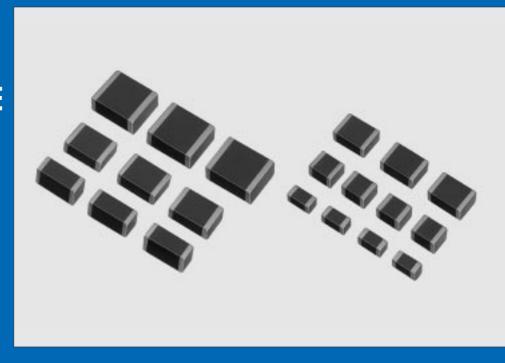


# MEDIUM-VOLTAGE CHIP MONOLITHIC CERAMIC CAPACITOR DC250V-3.15kV/AC250V (r.m.s.) GHM Series

MEDIUM-VOLTAGE
CHIP
MONOLITHIC
CERAMIC
CAPACITOR





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#### **■PART NUMBERING**

(\*Please specify the part number when ordering.)



#### Type

GHMXX

GHM plus two digits denote the series.

Code	Series	Feature			
GHM10	GHM1000	Low dissipation			
GHM15	GHM1500	High-capacitance General electrical equipment			
GHM21	GHM2000	AC-rated capacitor			
GHM22	GHM2000	AC-rated capacitor			
GHM30	GHM3000	Safety standard recognized Y capacitor			
GHM31	GHM3000	Safety standard recognized X capacitor			

#### **2**Dimension

Code (EIA Code)	Dimension (mm)	Code (EIA Code)	Dimension (mm)
25 (0805)	2.0×1.25	40 (1812)	4.5×3.2
30 (1206)	3.2×1.6	43 (2211)	5.7×2.8
35 (1210)	3.2×2.5	45 (2220)	5.7×5.0
38 (1808)	4.5×2.0		

#### **3**Temperature Characteristics

Code	Temp. Coeff./Cap. Change	Temp.Range (℃)	Remarks
SL	+350 to −1000 ppm/°C	20 to 85	
В	±10%	-25 to 85	Equivalent to X7R*
R	±15%	-55 to 125	Equivalent to X7R*
X7R	±15%	-55 to 125	

<sup>\*</sup> Except GHM2000 series

#### **4** Nominal Capacitance

The first two digits represent significant figures; the last digit represents the multiplier of 10 in pF.

Code (Ex.)	Value (pF)	Code (Ex.)	Value (pF)
100	10	223	22,000
121	120	104	100,000
472	4,700	_	_

#### **6**Capacitance Tolerance

Code	Tolerance
D	±0.5pF
J	± 5%
K	±10%
M	±20%

### 6 Rated Voltage

Code	Voltage
250	DC250V
630	DC630V
2K	DC2kV
3K	DC3.15kV
AC250	AC250V (r.m.s.)

<sup>\*</sup> Not apply to GHM3000 series [Rated Voltage : AC250V (r.m.s.)]

#### Type Designation

	-
Code	Type Designation
-GC	Type GC
-GB	Type GB

\* Apply to GHM3000 series.

#### ■CAPACITANCE TABLE

■ CAPAC										. ( . =)		
Туре	Temp. Char.	Rated Voltage	10	50	100	500	1,000	5,000	itance Rang 10,000	ge (pF) 50,000	100,000	500,000
GHM1030	R	DC630V				<u>'</u>	100-	-1,000	<u> </u>	'	<u> </u>	'
GHM1040	SL	DC2kV			12	20-220						
GHM1038	SL	DC3.15kV			10-82							
GHM1040	SL	DC3.15kV			100	ı						
GHM1525	В	DC250V							1,000	-10,000		
GHM1530	В	DC250V								15,00	0-47,000	
GHW1530	В	DC630V							1,000	-10,000		
GHM1535	В	DC250V									68,00	00 • 100,000
Grimi1333	В	DC630V								15,000 • 22,0	000	
GHM1540	В	DC250V										150,000 • 220,000
GHW1540	В	DC630V									33,00	00-100,000
GHM1545	В	DC250V								330,	,000 • 470,000	
GHW1545	В	DC630V										150,000 • 220,000
GHM2143	В	AC250V (r.m.s.)								10,00	0-47,000	
GHM2145	В	AC250V (r.m.s.)									100,	000
GHM2243	В	AC250V (r.m.s.)						470-	-4,700			
GHM3045	X7R	AC250V (r.m.s.)						100-	-4,700			
GHM3145	X7R	AC250V (r.m.s.)								10,000—33	3,000	





### Medium voltage Low Dissipation GHM1000 Series

#### **■**FEATURES

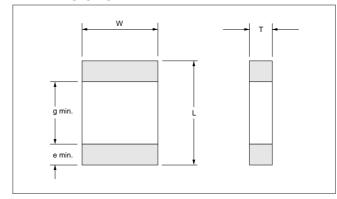
- 1. Murata's original internal electrode structure realizes high Flash-over Voltage.
- 2. A new monolithic structure for small, surface-mountable devices capable of operating at high-voltage levels.
- Sn-plated external electrodes allow mounting without silver compound solder.
- The GHM1030 type for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

#### **■**APPLICATIONS

- 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)
- Ideal for use as the ballast in liquid crystal backlighting inverters.

(SL Characteristics)

#### **■**DIMENSIONS



Type	Dimensions (mm)								
(EIA Code)	L	W	Т	g	е				
GHM1030 (1206)	3.2±0.2	1.6±0.2	See	1.5					
GHM1038 (1808)	4.5±0.3	2.0±0.2	"STANDARD	2.0	0.3				
GHM1040 (1812)	4.5±0.3	3.2±0.3	LIST	2.9					

#### **■STANDARD LIST**

Temperature Compensating Type SL Characteristic (+350 to −1000ppm/°C)

Dort Number		Dimensions (mm)		Nom.Cap.	Cap.	DC Rated Volt.	Packaging Qty.								
Part Number	L	W	Т	(pF) ·	Tol.	(V)	(pcs./reel)								
GHM1040 SL 121 J 2K				120											
GHM1040 SL 151 J 2K	4.5±0.3	3.2±0.3	2.0+0	150	±5%	2k	1,000								
GHM1040 SL 181 J 2K	1.020.0	0.2±0.0	2.0_0.3	180	1570	ZK	1,000								
GHM1040 SL 221 J 2K				220											
GHM1038 SL 100 D 3K				10	±0.5pF		2,000								
GHM1038 SL 120 J 3K				12											
GHM1038 SL 150 J 3K				15											
GHM1038 SL 180 J 3K				18											
GHM1038 SL 220 J 3K				22											
GHM1038 SL 270 J 3K	4.5±0.3	2.0±0.2	2.0±0.3	27											
GHM1038 SL 330 J 3K	1.020.0	2.020.2	2.020.2	2.020.2	2.020.2	2.020.2	2.020.2	2.020.2	2.020.2	2.010.	2.010.0	33	±5%	3.15k	2,000
GHM1038 SL 390 J 3K				39	15/6										
GHM1038 SL 470 J 3K				47											
GHM1038 SL 560 J 3K				56											
GHM1038 SL 680 J 3K				68	ļ										
GHM1038 SL 820 J 3K				82											
GHM1040 SL 101 J 3K	4.5±0.3	3.2±0.3	2.5 <sup>+</sup> <sub>0.3</sub>	100			500								

<sup>\*</sup> We also have small DC 2kV (less than 100pF) products. Please contact for more details.

#### High Dielectric Constant Type R Characteristic (±15%)

Part Number	Dimensions (mm)			Nom.Cap.	Cap.	DC Rated Volt.	Packaging Qty.													
Part Number	L	W	Т	(pF) ·	Cap. Tol.	(V)	Packaging Qty. (pcs./reel)													
GHM1030 R 101 K 630				100																
GHM1030 R 151 K 630		1.6±0.2						10+0	150			4,000								
GHM1030 R 221 K 630				1.0_0.3	220			4,000												
GHM1030 R 331 K 630	3.2±0.2			1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2	1.6±0.2		330	±10%	630	
GHM1030 R 471 K 630									470											
GHM1030 R 681 K 630				1.25 <sup>+</sup> 0	680			3,000												
GHM1030 R 102 K 630				1,000																

<sup>\*</sup> We also have DC 1kV products. Please contact for more details.





