

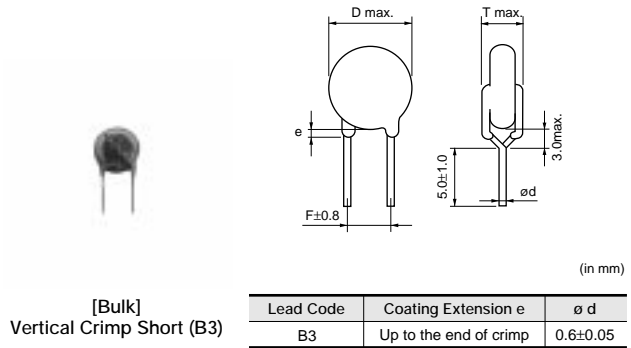
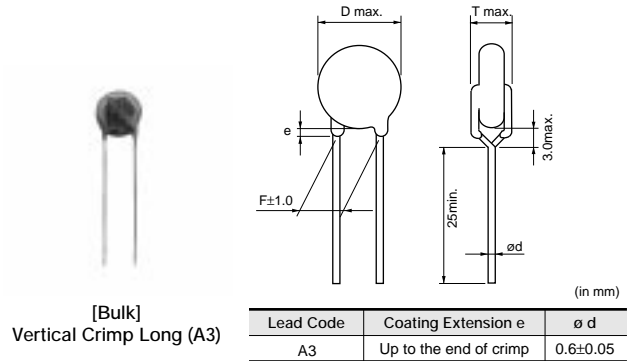
# Safety Recognized Ceramic Capacitors



## Type KH (Basic insulation)-IEC60384-14 Class X1, Y2-

### ■ Features

1. Operating temperature range guaranteed up to 125 degree(UL/CSA:85deg.).
2. Dielectric strength:AC2600V(r.m.s.)
3. Class X1/Y2 capacitors of UL1414 6th edition and IEC60384-14 2nd edition.
4. The type KH is recognized by UL/CSA/BSI/SEMKO/SEV/VDE/FIMKO/NEMKO/DEMKO/NSW.
5. Coated with flame-retardant epoxy resin (conforming to UL94V-0 standards).
6. Automatic insertion can be, and save costs.



### ■ Standard Recognition

|           | Standard No.                    | Recognized No.            |                     | Rated Voltage      |  |
|-----------|---------------------------------|---------------------------|---------------------|--------------------|--|
|           |                                 | Japan                     | Taiwan              |                    |  |
| UL        | UL1414                          | E37921                    |                     | AC250V<br>(r.m.s.) |  |
| CSA       | C22.2 No.1                      | LR36214                   | LR44559             |                    |  |
| BSI       | EN60065 (8.8, 14.2)<br>EN132400 | 227636                    |                     |                    |  |
| SEMKO     | EN132400                        | 9735044/01-02             |                     |                    |  |
| SEV       |                                 | 98, 5 50212               |                     |                    |  |
| VDE       |                                 | 83663, 83665, 83667       | 83664, 83666, 83668 |                    |  |
| FIMKO     |                                 | 198418                    |                     |                    |  |
| NEMKO     |                                 | P97102089                 |                     |                    |  |
| DEMKO     |                                 | 113878A/DK 98-01362       |                     |                    |  |
| NSW (SAA) |                                 | IEC60384-14 (2nd Edition) | 6529                |                    |  |

- The recognition number might change by the revision of the application standard and the change within the range of acquisition.
- CCEE (Chinese Safety Standard) Safety Standard is also available as special specification. Please contact us for details.

