

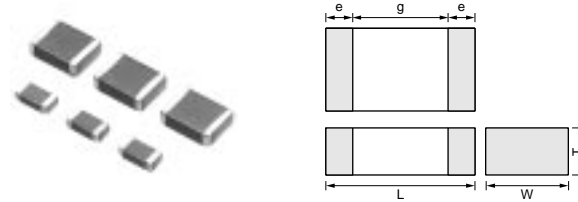
# Chip Monolithic Ceramic Capacitors



## AC250V Type (Which Meet Japanese Low)

### ■ Features

1. Chip monolithic ceramic capacitor for AC line.
2. A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
3. Sn-plated external electrodes realize good solderability.
4. Only for Reflow soldering.
5. Capacitance 0.01 to 0.1 uF for connecting lines and 470 to 4700 pF for connecting line to earth.



| Part Number | Dimensions (mm) |          |          |        |        |
|-------------|-----------------|----------|----------|--------|--------|
|             | L               | W        | T        | e min. | g min. |
| GA252D      | 5.7 ±0.4        | 2.8 ±0.3 | 2.0 ±0.3 | 0.3    | 3.5    |
| GA255D      |                 | 5.0 ±0.4 |          |        |        |

### ■ Applications

Noise suppression filters for switching power supplies, telephones, facsimiles, modems.

### ■ Reference standard

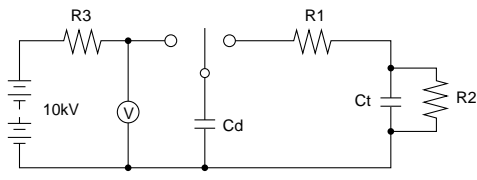
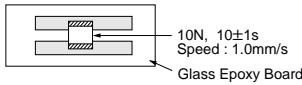
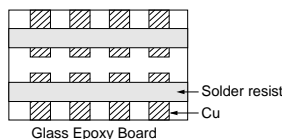
JIS C 5102

JIS C 5150

The standards of the electrical appliance and material safety law of Japan, separated table 4.

| Part Number        | Rated Voltage (V) | TC Code | Capacitance      | Length L (mm) | Width W (mm) | Thickness T (mm) | Electrode g (mm) | Electrode e (mm) |
|--------------------|-------------------|---------|------------------|---------------|--------------|------------------|------------------|------------------|
| GA252DB3E2471MY02L | AC250 (r.m.s.)    | B       | 470pF +20,-20%   | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA252DB3E2102MY02L | AC250 (r.m.s.)    | B       | 1000pF +20,-20%  | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA252DB3E2222MY02L | AC250 (r.m.s.)    | B       | 2200pF +20,-20%  | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA252DB3E2472MY02L | AC250 (r.m.s.)    | B       | 4700pF +20,-20%  | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA252DB3E2103MY02L | AC250 (r.m.s.)    | B       | 10000pF +20,-20% | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA252DB3E2223MY02L | AC250 (r.m.s.)    | B       | 22000pF +20,-20% | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA252DB3E2473MY02L | AC250 (r.m.s.)    | B       | 47000pF +20,-20% | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA255DB3E2104MY02L | AC250 (r.m.s.)    | B       | 0.1μF +20,-20%   | 5.7           | 5.0          | 2.0              | 3.5 min.         | 0.3 min.         |

## Specifications and Test Methods

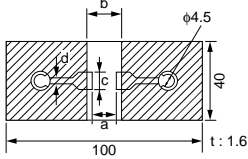
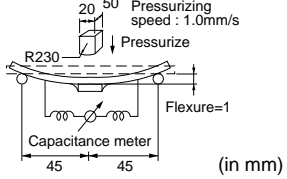
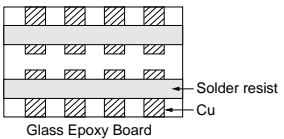
| No.                        | Item  | Specification  | Test Method  |                     |              |                            |                 |                         |                  |
|----------------------------|---|--|--|---------------------|--------------|----------------------------|-----------------|-------------------------|------------------|
| 1                          | Operating Temperature Range   | -25 to +85°C   | —  |                     |              |                            |                 |                         |                  |
| 2                          | Appearance  | No defects or abnormalities.                                 | Visual inspection.   |                     |              |                            |                 |                         |                  |
| 3                          | Dimensions  | Within the specified dimensions.                             | Using calipers.  |                     |              |                            |                 |                         |                  |
| 4                          | Dielectric Strength   | No defects or abnormalities.                                 | <p>No failure shall be observed when voltage as table is applied between the terminations for 60±1 s, provided the charge/discharge current is less than 50mA.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="padding: 2px;">Nominal Capacitance</th> <th style="padding: 2px;">Test voltage</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px; text-align: center;"><math>C \geq 10,000\mu\text{F}</math></td> <td style="padding: 2px; text-align: center;">AC575V (r.m.s.)</td> </tr> <tr> <td style="padding: 2px; text-align: center;"><math>C &lt; 10,000\mu\text{F}</math></td> <td style="padding: 2px; text-align: center;">AC1500V (r.m.s.)</td> </tr> </tbody> </table> | Nominal Capacitance | Test voltage | $C \geq 10,000\mu\text{F}$ | AC575V (r.m.s.) | $C < 10,000\mu\text{F}$ | AC1500V (r.m.s.) |
| Nominal Capacitance        | Test voltage  |  |  |                     |              |                            |                 |                         |                  |
| $C \geq 10,000\mu\text{F}$ | AC575V (r.m.s.)   |  |  |                     |              |                            |                 |                         |                  |
| $C < 10,000\mu\text{F}$    | AC1500V (r.m.s.)  |  |  |                     |              |                            |                 |                         |                  |
| 5                          | Insulation Resistance (I.R.)  | More than 2,000MΩ  | The insulation resistance shall be measured with 500±50V and within 60±5 s of charging.  |                     |              |                            |                 |                         |                  |
| 6                          | Capacitance   | Within the specified tolerance.                              | The capacitance/D.F. shall be measured at 20°C at a frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)   |                     |              |                            |                 |                         |                  |
| 7                          | Dissipation Factor (D.F.)   | 0.025 max.   | <p>•Pretreatment<br/>Perform a heat treatment at 150 ± 5°C for 60±5 min and then let sit for 24±2 h at room condition.</p>   |                     |              |                            |                 |                         |                  |
| 8                          | Capacitance Temperature Characteristics                                       | Cap. Change Within ±10%                                      | <p>The range of capacitance change compared with the 20°C value within -25 to +85°C shall be within the specified range.</p> <p>•Pretreatment<br/>Perform a heat treatment at 150 ± 5°C for 60±5 min and then let sit for 24±2 h at room condition.</p>  |                     |              |                            |                 |                         |                  |
| 9                          | Discharge Test<br>(Application: Nominal Capacitance $C < 10,000\mu\text{F}$ ) | Appearance   | <p>No defects or abnormalities.</p> <p>As in Fig., 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; font-size: small;">             Ct : Capacitor under test   Cd : 0.001μF<br/>             R1 : 1,000Ω   R2 : 100MΩ   R3 : Surge resistance         </p>  |                     |              |                            |                 |                         |                  |
| 10                         | Adhesive Strength of Termination  | No removal of the terminations or other defects shall occur. | <p>Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N force in the direction of the arrow. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  <p style="text-align: center; font-size: small;">             10N, 10±1s<br/>             Speed : 1.0mm/s<br/>             Glass Epoxy Board         </p> <p style="text-align: center;">Fig.1</p>   |                     |              |                            |                 |                         |                  |
| 11                         | Vibration Resistance  | Appearance   | No defects or abnormalities.   |                     |              |                            |                 |                         |                  |
|                            |   | Capacitance  | Within the specified tolerance.  |                     |              |                            |                 |                         |                  |
|                            |   | D.F.   | 0.025 max.   |                     |              |                            |                 |                         |                  |
|                            |   |  | <p>Solder the capacitor to the test jig (glass epoxy board). The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 min. This motion shall be applied for a period of 2 h in each 3 mutually perpendicular directions (total of 6 h).</p>  <p style="text-align: center; font-size: small;">             Solder resist<br/>             Cu<br/>             Glass Epoxy Board         </p>  |                     |              |                            |                 |                         |                  |

"Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

Continued on the following page.

## Specifications and Test Methods

Continued from the preceding page.

| No.                 | Item                         | Specification   | Test Method  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|---------------------|------------------------------|---|--|---|----------------|------------------|------------|---|------------------------|-------|---|----------------|---------|-----|------------------------|------|-----|------------|--------|-----|-----|
| 12                  | Deflection                   | No cracking or marking defects shall occur.                         | <p>Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  <table border="1" data-bbox="542 798 1049 900"> <thead> <tr> <th rowspan="2">LxW (mm)</th> <th colspan="4">Dimension (mm)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>5.7x2.8</td> <td>4.5</td> <td>8.0</td> <td>3.2</td> <td rowspan="2">1.0</td> </tr> <tr> <td>5.7x5.0</td> <td>4.5</td> <td>8.0</td> <td>5.6</td> </tr> </tbody> </table> <p style="text-align: center;">Fig.2</p>  <p style="text-align: center;">Fig.3</p> | LxW (mm)  | Dimension (mm) |                  |            |   | a                      | b     | c | d              | 5.7x2.8 | 4.5 | 8.0                    | 3.2  | 1.0 | 5.7x5.0    | 4.5    | 8.0 | 5.6 |
|                     |                              | LxW (mm)  |  |   | Dimension (mm) |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| a                   | b                            |   | c  | d   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 5.7x2.8             | 4.5                          | 8.0   | 3.2  | 1.0   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 5.7x5.0             | 4.5                          | 8.0   | 5.6  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 13                  | Solderability of Termination | 75% of the terminations are to be soldered evenly and continuously. | <p>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 2±0.5 s at 235±5°C. Immersing speed : 25±2.5mm/s</p>   |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 14                  | Humidity Insulation          | Appearance  | No marking defects.  | <p>The capacitor shall be subjected to 40±2°C, relative humidity of 90 to 98% for 8 h, and then removed in room condition for 16 h until 5 cycles.</p>  |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | Capacitance Change  | Within ±15%  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | D.F.  | 0.05 max.  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | I.R.  | More than 1,000MΩ  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | Dielectric Strength   | Pass the item No.4.  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 15                  | Resistance to Soldering Heat | Appearance  | No marking defects.  | <p>Preheat the capacitor as table.<br/>Immerse the capacitor in eutectic solder solution at 260±5°C for 10±1 s. Let sit at room condition for 24±2 h, then measure.<br/>•Immersing speed : 25±2.5mm/s<br/>•Pretreatment<br/>Perform a heat treatment at 150±,8°C for 60±5 min and then let sit for 24±2 h at room condition.</p> <p>*Preheating</p> <table border="1" data-bbox="1107 1498 1613 1572"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100°C to 120°C</td> <td>1 min</td> </tr> <tr> <td>2</td> <td>170°C to 200°C</td> <td>1 min</td> </tr> </tbody> </table>   | Step           | Temperature      | Time       | 1 | 100°C to 120°C         | 1 min | 2 | 170°C to 200°C | 1 min   |     |                        |      |     |            |        |     |     |
|                     |                              | Step  | Temperature  |   | Time           |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | 1   | 100°C to 120°C   |   | 1 min          |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | 2   | 170°C to 200°C   |   | 1 min          |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | Capacitance Change  | Within ±10%  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| D.F.                | 0.025 max.                   |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| I.R.                | More than 2,000MΩ            |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| Dielectric Strength | Pass the item No.4.          |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 16                  | Temperature Cycle            | Appearance  | No marking defects.  | <p>Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig.4 using a eutectic solder. Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 h at room condition, then measure.</p> <table border="1" data-bbox="1107 1717 1613 1841"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. Operating Temp.±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>2 to 3</td> </tr> <tr> <td>3</td> <td>Max. Operating Temp.±2</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temp.</td> <td>2 to 3</td> </tr> </tbody> </table> <p>•Pretreatment<br/>Perform a heat treatment at 150±,8°C for 60±5 min and then let sit for 24±2 h at room condition.</p>  <p style="text-align: center;">Fig.4</p> | Step           | Temperature (°C) | Time (min) | 1 | Min. Operating Temp.±3 | 30±3  | 2 | Room Temp.     | 2 to 3  | 3   | Max. Operating Temp.±2 | 30±3 | 4   | Room Temp. | 2 to 3 |     |     |
|                     |                              | Step  | Temperature (°C)   |   | Time (min)     |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | 1   | Min. Operating Temp.±3   |   | 30±3           |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | 2   | Room Temp.   |   | 2 to 3         |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
|                     |                              | 3   | Max. Operating Temp.±2   |   | 30±3           |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| 4                   | Room Temp.                   | 2 to 3  |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| Capacitance Change  | Within ±7.5%                 |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| D.F.                | 0.025 max.                   |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| I.R.                | More than 2,000MΩ            |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |
| Dielectric Strength | Pass the item No.4.          |   |  |   |                |                  |            |   |                        |       |   |                |         |     |                        |      |     |            |        |     |     |

"Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

Continued on the following page. ↗

## Specifications and Test Methods

↳ Continued from the preceding page.

| No. | Item                       | Specification       | Test Method               |
|-----|----------------------------|---------------------|---------------------------|
| 17  | Humidity<br>(Steady State) | Appearance          | No marking defects.       |
|     |                            | Capacitance Change  | Within $\pm 15\%$         |
|     |                            | D.F.                | 0.05 max.                 |
|     |                            | I.R.                | More than 1,000M $\Omega$ |
|     |                            | Dielectric Strength | Pass the item No.4.       |
| 18  | Life                       | Appearance          | No marking defects.       |
|     |                            | Capacitance Change  | Within $\pm 15\%$         |
|     |                            | D.F.                | 0.05 max.                 |
|     |                            | I.R.                | More than 1,000M $\Omega$ |
|     |                            | Dielectric Strength | Pass the item No.4.       |
| 19  | Humidity Loading           | Appearance          | No marking defects.       |
|     |                            | Capacitance Change  | Within $\pm 15\%$         |
|     |                            | D.F.                | 0.05 max.                 |
|     |                            | I.R.                | More than 1,000M $\Omega$ |
|     |                            | Dielectric Strength | Pass the item No.4.       |

Sit the capacitor at  $40\pm 2^\circ\text{C}$  and relative humidity 90 to 95% for  $500\pm 2\frac{4}{8}$  h.  
Remove and let sit for  $24\pm 2$  h at room condition, then measure.  
•Pretreatment  
Perform a heat treatment at  $150\pm 1\frac{0}{8}^\circ\text{C}$  for  $60\pm 5$  min and then let sit for  $24\pm 2$  h at room condition.

Apply voltage and time as Table at  $85\pm 2^\circ\text{C}$ . Remove and let sit for  $24\pm 2$  h at room condition, then measure. The charge / discharge current is less than 50mA.

| Nominal Capacitance      | Test Time                 | Test voltage     |
|--------------------------|---------------------------|------------------|
| $C \geq 10,000\text{pF}$ | $1,000\pm 4\frac{8}{8}$ h | AC300V (r.m.s.)  |
| $C < 10,000\text{pF}$    | $1,500\pm 4\frac{8}{8}$ h | AC500V (r.m.s.)* |

\* Except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 s

•Pretreatment  
Apply test voltage for  $60\pm 5$  min at test temperature.  
Remove and let sit for  $24\pm 2$  h at room condition.

Apply the rated voltage at  $40\pm 2^\circ\text{C}$  and relative humidity 90 to 95% for  $500\pm 2\frac{4}{8}$  h.  
Remove and let sit for  $24\pm 2$  h at room condition, then measure.  
•Pretreatment  
Apply test voltage for  $60\pm 5$  min at test temperature.  
Remove and let sit for  $24\pm 2$  h at room condition.

"Room condition" Temperature : 15 to  $35^\circ\text{C}$ , Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

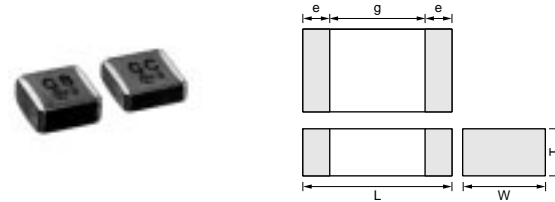
# Chip Monolithic Ceramic Capacitors



## Safety Standard Recognized Type GC (UL, IEC60384-14 Class X1/Y2)

### ■ Features

1. Chip monolithic ceramic capacitor (certified as conforming to safety standards) for AC line.
2. A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
3. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
4. The type GB can be used as an X2-class capacitor.
5. The type GC can be used as an X1-class and Y2-class capacitor.
6. +125 degree C guaranteed.
7. Only for reflow soldering.



| Part Number | Dimensions (mm) |          |          |        |        |
|-------------|-----------------|----------|----------|--------|--------|
|             | L               | W        | T        | e min. | g min. |
| GA355D      | 5.7 ±0.4        | 5.0 ±0.4 | 2.0 ±0.3 | 0.3    | 4.0    |
| GA355X      |                 |          | 2.7 ±0.3 |        |        |

### ■ Standard Recognition

|                | Standard No. | Status of Recognition |         | Rated Voltage      |
|----------------|--------------|-----------------------|---------|--------------------|
|                |              | Type GB               | Type GC |                    |
| UL             | UL1414       | —                     | ⊙*      | AC250V<br>(r.m.s.) |
| BSI            | EN132400     | —                     | ⊙       |                    |
| VDE            |              | ⊙                     | ⊙       |                    |
| SEV            |              | ⊙                     | ⊙       |                    |
| SEMKO          |              | ⊙                     | ⊙       |                    |
| EN132400 Class |              | X2                    | X1, Y2  |                    |

\* : Line By Pass only

| Part Number        | Rated Voltage (V) | TC Code | Capacitance (pF) | Length L (mm) | Width W (mm) | Thickness T (mm) | Electrode g (mm) | Electrode e (mm) |
|--------------------|-------------------|---------|------------------|---------------|--------------|------------------|------------------|------------------|
| GA355DR7GC101KY02L | AC250 (r.m.s.)    | X7R     | 100 +10,-10%     | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC151KY02L | AC250 (r.m.s.)    | X7R     | 150 +10,-10%     | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC221KY02L | AC250 (r.m.s.)    | X7R     | 220 +10,-10%     | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC331KY02L | AC250 (r.m.s.)    | X7R     | 330 +10,-10%     | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC471KY02L | AC250 (r.m.s.)    | X7R     | 470 +10,-10%     | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC681KY02L | AC250 (r.m.s.)    | X7R     | 680 +10,-10%     | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC102KY02L | AC250 (r.m.s.)    | X7R     | 1000 +10,-10%    | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC152KY02L | AC250 (r.m.s.)    | X7R     | 1500 +10,-10%    | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC222KY02L | AC250 (r.m.s.)    | X7R     | 2200 +10,-10%    | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC332KY02L | AC250 (r.m.s.)    | X7R     | 3300 +10,-10%    | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GC472KY02L | AC250 (r.m.s.)    | X7R     | 4700 +10,-10%    | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |

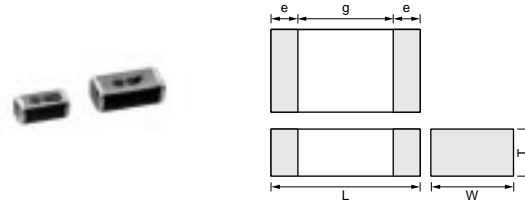
# Chip Monolithic Ceramic Capacitors



## Safety Standard Recognized Type GD (IEC60384-14 Class Y3)

### ■ Features

1. A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
2. The type GD can be used as an Y3-class capacitor, and the type GF can be used as an Y2-class capacitor.
3. Available for the equipment based on IEC/EN60950 and UL1950.
4. +125 degree C guaranteed.
5. Only for reflow soldering.



| Part Number | Dimensions (mm) |          |          |        |                                |
|-------------|-----------------|----------|----------|--------|--------------------------------|
|             | L               | W        | T        | e min. | g min.                         |
| GA342D      | 4.5 ±0.3        | 2.0 ±0.2 | 2.0 ±0.3 | 0.3    | Type GD : 2.5<br>Type GF : 3.5 |
| GA343D      | 4.5 ±0.4        | 3.2 ±0.3 | 2.0 ±0.3 |        |                                |
| GA352D      | 5.7 ±0.4        | 2.8 ±0.3 | 2.0 ±0.3 |        |                                |
| GA355D      | 5.7 ±0.4        | 5.0 ±0.4 | 2.0 ±0.3 |        |                                |

### ■ Applications

- Ideal use on line filter and coupling for transformer-less DAA modem.
- Ideal use on line filter for information equipment.

### ■ Standard Recognition

|                | Standard No. | Status of Recognition |         | Rated Voltage      |
|----------------|--------------|-----------------------|---------|--------------------|
|                |              | Type GD               | Type GF |                    |
| SEMKO          | EN132400     | ☉                     | ☉       | AC250V<br>(r.m.s.) |
| EN132400 Class |              | Y3                    | Y2      |                    |

| Part Number        | Rated Voltage (V) | TC Code | Capacitance (pF) | Length L (mm) | Width W (mm) | Thickness T (mm) | Electrode g (mm) | Electrode e (mm) |
|--------------------|-------------------|---------|------------------|---------------|--------------|------------------|------------------|------------------|
| GA342DR7GD101KW02L | AC250 (r.m.s.)    | X7R     | 100 +10,-10%     | 4.5           | 2.0          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA342DR7GD151KW02L | AC250 (r.m.s.)    | X7R     | 150 +10,-10%     | 4.5           | 2.0          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA342DR7GD221KW02L | AC250 (r.m.s.)    | X7R     | 220 +10,-10%     | 4.5           | 2.0          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA342DR7GD471KW02L | AC250 (r.m.s.)    | X7R     | 470 +10,-10%     | 4.5           | 2.0          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA342DR7GD102KW02L | AC250 (r.m.s.)    | X7R     | 1000 +10,-10%    | 4.5           | 2.0          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA342DR7GD152KW02L | AC250 (r.m.s.)    | X7R     | 1500 +10,-10%    | 4.5           | 2.0          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA343DR7GD182KW01L | AC250 (r.m.s.)    | X7R     | 1800 +10,-10%    | 4.5           | 3.2          | 2.0              | 2.5 min.         | 0.3 min.         |
| GA343DR7GD222KW01L | AC250 (r.m.s.)    | X7R     | 2200 +10,-10%    | 4.5           | 3.2          | 2.0              | 2.5 min.         | 0.3 min.         |

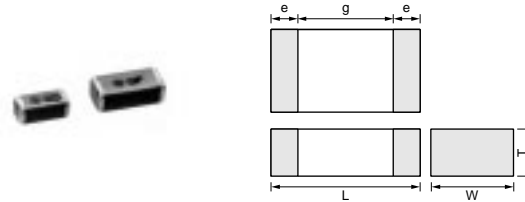
# Chip Monolithic Ceramic Capacitors



## Safety Standard Recognized Type GF (IEC60384-14 Class Y2)

### ■ Features

1. A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
2. The type GD can be used as an Y3-class capacitor, and the type GF can be used as an Y2-class capacitor.
3. Available for the equipment based on IEC/EN60950 and UL1950.
4. +125 degree C guaranteed.
5. Only for reflow soldering.



| Part Number | Dimensions (mm) |          |          |        |                                |
|-------------|-----------------|----------|----------|--------|--------------------------------|
|             | L               | W        | T        | e min. | g min.                         |
| GA342D      | 4.5 ±0.3        | 2.0 ±0.2 | 2.0 ±0.3 | 0.3    | Type GD : 2.5<br>Type GF : 3.5 |
| GA343D      | 4.5 ±0.4        | 3.2 ±0.3 | 2.0 ±0.3 |        |                                |
| GA352D      | 5.7 ±0.4        | 2.8 ±0.3 | 2.0 ±0.3 |        |                                |
| GA355D      | 5.7 ±0.4        | 5.0 ±0.4 | 2.0 ±0.3 |        |                                |

### ■ Applications

- Ideal use on line filter and coupling for transformer-less DAA modem.
- Ideal use on line filter for information equipment.

