FEATURES

- Chip monolithic ceramic capacitor for AC line
- Sn plated external electrodes allow mounting without silver compound solder.
- Reflow soldering

APPLICATIONS

- Ideal use for X/Y capacitor (GHM3000) or noise filter (GHM2000) on switching power supply, ballast, telephone, facsimile, modem

GHM2143/2243

- NOT safety approved. Made to the standards of the electrical appliance and material control law of Japan, separated table 4.
- Rated voltage: 250VAC
- Test voltage
  GHM2243: 1500VACrms, 60 sec.
  GHM2143: 575VACrms, 60 sec.

GHM3045

- Safety approved: VDE, SEV, SEMKO, BSI, and UL
- Rated voltage: 250VAC
- Test voltage: 1500VACrms, 60 sec.
- Recognized as X1/Y2 by IEC384-14 2nd ed. (EN132400) and as line by-pass by UL1414

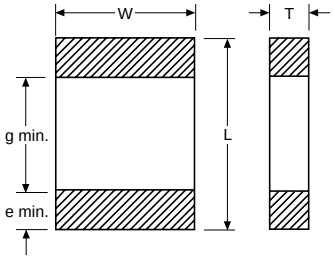
GHM3145

- Safety approved: VDE, SEV, SEMKO
- Rated voltage: 250VAC
- Test voltage: 1075VDC, 60 sec.
- Recognized as X2 by IEC384-14 2nd ed. (EN132400)

PART NUMBERING SYSTEM

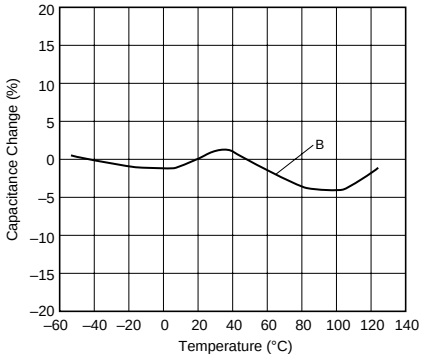
GHM3045	X7R	101	K	–	GC
CAPACITOR TYPE AND SIZE	**TEMPERATURE CHARACTERISTICS** Temperature Range B = –25 to +85°C X7R = –55 to +125°C Maximum Capacitance Change over temperature range B = ±10% R = ±15%	**CAPACITANCE VALUE** Expressed in picofarads and identified by a three-digit number. First two digits represent significant figures. Last digit specifies the number of zeros to follow.	**CAPACITANCE TOLERANCE** K = ±10% M = ±20%		**VOLTAGE** GB or GC: for GHM3000 listed designation AC250: for GHM2000 rating