### ■ Marking

| Example                          | Item  |
|----------------------------------|---|
|                                  | ① Type Designation KH                         |
|                                  | ② Nominal Capacitance (Marked with 3 figures) |
|                                  | ③ Capacitance Tolerance                       |
|                                  | ④ Manufacturer's Identification *             |
|                                  | ⑤ Manufactured Date Code                      |
|                                  | UL Approval Mark                              |
|                                  | CSA Approval Mark                             |
|                                  | BSI Approval Mark BS415                       |
|                                  | SEMKO Approval Mark                           |
|                                  | SEV Approval Mark                             |
| VDE Approval Mark                |   |
| FIMKO Approval Mark              |   |
| NEMKO Approval Mark              |   |
| DEMKO Approval Mark              |   |
| Class Code (Except for CSA) X1Y2 |   |
| Rated Voltage Mark 250~          |   |

\*C3 : Made in Japan. C8 : Made in Taiwan.

2

| Part Number    | AC Rated Voltage (Vac) | Temp. Char. | 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 (1) |
|----------------|------------------------|-------------|------------------|------------------|---------------------|-----------------------|------------------------|-------------------------|-------------------------|
| DE2B3KH101K□□□ | 250                    | B           | 100 +10,-10%     | 8 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2B3KH151K□□□ | 250                    | B           | 150 +10,-10%     | 8 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2B3KH221K□□□ | 250                    | B           | 220 +10,-10%     | 8 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2B3KH331K□□□ | 250                    | B           | 330 +10,-10%     | 8 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2B3KH471K□□□ | 250                    | B           | 470 +10,-10%     | 8 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2B3KH681K□□□ | 250                    | B           | 680 +10,-10%     | 9 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2E3KH102M□□□ | 250                    | E           | 1000 +20,-20%    | 8 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2E3KH152M□□□ | 250                    | E           | 1500 +20,-20%    | 9 max.           | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2E3KH222M□□□ | 250                    | E           | 2200 +20,-20%    | 10 max.          | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2E3KH332M□□□ | 250                    | E           | 3300 +20,-20%    | 12 max.          | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2E3KH472M□□□ | 250                    | E           | 4700 +20,-20%    | 13 max.          | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N3A                     |
| DE2F3KH103M□□□ | 250                    | F           | 10000 +20,-20%   | 16 max.          | 7.5                 | 7.0 max.              | A3B                    | B3B                     | N7A                     |

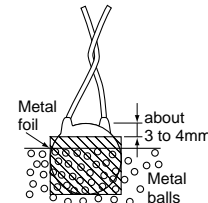
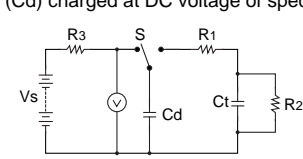
Three blank columns are filled with the lead and packaging codes. Please refer to each code which is shown in the right end.

Murata part numbers might be changed depending on lead code or any other changes. Therefore, please specify only the type name(KH) and capacitance of products in the parts list when it is required for applying safety standard of electric equipment.

## Type KY/KH/KX Specifications and Test Methods

### ■ Apply to Type KY/KH/KX

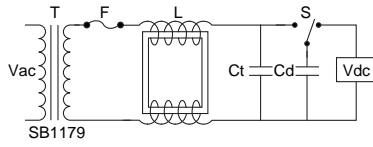
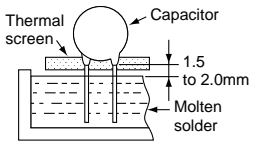
Operating Temperature Range : -25 to +125°C (-25 to +85°C in case of the standard of UL / CSA)