# Medium voltage Low Dissipation **GHM1000** Series

#### **■**SPECIFICATIONS AND TEST METHODS

			Specification		Total Marie I		
No.	I1	tem	Temperature Compensating Type(SL Char.)	High Dielectric Constant Type (R Char.)	Test Method		
1	Operating		-55 to +125°C	The same of the control of the contr	_		
	Temperature Ra	nge			_		
2	Appearance		No defects or abnormalities.		Visual inspection.		
3	Dimensions		Within the specified dimension	٦.	Using Calipers.		
4	Dielectric		No defects or abnormalities.		No failure shall be observed when voltage in Table is applied		
	Strength				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		
					Less than DC1kV 150% of the rated voltage		
5	Insulation		More than 10000MΩ		The insulation resistance shall be measured with 500±50V		
	Resistance (I.R.)	)			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		
7	Q/		C≧30pF : Q≧1000	D.F.≦0.01	frequency and voltage shown as follows.		
	Dissipation		C<30pF : Q≥400+20C		(1) Temperature Compensating Type		
	Factor (D.F.)		C : Nominal Capacitance (pF)		Frequency :1±0.2MHz		
					Voltage :0.5 to 5V (r.m.s.)		
					(2) High Dielectric Constant Type		
					Frequency:1±0.2kHz		
0	Compositence		Town Coefficient	Can Charrie	Voltage :1±0.2V (r.m.s.)		
8	Capacitance		Temp. Coefficient	Cap. Change Within ±15%	(1) Temperature Compensating Type The temperature coefficient is determined using the		
	Temperature Characteristics		+350 to −1000 ppm/°C (Temp. Range: +20 to +85°C)		capacitance measured in step 3 as a reference.		
	Characteristics		(Temp. Range . +20 to +65 C)		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		
					3 2012		
					(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 <sup>+</sup> <sub>10</sub> °C for 60±5 min and		
9	Adhasiva Ctrons	u4la	No removal of the termination	a ar athar	then let sit for 24±2 h at room condition.		
9	Adhesive Streng	jtri	No removal of the termination defects shall occur.	s or other	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder.		
	or remination		delects shall occur.		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.		
					10N 10+10		
					10N, 10±1s Speed : 1.0mm/s		
					Glass Epoxy Board		
					<u> </u>		
10	Vibration	Appearance	No defects or abnormalities.		Solder the capacitor to the test jig (glass epoxy board).		
	Desigtence	Capacitance	Within the specified tolerance		The capacitor shall be subjected to a simple harmonic motion		
	Resistance	Q/D.F.	C≧30pF : Q≥1000	D.F.≦0.01	having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The		
	Resistance	_	0 400 F 0> 100 L000		LIDITORMIV between the approximate limits of 10 and 55Hz. The		
	Resistance		C<30pF : Q≥400+20C				
	Resistance		C<30pF : Q≥400+20C C : Nominal Capacitance (pF)		frequency range, from 10 to 55Hz and return to 10Hz, shall be		
	Resistance		•		frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 min. This motion shall be applied		
	Resistance		•		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		
	Resistance		•		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).		
	Resistance		•		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		
	Resistance		•		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).		
	Resistance		•		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).		
	Resistance		•		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).		

<sup>&</sup>quot;room condition" Temperature : 15 to 35℃, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

No.		tem	Specification Temperature High Dielectri	C Test Method		
		tem	Compensating Type(SL Char.) Constant Type (R	Char.)		
11	Deflection		No cracking or marking defects shall occur.	Conseitance mater		
12	Solderability of	Termination	75% of the terminations are to be soldered	Immerse the capacitor in a solution of ethanol (JIS-K-8101)		
12	Solder ability of	Termination	evenly and continuously.	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		
13	Resistance to Soldering	Appearance	No marking defects	Preheat the capacitor at 120 to 150°C* for 1 min.  Immerse the capacitor in eutectic solder solution at 260±5°C		
	Heat	Capacitance	Within ±2.5% or ±0.25pF Within ±10%	for 10±1 s. Let sit at room condition for 24±2 h, then measure.		
		Change Q/D.F.	(Whichever is larger)         C≥30pF : Q≥1000       D.F.≤0.01	•Immersing speed : 25±2.5mm/s     •Pretreatment for high dielectric constant type		
			C<30pF : Q≧400+20C C : Nominal Capacitance (pF)	Perform a heat treatment at $150^{+0.0}_{-1.0}$ °C for $60\pm5$ min and ther let sit for $24\pm2$ h at room condition.		
		I.R. Dielectric	More than 10000MΩ Pass the item No.4.	*Preheating for more than 3.2×2.5mm		
		Strength	T das the territo.4.	Step         Temperature         Time           1         100°c to 120°c         1 min           2         170°c to 200°c         1 min		
14	Temperature	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board)		
	Cycle	Capacitance Change	Within ±2.5% or ±0.25pF Within ±10% (Whichever is larger)	shown in Fig.4 using a eutectic solder.  Perform the five cycles according to the four heat treatments		
		Q/D.F.	C≧30pF : Q≥1000 D.F.≤0.01	listed in the following table.		
			C<30pF : Q≧400+20C C : Nominal Capacitance (pF)	Let sit for 24±2 h at room condition, then measure.		
			I.R.	More than 10000MΩ	Step Temperature (°C) Time (min)  1 Min. Operating Temp.±3 30±3	
		Dielectric Strength	Pass the item No.4.	2 Room Temp. 2 to 3		
15	llumi dite			Max. Operating Temp.±2 30±3  4 Room Temp. 2 to 3  • Pretreatment for high dielectric constant type Perform a heat treatment at 150 <sup>±</sup> <sub>10</sub> °C for 60±5 min and then let sit for 24±2 h at room condition.  □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□		
15	Humidity (Steady State)	Appearance Capacitance	No marking defects Within ±5.0% or ±0.5pF Within ±10%	Sit the capacitor at 40±2°C and relative humidity 90 to 95% for 500±24h.		
	,,,	Change Q/D.F.	(Whichever is larger)  C≧30pF : Q≧350 C<30pF : Q≧275+½C C : Nominal Capacitance (pF)	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 <sup>±</sup> 0° c for 60±5 min and then		
		I.R. Dielectric	More than 1000M $\Omega$ Pass the item No.4.	let sit for 24±2 h at room condition.		
		Strength				
16	Life	Appearance Capacitance	No marking defects Within ±3.0% or ±0.3pF Within ±10%	Apply the voltage in following table for 1000±48 at maximum operating temperature±3℃.		
		Change	(Whichever is larger)	Remove and let sit for 24±2 h at room condition, then		
		Q/D.F.	C≥30pF: Q≥350 D.F.≤0.02 C<30pF: Q≥275+5/2 C	measure. The charge/discharge current is less than 50mA.		
		I.R.	C : Nominal Capacitance (pF)  More than 1000MΩ	Pretreatment for high dielectric constant type     Apply test voltage for 60±5 min at test temperature.		
		Dielectric	Pass the item No.4.	Remove and let sit for 24±2 h at room condition.		
		Strength		Rated voltage Test voltage		
				More than DC1kV Rated voltage		
				Less than DC1kV 120% of the rated voltage		





### High-capacitance for General Electrical Equipment GHM1500 Series

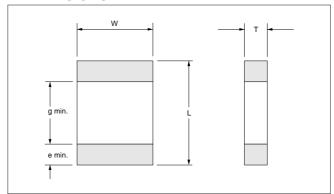
#### **■**FEATURES

- 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 GHM1525/1530 type for flow and reflow soldering, and other types for reflow soldering.

#### **■**APPLICATIONS

- 1. 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.

#### **■**DIMENSIONS



Type	Dimension (mm)					
(EIA Code)	١	W	Т	g	е	
GHM1525 (0805)	2.0±0.2	1.25±0.2		0.7		
GHM1530 (1206)	3.2±0.2	1.6±0.2	See	1.5		
GHM1535 (1210)	3.2±0.3	2.5±0.2	"STANDARD	1.5	0.3	
GHM1540 (1812)	4.5±0.4	3.2±0.3	LIST	2.5		
GHM1545 (2220)	5.7±0.4	5.0±0.4		3.5		