DIMENSIONS: mm

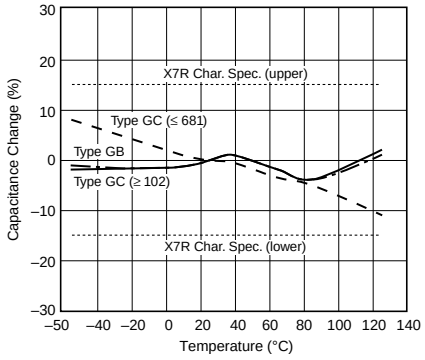


CAPACITANCE – TEMPERATURE CHARACTERISTICS

GHM2000 Series

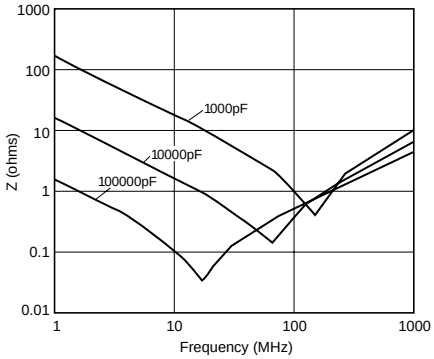


GHM3000 Series

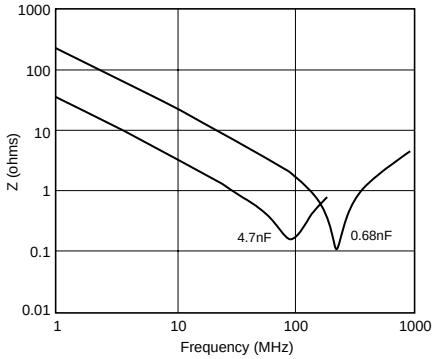


FREQUENCY CHARACTERISTICS

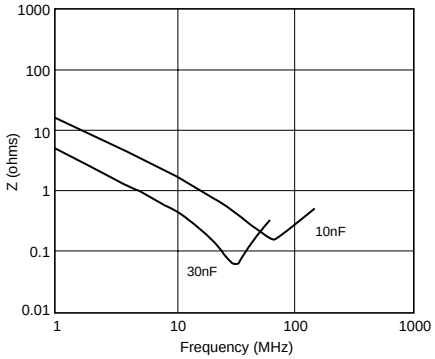
GHM2000 Series
Impedance – Frequency



GHM3000 Series Type GC
Impedance – Frequency



GHM3000 Series Type GB
Impedance – Frequency



GHM21□□ (Line to Line Capacitor) **NOT Safety Approved**

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	Dimensions: mm					AC Rated Voltage [V(r.m.s.)]	Packaging Quantity (pcs/reel)
			L	W	T	g	e		
GHM2143B103MAC250	10000	±20%	5.7 ± 0.4	2.8 ± 0.3	2.0 ± 0.3	3.5	0.3	250	1000
GHM2143B223MAC250	22000								
GHM2143B473MAC250	47000								
GHM2145B104MAC250	100000			5.0 ± 0.4					

GHM22□□ (Line to Earth Capacitor) **NOT Safety Approved**

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	Dimensions: mm					AC Rated Voltage [V(r.m.s.)]	Packaging Quantity (pcs/reel)
			L	W	T	g	e		
GHM2243B471MAC250	470	±20%	5.7 ± 0.4	2.8 ± 0.3	2.0 ± 0.3	3.5	0.3	250	1000
GHM2243B102MAC250	1000								
GHM2243B222MAC250	2200								
GHM2243B472MAC250	4700								

GHM3045 (X1, Y2)

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	Dimensions: mm					Rated Voltage (VAC)	Packaging Quantity (pcs/reel)
			L	W	T	g	e		
GHM3045X7R101K-GC	100	±10%	5.7 ± 0.4	5.0 ± 0.4	2.0 ± 0.3	4.0	0.3	250	1000
GHM3045X7R151K-GC	150								
GHM3045X7R221K-GC	220								
GHM3045X7R331K-GC	330								
GHM3045X7R471K-GC	470								
GHM3045X7R681K-GC	680								
GHM3045X7R102K-GC	1000								
GHM3045X7R152K-GC	1500								
GHM3045X7R222K-GC	2200								
GHM3045X7R332K-GC	3300								
GHM3045X7R472K-GC	4700								

GHM3145 (X2)

Part Number	Nominal Capacitance (pF)	Capacitance Tolerance	Dimensions: mm					Rated Voltage (VAC)	Packaging Quantity (pcs/reel)
			L	W	T	g	e		
GHM3145X7R103K-GB	10000	±10%	5.7 ± 0.4	5.0 ± 0.4	2.0 ± 0.3	4.0	0.3	250	1000
GHM3145X7R153K-GB	15000								
GHM3145X7R223K-GB	22000								
GHM3145X7R333K-GB	33000				2.7 ± 0.3				500

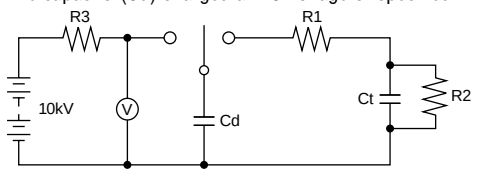
APPROVAL STANDARDS AND RECOGNIZED NUMBERS

