# CHIP MONOLITHIC CERAMIC CAPACITOR

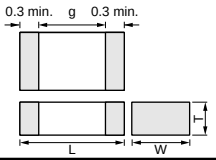
## for High-voltage High-capacitance Type GHM1500 Series

### ■ Features

1. A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
2. Sn-plated external electrodes allow mounting without silver compound solder.
3. The GHM1525 and GHM1530 type for flow and reflow soldering, and other types for reflow soldering.

### ■ Application

1. Ideal use as hot-cold coupling for DC-DC converter.
2. Ideal use on line filter and ringer detector for telephone, facsimile and modem.
3. Ideal use on diode-snubber circuit for switching power supply.




| Part Number | Dimensions (mm) | | | |
|---|---|---|---|---|
| | L | W | T | g min. |
| **GHM1525** | 2.0 ±0.2 | 1.25 ±0.2 | 1.0 +0,-0.3 | 0.7 |
| | | | 1.25 ±0.2 | |
| **GHM1530** | 3.2 ±0.2 | 1.6 ±0.2 | 1.0 +0,-0.3 | 1.5 |
| | | | 1.25 +0,-0.3 | |
| | | | 1.6 ±0.2 | |
| **GHM1535** | 3.2 ±0.3 | 2.5 ±0.2 | 1.5 +0,-0.3 | |
| | | | 2.0 +0,-0.3 | |
| **GHM1540** | 4.5 ±0.4 | 3.2 ±0.3 | 1.5 +0,-0.3 | 2.5 |
| | | | 2.0 +0,-0.3 | |
| | | | 2.5 +0,-0.3 | |
| | | | 2.6 +0,-0.3 | |
| **GHM1545** | 5.7 ±0.4 | 5.0 ±0.4 | 2.0 +0,-0.3 | 3.5 |
| | | | 2.7 +0,-0.3 | |

| Part Number | Rated Voltage (V) | TC Code | Capacitance | Length L (mm) | Width W (mm) | Thickness T (mm) | Electrode g (mm) | Electrode e (mm) |
|---|---|---|---|---|---|---|---|---|
| **GHM1525B102K250** | DC250 | B | 1000pF +10,-10% | 2.0 | 1.25 | 1.0 | 0.7 min. | 0.3 min. |
| **GHM1525B152K250** | DC250 | B | 1500pF +10,-10% | 2.0 | 1.25 | 1.0 | 0.7 min. | 0.3 min. |
| **GHM1525B222K250** | DC250 | B | 2200pF +10,-10% | 2.0 | 1.25 | 1.0 | 0.7 min. | 0.3 min. |
| **GHM1525B332K250** | DC250 | B | 3300pF +10,-10% | 2.0 | 1.25 | 1.0 | 0.7 min. | 0.3 min. |
| **GHM1525B472K250** | DC250 | B | 4700pF +10,-10% | 2.0 | 1.25 | 1.0 | 0.7 min. | 0.3 min. |
| **GHM1525B682K250** | DC250 | B | 6800pF +10,-10% | 2.0 | 1.25 | 1.0 | 0.7 min. | 0.3 min. |
| **GHM1525B103K250** | DC250 | B | 10000pF +10,-10% | 2.0 | 1.25 | 1.25 | 0.7 min. | 0.3 min. |
| **GHM1530B153K250** | DC250 | B | 15000pF +10,-10% | 3.2 | 1.6 | 1.0 | 1.5 min. | 0.3 min. |
| **GHM1530B223K250** | DC250 | B | 22000pF +10,-10% | 3.2 | 1.6 | 1.0 | 1.5 min. | 0.3 min. |
| **GHM1530B333K250** | DC250 | B | 33000pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B473K250** | DC250 | B | 47000pF +10,-10% | 3.2 | 1.6 | 1.6 | 1.5 min. | 0.3 min. |
| **GHM1535B683K250** | DC250 | B | 68000pF +10,-10% | 3.2 | 2.5 | 1.5 | 1.5 min. | 0.3 min. |
| **GHM1535B104K250** | DC250 | B | 0.1µF +10,-10% | 3.2 | 2.5 | 2.0 | 1.5 min. | 0.3 min. |
| **GHM1540B154K250** | DC250 | B | 0.15µF +10,-10% | 4.5 | 3.2 | 2.0 | 2.9 min. | 0.3 min. |
| **GHM1540B224K250** | DC250 | B | 0.22µF +10,-10% | 4.5 | 3.2 | 2.5 | 2.9 min. | 0.3 min. |
| **GHM1545B334K250** | DC250 | B | 0.33µF +10,-10% | 5.7 | 5.0 | 2.0 | 3.5 min. | 0.3 min. |
| **GHM1545B474K250** | DC250 | B | 0.47µF +10,-10% | 5.7 | 5.0 | 2.0 | 3.5 min. | 0.3 min. |
| **GHM1530B102K630** | DC630 | B | 1000pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B152K630** | DC630 | B | 1500pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B222K630** | DC630 | B | 2200pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B332K630** | DC630 | B | 3300pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B472K630** | DC630 | B | 4700pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B682K630** | DC630 | B | 6800pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1530B103K630** | DC630 | B | 10000pF +10,-10% | 3.2 | 1.6 | 1.25 | 1.5 min. | 0.3 min. |
| **GHM1535B153K630** | DC630 | B | 15000pF +10,-10% | 3.2 | 2.5 | 1.5 | 1.5 min. | 0.3 min. |
| **GHM1535B223K630** | DC630 | B | 22000pF +10,-10% | 3.2 | 2.5 | 1.5 | 1.5 min. | 0.3 min. |
| **GHM1540B333K630** | DC630 | B | 33000pF +10,-10% | 4.5 | 3.2 | 1.5 | 2.5 min. | 0.3 min. |
| **GHM1540B473K630** | DC630 | B | 47000pF +10,-10% | 4.5 | 3.2 | 1.5 | 2.5 min. | 0.3 min. |
| **GHM1540B683K630** | DC630 | B | 68000pF +10,-10% | 4.5 | 3.2 | 2.0 | 2.5 min. | 0.3 min. |
| **GHM1540B104K630** | DC630 | B | 0.1µF +10,-10% | 4.5 | 3.2 | 2.6 | 2.5 min. | 0.3 min. |
| **GHM1545B154K630** | DC630 | B | 0.15µF +10,-10% | 5.7 | 5.0 | 2.0 | 3.5 min. | 0.3 min. |
| **GHM1545B224K630** | DC630 | B | 0.22µF +10,-10% | 5.7 | 5.0 | 2.7 | 3.5 min. | 0.3 min. |



