CHIP MONOLITHIC CERAMIC CAPACITOR

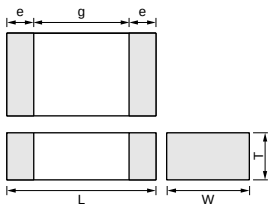
for High-voltage Low Dissipation Type GHM1000 Series

■ Features

1. Murata's original internal electrode structure realizes high Flash-over Voltage.
2. A new monolithic structure for small, surface-mountable devices capable of operating at high-voltage levels.
3. Sn-plated external electrodes allow mounting without silver compound solder.
4. The GHM1030 type for flow and reflow soldering, and other types for reflow soldering.
5. Low-loss and suitable for high-frequency circuits.
6. The temperature characteristics R is high dielectric constant type, and SL is temperature compensating type.

■ Application

1. Ideal use on high-frequency pulse circuit such as snubber circuit for switching power supply, DC-DC converter, ballast(inverter fluorescent lamp), and so on. (R Characteristics)
2. Ideal for use as the ballast in liquid crystal back lighting inverters. (SL Characteristics)



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GHM1030	3.2 ±0.2	1.6 ±0.2	1.0 +0 -0.3	0.3	1.5*
			1.25 +0 -0.3		
GHM1035	3.2 ±0.2	2.5 ±0.2	1.5 +0 -0.3		1.8
GHM1038	4.5 ±0.3	2.0 ±0.2	2.0 ±0.3		2.9
GHM1040	4.5 ±0.3	3.2 ±0.3	2.0 +0 -0.3		
			2.5 +0 -0.3		

* SL 2kV : 1.8mm min.

Part Number	Rated Voltage (V)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)
GHM1030R101K630	DC630	R	100 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R151K630	DC630	R	150 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R221K630	DC630	R	220 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R331K630	DC630	R	330 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R471K630	DC630	R	470 +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1030R681K630	DC630	R	680 +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1030R102K630	DC630	R	1000 +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1030R470K1K	DC1000	R	47 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R680K1K	DC1000	R	68 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R101K1K	DC1000	R	100 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R151K1K	DC1000	R	150 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R221K1K	DC1000	R	220 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R331K1K	DC1000	R	330 +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1030R471K1K	DC1000	R	470 +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1030SL100D2K	DC2000	SL	10 +0.5,-0.5pF	3.2	1.6	1.25	1.8 min.	0.3 min.
GHM1030SL120J2K	DC2000	SL	12 +5,-5%	3.2	1.6	1.25	1.8 min.	0.3 min.
GHM1030SL150J2K	DC2000	SL	15 +5,-5%	3.2	1.6	1.25	1.8 min.	0.3 min.
GHM1030SL180J2K	DC2000	SL	18 +5,-5%	3.2	1.6	1.25	1.8 min.	0.3 min.
GHM1030SL220J2K	DC2000	SL	22 +5,-5%	3.2	1.6	1.25	1.8 min.	0.3 min.
GHM1035SL270J2K	DC2000	SL	27 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1035SL330J2K	DC2000	SL	33 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1035SL390J2K	DC2000	SL	39 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1035SL470J2K	DC2000	SL	47 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1035SL560J2K	DC2000	SL	56 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1035SL680J2K	DC2000	SL	68 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1035SL820J2K	DC2000	SL	82 +5,-5%	3.2	2.5	1.5	1.8 min.	0.3 min.
GHM1040SL121J2K	DC2000	SL	120 +5,-5%	4.5	3.2	2.0	2.9 min.	0.3 min.