GHM3045

	Standard Number	Recognized Number
UL	UL1414 (Line By Pass)	E37921
SEMKO	IEC384-14 2nd Edition (EN132400) CLASS X1/Y2	9614021 01
SEV		96.1 10333.02
VDE		94671
BSI		228163

GHM3145

	Standard Number	Recognized Number
SEMKO	IEC384-14 2nd Edition (EN132400) CLASS X2	9614020 01
SEV		96.1 10333.02
VDE		94729

<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>GHM2000: –25 to +85°C
GHM3000: –55 to +125°C</td><td>—</td></tr>
<tr><td>2</td><td>Dielectric Strength</td><td>No defects or abnormalities.</td><td>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.
<table><tr><th></th><th>Test Voltage</th></tr><tr><td>GHM21□□</td><td>AC575V(r.m.s.)</td></tr><tr><td>GHM22□□</td><td>AC1500V(r.m.s.)</td></tr><tr><td>GHM3000 Type GB</td><td>1075VDC</td></tr><tr><td>GHM3000 Type GC</td><td>AC1500V(r.m.s.)</td></tr></table></td></tr>
<tr><td>3</td><td>Insulation Resistance (I.R.)</td><td>GHM2000: >2000M ohms
GHM3000: >6000M ohms</td><td>The insulation resistance shall be measured with 500 ± 50V and within 60 ± 5 s of charging.</td></tr>
<tr><td>4</td><td>Capacitance</td><td>Within the specified tolerance.</td><td rowspan="2">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.)</td></tr>
<tr><td>5</td><td>Dissipation Factor (D.F.)</td><td>0.025 max.</td></tr>
<tr><td>6</td><td>Capacitance Temperature Characteristics</td><td>Cap. Change
GHM2000: ±10%
GHM3000: ±15%</td><td>The range of capacitance change compared with the 20°C value within –25 to +85°C (–55 to +125°C for GHM3000) 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.</td></tr>
<tr><td>7</td><td>Discharge Test (Application: GHM22□□)</td><td>Appearance</td><td>No defects or abnormalities.</td><td rowspan="3">As in figure below, discharge is made 50 times at 5 s intervals from the capacitor(Cd) charged at DC voltage of specified.
 

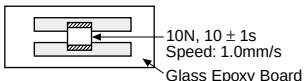
Ct: Capacitor under test Cd: 0.001μF
R1: 1000 ohms R2: 100M ohms R3: Surge resistance</td></tr>
<tr><td></td><td>(Application: Type GC)</td><td>I.R.</td><td>More than 1000M ohms.</td></tr>
<tr><td></td><td></td><td>Dielectric Strength</td><td>See item 2.</td></tr>
<tr><td>8</td><td>Adhesive Strength of Termination</td><td>No removal of the terminations or other defects shall occur.</td><td>Solder the capacitor to the test 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.
 

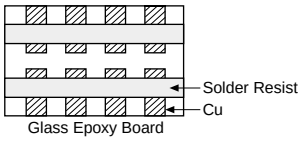
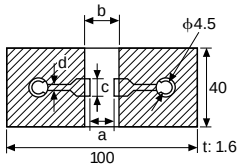
Fig. 1</td></tr>
<tr><td>9</td><td>Vibration Resistance</td><td>Capacitance</td><td>Within the specified tolerance.</td><td rowspan="2">Solder the capacitor to the test jig (glass epoxy board).
The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency 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 of 3 mutually perpendicular directions (total of 6 h).
 
</td></tr>
<tr><td></td><td></td><td>D.F.</td><td>0.025 max.</td></tr>
<tr><td>10</td><td>Deflection</td><td>No cracking or marking defects shall occur.
 