| No.             | Item   | Specification  | Testing Method   |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
|-----------------|--|--|--|--------------------|---------------|------------------|--|---------------------|------------------|---------------------|---|-------------------------|----|---------------------|--|------|------------------|---|-------|---|-------|---|-------|---|-------|---|-------|
| 1               | 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.<br>Dimensions shall be measured with slide calipers.  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 2               | Marking  | To be easily legible   | The capacitor shall be inspected by naked eyes.  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 3               | Capacitance  | Within specified tolerance.  | The capacitance, dissipation factor and Q shall be measured at 20°C with 1±0.1kHz(char. SL : 1±0.1MHz) and AC5V (r.m.s.) max.  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 4               | Dissipation Factor (D.F.)<br>Q   | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Char.</th> <th style="width: 80%;">Specification</th> </tr> </thead> <tbody> <tr> <td>B, E</td> <td>D.F. ≤ 2.5%</td> </tr> <tr> <td>F</td> <td>D.F. ≤ 5.0%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 400+20C*(C &lt; 30pF)<br/>Q ≥ 1000 (C ≥ 30pF)</td> </tr> </tbody> </table>  |  | Char.              | Specification | B, E             | D.F. ≤ 2.5%  | F                   | D.F. ≤ 5.0%      | SL                  | Q ≥ 400+20C*(C < 30pF)<br>Q ≥ 1000 (C ≥ 30pF) |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| Char.           | Specification  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| B, E            | D.F. ≤ 2.5%  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| F               | D.F. ≤ 5.0%  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| SL              | Q ≥ 400+20C*(C < 30pF)<br>Q ≥ 1000 (C ≥ 30pF)  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 5               | Insulation Resistance (I.R.)   | 10000MΩ min.   | The insulation resistance shall be measured with DC500±50V within 60±5 s of charging.<br>The voltage shall be applied to the capacitor through a resistor of 1MΩ.  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 6               | Between Lead Wires   | No failure.  | <p>The capacitor shall not be damage when Test voltage of Table 1 are applied between the lead wires for 60 s.</p> <p style="text-align: center;">&lt;Table.1&gt;</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Type</th> <th style="width: 80%;">Test voltage</th> </tr> </thead> <tbody> <tr> <td>KY</td> <td>In case of lead spacing F=5mm AC2000V (r.m.s.)<br/>In case of lead spacing F=7.5mm AC2600V (r.m.s.)</td> </tr> <tr> <td>KH</td> <td>AC2600V (r.m.s.)</td> </tr> <tr> <td>KX</td> <td>AC4000V (r.m.s.)</td> </tr> </tbody> </table> | Type               | Test voltage  | KY               | In case of lead spacing F=5mm AC2000V (r.m.s.)<br>In case of lead spacing F=7.5mm AC2600V (r.m.s.) | KH                  | AC2600V (r.m.s.) | KX                  | AC4000V (r.m.s.)                              |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
|                 | Type   | Test voltage   |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| KY              | In case of lead spacing F=5mm AC2000V (r.m.s.)<br>In case of lead spacing F=7.5mm AC2600V (r.m.s.) |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| KH              | AC2600V (r.m.s.)   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| KX              | AC4000V (r.m.s.)   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| Body Insulation | No failure.  | <p>First, the terminals of the capacitor shall be connected together. Then, as shown in Figure right, a metal foil shall be closely wrapped around the body of the capacitor to the distance of about 3 to 4mm from each terminal.</p>  <p>Then, the capacitor shall be inserted into a container filled with metal balls of about 1mm diameter. Finally, AC voltage of Table 2 is applied for 60 s between the capacitor lead wires and metal balls.