#### **■STANDARD LIST**

#### High Dielectric Constant Type B Characteristic (±10%)

Part Number		Dimensions (mm)		Nom.Cap.	Cap.	DC Rated Volt.	Packaging Qty.
Part Number	L	W	Т	(pF)	Tol.	(V)	(pcs./reel)
GHM1525 B 102 K 250				1,000			
GHM1525 B 152 K 250				1,500			
GHM1525 B 222 K 250			1.0 + 0	2,200			4.000
GHM1525 B 332 K 250	2.0±0.2	1.25±0.2	1.0 -0.3	3,300			4,000
GHM1525 B 472 K 250				4,700			
GHM1525 B 682 K 250				6,800			
GHM1525 B 103 K 250			1.25±0.2	10,000			3,000
GHM1530 B 153 K 250			1.0 + 0	15,000			4.000
GHM1530 B 223 K 250	3.2±0.2	1.6±0.2		22,000		250	4,000
GHM1530 B 333 K 250	3.210.2	1.0±0.2	1.25 <sup>+</sup> 0	33,000			3,000
GHM1530 B 473 K 250			1.6 ±0.2	47,000			2,000
GHM1535 B 683 K 250	3.2±0.3	2.5±0.2	1.5 + 0	68,000			2,000
GHM1535 B 104 K 250	3.2±0.3	2.5±0.2	2.0 + 0	100,000			1.000
GHM1540 B 154 K 250	4.5±0.4	3.2±0.3		150,000			1,000
GHM1540 B 224 K 250	4.5±0.4	3.210.3	2.5 + 0	220,000			500
GHM1545 B 334 K 250	5.7±0.4	5.0±0.4	2.0 + 0	330,000	±10%		1,000
GHM1545 B 474 K 250	3.7 ±0.4	3.0±0.4	2.0 -0.3	470,000	1078		1,000
GHM1530 B 102 K 630				1,000			
GHM1530 B 152 K 630				1,500			
GHM1530 B 222 K 630				2,200			
GHM1530 B 332 K 630	3.2±0.2	1.6±0.2	1.25 <sup>+</sup> <sub>-0.3</sub>	3,300			3,000
GHM1530 B 472 K 630				4,700			
GHM1530 B 682 K 630				6,800			
GHM1530 B 103 K 630				10,000			
GHM1535 B 153 K 630	3.2±0.3	2.5±0.2		15,000		630	2,000
GHM1535 B 223 K 630	3.2±0.3	2.3±0.2	1.5 + 0	22,000			2,000
GHM1540 B 333 K 630			1.0 -0.3	33,000			
GHM1540 B 473 K 630	4.5±0.4	3.2±0.3		47,000			1,000
GHM1540 B 683 K 630	4.5±0.4	3.Z±0.3	2.0 + 0	68,000			
GHM1540 B 104 K 630			2.6 + 0	100,000			500
GHM1545 B 154 K 630	5.7±0.4	5.0±0.4	2.0 + 0	150,000			1,000
GHM1545 B 224 K 630	3.7±0.4	5.0±0.4	2.7 + 0	220,000			500





# High-capacitance for General Electrical Equipment **GHM1500** Series

#### **■**SPECIFICATIONS AND TEST METHODS

No.			Specification	Test Method		
1	Operating		-55 to +125℃	_		
2	Temperature R	ange	No defects or abnormalities.	Visual inspection.		
3	Dimensions		Within the specified dimension.	Using Calipers.		
4	Dielectric		No defects or abnormalities.	No failure shall be observed when 150% of the rated voltage		
7	Strength		TWO defects of abnormalities.	(200% of the rated voltage in case of rated voltage: DC 250V)		
	g			is applied between the terminations for 1 to 5 s, provided the		
				charge/discharge current is less than 50mA.		
5	Insulation		C≧0.01µF : More than 100MΩ · µF	The insulation resistance shall be measured with 500±50V		
	Resistance (I.R	i.)	C<0.01 $\mu$ F : More than 10000M $\Omega$	(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°C at a		
7	Dissipation		0.025 max.	frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)		
_	Factor (D.F.)		Con Change	The range of connectiones shange compagned with the 20°C		
8	Capacitance		Cap. Change	The range of capacitance change compeared with the 20°C value within −25 to 85°C shall be within the specified range.		
	Temperature Characteristics		Within ±10% (Temp. Range : −25 to 85°C)	Pretreatment		
	Characteristics		(Temp. Kange : -25 to 65 c)	Perform a heat treatment at 150 <sup>+</sup> <sub>10</sub> °C for 60±5 min and then		
				let sit for 24±2 h at room condition.		
9	Adhesive Stren	ngth	No removal of the terminations or other	Solder the capacitor to the testing jig (glass epoxy board)		
	of Termination	· ·	defects shall occur.	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.		
				10N, 10±1s Speed : 1.0mm/s		
				T T		
				Fig. 1 Glass Epoxy Board		
10	Vibration	Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).		
	Resistance	Capacitance	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion		
		D.F.	0.025 max.	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).		
				<u> </u>		
				FZZA FZZA FZZA Solder resist		
				Cu		
				Glass Epoxy Board		
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.		
			d   Ø4,5	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.		
				soldering is dimonificated for defects such as field shock.		
			///////\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			
			+ 100 t:1.6 Fig. 2	20.50 Pressurizing		
			LXW Dimension (mm)	20 <sup>50</sup> Pressurizing speed : 1.0mm/s I Pressurize		
			(mm) a b c d	R230 Pressurize		
			2.0×1.25 1.2 4.0 1.65			
				Flexure=1		
			<b>3.2×1.6</b> 2.2 5.0 2.0	Fiexure=1		
			3.2×1.6     2.2     5.0     2.0       3.2×2.5     2.2     5.0     2.9     1.0	Capacitance meter		
				Capacitance meter		
			<b>3.2×2.5</b> 2.2 5.0 2.9 1.0	Capacitance meter		
12	Soldershility of	f Termination	3.2×2.5     2.2     5.0     2.9     1.0       4.5×3.2     3.5     7.0     3.7       5.7×5.0     4.5     8.0     5.6	Capacitance meter 45 45 (in mm) Fig. 3		
12	Solderability of	f Termination	3.2×2.5     2.2     5.0     2.9     1.0       4.5×3.2     3.5     7.0     3.7       5.7×5.0     4.5     8.0     5.6   1.0	Capacitance meter  45  (in mm)  Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101)		
12	Solderability of	f Termination	3.2×2.5     2.2     5.0     2.9     1.0       4.5×3.2     3.5     7.0     3.7       5.7×5.0     4.5     8.0     5.6	Capacitance meter  45  (in mm)  Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion).		
12	Solderability of	f Termination	3.2×2.5     2.2     5.0     2.9     1.0       4.5×3.2     3.5     7.0     3.7       5.7×5.0     4.5     8.0     5.6   1.0	Capacitance meter  45  (in mm)  Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101)		

 $<sup>&</sup>quot;room\ condition"\ \ Temperature: 15\ to\ 35\%,\ \ Relative\ humidity: 45\ to\ 75\%,\ \ Atmosphere\ pressure: 86\ to\ 106kPa$ 