### ■ Standard Recognition

|                | Standard No. | Status of Recognition |         | Rated Voltage      |
|----------------|--------------|-----------------------|---------|--------------------|
|                |              | Type GD               | Type GF |                    |
| SEMKO          | EN132400     | ☉                     | ☉       | AC250V<br>(r.m.s.) |
| EN132400 Class |              | Y3                    | Y2      |                    |

| Part Number        | Rated Voltage (V) | TC Code | Capacitance (pF) | Length L (mm) | Width W (mm) | Thickness T (mm) | Electrode g (mm) | Electrode e (mm) |
|--------------------|-------------------|---------|------------------|---------------|--------------|------------------|------------------|------------------|
| GA352DR7GF102KW01L | AC250 (r.m.s.)    | X7R     | 1000 +10,-10%    | 5.7           | 2.8          | 2.0              | 3.5 min.         | 0.3 min.         |
| GA355DR7GF222KW01L | AC250 (r.m.s.)    | X7R     | 2200 +10,-10%    | 5.7           | 5.0          | 2.0              | 3.5 min.         | 0.3 min.         |

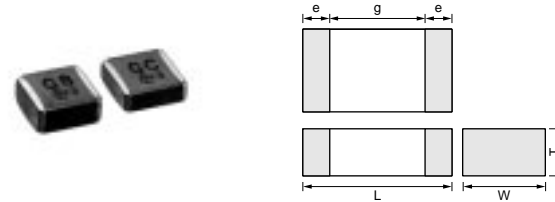
# Chip Monolithic Ceramic Capacitors



## Safety Standard Recognized Type GB (IEC60384-14 Class X2)

### ■ Features

1. Chip monolithic ceramic capacitor (certified as conforming to safety standards) for AC line.
2. A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
3. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
4. The type GB can be used as an X2-class capacitor.
5. The type GC can be used as an X1-class and Y2-class capacitor.
6. +125 degree C guaranteed.
7. Only for reflow soldering.



| Part Number | Dimensions (mm) |          |          |        |        |
|-------------|-----------------|----------|----------|--------|--------|
|             | L               | W        | T        | e min. | g min. |
| GA355D      | 5.7 ±0.4        | 5.0 ±0.4 | 2.0 ±0.3 | 0.3    | 4.0    |
| GA355X      |                 |          | 2.7 ±0.3 |        |        |

### ■ Applications

- Ideal use as Y capacitor or X capacitor for various switching power supply.
- Ideal use as linefilter for MODEM.

### ■ Standard Recognition

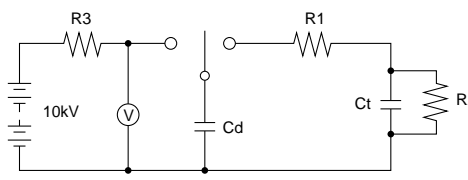
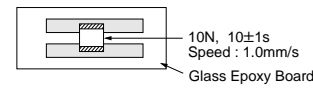
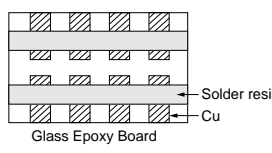
|                | Standard No. | Status of Recognition |         | Rated Voltage      |
|----------------|--------------|-----------------------|---------|--------------------|
|                |              | Type GB               | Type GC |                    |
| UL             | UL1414       | —                     | ⊙*      | AC250V<br>(r.m.s.) |
| BSI            | EN132400     | —                     | ⊙       |                    |
| VDE            |              | ⊙                     | ⊙       |                    |
| SEV            |              | ⊙                     | ⊙       |                    |
| SEMKO          |              | ⊙                     | ⊙       |                    |
| EN132400 Class |              | X2                    | X1, Y2  |                    |

\* : Line By Pass only


| Part Number        | Rated Voltage (V) | TC Code | Capacitance (pF) | Length L (mm) | Width W (mm) | Thickness T (mm) | Electrode g (mm) | Electrode e (mm) |
|--------------------|-------------------|---------|------------------|---------------|--------------|------------------|------------------|------------------|
| GA355DR7GB103KY02L | AC250 (r.m.s.)    | X7R     | 10000 +10,-10%   | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GB153KY02L | AC250 (r.m.s.)    | X7R     | 15000 +10,-10%   | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355DR7GB223KY02L | AC250 (r.m.s.)    | X7R     | 22000 +10,-10%   | 5.7           | 5.0          | 2.0              | 4.0 min.         | 0.3 min.         |
| GA355XR7GB333KY06L | AC250 (r.m.s.)    | X7R     | 33000 +10,-10%   | 5.7           | 5.0          | 2.7              | 4.0 min.         | 0.3 min.         |



## GA3 Series Specifications and Test Methods

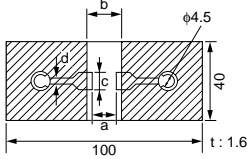
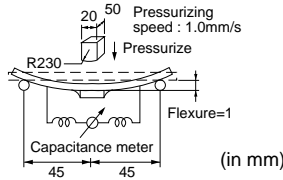
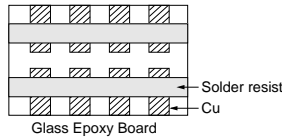
| No.           | Item                                     | Specification   | Test Method   |              |  |         |         |               |                  |
|---------------|--|---|---|--------------|--|---------|---------|---------------|------------------|
| 1             | Operating Temperature Range              | -55 to +125°C   | —   |              |  |         |         |               |                  |
| 2             | Appearance                               | No defects or abnormalities.                                | Visual inspection.  |              |  |         |         |               |                  |
| 3             | Dimensions                               | Within the specified dimensions.                            | Using calipers.   |              |  |         |         |               |                  |
| 4             | Dielectric Strength                      | No defects or abnormalities.                                | No failure shall be observed when voltage as table is applied between the terminations for 60±1 s, provided the charge/discharge current is less than 50mA.<br><table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Test voltage</th> </tr> </thead> <tbody> <tr> <td>Type GB</td> <td>DC1075V</td> </tr> <tr> <td>Type GC/GD/GF</td> <td>AC1500V (r.m.s.)</td> </tr> </tbody> </table>   | Test voltage |  | Type GB | DC1075V | Type GC/GD/GF | AC1500V (r.m.s.) |
| Test voltage  |  |   |   |              |  |         |         |               |                  |
| Type GB       | DC1075V                                  |   |   |              |  |         |         |               |                  |
| Type GC/GD/GF | AC1500V (r.m.s.)                         |   |   |              |  |         |         |               |                  |
| 5             | Insulation Resistance (I.R.)             | More than 6,000MΩ   | The insulation resistance shall be measured with 500±50V and within 60±5 s of charging.   |              |  |         |         |               |                  |
| 6             | Capacitance                              | Within the specified tolerance.                             | The capacitance/D.F. shall be measured at 20°C at a frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)  |              |  |         |         |               |                  |
| 7             | Dissipation Factor (D.F.)                | 0.025 max.  | •Pretreatment<br>Perform a heat treatment at 150±18°C for 60±5 min and then let sit for 24±2 h at room condition.   |              |  |         |         |               |                  |
| 8             | Capacitance Temperature Characteristics  | Cap. Change<br>Within ±15%                                  | The range of capacitance change compared with the 25°C value within -55 to +125°C shall be within the specified range.<br>•Pretreatment<br>Perform a heat treatment at 150±18°C for 60±5 min and then let sit for 24±2 h at room condition.   |              |  |         |         |               |                  |
| 9             | Discharge Test<br>(Application: Type GC) | Appearance  | No defects or abnormalities.  |              |  |         |         |               |                  |
|               |  | I.R.  | More than 1,000MΩ   |              |  |         |         |               |                  |
|               |  | Dielectric Strength   | Pass the item No.4.   |              |  |         |         |               |                  |
|               |  |   | As in Fig., discharge is made 50 times at 5 s intervals from the capacitor(Cd) charged at DC voltage of specified.<br><br>Ct : Capacitor under test Cd : 0.001μF<br>R1 : 1,000Ω R2 : 100MΩ R3 : Surge resistance   |              |  |         |         |               |                  |
| 10            | Adhesive Strength of Termination         | No removal of the terminations or other defect shall occur. | Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N force in the direction of the arrow. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.<br><br>Fig.1  |              |  |         |         |               |                  |
| 11            | Vibration Resistance                     | Appearance  | No defects or abnormalities.  |              |  |         |         |               |                  |
|               |  | Capacitance   | Within the specified tolerance.   |              |  |         |         |               |                  |
|               |  | D.F.  | 0.025 max.  |              |  |         |         |               |                  |
|               |  |   | Solder the capacitor to the test jig (glass epoxy board). The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 min. This motion shall be applied for a period of 2 h in each 3 mutually perpendicular directions (total of 6 h).<br> |              |  |         |         |               |                  |

"Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

Continued on the following page. 

## GA3 Series Specifications and Test Methods

Continued from the preceding page.

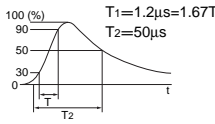
| No.     | Item                         | Specification   | Test Method  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|---------|------------------------------|---|--|------------------|----------------|---|------------------------|--------|---|----------------|--------|---|------------------------|------|-----|------------|--------|---------|-----|-----|-----|---------|-----|-----|-----|---------|-----|-----|-----|
| 12      | Deflection                   | No cracking or marking defects shall occur.   | <p>Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  <table border="1" style="margin-top: 10px;"> <thead> <tr> <th rowspan="2">L×W (mm)</th> <th colspan="4">Dimension (mm)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>4.5×2.0</td> <td>3.5</td> <td>7.0</td> <td>2.4</td> <td rowspan="4" style="text-align: center;">1.0</td> </tr> <tr> <td>4.5×3.2</td> <td>3.5</td> <td>7.0</td> <td>3.7</td> </tr> <tr> <td>5.7×2.8</td> <td>4.5</td> <td>8.0</td> <td>3.2</td> </tr> <tr> <td>5.7×5.0</td> <td>4.5</td> <td>8.0</td> <td>5.6</td> </tr> </tbody> </table> <p style="text-align: center;">Fig.2</p> | L×W (mm)         | Dimension (mm) |   |                        |        | a | b              | c      | d | 4.5×2.0                | 3.5  | 7.0 | 2.4        | 1.0    | 4.5×3.2 | 3.5 | 7.0 | 3.7 | 5.7×2.8 | 4.5 | 8.0 | 3.2 | 5.7×5.0 | 4.5 | 8.0 | 5.6 |
|         |                              | L×W (mm)  |  |                  | Dimension (mm) |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| a       | b                            |   | c  | d                |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 4.5×2.0 | 3.5                          | 7.0   | 2.4  | 1.0              |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 4.5×3.2 | 3.5                          | 7.0   | 3.7  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 5.7×2.8 | 4.5                          | 8.0   | 3.2  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 5.7×5.0 | 4.5                          | 8.0   | 5.6  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              |   |  <p style="text-align: center;">Fig.3</p>   |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 13      | Solderability of Termination | 75% of the terminations is to be soldered evenly and continuously.  | <p>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 2±0.5 s at 235±5°C. Immersing speed : 25±2.5mm/s</p>   |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 14      | Resistance to Soldering Heat | Appearance  | No marking defects.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | Capacitance Change  | Within ±10%  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | I.R.  | More than 1,000MΩ  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | Dielectric Strength   | Pass the item No.4.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | <p>Preheat the capacitor as table. Immerse the capacitor in eutectic solder solution at 260±5°C for 10±1 s. Let sit at room condition for 24±2 h, then measure.</p> <ul style="list-style-type: none"> <li>Immersing speed : 25±2.5mm/s</li> <li>Pretreatment</li> </ul> <p>Perform a heat treatment at 150 ± 10°C for 60±5 min and then let sit for 24±2 h at room condition.</p> <p>*Preheating</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100°C to 120°C</td> <td>1 min.</td> </tr> <tr> <td>2</td> <td>170°C to 200°C</td> <td>1 min.</td> </tr> </tbody> </table>  | Step   | Temperature      | Time           | 1 | 100°C to 120°C         | 1 min. | 2 | 170°C to 200°C | 1 min. |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| Step    | Temperature                  | Time  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 1       | 100°C to 120°C               | 1 min.  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 2       | 170°C to 200°C               | 1 min.  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 15      | Temperature Cycle            | Appearance  | No marking defects.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | Capacitance Change  | Within ±15%  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | D.F.  | 0.05 max.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | I.R.  | More than 3,000MΩ  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | Dielectric Strength   | Pass the item No.4.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | <p>Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig.4 using a eutectic solder. Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 h at room condition, then measure.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. Operating Temp.±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>2 to 3</td> </tr> <tr> <td>3</td> <td>Max. Operating Temp.±2</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temp.</td> <td>2 to 3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Pretreatment</li> </ul> <p>Perform a heat treatment at 150 ± 10°C for 60±5 min and then let sit for 24±2 h at room condition.</p>  <p style="text-align: center;">Fig.4</p> | Step   | Temperature (°C) | Time (min)     | 1 | Min. Operating Temp.±3 | 30±3   | 2 | Room Temp.     | 2 to 3 | 3 | Max. Operating Temp.±2 | 30±3 | 4   | Room Temp. | 2 to 3 |         |     |     |     |         |     |     |     |         |     |     |     |
| Step    | Temperature (°C)             | Time (min)  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 1       | Min. Operating Temp.±3       | 30±3  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 2       | Room Temp.                   | 2 to 3  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 3       | Max. Operating Temp.±2       | 30±3  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 4       | Room Temp.                   | 2 to 3  |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
| 16      | Humidity (Steady State)      | Appearance  | No marking defects.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | Capacitance Change  | Within ±15%  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | D.F.  | 0.05 max.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | I.R.  | More than 3,000MΩ  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | Dielectric Strength   | Pass the item No.4.  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |
|         |                              | <p>Sit the capacitor at 40±2°C and relative humidity 90 to 95% for 500±12 h. Remove and let sit for 24±2 h at room condition, then measure.</p>   |  |                  |                |   |                        |        |   |                |        |   |                        |      |     |            |        |         |     |     |     |         |     |     |     |         |     |     |     |

"Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

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## GA3 Series Specifications and Test Methods

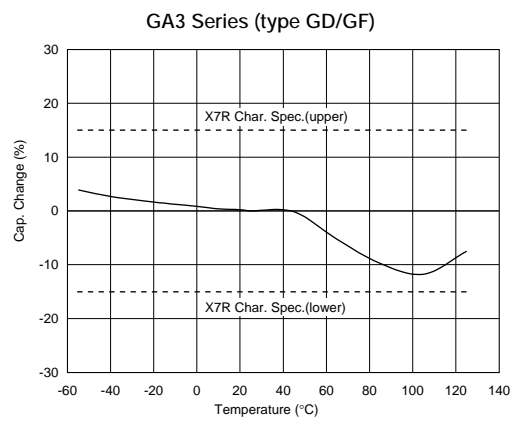
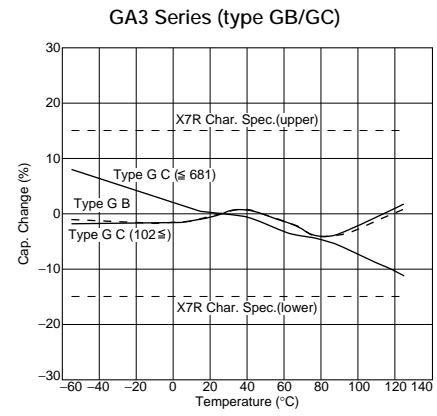
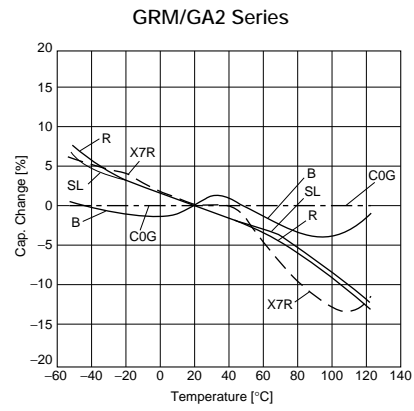
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| No.  | Item  | Specification       | Test Method   |      |                 |    |   |    |   |    |    |
|------|---|---------------------|---|------|-----------------|----|---|----|---|----|----|
| 17   | Life  | Appearance          | No marking defects.   |      |                 |    |   |    |   |    |    |
|      |   | Capacitance Change  | Within $\pm 20\%$   |      |                 |    |   |    |   |    |    |
|      |   | D.F.                | 0.05 max.   |      |                 |    |   |    |   |    |    |
|      |   | I.R.                | More than 3,000M $\Omega$   |      |                 |    |   |    |   |    |    |
|      |   | Dielectric Strength | Pass the item No.4.   |      |                 |    |   |    |   |    |    |
|      |   |                     | <p>Impulse Voltage</p> <p>Each individual capacitor shall be subjected to a 2.5kV (Type GC/GF:5kV) Impulses (the voltage value means zero to peak) for three times. Then the capacitors are applied to life test.</p>  <p>Apply voltage as Table for 1,000 h at <math>125 \pm 2^\circ\text{C}</math>, relative humidity 50% max.</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Applied voltage</th> </tr> </thead> <tbody> <tr> <td>GB</td> <td>AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s.</td> </tr> <tr> <td>GC</td> <td rowspan="3">AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s.</td> </tr> <tr> <td>GD</td> </tr> <tr> <td>GF</td> </tr> </tbody> </table> | Type | Applied voltage | GB | AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s. | GC | AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s. | GD | GF |
| Type | Applied voltage   |                     |   |      |                 |    |   |    |   |    |    |
| GB   | AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s. |                     |   |      |                 |    |   |    |   |    |    |
| GC   | AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s.   |                     |   |      |                 |    |   |    |   |    |    |
| GD   |   |                     |   |      |                 |    |   |    |   |    |    |
| GF   |   |                     |   |      |                 |    |   |    |   |    |    |
| 18   | Humidity Loading  | Appearance          | No marking defects.   |      |                 |    |   |    |   |    |    |
|      |   | Capacitance Change  | Within $\pm 15\%$   |      |                 |    |   |    |   |    |    |
|      |   | D.F.                | 0.05 max.   |      |                 |    |   |    |   |    |    |
|      |   | I.R.                | More than 3,000M $\Omega$   |      |                 |    |   |    |   |    |    |
|      |   | Dielectric Strength | Pass the item No.4.   |      |                 |    |   |    |   |    |    |
|      |   |                     | <p>Apply the rated voltage at <math>40 \pm 2^\circ\text{C}</math> and relative humidity 90 to 95% for <math>500 \pm 2\frac{1}{2}</math> h. Remove and let sit for <math>24 \pm 2</math> h at room condition, then measure.</p>  |      |                 |    |   |    |   |    |    |

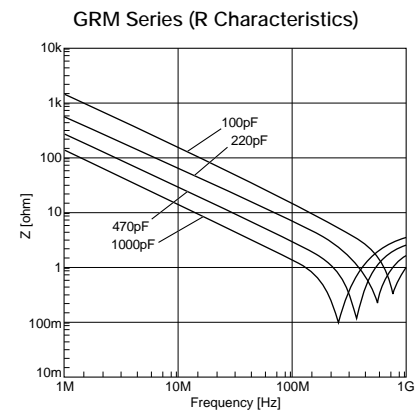
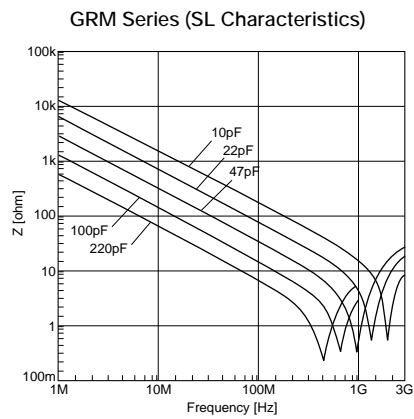
"Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