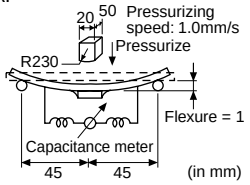
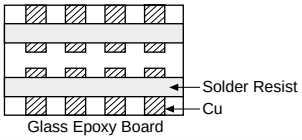
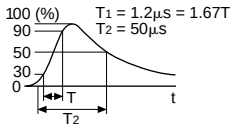
Fig. 2
<table><tr><th rowspan="2">L x W (mm)</th><th colspan="4">Dimensions (mm)</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>5.7 x 2.5</td><td>4.5</td><td>8.0</td><td>3.2</td><td rowspan="2">1.0</td></tr><tr><td>5.7 x 5.0</td><td>4.5</td><td>8.0</td><td>5.6</td></tr></table></td><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>11</td><td>Solderability of Termination</td><td>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>
</table>

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

No.	Item		Specification	Test Method
12	**Resistance to Soldering Heat**	**Capacitance Change**	Within ±10%	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. **Immersing speed:** 25 ± 2.5mm/s **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. *Preheating **Step** / **Temperature** / **Time**: 1 / 100°C to 120°C / 1 min; 2 / 170°C to 200°C / 1 min
		I.R.	GHM2000: >2000M ohms GHM3000: >1000M ohms	
		Dielectric Strength	See item 2.	
13	**Temperature Cycle**	**Capacitance Change**	GHM2000: within ±7.5% GHM3000: within ±15%	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 (°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 **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.  **Fig. 4**
		D.F.	GHM2000: 0.025 max. GHM3000: 0.05 max.	
		I.R.	GHM2000: >2000M ohms GHM3000: >3000M ohms	
		Dielectric Strength	See item 2.	
14	**Humidity (Steady State)**	**Capacitance Change**	Within ±15%	Sit 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** Perform a heat treatment at 150 $^{+0}_{-10}$°C for 60 ± 5 min. and then let sit for 24 ± 2 h at room condition.
		D.F.	0.05 max.	
		I.R.	GHM2000: >1000M ohms GHM3000: >3000M ohms	
		Dielectric Strength	See item 2.	
15	**Life**	**Capacitance Change**	GHM2000: ±15% GHM3000: ±20%	**GHM2000:** Apply voltage and time as Table at 85 ± 2°C. Remove and let sit for 24 ± 2 h at room condition, then measure. The charge/discharge current is less than 50mA. **Test Time** / **Test Voltage**: **GHM21□□** / 1000 $^{+48}_{-0}$ h / AC300V(r.m.s.); **GHM22□□** / 1500 $^{+48}_{-0}$ h / AC500V(r.m.s.)* *Except that once each hour the voltage is increased to AC1000V(r.m.s.) for 0.1 s. **Pretreatment** Apply test voltage for 60 ± 5 min. at test temperature. **GHM3000:** Impulse Voltage Each individual capacitor shall be subjected to a 2.5kV (Type GC: 5kV) Impulse (the voltage value means zero to peak) for three times. Then the capacitors are applied to life test.  Apply voltage as Table for 1000 h at 125 $^{+2}_{-0}$°C, relative humidity 50% max. **Type** / **Applied Voltage**: **GB** / AC312.5V(r.m.s.), except that once each hour the voltage is increased to AC1000V(r.m.s.) for 0.1 s.; **GC** / AC425V(r.m.s.), except that once each hour the voltage is increased to AC1000V(r.m.s.) for 0.1 s.
		D.F.	0.05 max.	
		I.R.	GHM2000: >1000M ohms GHM3000: >3000M ohms	
		Dielectric Strength	See item 2.	
16	**Humidity Loading**	**Appearance**	No marking defects.	Apply the rated voltage 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** Apply test voltage for 60 ± 5 min. at test temperature. Remove and let sit for 24 ± 2 h at room condition.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	GHM2000: >1000M ohms GHM3000: >3000M ohms	
		Dielectric Strength	See item 2.	

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