# High-capacitance for General Electrical Equipment GHM1500 Series

No.		Item	Specification		Test Metho		
13	Resistance to	Appearance	No marking defects		the capacitor at 120 to 150°		
	Soldering	Capacitance	Within ±10%		the capacitor in eutectic so		
	Heat	Change		for 10±1	s. Let sit at room condition	for 24±2 h, then m	easure.
		D.F.	0.025 max.		ing speed : 25±2.5mm/s		
		I.R.	C≧0.01μF : More than 100MΩ · μF	Pretrea		_	
			C<0.01 $\mu$ F : More than 10000M $\Omega$	Perform	a heat treatment at $150^{+}_{-1}$	0°℃ for 60±5 min a	and then
		Dielectric	Pass the item No.4.	let sit fo	r 24±2 h at room condition.		
		Strength					
				*Prehea	ting for more than 3.2×2.5n	nm	
				Step	Temperature	Time	
				1	100℃ to 120℃	1 min	7
				2	170°C to 200°C	1 min	
14	Temperature	Appearance	No marking defects	Fix the c	apacitor to the supporting ji	a (alass epoxy boa	ard)
	Cycle	Capacitance	Within ±7.5%		Fig.4 using a eutectic sold		,
	-,	Change			the five cycles according to		ments
		D.F.	0.025 max.		the following table.	ano roar moat aroa	
		I.R.	C≧0.01μF : More than 100MΩ · μF		r 24±2 h at room condition,	then measure	
			C<0.01μF : More than $10000$ M $\Omega$	Step	Temperature (℃)	Time (min)	1
		Dielectric	Pass the item No.4.	1	Min. Operating Temp.±3	30±3	1
		Strength	. 430 110 11011 110. 11	2	Room Temp.	2 to 3	1
		Juongui		3	Max. Operating Temp.±2	30±3	-
				4	Room Temp.	2 to 3	
				4	Room remp.	2 10 3	J
				Pretrea	tment		
					a heat treatment at 150+1	2°C for 60±5 min a	and then
					or $24\pm2$ h at room condition.	0 0 101 00 23 111111 6	and then
				161 311 10			
					PZA PZA PZA → Solder	Fig. 4	
					Solder Cu	resist	
				'	Glass Epoxy Board		
15	Humidity	Appearance	No marking defects	Sit the ca	apacitor at 40±2°C and relat	ive humidity 90 to	95% for
	(Steady State)	Capacitance	Within ±15%	500 <sup>+24</sup> <sub>0</sub> l	n.	-	
		Change			and let sit for 24±2 h at roo	m condition, then	
		D.F.	0.05 max.	measure			
		I.R.	C≧0.01μF : More than 10MΩ · μF	Pretrea			
			·				
			$C<0.01\mu F$ : More than $1000M\Omega$	Penom	a heat treatment at 150 <sup>+</sup> <sub>4</sub>	°C for 60±5 min a	and then
		Dielectric	$C$ <0.01μF : More than 1000M $\Omega$ Pass the item No.4.		n a heat treatment at $150^{+}_{-1}$ or $24\pm2$ h at room condition.	°C for 60±5 min a	and then
						$_{0}^{0}$ °C for 60±5 min a	and then
16	Life	Strength	Pass the item No.4.	let sit fo	r 24±2 h at room condition.	-	
16	Life	Strength Appearance	Pass the item No.4.  No marking defects	let sit fo	r 24±2 h at room condition.	0% of the rated vo	oltage in
16	Life	Strength Appearance Capacitance	Pass the item No.4.	let sit fo  Apply 12 case of r	r 24±2 h at room condition. 20% of the rated voltage (15 rated voltage: DC250V) for 2	0% of the rated vo	oltage in imum
16	Life	Strength Appearance Capacitance Change	Pass the item No.4.  No marking defects  Within ±15%	Apply 12 case of roperating	r 24±2 h at room condition. 20% of the rated voltage (15 ated voltage: DC250V) for 'g temperature±3°C. Remove	0% of the rated vo	oltage in imum
16	Life	Strength Appearance Capacitance Change D.F.	Pass the item No.4.  No marking defects  Within ±15%  0.05 max.	Apply 12 case of r operating room coil	r 24±2 h at room condition. 20% of the rated voltage (15 rated voltage: DC250V) for 'g g temperature±3°C. Remove ndition, then measure.	0% of the rated vo 000 <sup>±48</sup> <sub>0</sub> h at max and let sit for 24	oltage in imum
16	Life	Strength Appearance Capacitance Change	Pass the item No.4.  No marking defects  Within ±15%  0.05 max.  C≥0.01μF : More than 10MΩ · μF	let sit fo  Apply 12 case of r operating room col The chai	r 24±2 h at room condition. 20% of the rated voltage (15 rated voltage: DC250V) for 'g temperature±3°C. Remove adition, then measure. rge / discharge current is les	0% of the rated vo 000 <sup>±48</sup> <sub>0</sub> h at max and let sit for 24	oltage in imum
16	Life	Strength Appearance Capacitance Change D.F. I.R.	Pass the item No.4.  No marking defects  Within ±15%  0.05 max.  C≥0.01μF : More than 10MΩ · μF  C<0.01μF : More than 1000MΩ	Apply 12 case of r operating room col The chal • Pretrea	r 24±2 h at room condition. 20% of the rated voltage (15 rated voltage: DC250V) for 7 g temperature±3°C. Remove adition, then measure.  rge / discharge current is lest tment	0% of the rated vo 000 <sup>±48</sup> <sub>0</sub> h at max and let sit for 24 ss than 50mA.	oltage in imum
16	Life	Strength Appearance Capacitance Change D.F. I.R.	Pass the item No.4.  No marking defects  Within ±15%  0.05 max.  C≥0.01μF : More than 10MΩ · μF	Apply 12 case of r operating room con The chai • Pretrea Apply te	r 24±2 h at room condition. 20% of the rated voltage (15 rated voltage: DC250V) for 7 g temperature±3°C. Remove ndition, then measure. rge / discharge current is lest tment est voltage for 60±5 min at the street in the street	0% of the rated vo 000 <sup>±48</sup> <sub>0</sub> h at max and let sit for 24 as than 50mA. est temperature.	oltage in imum
		Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength	Pass the item No.4.  No marking defects Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F : \text{More than } 10\text{M}\Omega \cdot \mu F$ $C < 0.01 \mu F : \text{More than } 1000\text{M}\Omega$ Pass the item No.4.	Apply 12 case of r operating room coi The chai • Pretrea Apply te Remove	or 24±2 h at room condition.  20% of the rated voltage (15 ated voltage: DC250V) for a gtemperature±3°C. Remove a dition, then measure.  20ge / discharge current is lest the the strong of the strong	0% of the rated vo 000 <sup>±48</sup> <sub>0</sub> h at max and let sit for 24 as than 50mA. est temperature. om condition.	oltage in imum ±2 h at
16	Humidity	Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance	Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max.  C≥0.01μF: More than $10M\Omega \cdot \mu F$ C<0.01μF: More than $1000M\Omega$ Pass the item No.4.  No marking defects	Apply 12 case of r operating room con The char •Pretrea Apply te Remove Apply the	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement  10ge and let sit for 24±2 h at roge arated voltage at 40±2°C are	0% of the rated vo 000 <sup>±48</sup> <sub>0</sub> h at max and let sit for 24 as than 50mA. est temperature. om condition.	oltage in imum ±2 h at
		Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength Appearance Capacitance	Pass the item No.4.  No marking defects Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F : \text{More than } 10 \text{M}\Omega \cdot \mu F$ $C < 0.01 \mu F : \text{More than } 1000 \text{M}\Omega$ Pass the item No.4.	Apply 12 case of r operating room con The chai •Pretrea Apply te Remove Apply the 95% for	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement est voltage for 60±5 min at the earn of the set voltage at 40±2°C are 1500±2°dh.	0% of the rated vo 000 <sup>+48</sup> / <sub>0</sub> h at max e and let sit for 24 as than 50mA. est temperature. om condition. ad relative humidity	oltage in imum ±2 h at
	Humidity	Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength Appearance Capacitance Change	Pass the item No.4.  No marking defects Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F : \text{More than } 10 \text{M}\Omega \cdot \mu F$ $C < 0.01 \mu F : \text{More than } 1000 \text{M}\Omega$ Pass the item No.4.  No marking defects Within $\pm 15\%$	Apply 12 case of r operating room con The chai •Pretrea Apply te Remove Apply the 95% for Remove	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement as the voltage for 60±5 min at the earned to the voltage at 40±2°C are 500±2°dh.  10mm and let sit for 24±2 h at room and let sit fo	0% of the rated vo 000 <sup>+48</sup> / <sub>0</sub> h at max e and let sit for 24 as than 50mA. est temperature. om condition. ad relative humidity	oltage in imum ±2 h at
	Humidity	Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength Appearance Capacitance Change D.F.	Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F$ : More than $10 M \Omega \cdot \mu F$ $C < 0.01 \mu F$ : More than $1000 M \Omega$ Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max.	Apply 12 case of r operating room coi The chai •Pretrea Apply te Remove Apply the 95% for Remove measure	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.	0% of the rated vo 000 <sup>+48</sup> / <sub>0</sub> h at max e and let sit for 24 as than 50mA. est temperature. om condition. ad relative humidity	oltage in imum ±2 h at
	Humidity	Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength Appearance Capacitance Change	Pass the item No.4.  No marking defects Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F : \text{More than } 10 \text{M}\Omega \cdot \mu F$ $C < 0.01 \mu F : \text{More than } 1000 \text{M}\Omega$ Pass the item No.4.  No marking defects Within $\pm 15\%$	Apply 12 case of r operating room con The chai •Pretrea Apply te Remove Apply the 95% for Remove	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.	0% of the rated vo 000 <sup>+48</sup> / <sub>0</sub> h at max e and let sit for 24 as than 50mA. est temperature. om condition. ad relative humidity	oltage in imum ±2 h at
	Humidity	Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength Appearance Capacitance Change D.F.	Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F$ : More than $10 M \Omega \cdot \mu F$ $C < 0.01 \mu F$ : More than $1000 M \Omega$ Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max.	Apply 12 case of r operating room coi The chai •Pretrea Apply te Remove Apply thi 95% for Remove measure •Pretrea	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.  10ge and let sit for 24±2 h at room at the ated voltage at 40±2°C ar 1500±2°dh.	0% of the rated vo 000 <sup>±48</sup> h at max and let sit for 24 as than 50mA. est temperature. om condition. and relative humidity m condition, then	oltage in imum ±2 h at
	Humidity	Strength Appearance Capacitance Change D.F. I.R.  Dielectric Strength Appearance Capacitance Change D.F.	Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F$ : More than $10 M \Omega \cdot \mu F$ $C < 0.01 \mu F$ : More than $1000 M \Omega$ Pass the item No.4.  No marking defects  Within $\pm 15\%$ 0.05 max. $C \ge 0.01 \mu F$ : More than $10 M \Omega \cdot \mu F$	Apply 12 case of r operating room coi The chai •Pretrea Apply te Remove Apply thi 95% for Remove measure •Pretrea Apply te	or 24±2 h at room condition.  10% of the rated voltage (15 ated voltage: DC250V) for a gremperature±3°C. Remove addition, then measure.  10ge / discharge current is less thement  10ge and let sit for 24±2 h at roce arated voltage at 40±2°C ar 500±2°h.  10ge and let sit for 24±2 h at roce.  10ge and let sit for 24±2 h at roce.  10ge arated voltage at 40±2°C ar 500±2°h.  10ge and let sit for 24±2 h at roce.	0% of the rated vo 000±48 h at max and let sit for 24 as than 50mA. est temperature. om condition. and relative humidity m condition, then est temperature.	oltage in imum ±2 h at

<sup>&</sup>quot;room condition" Temperature : 15 to 35℃, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa





# Ceramic Capacitor for AC250V GHM2000 Series

Products which are based on the Standards of the Electrical Appliance And Material control Law of Japan

#### **■**FEATURES

- 1. Chip monolitic ceramic capacitor for AC line.
- A new monolithic structure for small, high-capacitance capable of operating at high-voltage levels.
- Sn-plated external electrodes allow mounting without silver compound solder.
- Only for Reflow soldering.