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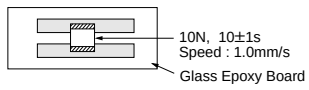
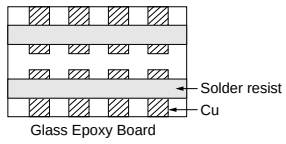
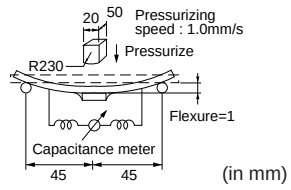
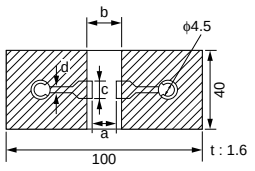
# Specifications and Test Methods

| No. | Item | | Specification | Test Method |
|---|---|---|---|---|
| 1 | Operating Temperature Range | | −55 to +125℃ | − |
| 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 150% of the rated voltage (200% of the rated voltage in case of rated voltage: DC 250V) is applied between the terminations for 1 to 5 s, provided the charge/discharge current is less than 50mA. |
| 5 | Insulation Resistance (I.R.) | | C≧0.01μF : More than 100MΩ • μF<br>C<0.01μF : More than 10,000MΩ | The insulation resistance shall be measured with 500±50V (250±50V in case of rated voltage: DC 250V) and within 60±5 s of charging. |
| 6 | Capacitance | | Within the specified tolerance. | The capacitance/D.F. shall be measured at 20℃ 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. | |
| 8 | Capacitance Temperature Characteristics | | Cap. Change<br>Within ±10%<br>(Temp. Range : −25 to +85℃) | The range of capacitance change compared with the 20℃ value within −25 to +85℃ shall be within the specified range.<br>•Pretreatment<br>Perform a heat treatment at 150 $^{+0}_{-10}$ ℃ for 60±5 min and then let sit for 24±2 h at room condition. |
| 9 | 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.<br>Then apply 10N force in the direction of the arrow.<br>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><br>Fig.1 |
| 10 | Vibration Resistance | Appearance | No defects or abnormalities. | Solder the capacitor to the test jig (glass epoxy board).<br>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>  <br> |
| | | Capacitance | Within the specified tolerance. | |
| | | D.F. | 0.025 max. | |
| 11 | Deflection | | No cracking or marking defects shall occur. | Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.2 using a eutectic solder.<br>Then apply a force in the direction shown in Fig.3.<br>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><br>(in mm)<br>Fig.3 |




| LXW (mm) | Dimension (mm) | | | |
|---|---|---|---|---|
| | a | b | c | d |
| 2.0X1.25 | 1.2 | 4.0 | 1.65 | 1.0 |
| 3.2X1.6 | 2.2 | 5.0 | 2.0 | |
| 3.2X2.5 | 2.2 | 5.0 | 2.9 | |
| 4.5X3.2 | 3.5 | 7.0 | 3.7 | |
| 5.7X5.0 | 4.5 | 8.0 | 5.6 | |