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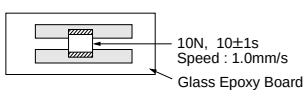
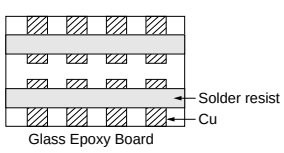
Part Number	Rated Voltage (V)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)
GHM1040SL151J2K	DC2000	SL	150 +5,-5%	4.5	3.2	2.0	2.9 min.	0.3 min.
GHM1040SL181J2K	DC2000	SL	180 +5,-5%	4.5	3.2	2.0	2.9 min.	0.3 min.
GHM1040SL221J2K	DC2000	SL	220 +5,-5%	4.5	3.2	2.0	2.9 min.	0.3 min.
GHM1038SL100D3K	DC3150	SL	10 +0.5,-0.5pF	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL120J3K	DC3150	SL	12 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL150J3K	DC3150	SL	15 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL180J3K	DC3150	SL	18 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL220J3K	DC3150	SL	22 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL270J3K	DC3150	SL	27 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL330J3K	DC3150	SL	33 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL390J3K	DC3150	SL	39 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL470J3K	DC3150	SL	47 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL560J3K	DC3150	SL	56 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL680J3K	DC3150	SL	68 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1038SL820J3K	DC3150	SL	82 +5,-5%	4.5	2.0	2.0	2.9 min.	0.3 min.
GHM1040SL101J3K	DC3150	SL	100 +5,-5%	4.5	3.2	2.5	2.9 min.	0.3 min.

Specifications and Test Methods

No.	Item		Specification		Test Method
			Temperature Compensating Type (SL Char.)	High Dielectric Constant Type (R Char.)	
1	Operating Temperature Range		−55 to +125℃		
2	Appearance		No defects or abnormalities.		Visual inspection.
3	Dimensions		Within the specified dimension.		Using calipers.
4	Dielectric Strength		No defects or abnormalities.		No failure shall be observed when voltage in Table is applied between the terminations for 1 to 5 s, provided the charge/discharge current is less than 50mA. Rated voltage: Test voltage More than DC 1kV: 120% of the rated voltage Less than DC 1kV: 150% of the rated voltage
5	Insulation Resistance (I.R.)		More than 10,000MΩ		The insulation resistance shall be measured with 500±50V and within 60±5 s of charging.
6	Capacitance		Within the specified tolerance.		The capacitance/Q/D.F. shall be measured at 20℃ at the frequency and voltage shown as follows. (1) Temperature Compensating Type Frequency : 1±0.2MHz Voltage : 0.5 to 5V (r.m.s.) (2) High Dielectric Constant Type Frequency : 1±0.2kHz Voltage : 1±0.2V (r.m.s.)
7	Q/ Dissipation Factor (D.F.)		C≧30pF : Q≧1,000 C<30pF : Q≧400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	
8	Capacitance Temperature Characteristics		Temp. Coefficient +350 to −1,000 ppm/℃ (Temp. Range : +20 to +85℃)	Cap. Change Within ±15%	(1) Temperature Compensating Type The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5 (+20 to +85 ℃) the capacitance shall be within the specified tolerance for the temperature coefficient. Step: Temperature(℃) 1: 20±2 2: Min. Operating Temp.±3 3: 20±2 4: Max. Operating Temp.±2 5: 20±2 (2) High Dielectric Constant Type The range of capacitance change compared to the 20℃ value within −55 to +125℃ shall be within the specified range. •Pretreatment 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. 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.  Fig.1
10	Vibration Resistance	Appearance	No defects or abnormalities.		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). 
		Capacitance	Within the specified tolerance.		
		Q/D.F.	30pF min. : Q≧1,000 30pF max. : Q≧400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	

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

Continued on the following page.

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Specifications and Test Methods

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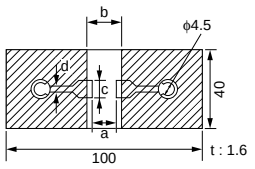
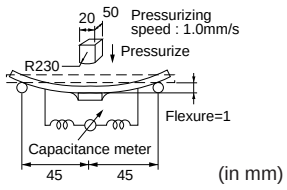
<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specification</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type (SL Char.)</th><th>High Dielectric Constant Type (R Char.)</th></tr>
<tr><td>11</td><td colspan="2">Deflection</td><td colspan="2">No cracking or marking defects shall occur.
 

LXW (mm) / Dimension (mm)
a / b / c / d
3.2X1.6 / 2.2 / 5.0 / 2.0 / 1.0
3.2X2.5 / 2.2 / 5.0 / 2.9
4.5X2.0 / 3.5 / 7.0 / 2.4
4.5X3.2 / 3.5 / 7.0 / 3.7
Fig.2</td><td>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.
 