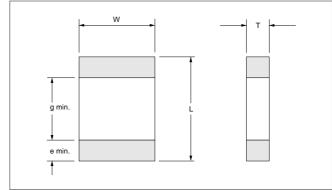
#### **■**APPLICATIONS

Noise filter for switching power supply, telephone, facsimile and modem.

#### **■**REFFERENCE STANDARD

- JIS C 5102
- JIS C 5150
- The standards of the electrical appliance and material control law of Japan, separated table 4.

### **■**DIMENSIONS



Type	Dimension (mm)								
(EIA Code)	L	W	Т	g	е				
GHM2143 (2211)		2.8±0.3							
GHM2145 (2220)	5.7±0.4	5.0±0.4	2.0±0.3	3.5	0.3				
GHM2243 (2211)		2.8±0.3							

#### **■STANDARD LIST**

B Characteristic (±10%)

[ GHM21xx (Line to line capacitor) ]

Part Number		Dimensions (mm)			Сар.	AC Rated Volt.	Packaging Qty.
Part Number	L	W	Т	(pF)	Tol.	[ V (r.m.s.)]	(pcs./reel)
GHM2143 B 103 M AC250		2.8±0.3	2.0±0.3	10,000	±20%	250	1,000
GHM2143 B 223 M AC250	F 7±0.4			22,000			
GHM2143 B 473 M AC250	5.7±0.4			47,000			
GHM2145 B 104 M AC250		5.0±0.4		100,000			

#### [ GHM22xx (Line to earth capacitor) ]

Part Number	Dimensions (mm)			Nom.Cap.		AC Rated Volt.	Packaging Qty.
Fait Nullibei	L	W	Т	(pF) ·	Tol.	[ V (r.m.s.)]	(pcs./reel)
GHM2243 B 471 M AC250				470			
GHM2243 B 102 M AC250	5.7±0.4	2.8±0.3	0.010.0	1,000	±20%	250	1,000
GHM2243 B 222 M AC250	5.7±0.4	2.0±0.3	2.0±0.3	2,200	120%		
GHM2243 B 472 M AC250				4,700			

### ■SPECIFICATIONS AND TEST METHODS

2 App 3 Dim 4 Diel 5 Insu 6 Cap	erating Temp bearance nensions lectric Streng	erature Range	Specification	Test Method		
3 Dim 4 Diel 5 Insu 6 Cap	ensions		-25 to +85℃	<u> </u>		
4 Diel 5 Insu 6 Cap			No defects or abnormalities.	Visual inspection.		
5 Insu	lectric Stren		Within the specified dimension.	Using Calipers.		
6 Cap					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.
6 Cap				Test voltage		
6 Cap				GHM21xx AC575V (r.m.s.)		
6 Cap				GHM22xx AC1500V (r.m.s.)		
	ulation Resis	tance (I.R.)	More than $2000 \text{M}\Omega$	The insulation resistance shall be measured with 500±50V and within 60±5 s of charging.		
	acitance		Within the specified tolerance.	The capacitance/D.F. shall be measured at 20°C at a		
7 Diss	sipation Fact	or (D.F.)	0.025 max.	frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)		
	acitance Ter		Cap. Change	The range of capacitance change compeared with the 20°C		
Cha	racteristics		Within ±10%	value within −25 to 85°C shall be within the specified range.  •Pretreatment  Perform a heat treatment at 150 <sup>+</sup> <sub>1</sub> 0°C for 60±5 min and then let sit for 24±2 h at room condition.		
(Ap	charge Test oplication: GHM22xx)	Appearance	No defects or abnormalities.	As in Fig., discharge is made 50 times at 5 s intervals from the capacitor(Cd) charged at DC voltage of specified.  R3  R1  Ct: Capacitor under test Cd: 0.001μF  R1: 1000Ω R2: 100ΜΩ R3: Surge resistance		
10 Adh	nesive Strenç	th 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.    10N, 10±1s   Speed: 1.0mm/s   Glass Epoxy Board		
11 Vibr	ration	Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).		
	istance	Capacitance	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion		
		D.F.	0.025 max.	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).  Solder resist  Cu  Glass Epoxy Board		
			No cracking or marking defects shall occur.			
12 Defl	lection		No cracking of marking defects shall occur.	Solder the capacitor to the testing jig (glass epoxy board)		
12 Defi	lection		Dimension (mm)   C   Dimension (mm)   D	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.  20 50 Pressurizing speed: 1.0mm/s Pressurize  Pressurize  Capacitance meter  (in mm) Fig. 3		
			C   C   C   C   C   C   C   C   C   C	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.  20 50 Pressurizing speed: 1.0mm/s Pressurize  Flexure=1  Capacitance meter  (in mm)  Fig. 3		
	lection	Termination	Dimension (mm)   C   C   C   C   C   C   C   C   C	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.  20 50 Pressurizing Speed: 1.0mm/s Pressurize  Flexure=1  Capacitance meter  (in mm)  Fig. 3		
		Termination	C   C   C   C   C   C   C   C   C   C	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.  20 50 Pressurizing Speet: 1.0mm/s Pressurize  1 (in mm) Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion).		
		Termination	Dimension (mm)   C   C   C   C   C   C   C   C   C	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.  20 50 Pressurizing Speed: 1.0mm/s Pressurize  Flexure=1  Capacitance meter  (in mm)  Fig. 3		

<sup>&</sup>quot;room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa





### Ceramic Capacitor for AC250V GHM2000 Series

Products which are based on the Standards of the Electrical Appliance And Material control Law of Japan

No.		Item	Specification	Test Method
14	Humidity	Appearance	No marking defects.	The capacitor shall be subjected to 40±2℃, relative humidity
	Insulation	Capacitance	Within ±15%	of 90 to 98% for 8 h, and then removed in room condition for
		Change		16 h until 5 cycles.
		D.F.	0.05 max.	
		I.R.	More than 1000MΩ	
		Dielectric	Pass the item No.4.	
		Strength		
5	Resistance to	Appearance	No marking defects.	Preheat the capacitor as table. Immerse the capacitor in
	Soldering	Capacitance	Within ±10%	eutectic solder solution at 260±5°C for 10±1 s. Let sit at room
	Heat	Change		condition for 24±2 h, then measure.
		D.F.	0.025 max.	•Immersing speed : 25±2.5mm/s
		I.R.	More than 2000MΩ	•Pretreatment
		Dielectric	Pass the item No.4.	Perform a heat treatment at 150 <sup>+</sup> <sub>10</sub> °C for 60±5 min and ther
		Strength		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
				2 1700 10 2000 1 111111
6	Tomporeture	Annogramas	No marking defeate	Fix the capacitor to the supporting jig (glass epoxy board)
,	Temperature Cycle	Appearance Capacitance	No marking defects. Within ±7.5%	shown in Fig.4 using a eutectic solder.
	Cycle	Change	VVIIIII 1 1 .3 /0	Perform the five cycles according to the four heat treatments
		D.F.	0.025 max.	listed in the following table.
		I.R.	More than $2000M\Omega$	Let sit for 24±2 h at room condition, then measure.
		Dielectric	Pass the item No.4.	Step Temperature (°C) Time (min)
		Strength	T doe and nomination	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
				4 Room remp. 2 to 5
				Pretreatment
				Perform a heat treatment at 150 <sup>+</sup> <sub>−10</sub> °C for 60±5 min and then
				let sit for 24±2 h at room condition.
				Solder resist
				- Cu Fig. 4
				Glass Epoxy Board Fig. 4
7	Humidity	Appearance	No marking defects.	Sit the capacitor at 40±2℃ and relative humidity 90 to 95% for
	(Steady State)	Capacitance	Within ±15%	500 <sup>+24</sup> <sub>0</sub> h.
		Change		Remove and let sit for 24±2 h at room condition, then measure.
		D.F.	0.05 max.	Pretreatment
		I.R.	More than 1000MΩ	Perform a heat treatment at 150 <sup>+</sup> <sub>−10</sub> °C for 60±5 min and ther
		Dielectric	Pass the item No.4.	let sit for 24±2 h at room condition.
		Strength		
В	1 if a	Annogrange	No marking defects.	Apply voltage and time as Table at 85±2℃. Remove and let
9	Life	Appearance	-	
	Life	Capacitance	Within ±15%	sit for 24 $\pm$ 2 h at room condition, then measure. The charge
	Life		-	sit for 24 ±2 h at room condition, then measure. The charge discharge current is less than 50mA.
	Life	Capacitance Change D.F.	Within ±15%  0.05 max.	discharge current is less than 50mA.    Test Time   Test voltage
	Life	Capacitance Change D.F.	Within ±15%	discharge current is less than 50mA.  Test Time Test voltage GHM21xx 1000±48 h AC300V (r.m.s.)
	Life	Capacitance Change D.F.	Within ±15%  0.05 max.	discharge current is less than 50mA.  Test Time Test voltage
	Life	Capacitance Change D.F.	Within ±15%  0.05 max.  More than 1000MΩ	discharge current is less than 50mA.     Test Time   Test voltage   GHM21xx   1000±48 h   AC300V (r.m.s.)
	Life	Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000 <sup>±4</sup> 8 h AC300V (r.m.s.)  GHM22xx 1500 <sup>±4</sup> 8 h AC500V (r.m.s.)*  * Except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s
	Life	Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000 <sup>±4</sup> 8 h AC300V (r.m.s.)  GHM22xx 1500 <sup>±4</sup> 8 h AC500V (r.m.s.)*  * Except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s  • Pretreatment
	Life	Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.
		Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.
	Humidity	Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.  Apply the rated voltage at 40±2℃ and relative humidity 90 to
		Capacitance Change D.F. I.R. Dielectric Strength	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.  Apply the rated voltage at 40±2°C and relative humidity 90 to 95% for 500±26h. Remove and let sit 24±2 h at room
	Humidity	Capacitance Change D.F. I.R. Dielectric Strength	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.  Apply the rated voltage at 40±2°C and relative humidity 90 to
	Humidity	Capacitance Change D.F. I.R. Dielectric Strength  Appearance Capacitance	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.  Apply the rated voltage at 40±2°C and relative humidity 90 to 95% for 500±20 h. Remove and let sit 24±2 h at room
	Humidity	Capacitance Change D.F. I.R. Dielectric Strength  Appearance Capacitance Change	Within $\pm 15\%$ 0.05 max.  More than $1000M\Omega$ Pass the item No.4.  No marking defects.  Within $\pm 15\%$	discharge current is less than 50mA.  Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.  Apply the rated voltage at 40±2°C and relative humidity 90 to 95% for 500±26h. Remove and let sit 24±2 h at room condition, then measure.
9	Humidity	Capacitance Change D.F. I.R. Dielectric Strength  Appearance Capacitance Change D.F.	$Within \pm 15\%$ $0.05 \text{ max.}$ $More than 1000M\Omega$ $Pass the item No.4.$ $No marking defects.$ $Within \pm 15\%$ $0.05 \text{ max.}$	Test Time Test voltage  GHM21xx 1000±48 h AC300V (r.m.s.)  GHM22xx 1500±48 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.  Remove and let sit for 24±2 h at room condition.  Apply the rated voltage at 40±2°C and relative humidity 90 to 95% for 500±24h. Remove and let sit 24±2 h at room condition, then measure.  • Pretreatment

