SURFACE MOUNT MONOLITHIC CHIP CAPACITORS
250VDC TO 315kVDC, SL, R & B TYPES

muRata
Innovator in Electronics

GHM1000/1500 Series

FEATURES
- A new multi-layer structure for small, surface-mountable devices capable of operating at high-voltage.
- Sn plated external electrodes allow mounting without silver compound solder.
- The GHM1030 type and 1525/1530 types for flow and reflow soldering. All other types for reflow soldering only.

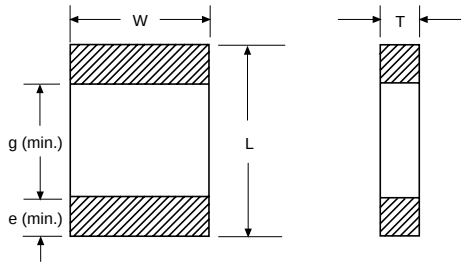
APPLICATIONS
GHM1000
- Ideal use on high-frequency pulse circuit such as snubber circuit for switching power supply, DC-DC converter, ballast (inverter fluorescent lamp). (R Characteristics)
- Ideal for use as the ballast in liquid crystal back-lighting inverters. (SL Characteristics)

GHM1500
- Ideal use as hot-cold coupling for DC-DC converter.
- Ideal use on line filter and ringer detector for telephone, facsimile and modem.
- Ideal use on diode-snubber circuit for switching power supply.

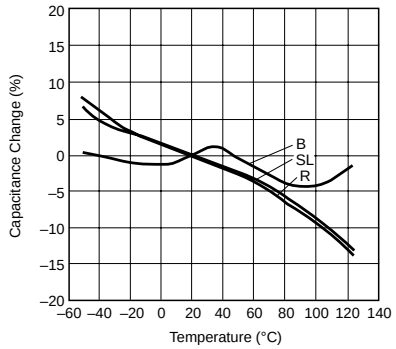
PART NUMBERING SYSTEM

GHM1040	SL	121	J	2K
CAPACITOR TYPE AND SIZE	**TEMPERATURE CHARACTERISTICS** Temperature Range SL, R, & B = –55 to +125°C Maximum Capacitance Change SL = +350 to –1000ppm/°C (+20 to +85°C) R = ±15% (–55 to +125°C) B = ±10% (–25 to +85°C)	**CAPACITANCE VALUE** Expressed in picofarads and identified by a three-digit number. First two digits represent significant figures. Last digit specifies the number of zeros to follow.	**CAPACITANCE TOLERANCE** D = ±0.5pF J = ±5% K = ±10%	**VOLTAGE** 250 = 250VDC 630 = 630VDC 2K = 2KVDC 3K = 3.15KVDC

DIMENSIONS: mm

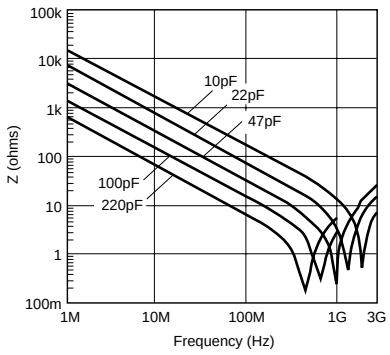


CAPACITANCE – TEMPERATURE CHARACTERISTICS

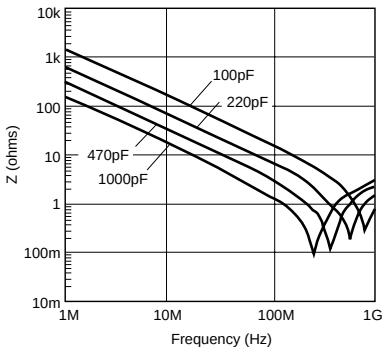


IMPEDANCE – FREQUENC Y CHARACTERISTICS

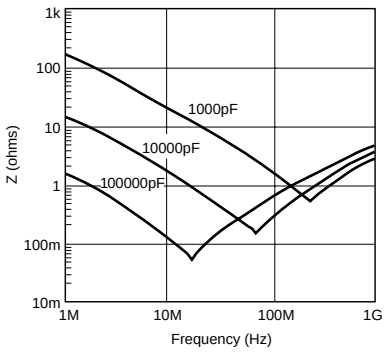
GHM1000 Series (SL Char.)



GHM1000 Series (R Char.)



GHM1500 Series (B Char.)