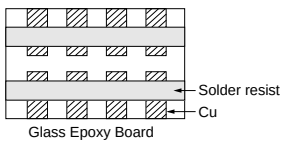
(in mm)
Fig.3</td></tr>
<tr><td>12</td><td colspan="2">Solderability of Termination</td><td colspan="2">75% of the terminations are to be soldered evenly and continuously.</td><td>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 2±0.5 s at 235±5℃.
Immersing speed : 25±2.5mm/s</td></tr>
<tr><td rowspan="4">13</td><td rowspan="4">Resistance to Soldering Heat</td><td>Appearance</td><td colspan="2">No marking defects.</td><td rowspan="4">Preheat the capacitor at 120 to 150℃* for 1 min.
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.
•Immersing speed : 25±2.5mm/s
•Pretreatment for high dielectric constant type
Perform a heat treatment at 150 $^{+0}_{-10}$ ℃ for 60±5 min and then let sit for 24±2 h at room condition.
*Preheating for more than 3.2X2.5mm
Step / Temperature / Time
1 / 100℃ to 120℃ / 1 min.
2 / 170℃ to 200℃ / 1 min.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td><td>Within ±10%</td></tr>
<tr><td>Q/D.F.</td><td>C≧30pF : Q≧1,000
C<30pF : Q≧400+20C
C : Nominal Capacitance (pF)</td><td>D.F.≦0.01</td></tr>
<tr><td>I.R.</td><td colspan="2">More than 10,000MΩ</td></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td colspan="2">No marking defects.</td><td rowspan="5">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.
Step / Temperature (℃) / 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
•Pretreatment for high dielectric constant type
Perform a heat treatment at 150 $^{+0}_{-10}$ ℃ for 60±5 min and then let sit for 24±2 h at room condition.
 

Fig.4</td></tr>
<tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td><td>Within ±10%</td></tr>
<tr><td>Q/D.F.</td><td>C≧30pF : Q≧1,000
C<30pF : Q≧400+20C
C : Nominal Capacitance (pF)</td><td>D.F.≦0.01</td></tr>
<tr><td>I.R.</td><td colspan="2">More than 10,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">Pass the item No.4.</td></tr>
<tr><td rowspan="5">15</td><td rowspan="5">Humidity (Steady State)</td><td>Appearance</td><td colspan="2">No marking defects.</td><td rowspan="5">Sit the capacitor at 40±2℃ and relative humidity 90 to 95% for 500 $^{+24}_{-0}$ h.
Remove and let sit for 24±2 h at room condition, then measure.
•Pretreatment for high dielectric constant type
Perform a heat treatment at 150 $^{+0}_{-10}$ ℃ for 60±5 min and then let sit for 24±2 h at room condition.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5.0% or ±0.5pF (Whichever is larger)</td><td>Within ±10%</td></tr>
<tr><td>Q/D.F.</td><td>C≧30pF : Q≧350
C<30pF : Q≧275+ $\frac{5}{2}$ C
C : Nominal Capacitance (pF)</td><td>D.F.≦0.01</td></tr>
<tr><td>I.R.</td><td colspan="2">More than 1,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">Pass the item No.4.</td></tr>
</table>

"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: Temperature Compensating Type (SL Char.)	Specification: High Dielectric Constant Type (R Char.)	Test Method
16	Life	Appearance	No marking defects.		Apply the voltage in following table for 1,000 $^{+48}_{0}$ at maximum operating temperature±3℃. Remove and let sit for 24±2 h at room condition, then measure. The charge/discharge current is less than 50mA. •Pretreatment for high dielectric constant type Apply test voltage for 60±5 min at test temperature. Remove and let sit for 24±2 h at room condition.
		Capacitance Change	Within ±3.0% or ±0.3pF (Whichever is larger)	Within ±10%	
		Q/D.F.	C≧30pF : Q≧350 C<30pF : Q≧275+ $\frac{5}{2}$ C C : Nominal Capacitance (pF)	D.F.≦0.02	
		I.R.	More than 1,000MΩ		
		Dielectric Strength	Pass the item No.4.		

Rated voltage	Test voltage
More than DC 1kV	Rated voltage
Less than DC 1kV	120% of the rated voltage

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