</p> <p style="text-align: center;">&lt;Table.2&gt;</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Type</th> <th style="width: 80%;">Test voltage</th> </tr> </thead> <tbody> <tr> <td>KY</td> <td>AC2600V (r.m.s.)</td> </tr> <tr> <td>KH</td> <td>AC2600V (r.m.s.)</td> </tr> <tr> <td>KX</td> <td>AC4000V (r.m.s.)</td> </tr> </tbody> </table> | Type   | Test voltage       | KY            | AC2600V (r.m.s.) | KH   | AC2600V (r.m.s.)    | KX               | AC4000V (r.m.s.)    |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| Type            | Test voltage   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| KY              | AC2600V (r.m.s.)   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| KH              | AC2600V (r.m.s.)   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| KX              | AC4000V (r.m.s.)   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 7               | Temperature Characteristics  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Char.</th> <th style="width: 80%;">Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Within ±10%</td> </tr> <tr> <td>E</td> <td>Within +20%<br/>-55%</td> </tr> <tr> <td>F</td> <td>Within +30%<br/>-30%</td> </tr> </tbody> </table> <p>Temperature characteristic guarantee is -25 to +85°C</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Char.</th> <th style="width: 80%;">Temperature Coefficient</th> </tr> </thead> <tbody> <tr> <td>SL</td> <td>+350 to -1000ppm/°C</td> </tr> </tbody> </table> <p>Temperature characteristic guarantee is +20 to +85°C</p>  | Char.  | Capacitance Change | B             | Within ±10%      | E  | Within +20%<br>-55% | F                | Within +30%<br>-30% | Char.   | Temperature Coefficient | SL | +350 to -1000ppm/°C | <p>The capacitance measurement shall be made at each step specified in Table 3.</p> <p style="text-align: center;">&lt;Table.3&gt;</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Step</th> <th style="width: 80%;">Temperature (°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+20±2</td> </tr> <tr> <td>2</td> <td>-25±2</td> </tr> <tr> <td>3</td> <td>+20±2</td> </tr> <tr> <td>4</td> <td>+85±2</td> </tr> <tr> <td>5</td> <td>+20±2</td> </tr> </tbody> </table> | Step | Temperature (°C) | 1 | +20±2 | 2 | -25±2 | 3 | +20±2 | 4 | +85±2 | 5 | +20±2 |
| Char.           | Capacitance Change   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| B               | Within ±10%  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| E               | Within +20%<br>-55%  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| F               | Within +30%<br>-30%  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| Char.           | Temperature Coefficient  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| SL              | +350 to -1000ppm/°C  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| Step            | Temperature (°C)   |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 1               | +20±2  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 2               | -25±2  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 3               | +20±2  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 4               | +85±2  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 5               | +20±2  |  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
| 8               | Appearance   | No marked defect.  | <p>As in Figure 1, discharge is made 50 times at 5 s intervals from the capacitor (Cd) charged at DC voltage of specified.</p>  <p style="text-align: center;">Fig.1</p> <p>Ct: Capacitor under test<br/>Cd: 0.001μF<br/>S: High-voltage switch<br/>R1: 1000Ω<br/>R2: 100MΩ<br/>R3: Surge resistance<br/>Vs: DC10kV</p>   |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |
|                 | Dielectric Strength  | Per Item 6.  |  |                    |               |                  |  |                     |                  |                     |   |                         |    |                     |  |      |                  |   |       |   |       |   |       |   |       |   |       |