<sup>&</sup>quot;room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmosphere pressure: 86 to 106kPa





### Safety Standard Recognized GHM3000 Series

#### **■**FEATURES

- 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, line by pass capacitor in UL1414.
- 6. +125°C guaranteed.
- 7. Only for Reflow soldering.

#### **■**APPLICATIONS

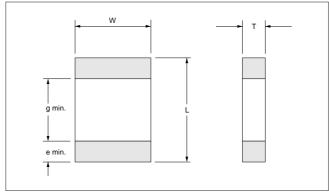
- Ideal use as Y capacitor or X capacitor for various switching power supply.
- 2. Ideal use as line filter for modem.

#### ■STANDARD NO.

	Standard No.	Status of Recognition		AC Rated Voltage
	Standard No.	Type GB	Type GC	[ V (r.m.s.) ]
UL	UL1414	_	©*	
BSI		_	0	
VDE	IEC384-14 2nd	0	0	250
SEV	edition (1993)	0	0	250
SEMKO		0	0	
IEC384-14 C	lass	X2	X1, Y2	1

<sup>\*</sup> Line By Pass only

### **■**DIMENSIONS



Type	Dimension (mm)					
(EIA Code)	L	W	Т	g	е	
GHM3045 (2220)	5.7±0.4	5.0±0.4	See "STANDARD	4.0	0.3	
GHM3145 (2220)	5.7±0.4	5.0±0.4	LIST"	4.0	0.3	

#### **■STANDARD LIST**

High Dielectric Constant Type X7R Characteristic (±15%)

#### Type GC

Part Number		Dimensions (mm)			Cap.	AC Rated Volt.	
Part Number	L	W	Т	(pF)	Tol.	[V (r.m.s.)]	(pcs./reel)
GHM3045 X7R 101K -GC				100			
GHM3045 X7R 151K -GC				150			
GHM3045 X7R 221K -GC				220			
GHM3045 X7R 331K -GC				330			
GHM3045 X7R 471K -GC				470			
GHM3045 X7R 681K -GC	5.7±0.4	5.0±0.4	2.0±0.3	680	±10%	250	1,000
GHM3045 X7R 102K -GC				1,000			
GHM3045 X7R 152K -GC				1,500			
GHM3045 X7R 222K -GC				2,200			
GHM3045 X7R 332K -GC				3,300			
GHM3045 X7R 472K -GC				4,700			

#### Type GB

Part Number	Dimensions (mm)		Nom.Cap.	Сар.	AC Rated Volt.	Packaging Qty.	
Part Number	L	W	Т	(pF) ·	Tol.	[V (r.m.s.)]	(pcs./reel)
GHM3145 X7R 103K -GB				10,000			
GHM3145 X7R 153K -GB	F 7±0.4	E 0+0 4	2.0±0.3 15,000	1.4.00/	050	1,000	
GHM3145 X7R 223K -GB	5.7±0.4	5.0±0.4		22,000	±10%	250	
GHM3145 X7R 333K -GB	1		2.7±0.3	33,000			500

### ■SPECIFICATIONS AND TEST METHODS

No.	l I			Lost Mothod
1	Operating Temp	em erature Range	Specification  -55 to +125°C	Test Method
2	Appearance	crature Nange	No defects or abnormalities.	Visual inspection.
3	Dimensions		Within the specified dimension.	Using Calipers.
4	Dielectric Streng	yth	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.
				Test voltage
5	Insulation Resis	tance (I.R.)	More than 6000MΩ	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℃ at a
7	Dissipation Fact	or (D.F.)	0.025 max.	frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)
8	Capacitance Ter Characteristics		Cap. Change Within ±15%	The range of capacitance change compeared with the 25°C value within −55 to 125°C shall be within the specified range.  •Pretreatment  Perform a heat treatment at 150 <sup>+</sup> <sub>-10</sub> °C for 60±5 min and then let sit for 24±2 h at room condition.
9	Discharge Test	Appearance	No defects or abnormalities.	As in Fig., discharge is made 50 times at 5 s intervals from
	(Application:	I.R.	More than $1000M\Omega$	the capacitor(Cd) charged at DC voltage of specified.
	Type GC)	Dielectric Strength	Pass the item No. 4.	R3  T 10kV
10	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.
11	Vibration	Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).
	Resistance	Capacitance	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion
		D.F.	0.025 max.	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).  Solder resist  Glass Epoxy Board
12	Deflection		No cracking or marking defects shall occur.	Solder the capacitor to the testing jig (glass epoxy board)
			C   C   C   C   C   C   C   C   C   C	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.  20 50 Pressurizing speed: 1.0mm/s  Pressurize  Flexure=1  Capacitance meter  (in mm) Fig. 3
40	Soldershillt C	Forming! on	750/ of the terminations are to be said and	Immoreo the capacitor is a solution of others ( / IIC IZ 0404)
13	3 Solderability of Termination		75% of the terminations are to be soldered evenly and continuously.  Relative humidity: 45 to 75%. Atmosphere pressure	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

<sup>&</sup>quot;room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa





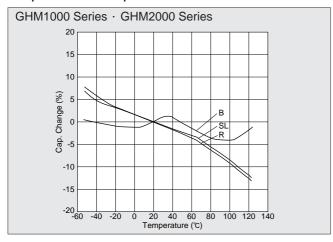
# Safety Standard Recognized GHM3000 Series