TEMPERATURE COMPENSATING TYPE SL Characteristic (+350 to –1000ppm/°C)

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	DC Rated Voltage (V)	Dimensions (mm)					Packaging Qty. (pcs./reel)
				L	W	T	g	e	
GHM1040SL121J2K	120	±5%	2k	4.5 ± 0.3	3.2 ± 0.3	2.0 $^{+0}_{-0.3}$	2.9	0.3	1000
GHM1040SL151J2K	150								
GHM1040SL181J2K	180								
GHM1040SL221J2K	220								
GHM1038SL100D3K	10	±0.5pF	3.15k		2.0 ± 0.2	2.0 ± 0.3			2000
GHM1038SL120J3K	12	±5%							
GHM1038SL150J3K	15								
GHM1038SL180J3K	18								
GHM1038SL220J3K	22								
GHM1038SL270J3K	27								
GHM1038SL330J3K	33								
GHM1038SL390J3K	39								
GHM1038SL470J3K	47								
GHM1038SL560J3K	56								
GHM1038SL680J3K	68								
GHM1038SL820J3K	82								
GHM1040SL101J3K	100				3.2 ± 0.3	2.5 $^{+0}_{-0.3}$			500

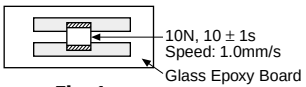
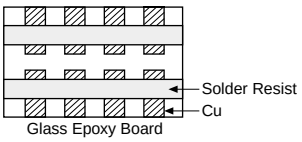
*1k VDC product also available. Please contact us for further details.

HIGH DIELECTRIC CONSTANT TYPE R Characteristic (±15%)

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	DC Rated Voltage (V)	Dimensions (mm)					Packaging Qty. (pcs./reel)
				L	W	T	g	e	
GHM1030R101K630	100	±10%	630	3.2 ± 0.2	1.6 ± 0.2	1.0 $^{+0}_{-0.3}$	1.5	0.3	4000
GHM1030R151K630	150								
GHM1030R221K630	220								
GHM1030R331K630	330								
GHM1030R471K630	470					1.25 $^{+0}_{-0.3}$			3000
GHM1030R681K630	680								
GHM1030R102K630	1000								

HIGH DIELECTRIC CONSTANT TYPE B Characteristic (±15% from –55 to +125°C; ±10% within –25 to +85°C)

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	DC Rated Voltage (V)	Dimensions (mm)					Packaging Qty. (pcs./reel)
				L	W	T	g	e	
GHM1525B102K250	1000	±10%	250	2.0 ± 0.2	1.25 ± 0.2	1.0 $^{+0}_{-0.3}$	0.7	0.3	4000
GHM1525B152K250	1500								
GHM1525B222K250	2200								
GHM1525B332K250	3300								
GHM1525B472K250	4700								
GHM1525B682K250	6800								
GHM1525B103K250	10000					1.25 ± 0.2			3000
GHM1530B153K250	15000			3.2 ± 0.2	1.6 ± 0.2	1.0 $^{+0}_{-0.3}$	1.5		4000
GHM1530B223K250	22000								
GHM1530B333K250	33000					1.25 $^{+0}_{-0.3}$			3000
GHM1530B473K250	47000					1.6 ± 0.2			2000
GHM1535B683K250	68000			3.2 ± 0.3	2.5 ± 0.2	1.5 $^{+0}_{-0.3}$			
GHM1535B104K250	100000					2.0 $^{+0}_{-0.3}$			1000
GHM1540B154K250	150000			4.5 ± 0.4	3.2 ± 0.3		2.5		
GHM1540B224K250	220000					2.5 $^{+0}_{-0.3}$			500
GHM1545B334K250	330000			5.7 ± 0.4	5.0 ± 0.4	2.0 $^{+0}_{-0.3}$	3.5		1000
GHM1545B474K250	470000								
GHM1530B102K630	1000		630	3.2 ± 0.2	1.6 ± 0.2	1.25 $^{+0}_{-0.3}$	1.5		3000
GHM1530B152K630	1500								
GHM1530B222K630	2200								
GHM1530B332K630	3300								
GHM1530B472K630	4700								
GHM1530B682K630	6800								
GHM1530B103K630	10000								
GHM1535B153K630	15000			3.2 ± 0.3	2.5 ± 0.2	1.5 $^{+0}_{-0.3}$			2000
GHM1535B223K630	22000								
GHM1540B333K630	33000			4.5 ± 0.4	3.2 ± 0.3		2.5		1000
GHM1540B473K630	47000								
GHM1540B683K630	68000					2.0 $^{+0}_{-0.3}$			
GHM1540B104K630	100000					2.6 $^{+0}_{-0.3}$			500
GHM1545B154K630	150000			5.7 ± 0.4	5.0 ± 0.4	2.0 $^{+0}_{-0.3}$	3.5		1000
GHM1545B224K630	220000					2.7 $^{+0}_{-0.3}$			500