\*1 "C" expresses nominal capacitance value (pF).

## Type KY/KH/KX Specifications and Test Methods

Continued from the preceding page.

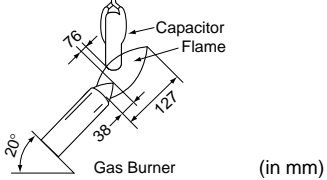
| No.                 | Item   | Specification  | Testing Method   |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
|---------------------|--|--|--|-------------------|--------------------|---------------------------------|------------------|--|---|---------------|--|------------|---|------------|----|---|---|
| 9                   | Discharge Test ( II )<br>[Not apply to Type KY]  | The cheese-cloth around capacitors shall not glow or flame.  | <p>A single layer of cheese-cloth is to be placed around the body of the test capacitor. Each sample is to be subjected to four discharges from a dump capacitor charged to a voltage that, when discharged, placed DC 5kV across the capacitor under test. The interval between successive discharges is to be 5 s. AC240V (r.m.s.), 60Hz potential is to be applied across the capacitor under test and is to be maintained for 30 s after the fourth discharge, unless the circuit is opened in a shorter time by breakdown of the test capacitor. The direct current supply is to be adjusted to provide a potential in accordance with the following.</p> $V_{dc} = \frac{5000 (C_d + C_t)}{C_d} (V)$  <p style="text-align: center;">Fig.2</p> <p>Vdc : Variable direct-current voltage source<br/>                     S : High-voltage switch<br/>                     L : Choke coil of approximately 3mH and 0.03Ω<br/>                     F : Plug fuse rated 30A and 250V<br/>                     Vac : Supply source rated 240V, 60Hz and 30A<br/>                     Ct : Capacitor under test<br/>                     Cd : Dump Capacitor</p> <p style="text-align: center;">Capacitance value and D.F. are as follows.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Cap. value of Ct</td> <td>0 to 0.005μF</td> <td>0.0051 to 0.05μF</td> </tr> <tr> <td>Cap. value of Cd</td> <td>0.005μF</td> <td>0.05μF</td> </tr> <tr> <td>D.F. of Cd</td> <td>0.5% max.</td> <td>0.5% max.</td> </tr> </table> | Cap. value of Ct  | 0 to 0.005μF       | 0.0051 to 0.05μF                | Cap. value of Cd | 0.005μF  | 0.05μF  | D.F. of Cd    | 0.5% max.  | 0.5% max.  |   |            |    |   |   |
| Cap. value of Ct    | 0 to 0.005μF   | 0.0051 to 0.05μF   |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| Cap. value of Cd    | 0.005μF  | 0.05μF   |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| D.F. of Cd          | 0.5% max.  | 0.5% max.  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| 10                  | Solderability of Leads   | Lead wire shall be soldered with uniformly coated on the axial direction over 3/4 of the circumferential direction.  | <p>The lead wire of a capacitor shall be dipped into molten solder of 235±5°C for 2±0.5 s. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires.</p>   |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| 11                  | Soldering Effect   | <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Appearance</td> <td>No marked defect.</td> </tr> <tr> <td>Capacitance Change</td> <td>Within±10%</td> </tr> <tr> <td>I.R.</td> <td>1000MΩ min.</td> </tr> <tr> <td>Dielectric Strength</td> <td>Per Item 6.</td> </tr> </table>   | Appearance   | No marked defect. | Capacitance Change | Within±10%                      | I.R.             | 1000MΩ min.  | Dielectric Strength                               | Per Item 6.   | <p>As in figure, the lead wires shall be immersed solder of 350 ±10°C or 260±5°C up to 1.5 to 2.0mm from the root of terminal for 3.5±0.5 s (10±1 s for 260 ±5°C).</p>  <p>Pre-treatment:<br/>                     Capacitor shall be stored at 85±2°C for 1 h, then placed at "room condition" for 24±2 h before initial measurements.<br/>                     Post-treatment:<br/>                     Capacitor shall be stored for 1 to 2 h at "room condition".</p> |            |   |            |    |   |   |
