | | | | | |
| | | Dielectric Strength (Between Lead Wires) | Per item 4. | | | | | | | | | | | |



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

Specifications and Test Methods

Continued from the preceding page.

| No. | Item | Specification | Testing Method | | | | | | | | | | | | | | | |
|--|-------------------------------|--------------------|--|-------------------|-----------------|------|---|-------|--------|---|------------|-------|---|--------|--------|---|------------|-------|
| 13 | Humidity (Under Steady State) | Appearance | Set the capacitor for 500 +24/-0 h at 40±2°C in 90 to 95% relative humidity. Pre-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1room condition for 24±2 h before initial measurements. Post-treatment : Capacitor shall be stored for 1 to 2 h at *1room condition. Measurement order : I.R. -> Pre-treatment -> Capacitance · D.F. -> Humidity test -> Post-treatment -> Capacitance · D.F. · I.R. (Char. R[DC250V]) | | | | | | | | | | | | | | | |
| | | Capacitance Change | | No marked defect. | | | | | | | | | | | | | | |
| | | D.F. | | Within ±10% | | | | | | | | | | | | | | |
| | | I.R. | | 0.4% max. | | | | | | | | | | | | | | |
| 14 | Humidity Loading | Appearance | Apply the rated voltage for 500 +24/-0 h at 40±2°C in 90 to 95% relative humidity. (Charge/Discharge current≤50mA.) Pre-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1room condition for 24±2 h before initial measurements. Post-treatment : Capacitor shall be stored for 1 to 2 h at *1room condition. (Char. R[DC1 to 3.15kV], Char. C) Post-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1room condition for 24±2 h. (Char. R[DC250V]) Measurement order : I.R. -> Pre-treatment -> Capacitance · D.F. -> Humidity loading test -> *2 I.R. -> Post-treatment -> Capacitance · D.F. (Char. R[DC250V]) | | | | | | | | | | | | | | | |
| | | Capacitance Change | | No marked defect. | | | | | | | | | | | | | | |
| | | D.F. | | Within ±10% | | | | | | | | | | | | | | |
| | | I.R. | | 0.6% max. | | | | | | | | | | | | | | |
| 15 | Life | Appearance | Apply a DC voltage of 200% of the rated voltage (In case of rated voltage:DC250V, DC500V) or DC voltage of 150% of the rated voltage (In case of rated voltage:DC1 to 3.15kV) for 1000 +48/-0 h at 125±2°C and relative humidity of 50% max.. (Charge/Discharge current≤50mA.) Pre-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1room condition for 24±2 h before initial measurements. Post-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1room condition for 24±2 h. Measurement order : I.R. -> Pre-treatment -> Capacitance · D.F. -> Life test -> *3I.R. -> Post-treatment -> Capacitance · D.F. (Char. R[DC250V]) | | | | | | | | | | | | | | | |
| | | Capacitance Change | | No marked defect. | | | | | | | | | | | | | | |
| | | D.F. | | Within ±10% | | | | | | | | | | | | | | |
| | | I.R. | | 0.4% max. | | | | | | | | | | | | | | |
| 16 | Temperature Cycle | Appearance | The capacitor shall be subjected to 5 temperature cycles. <Temperature cycle> <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-25±3</td> <td>30 min</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>3 min</td> </tr> <tr> <td>3</td> <td>+125±3</td> <td>30 min</td> </tr> <tr> <td>4</td> <td>Room Temp.</td> <td>3 min</td> </tr> </tbody> </table> Cycle time : 5 cycle Pre-treatment : Capacitor shall be stored at 125±3°C for 1 h, then placed at *1room condition for 24±2 h before initial measurements. Post-treatment : Capacitor shall be stored for 24±2 h at *1room condition. Measurement order : I.R. · Dielectric strength -> Pre-treatment -> Capacitance · D.F. -> Temperature cycle test -> Post-treatment -> Capacitance · D.F. · I.R. · Dielectric strength (Char. R[DC250V]) | Step | Temperature(°C) | Time | 1 | -25±3 | 30 min | 2 | Room Temp. | 3 min | 3 | +125±3 | 30 min | 4 | Room Temp. | 3 min |
| | | Step | | Temperature(°C) | Time | | | | | | | | | | | | | |
| | | 1 | | -25±3 | 30 min | | | | | | | | | | | | | |
| | | 2 | | Room Temp. | 3 min | | | | | | | | | | | | | |
| | | 3 | | +125±3 | 30 min | | | | | | | | | | | | | |
| 4 | Room Temp. | 3 min | | | | | | | | | | | | | | | | |
| Capacitance Change | No marked defect. | | | | | | | | | | | | | | | | | |
| D.F. | Within ±10% | | | | | | | | | | | | | | | | | |
| I.R. | 0.4% max. | | | | | | | | | | | | | | | | | |
| Dielectric Strength (Between Lead Wires) | 1000MΩ min. | | | | | | | | | | | | | | | | | |
| | | Per item 4. | | | | | | | | | | | | | | | | |

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

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

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