No.	Item		Specification: Temperature Compensating Type (SL Char.)	Specification: High Dielectric Constant Type (R or B Char.)	Test Method
1	**Operating Temperature Range**		–55 to +125°C		—
2	**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 DC1kV**: 120% of the rated voltage **630V**: 150% of the rated voltage **250V**: 200% of the rated voltage
3	**Insulation Resistance (I.R.)**		C ≥ 0.01μF: More than 100M ohms • μF C < 0.01μF: More than 10000M ohms		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.
4	**Capacitance**		Within the specified tolerance.		The capacitance/Q/D.F. shall be measured at 20°C at the frequency and voltage shown as follows: ■ Temperature Compensating Type Frequency: 1 ± 0.2MHz Voltage: 0.5 to 5V(r.m.s.) ■ High Dielectric Constant Type Frequency: 1 ± 0.2kHz Voltage: 1 ± 0.2V(r.m.s.)
5	**Q/ Dissipation Factor (D.F.)**		C ≥ 30pF: Q ≥ 1000 C < 30pF: Q ≥ 400 + 20C C: Nominal Capacitance (pF)	D.F. ≤ 0.01 (R Char.) D.F. ≤ 0.025 (B Char.)	
6	**Capacitance Temperature Characteristics**		Temp. Coefficient +350 to –1000ppm/°C (Temp. Range: +20 to +85°C)	Cap. Change within ±15% (R Char.) Cap. Change within ±10% (B Char. for –25 to +85°C)	■ 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°C) the capacitance shall be within the specified tolerance for the temperature coefficient. **Step** / **Temperature (°C)** **1**: 20 ± 2 **2**: Min. Operating Temp. ±3 **3**: 20 ± 2 **4**: Max. Operating Temp. ±2 **5**: 20 ± 2 ■ High Dielectric Constant Type The range of capacitance change compared to the 20°C value within –55 to +125°C (–25 to +85°C for B Char.) shall be within the specified range. **Pretreatment** Perform a heat treatment at 150 $^{+0}_{-10}$°C for 60 ± 5 min. and then let sit for 24 ± 2 h at room condition.
7	**Adhesive Strength of Termination**		No removal of the terminations or other defects 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**
8	**Vibration Resistance**	**Capacitance**	Within the specified tolerance.		Solder the capacitor to the testing 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). 
		Q/D.F.	C ≥ 30pF: Q ≥ 1000 C < 30pF: Q ≥ 400 + 20C C: Nominal Capacitance (pF)	D.F. ≤ 0.01 (R Char.) D.F. ≤ 0.025 (B Char.)	

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

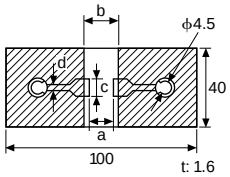
<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specification</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type (SL Char.)</th><th>High Dielectric Constant Type (R or B Char.)</th></tr>
<tr><td>9</td><td colspan="2">Deflection</td><td colspan="2">No cracking or marking defects shall occur.
 

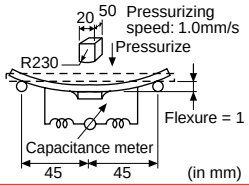
Fig. 2
<table>
<tr><th rowspan="2">L x W (mm)</th><th colspan="4">Dimensions (mm)</th></tr>
<tr><th>a</th><th>b</th><th>c</th><th>d</th></tr>
<tr><td>2.0 x 1.25</td><td>1.2</td><td>4.0</td><td>1.65</td><td rowspan="5">1.0</td></tr>
<tr><td>3.2 x 1.6</td><td>2.2</td><td>5.0</td><td>2.0</td></tr>
<tr><td>3.2 x 2.5</td><td>2.2</td><td>5.0</td><td>2.9</td></tr>
<tr><td>4.5 x 2.0</td><td>3.5</td><td>7.0</td><td>2.4</td></tr>
<tr><td>4.5 x 3.2</td><td>3.5</td><td>7.0</td><td>3.7</td></tr>
<tr><td>5.7 x 5.0</td><td>4.5</td><td>8.0</td><td>5.6</td></tr>
</table></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.
 