| Appearance          | No marked defect.  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| Capacitance Change  | Within±10%   |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| I.R.                | 1000MΩ min.  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| Dielectric Strength | Per Item 6.  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| 12                  | Vibration Resistance   | <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Appearance</td> <td>No marked defect.</td> </tr> <tr> <td>Capacitance</td> <td>Within the specified tolerance.</td> </tr> <tr> <td>D.F.</td> <td> <table border="1" style="width: 100%;"> <tr> <th>Char.</th> <th>Specification</th> </tr> <tr> <td>B, E</td> <td>D.F. ≤2.5%</td> </tr> <tr> <td>F</td> <td>D.F. ≤5.0%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 400 + 20C*2 (C &lt; 30pF)<br/>Q ≥ 1000 (C ≥ 30pF)</td> </tr> </table> </td> </tr> </table> | Appearance   | No marked defect. | Capacitance        | Within the specified tolerance. | D.F.             | <table border="1" style="width: 100%;"> <tr> <th>Char.</th> <th>Specification</th> </tr> <tr> <td>B, E</td> <td>D.F. ≤2.5%</td> </tr> <tr> <td>F</td> <td>D.F. ≤5.0%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 400 + 20C*2 (C &lt; 30pF)<br/>Q ≥ 1000 (C ≥ 30pF)</td> </tr> </table> | Char.   | Specification | B, E   | D.F. ≤2.5% | F | D.F. ≤5.0% | SL | Q ≥ 400 + 20C*2 (C < 30pF)<br>Q ≥ 1000 (C ≥ 30pF) | <p>The capacitor shall firmly be soldered to the supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range, 1.5mm in total amplitude, and about 1min in the rate of vibration change from 10Hz to 55Hz and back to 10Hz is applied for a total of 6 h; 2 h each in 3 mutually perpendicular directions.</p> |
| Appearance          | No marked defect.  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| Capacitance         | Within the specified tolerance.  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| D.F.                | <table border="1" style="width: 100%;"> <tr> <th>Char.</th> <th>Specification</th> </tr> <tr> <td>B, E</td> <td>D.F. ≤2.5%</td> </tr> <tr> <td>F</td> <td>D.F. ≤5.0%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 400 + 20C*2 (C &lt; 30pF)<br/>Q ≥ 1000 (C ≥ 30pF)</td> </tr> </table> | Char.  | Specification  | B, E              | D.F. ≤2.5%         | F                               | D.F. ≤5.0%       | SL   | Q ≥ 400 + 20C*2 (C < 30pF)<br>Q ≥ 1000 (C ≥ 30pF) |               |  |            |   |            |    |   |   |
| Char.               | Specification  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| B, E                | D.F. ≤2.5%   |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| F                   | D.F. ≤5.0%   |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |
| SL                  | Q ≥ 400 + 20C*2 (C < 30pF)<br>Q ≥ 1000 (C ≥ 30pF)  |  |  |                   |                    |                                 |                  |  |   |               |  |            |   |            |    |   |   |