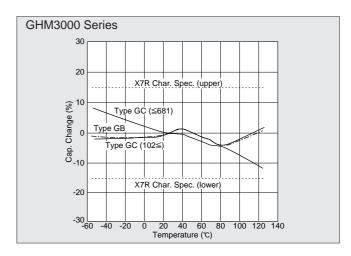
No.		Item	Specification	Test Method			
14	Resistance to	Appearance	No marking defects.	Preheat the capacitor as table. Immerse the capacitor in			
	Soldering	Capacitance	Within ±10%	eutectic solder solution at 260±5°C for 10±1 s. Let sit at room			
	Heat	Change		condition for 24±2 h, then measure.			
		I.R.	More than $1000 \text{M}\Omega$	•Immersing speed : 25±2.5mm/s			
		Dielectric	Pass the item No.4.	Pretreatment			
		Strength		Perform a heat treatment at 150 <sup>+</sup> <sub>-10</sub> °C for 60±5 min and then			
				let sit for 24±2 h at room condition.			
				de Donale a cabler or			
				*Preheating			
				Step         Temperature         Time           1         100℃ to 120℃         1 min			
				2 170°C to 200°C 1 min			
				2 170 C to 200 C 1 1111111			
15	Tomporoturo	Annogrange	No marking defeate	Fix the capacitor to the supporting jig (glass epoxy board)			
15	Temperature Cycle	Appearance Capacitance	No marking defects. Within ±15%	shown in Fig.4 using a eutectic solder.			
	Cycle	Change	VVIUIII1 ± 1376	Perform the five cycles according to the four heat treatments			
		D.F.	0.05 max.	listed in the following table.			
		I.R.	More than 3000MΩ	Let sit for 24±2 h at room condition, then measure.			
		Dielectric	Pass the item No.4.				
		Strength		StepTemperature (°C)Time (min)1Min. Operating Temp.±330±3			
		J J J		2 Room Temp. 2 to 3			
				3 Max. Operating Temp.±2 30±3			
				4 Room Temp. 2 to 3			
				Troom rompi			
				Pretreatment			
				Perform a heat treatment at 150 <sup>+</sup> <sub>10</sub> °C for 60±5 min and then			
				let sit for 24±2 h at room condition.			
				<u> </u>			
				Solder resist			
				Glass Epoxy Board Fig. 4			
4.0			Al III I C				
16	Humidity	Appearance	No marking defects.	Sit the capacitor at 40±2°C and relative humidity 90 to 95% for 500±12h.			
	(Steady State)	Capacitance Change	Within ±15%	Remove and let sit for 24±2 h at room condition, then measure.			
		D.F.	0.05 max.	Tromovo and for or to English deficient, thorn moderate.			
		I.R.	More than 3000MΩ				
		Dielectric	Pass the item No.4.				
		Strength	- ass the nem rest.				
17	Life	Appearance	No marking defects.	Impulse Voltage			
		Capacitance	Within ±20%	Each individual capacitor shall be			
		Change		subjected to a 2.5kV (Type GC:5kV)  T1=1.2μs=1.67T  T2=50μs			
		D.F.	0.05 max.	Impulses (the voltage value means 50			
		I.R.	More than 3000MΩ	zero to peak) for three times. Then			
		Dielectric	Pass the item No.4.	the capacitors are applied to life test.			
		Strength		12			
				Apply voltage as Table for 1000 h at $125^{+2}_{-0}$ °C, relative humidity			
				50% max.			
				Type Applied voltage			
				Type Applied voltage  AC312.5V (r.m.s.), except that once each hour the			
				voltage is increased to AC1000V (r.m.s.) for 0.1s.			
				AC425V (r.m.s.), except that once each hour the			
				voltage is increased to AC1000V (r.m.s.) for 0.1s.			
18	Humidity	Appearance	No marking defects.	Apply the rated voltage at 40±2℃ and relative humidity 90 to			
.0	Loading	Capacitance	Within ±15%	95% for 500 <sup>±2</sup> <sub>0</sub> h. Remove and let sit 24±2 h at room			
		Change		condition, then measure.			
		D.F.	0.05 max.	,			
		I.R.	More than 3000MΩ				
		Dielectric	Pass the item No.4.				
		Strength					
		J. J		1			

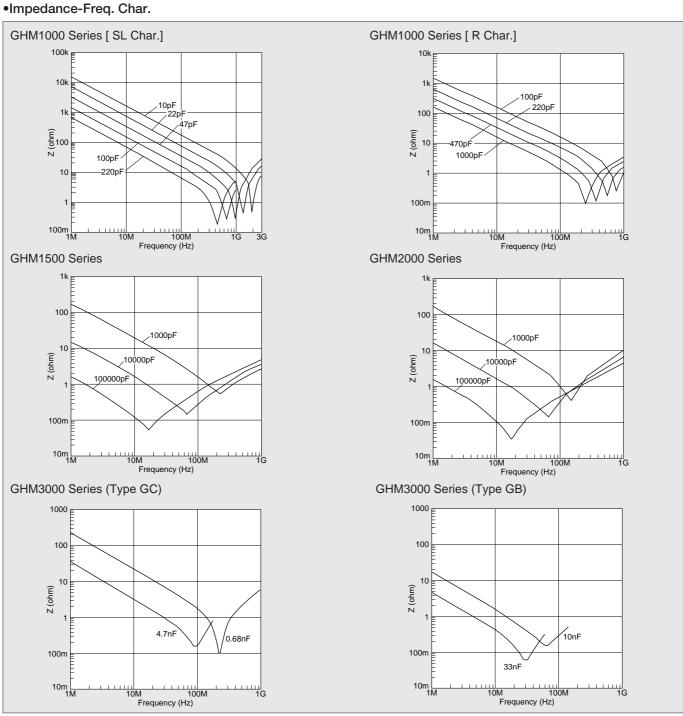
<sup>&</sup>quot;room condition" Temperature : 15 to 35℃, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

### TYPICAL CHARACTERISTICS DATA

#### •Capacitance-Temp. Char.

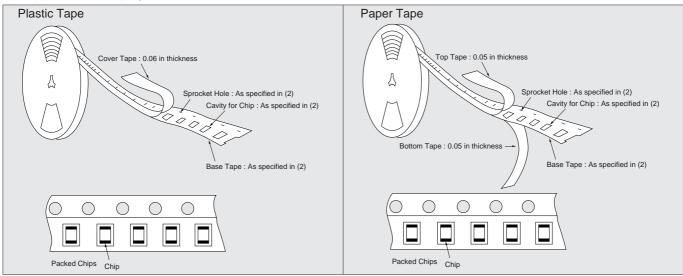




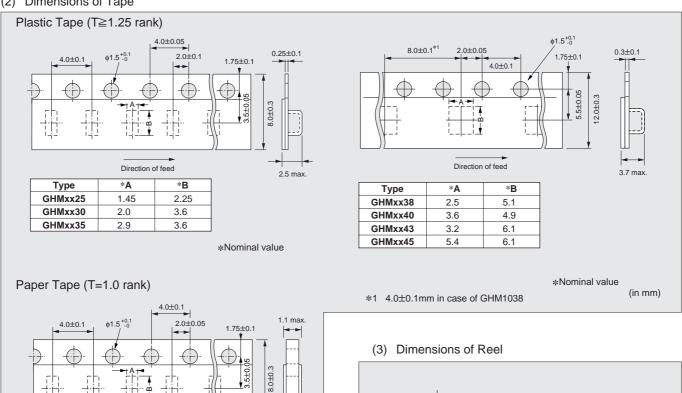


### PACKAGING (Taping is standard packaging method.)

#### (1) Appearance of taping



#### (2) Dimensions of Tape



(4) Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.

Direction of feed

\*B

2.25

3.6

\*Nominal value

(in mm)

\*A

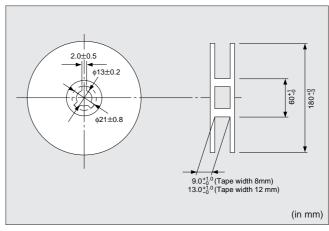
1.45

2.0

Type

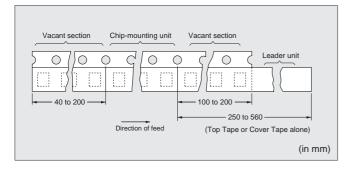
GHMxx25

GHMxx30



### PACKAGING (Taping is standard packaging method.)

(5) Part of the leader and part of the empty tape shall be attached to the end of the tape as follows.



(6) The top tape or cover tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.

- (7) Missing capacitors number within 0.1% of the number per reel or 1 pc, whichever is greater, and are not continuous.
- (8) The top tape or cover tape and bottom tape shall not protrude beyond the edges of the tape and shall not cover sprocket holes.
- (9) Cumulative tolerance of sprocket holes, 10 pitches: +0.3mm.
- (10) Peeling off force : 0.1 to 0.7N in the direction shown below.



### **!**CAUTION

#### 1. Operating voltage

Be sure to use a capacitor only within its rated operating voltage range. When DC-rated capacitors are to be used in AC or ripple voltage circuits, be sure to maintain the Vp-p value of the applied voltage within the rated voltage range.

#### 2. Operating temperature and self-generated heat

Keep the surface temperature of a capacitor within the rated operating temperature range.

Be sure to take into account the heat produced by the capacitor itself. When a capacitor is used in a high-frequency circuit, pulse voltage circuit or the like, it may produce heat due to dielectric loss.

Keep such self-generated temperature below 20℃.

#### 3. Operating and strage environment

Do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present and avoid exposure to moisture.

Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded, or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40℃ and 20 to 70%. Use capacitors within 6 months.

#### 4. Vibration and impact

Do not expose a capacitor to excessive shock or vibration during use.

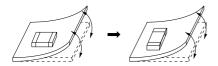
#### 5. Circuit board material

Please contact our sales representatives or engineers in case that GHM products (size 4.5×3.2mm and over) are to be mounted upon a metal-board or metal-frame. Soldering heat causes the expansion and shrinkage of a board or frame, which may result in chip-cracking.

#### 6. Land layout for cropping PC Board

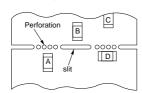
Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

[Component direction]



Locate chip horizontal to the direction in which stress acts.