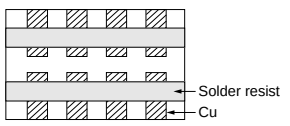
Fig.2

"Room condition" Temperature : 15 to 35℃, 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 | Solderability of Termination | | 75% of the terminations is to be soldered evenly and continuously. | Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion).<br>Immerse in eutectic solder solution for 2±0.5 s at 235±5℃.<br>Immersing speed : 25±2.5mm/s |
| 13 | Resistance to Soldering Heat | Appearance | No marking defects. | Preheat the capacitor at 120 to 150℃* for 1 min.<br>Immerse the capacitor in eutectic solder solution at 260±5℃ 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 $^{+0}_{-10}$℃ for 60±5 min and then let sit for 24±2 h at room condition.<br><br>*Preheating for more than 3.2×2.5mm<br>Step / Temperature / Time<br>1 / 100℃ to 120℃ / 1 min.<br>2 / 170℃ to 200℃ / 1 min. |
| | | Capacitance Change | Within ±10% | |
| | | D.F. | 0.025 max. | |
| | | I.R. | C≧0.01μF : More than 100MΩ • μF<br>C<0.01μF : More than 10,000MΩ | |
| | | Dielectric Strength | Pass the item No.4. | |
| 14 | Temperature Cycle | Appearance | No marking defects. | Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig.4 using a eutectic solder.<br>Perform the five cycles according to the four heat treatments listed in the following table.<br>Let sit for 24±2 h at room condition, then measure.<br>Step / Temperature (℃) / Time (min)<br>1 / Min. Operating Temp.±3 / 30±3<br>2 / Room Temp. / 2 to 3<br>3 / Max. Operating Temp.±2 / 30±3<br>4 / Room Temp. / 2 to 3<br>•Pretreatment<br>Perform a heat treatment at 150 $^{+0}_{-10}$℃ for 60±5 min and then let sit for 24±2 h at room condition.<br>  <br><br>Fig.4 |
| | | Capacitance Change | Within ±7.5% | |
| | | D.F. | 0.025 max. | |
| | | I.R. | C≧0.01μF : More than 100MΩ • μF<br>C<0.01μF : More than 10,000MΩ | |
| | | Dielectric Strength | Pass the item No.4. | |
| 15 | Humidity (Steady State) | Appearance | No marking defects. | Sit the capacitor at 40±2℃ and relative humidity 90 to 95% for 500 $^{+24}_{0}$ h.<br>Remove and let sit for 24±2 h at room condition, then measure.<br>•Pretreatment<br>Perform a heat treatment at 150 $^{+0}_{-10}$℃ for 60±5 min and then let sit for 24±2 h at room condition. |
| | | Capacitance Change | Within ±15% | |
| | | D.F. | 0.05 max. | |
| | | I.R. | C≧0.01μF : More than 10MΩ • μF<br>C<0.01μF : More than 1,000MΩ | |
| | | Dielectric Strength | Pass the item No.4. | |
| 16 | Life | Appearance | No marking defects. | Apply 120% of the rated voltage (150% of the rated voltage in case of rated voltage: DC250V) for 1,000 $^{+48}_{0}$ h at maximum operating temperature±3℃. Remove and let sit for 24 ±2 h at room condition, then measure.<br>The charge/discharge current is less than 50mA.<br>•Pretreatment<br>Apply test voltage for 60±5 min at test temperature.<br>Remove and let sit for 24±2 h at room condition. |
| | | Capacitance Change | Within ±15% | |
| | | D.F. | 0.05 max. | |
| | | I.R. | C≧0.01μF : More than 10MΩ • μF<br>C<0.01μF : More than 1,000MΩ | |
| | | Dielectric Strength | Pass the item No.4. | |
| 17 | Humidity Loading | Appearance | No marking defects. | Apply the rated voltage at 40±2℃ and relative humidity 90 to 95% for 500 $^{+24}_{0}$ h.<br>Remove and let sit for 24±2 h at room condition, then measure.<br>•Pretreatment<br>Apply test voltage for 60±5 min at test temperature.<br>Remove and let sit for 24±2 h at room condition. |
| | | Capacitance Change | Within ±15% | |
| | | D.F. | 0.05 max. | |
| | | I.R. | C≧0.01μF : More than 10MΩ • μF<br>C<0.01μF : More than 1,000MΩ | |
| | | Dielectric Strength | Pass the item No.4. | |

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