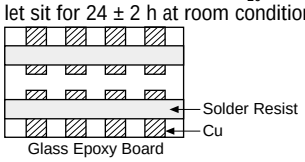
Fig. 3</td></tr>
<tr><td>10</td><td colspan="2">Solderability of Termination</td><td colspan="2">75% of the terminations are to be soldered evenly and continuously.</td><td>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion).
Immerse in eutectic solder solution for 2 ± 0.5 s at 235 ± 5°C.
Immersing speed: 25 ± 2.5mm/s</td></tr>
<tr><td rowspan="4">11</td><td rowspan="4">Resistance to Soldering Heat</td><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td><td>Within ±10%</td><td rowspan="4">Preheat the capacitor at 120 to 150°C* for 1 min.
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.
Immersing speed: 25 ± 2.5mm/s
■ Pretreatment for high dielectric constant type
Perform a heat treatment at 150 $^{+0}_{-10}$°C for 60 ± 5 min. and then let sit for 24 ± 2 h at room condition.
*Preheating for more than 3.2 x 2.5mm
<table>
<tr><th>Step</th><th>Temperature</th><th>Time</th></tr>
<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>
</table></td></tr>
<tr><td>Q/D.F.</td><td>C ≥ 30pF: Q ≥ 1000
C < 30pF: Q ≥ 400 + 20C
C: Nominal Capacitance (pF)</td><td>D.F. ≤ 0.01 (R Char.)
D.F. ≤ 0.025 (B Char.)</td></tr>
<tr><td>I.R.</td><td colspan="2">C ≥ 0.01μF: More than 100M ohms • μF
C < 0.01μF: More than 10000M ohms</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">See item 2.</td></tr>
<tr><td rowspan="4">12</td><td rowspan="4">Temperature Cycle</td><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td><td>Within ±10% (R Char.)
Within ±7.5% (B Char.)</td><td rowspan="4">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.
<table>
<tr><th>Step</th><th>Temperature (°C)</th><th>Time (min)</th></tr>
<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>
</table>
■ Pretreatment for high dielectric constant type
Perform a heat treatment at 150 $^{+0}_{-10}$°C for 60 ± 5 min. and then let sit for 24 ± 2 h at room condition.
 

Fig. 4</td></tr>
<tr><td>Q/D.F.</td><td>C ≥ 30pF: Q ≥ 1000
C < 30pF: Q ≥ 400 + 20C
C: Nominal Capacitance (pF)</td><td>D.F. ≤ 0.01 (R Char.)
D.F. ≤ 0.025 (B Char.)</td></tr>
<tr><td>I.R.</td><td colspan="2">C ≥ 0.01μF: More than 100M ohms • μF
C < 0.01μF: More than 10000M ohms</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">See item 2.</td></tr>
<tr><td rowspan="4">13</td><td rowspan="4">Humidity (Steady State)</td><td>Capacitance Change</td><td>Within ±5.0% or ±0.5pF (Whichever is larger)</td><td>Within ±10% (R Char.)
Within ±7.5% (B Char.)</td><td rowspan="4">Place the capacitor at 40 ± 2°C 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 $^{+0}_{-10}$°C for 60 ± 5 min. and then let sit for 24 ± 2 h at room condition.</td></tr>
<tr><td>Q/D.F.</td><td>C ≥ 30pF: Q ≥ 350
C < 30pF: Q ≥ 275 + 5/2C
C: Nominal Capacitance (pF)</td><td>D.F. ≤ 0.01 (R Char.)
D.F. ≤ 0.05 (B Char.)</td></tr>
<tr><td>I.R.</td><td colspan="2">C ≥ 0.01μF: More than 10M ohms • μF
C < 0.01μF: More than 1000M ohms</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">See item 2.</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Life</td><td>Capacitance Change</td><td>Within ±3.0% or ±0.3pF (Whichever is larger)</td><td>Within ±10% (R Char.)
Within ±15% (B Char.)</td><td rowspan="4">Apply the voltage in following table for 1000 $^{+48}_{-0}$h at maximum operating temperature ±3°C.
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.
<table>
<tr><th>Rated Voltage</th><th>Test Voltage</th></tr>
<tr><td>More than DC1kV</td><td>Rated voltage</td></tr>
<tr><td>630V</td><td>120% of the rated voltage</td></tr>
<tr><td>250V</td><td>150% of the rated voltage</td></tr>
</table></td></tr>
<tr><td>Q/D.F.</td><td>C ≥ 30pF: Q ≥ 350
C < 30pF: Q ≥ 275 + 5/2C
C: Nominal Capacitance (pF)</td><td>D.F. ≤ 0.02 (R Char.)
D.F. ≤ 0.05 (B Char.)</td></tr>
<tr><td>I.R.</td><td colspan="2">C ≥ 0.01μF: More than 10M ohms • μF
C < 0.01μF: More than 1000M ohms</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">See item 2.</td></tr>
</table>

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