\*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa  
 \*2 "C" expresses nominal capacitance value (pF).

Continued on the following page.

## Specifications and Test Methods

Continued from the preceding page.

| No.   | Item  | Specification  | Testing Method  |       |                    |           |            |           |  |    |            |
|---|---|--|---|-------|--------------------|-----------|------------|-----------|--|----|------------|
| 13  | Humidity<br>(Under Steady State)  | Appearance   | No marked defect.   |       |                    |           |            |           |  |    |            |
|   |   | Capacitance Change   | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Char.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Within±10%</td> </tr> <tr> <td>E, F</td> <td>Within±15%</td> </tr> <tr> <td>SL</td> <td>Within± 5%</td> </tr> </tbody> </table> | Char. | Capacitance Change | B         | Within±10% | E, F      | Within±15%   | SL | Within± 5% |
|   |   | Char.  | Capacitance Change  |       |                    |           |            |           |  |    |            |
|   |   | B  | Within±10%  |       |                    |           |            |           |  |    |            |
|   |   | E, F   | Within±15%  |       |                    |           |            |           |  |    |            |
| SL  | Within± 5%  |  |   |       |                    |           |            |           |  |    |            |
| D.F. Q  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Char.</th> <th>Specification</th> </tr> </thead> <tbody> <tr> <td>B, E</td> <td>D.F. ≤5.0%</td> </tr> <tr> <td>F</td> <td>D.F. ≤7.5%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 275 + 5/2C*2 (C &lt; 30pF)<br/>Q ≥ 350 (C ≥ 30pF)</td> </tr> </tbody> </table> | Char.  | Specification   | B, E  | D.F. ≤5.0%         | F         | D.F. ≤7.5% | SL        | Q ≥ 275 + 5/2C*2 (C < 30pF)<br>Q ≥ 350 (C ≥ 30pF)  |    |            |
| Char.   | Specification   |  |   |       |                    |           |            |           |  |    |            |
| B, E  | D.F. ≤5.0%  |  |   |       |                    |           |            |           |  |    |            |
| F   | D.F. ≤7.5%  |  |   |       |                    |           |            |           |  |    |            |
| SL  | Q ≥ 275 + 5/2C*2 (C < 30pF)<br>Q ≥ 350 (C ≥ 30pF)   |  |   |       |                    |           |            |           |  |    |            |
| I.R.  | 3000MΩ min.   |  |   |       |                    |           |            |           |  |    |            |
| Dielectric Strength   | Per Item 6.   |  |   |       |                    |           |            |           |  |    |            |
| 14  | Humidity Loading  | Appearance   | No marked defect.   |       |                    |           |            |           |  |    |            |
|   |   | Capacitance Change   | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Char.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Within±10%</td> </tr> <tr> <td>E, F</td> <td>Within±15%</td> </tr> <tr> <td>SL</td> <td>Within± 5%</td> </tr> </tbody> </table> | Char. | Capacitance Change | B         | Within±10% | E, F      | Within±15%   | SL | Within± 5% |
|   |   | Char.  | Capacitance Change  |       |                    |           |            |           |  |    |            |
|   |   | B  | Within±10%  |       |                    |           |            |           |  |    |            |
|   |   | E, F   | Within±15%  |       |                    |           |            |           |  |    |            |
| SL  | Within± 5%  |  |   |       |                    |           |            |           |  |    |            |
| D.F. Q  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Char.</th> <th>Specification</th> </tr> </thead> <tbody> <tr> <td>B, E</td> <td>D.F. ≤5.0%</td> </tr> <tr> <td>F</td> <td>D.F. ≤7.5%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 275 + 5/2C*2 (C &lt; 30pF)<br/>Q ≥ 350 (C ≥ 30pF)</td> </tr> </tbody> </table> | Char.  | Specification   | B, E  | D.F. ≤5.0%         | F         | D.F. ≤7.5% | SL        | Q ≥ 275 + 5/2C*2 (C < 30pF)<br>Q ≥ 350 (C ≥ 30pF)  |    |            |
| Char.   | Specification   |  |   |       |                    |           |            |           |  |    |            |
| B, E  | D.F. ≤5.0%  |  |   |       |                    |           |            |           |  |    |            |
| F   | D.F. ≤7.5%  |  |   |       |                    |           |            |           |  |    |            |
| SL  | Q ≥ 275 + 5/2C*2 (C < 30pF)<br>Q ≥ 350 (C ≥ 30pF)   |  |   |       |                    |           |            |           |  |    |            |
| I.R.  | 3000MΩ min.   |  |   |       |                    |           |            |           |  |    |            |
| Dielectric Strength   | Per Item 6.   |  |   |       |                    |           |            |           |  |    |            |
| 15  | Life  | Appearance   | No marked defect.   |       |                    |           |            |           |  |    |            |
|   |   | Capacitance Change   | Within±20%  |       |                    |           |            |           |  |    |            |
|   |   | I.R.   | 3000MΩ min.   |       |                    |           |            |           |  |    |            |
|   |   | Dielectric Strength  | Per Item 6.   |       |                    |           |            |           |  |    |            |
|   |   | Discharge Test (II)<br>[Not apply to Type KY]  | Per Item 9.   |       |                    |           |            |           |  |    |            |
| Applied voltage   |   |  |   |       |                    |           |            |           |  |    |            |
| AC425V (r.m.s.), except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s. |   |  |   |       |                    |           |            |           |  |    |            |
| 16  | Flame Test  | The capacitor flame discontinue as follows.  |   |       |                    |           |            |           |  |    |            |
|   |   | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Cycle</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1 to 4</td> <td>30 s max.</td> </tr> <tr> <td>5</td> <td>60 s max.</td> </tr> </tbody> </table> | Cycle   | Time  | 1 to 4             | 30 s max. | 5          | 60 s max. | <p>The capacitor shall be subjected to applied flame for 15 s and then removed for 15 s until 5 cycle.</p>  <p style="text-align: right;">(in mm)</p> |    |            |
| Cycle   | Time  |  |   |       |                    |           |            |           |  |    |            |
| 1 to 4  | 30 s max.   |  |   |       |                    |           |            |           |  |    |            |
| 5   | 60 s max.   |  |   |       |                    |           |            |           |  |    |            |

\*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

\*2 "C" expresses nominal capacitance value (pF).

Continued on the following page.