[Chip Mounting Close to Board Separation Point]



Chip arrangement
Worst A>C>B≂D Best

### **A**CAUTION

7. Soldering (Prevention of the thermal shock)

If a chip component is heated or cooled abruptly during soldering, it may crack due to the thermal shock. To prevent this, adequate soldering condition should be taken following our recommendation below.

Carefully perform pre-heating so that temperature difference ( $\Delta T$ ) between the solder and component surface should be in the following range.

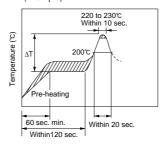
Chip Size Soldering method	3.2X1.6mm and under	3.2X2.5mm and over
Reflow method or Soldering iron method	ΔΤ≦190℃	ΔT≦130°C
Flow method or Dip Soldering method	ΔΤ≦150℃	

When components are immersed in solvent after mounting, pay special attention to maintain the temperature difference within  $100^{\circ}$ C.

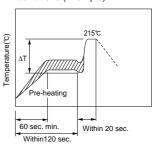
When soldering chips with a soldering iron, it should be performed in following conditions.

Item	Conditions			
Chip size	≦2.0×1.25mm	3.2×1.6mm		
Temperature of iron-tip	300°C max.	270°C max.		
Soldering iron wattage	20W max.			
Diameter of iron-tip	φ3.0mm max.			
Soldering time	3 sec. max.			
Caution	Do not allow the iron-tip to directly touch the ceramic element.			

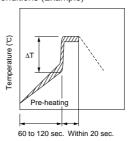
 Infrared reflow soldering conditions (Example)



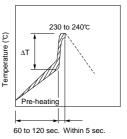
 Vapor reflow soldering (VPS) conditions (Example)



• Dip soldering/Soldering iron conditions (Example)



• Flow soldering conditions (Example)



#### 8. Soldering method

GHM products whose sizes are 3.2×1.6mm and under for flow and reflow soldering, and other sizes for reflow soldering.

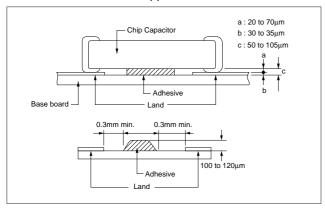
Be sure to contact our sales representatives or engineers in case that GHM products (size 3.2×2.5mm and over) are to be mounted with flow soldering. It may crack due to the thermal shock.

Failure to follow the above cautions may result, worst case, in a short circuit and fuming when the product is used.

#### **NOTICE**

#### 1. MOUNTING OF CHIPS

 Termination thickness of chip capacitor and desirable thickness of adhesives applied



#### Mechanical shock of the chip placer

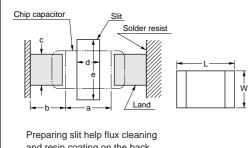
When the positioning claws and pick up nozzle are worn, the load is applied to the chip while positioning is concentrated to one position, thus causing cracks, breakage, faulty positioning accuracy, etc. Careful checking and maintenance are necessary to prevent unexpected trouble.

An excessively low bottom dead point of the suction nozzle imposes great force on the chip during mounting, causing cracked chips. Please set the suction nozzle's bottom dead point on the upper surface of the board.

#### 2. CONSTRUCTION OF BOARD PATTERN

After installing chips, if solder is excessively applied to the circuit board, mechanical stress will cause destruction resistance characteristics to lower. To prevent this, be extremely careful in determining shape and dimension before designing the circuit board diagram.

#### Construction and dimensions of pattern (example)

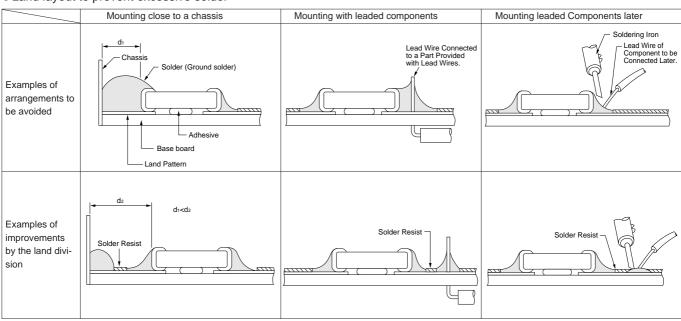


and resin coating on the back of the capacitor.

● Flow soldering (in mi						
LXW	а	b	С			
2.0×1.25	1.0-1.2	0.9-1.0	0.8-1.1			
3.2×1.6	2.2-2.6	1.0-1.1	1.0-1.4			

● Reflow soldering (in						
LXW	а	b	С	d	е	
2.0×1.25	1.0-1.2	0.9-1.0	0.8-1.1			
3.2×1.6	2.2-2.4	0.8-0.9	1.0-1.4	1.0-2.0	3.2-3.7	
3.2×2.5	2.0-2.4	1.0-1.2	1.8-2.3	1.0-2.0	4.1-4.6	
4.5×2.0	2.8-3.4	1.2-1.4	1.4-1.8	1.0-2.8	3.6-4.1	
4.5×3.2	2.8-3.4	1.2-1.4	2.3-3.0	1.0-2.8	4.8-5.3	
5.7×2.8	4.0-4.6	1.4-1.6	2.1-2.6	1.0-4.0	4.4-4.9	
5.7×5.0	4.0-4.6	1.4-1.6	3.5-4.8	1.0-4.0	6.6-7.1	

#### Land layout to prevent excessive solder



#### **NOTICE**

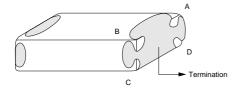
#### 3. SOLDERING

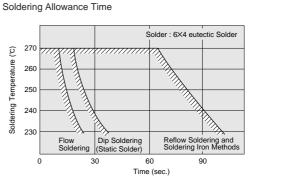
(Care for minimizing loss of the terminations)

 Limit of losing effective area of the terminations and conditions needed for soldering.

Depending on the conditions of the soldering temperature and/or immersion (melting time), effective areas may be lost in some part of the terminations.

To prevent this, be careful in soldering so that any possible loss of the effective area on the terminations will securely remain minimum 25% on all edge length A-B-C-D of part with A, B, C, D, shown in the Figure below.





In case of repeated soldering, the accumulated soldering time must be within the range shown above.

#### (Flux and Solder)

- •Use rosin-type flux and do not use a highly acidic flux (any containing a minimum of 0.2wt% chlorine).
- Please use 6X4 eutectic solder, or 5X5 solder. (Do not use solder with silver.)

#### (Solder Buildup)

- (i) Flow soldering and iron soldering
  Use as little solder as possible (as shown in Fig.1), and
  confirm that the solder is securely placed.
- (ii) Reflow soldering When soldering, confirm that the solder is placed over 0.2mm of the surface of the terminations (as shown in Fig.2).

#### 4. CLEANING

•To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity : Output of 20 watts per liter or less. Rinsing time : 5 minutes maximum.

#### 5. RESIN COATING

- When selecting resin materials, select those with low contraction and low moisture absorption coefficient (generally epoxy resin is used).
- •Buffer coat can decrease the influence of the resin shrinking (generally silicone resin).

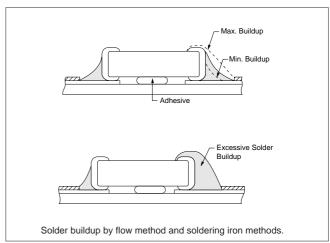


Fig.1

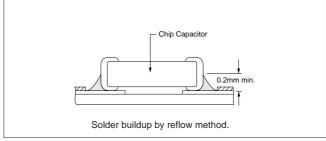


Fig.2

#### **■ISO9000 CERTIFICATIONS**

Manufacturing plants of these products in this catalog have obtained the ISO9001 quality system certificate.

Plant	Certified Date	Organization	Registration NO.
Izumo Murata Manufacturing Co.,Ltd.	May. 11, '95	RCJ* ISO9001	RCJ-93M-05A

\*RCJ: Reliability Center for Electronic Components of Japan



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(For customers in Japan)

For products which are controlled items subject to "the Foreign Exchange and Foreign Trade Control Law" of Japan, the export license specified by the law is

- 2. Please contact our sales representatives or engineers before using our products listed in this catalog for the applications requiring especially high reliability what defects might directly cause damage to other party's life, body or property (listed below) or for other applications not specified in this catalog.
  - 1 Aircraft equipment
  - 2 Aerospace equipment
  - 3 Undersea equipment
  - 4 Medical equipment
  - 5 Transportation equipment (automobiles, trains, ships, etc.)
  - (6) Traffic signal equipment
  - ⑦ Disaster prevention / crime prevention equipment
  - 8 Data-processing equipment
  - 9 Applications of similar complexity or with reliability requirements comparable to the applications listed in the above
- 3. Product specifications in this catalog are as of February 1998, and are subject to change or stop the supply without notice. Please confirm the specifications before ordering any product. If there are any questions, please contact our sales representatives or engineers.
- 4. The categories and specifications listed in this catalog are for information only. Please confirm detailed specifications by checking the product specification document or requesting for the approval sheet for product specification, before ordering.
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