## GRM/GA2/GA3 Series Data (Typical Example)

### ■ Capacitance-Temperature Characteristics



### ■ Impedance-Frequency Characteristics



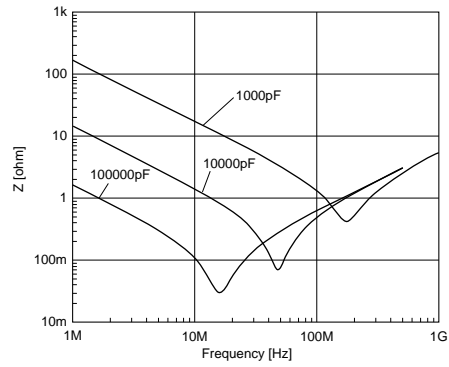
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## GRM/GA2/GA3 Series Data (Typical Example)

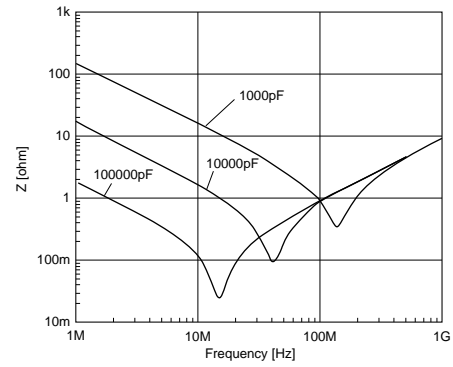
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### ■ Impedance-Frequency Characteristics

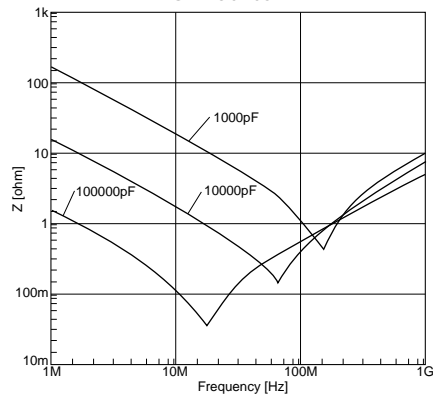
GRM Series (X7R Char. 250V)



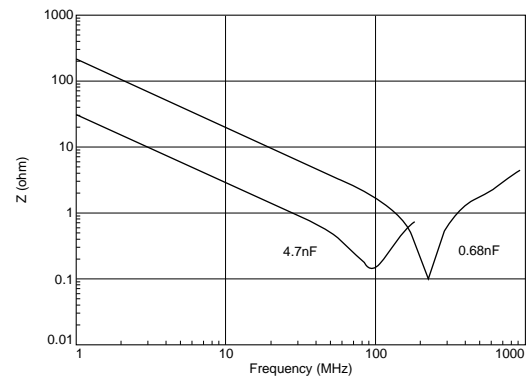
GRM Series (B/X7R Char. 630V)



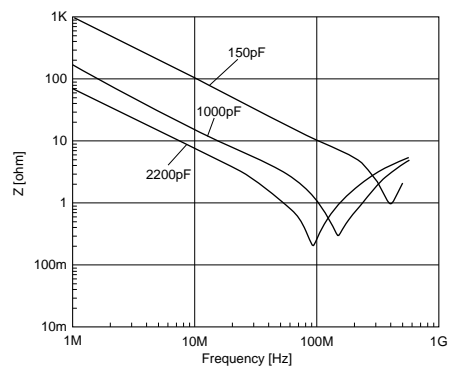
GA2 Series



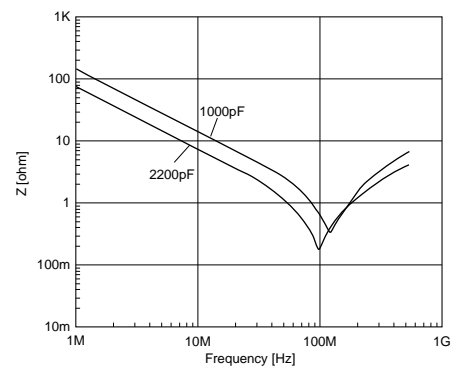
GA3 Series (Type GC)



GA3 Series (Type GD)



GA3 Series (Type GF)



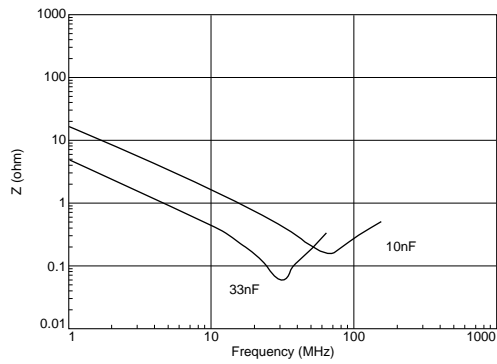
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## GRM/GA2/GA3 Series Data (Typical Example)

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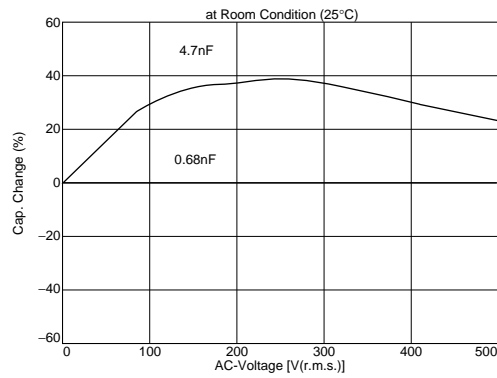
### ■ Impedance-Frequency Characteristics

GA3 Series (Type GB)

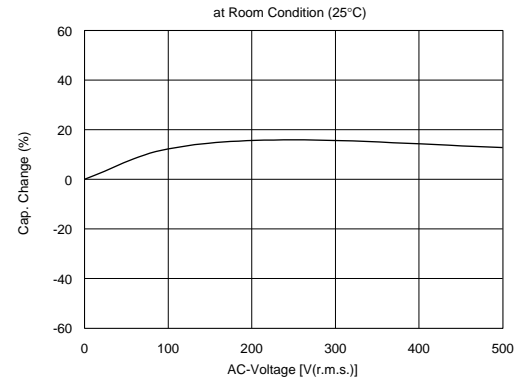


### ■ Capacitance-AC Voltage Characteristics

GA3 Series (Type GC)



GA3 Series (Type GD/GF)



GA3 Series (Type GB)