## Type KY/KH/KX Specifications and Test Methods

Continued from the preceding page.

| No.                 | Item   | Specification      | Testing Method  |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
|---------------------|--|--------------------|---|-------|--------------------|------|------------|----------|---|----|------------|-------|---|-----------|--------|---|------------|-------|------|------------------|------|-----------------|---|----------|--------|-------------|---|-----|--------|------------|
| 20                  | Temperature and Immersion Cycle  | Appearance         | No marked defect.   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
|                     |  | Capacitance Change | <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="width: 15%;">Char.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Within±10%</td> </tr> <tr> <td>E, F</td> <td>Within±20%</td> </tr> <tr> <td>SL</td> <td>Within± 5%</td> </tr> </tbody> </table>  | Char. | Capacitance Change | B    | Within±10% | E, F     | Within±20%                                      | SL | Within± 5% |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
|                     |  | Char.              | Capacitance Change  |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
|                     |  | B                  | Within±10%  |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
|                     |  | E, F               | Within±20%  |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| SL                  | Within± 5%   |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| D.F. Q              | <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 5px;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="width: 15%;">Char.</th> <th>Specification</th> </tr> </thead> <tbody> <tr> <td>B, E</td> <td>D.F. ≤5.0%</td> </tr> <tr> <td>F</td> <td>D.F. ≤7.5%</td> </tr> <tr> <td>SL</td> <td>Q ≥ 275+5/2C*2 (C &lt; 30pF)<br/>Q ≥ 350 (C ≥ 30pF)</td> </tr> </tbody> </table> | Char.              | Specification   | B, E  | D.F. ≤5.0%         | F    | D.F. ≤7.5% | SL       | Q ≥ 275+5/2C*2 (C < 30pF)<br>Q ≥ 350 (C ≥ 30pF) |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| Char.               | Specification  |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| B, E                | D.F. ≤5.0%   |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| F                   | D.F. ≤7.5%   |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| SL                  | Q ≥ 275+5/2C*2 (C < 30pF)<br>Q ≥ 350 (C ≥ 30pF)  |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| I.R.                | 3000MΩ min.  |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| Dielectric Strength | Per Item 6.  |                    |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
|                     |  |                    | <p>The capacitor shall be subjected to 5 temperature cycles, then consecutively to 2 immersion cycles.</p> <p style="text-align: center;">&lt;Temperature cycle&gt;</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="width: 15%;">Step</th> <th>Temperature (°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-25+0/-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/-0</td> <td>30 min</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>3 min</td> </tr> </tbody> </table> <p style="text-align: right;">Cycle time : 5 cycle</p> <p style="text-align: center;">&lt;Immersion cycle&gt;</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="width: 15%;">Step</th> <th>Temperature (°C)</th> <th>Time</th> <th>Immersion water</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+65+5/-0</td> <td>15 min</td> <td>Clean water</td> </tr> <tr> <td>2</td> <td>0±3</td> <td>15 min</td> <td>Salt water</td> </tr> </tbody> </table> <p style="text-align: right;">Cycle time : 2 cycle</p> <p>Pre-treatment :<br/>Capacitor shall be stored at 85±2°C for 1 h, then placed at *1room condition for 24±2 h.</p> <p>Post-treatment :<br/>Capacitor shall be stored for 24±2 h at *1room condition.</p> | Step  | Temperature (°C)   | Time | 1          | -25+0/-3 | 30 min  | 2  | Room temp. | 3 min | 3 | +125+3/-0 | 30 min | 4 | Room temp. | 3 min | Step | Temperature (°C) | Time | Immersion water | 1 | +65+5/-0 | 15 min | Clean water | 2 | 0±3 | 15 min | Salt water |
| Step                | Temperature (°C)   | Time               |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| 1                   | -25+0/-3   | 30 min             |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| 2                   | Room temp.   | 3 min              |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| 3                   | +125+3/-0  | 30 min             |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| 4                   | Room temp.   | 3 min              |   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| Step                | Temperature (°C)   | Time               | Immersion water   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| 1                   | +65+5/-0   | 15 min             | Clean water   |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |
| 2                   | 0±3  | 15 min             | Salt water  |       |                    |      |            |          |   |    |            |       |   |           |        |   |            |       |      |                  |      |                 |   |          |        |             |   |     |        |            |

\*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

\*2 "C" expresses nominal capacitance value (pF).