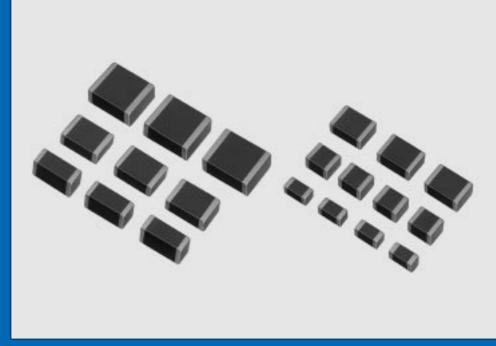
# MEDIUM-VOLTAGE CHIP MONOLITHIC CERAMIC CAPACITOR DC250V-3.15kV/AC250V (r.m.s.) GHM Series

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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			
GНM30	30 GHM3000 Safety standard rec Y capacitor				
GHM31	GHM3000	Safety standard recognized X capacitor			

### **2**Dimension

Code	Dimension (mm)	Code	Dimension (mm)
(EIA Code)	Dimension (mm)	(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		

### 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%
М	±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

_	Temp.	Rated					Nominal Capacitance Range (pF)								
Type	Char.	Voltage	10	50	100	500	1,000	5,000	10,000	50,000	100,000	500,000			
GHM1030	R	DC630V					100-	-1,000							
GHM1040	SL	DC2kV			12	20-220									
GHM1038	SL	DC3.15kV			10-82										
GHM1040	SL	DC3.15kV			100										
GHM1525	В	DC250V							1,000	0—10,000					
GHM1530	В	DC250V								15,00	0-47,000				
GHW1530	ь	DC630V							1,000	0—10,000					
GHM1535	В	DC250V									68,00	00 • 100,000			
GHWH333		DC630V								15,000 • 22,0	000				
GHM1540	В	DC250V										150,000 • 220,000			
GHW1340	В	DC630V									33,00	00-100,000			
GHM1545	В	DC250V								330,	,000 • 470,000				
GHW 1545	ь	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**

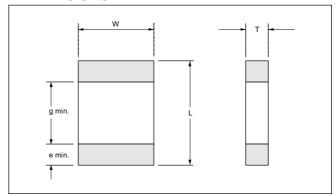
- 1. Murata's original internal electrode structure realizes high Flash-over Voltage.
- A new monolithic structure for small, surface-mountable devices capable of operating at high-voltage levels.
- Sn-plated external electrodes allow mounting without silver compound solder.
- The GHM1030 type for flow 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



Туре	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	2.9	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)

Part Number	Dimensions (mm)			Nom.Cap.	Сар.	DC Rated Volt.	Packaging Qty.
Part Number	L	W	T	(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	4.020.0	0.210.0	2.0_0.3	180	1370	ZK	1,000
GHM1040 SL 221 J 2K				220			
GHM1038 SL 100 D 3K				10	±0.5pF		
GHM1038 SL 120 J 3K				12			
GHM1038 SL 150 J 3K			0±0.2 2.0±0.3 15 18 22 27 33 ±5% 3.15k	15			2,000
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		27			
GHM1038 SL 330 J 3K	4.020.0	2.020.2		3.15k	2,000		
GHM1038 SL 390 J 3K				39	1376		
GHM1038 SL 470 J 3K				47	7		
GHM1038 SL 560 J 3K				56			
GHM1038 SL 680 J 3K				68			
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	Number Dimensions (mm)				Cap. Tol.	DC Rated Volt.	Packaging Qty.												
Part Number	L	W	Т	(pF) ·	Tol.	(V)	Packaging Qty. (pcs./reel)												
GHM1030 R 101 K 630				100															
GHM1030 R 151 K 630			1.0 + 0	150			4,000												
GHM1030 R 221 K 630		1.6±0.2		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	1.6±0.2	330	±10%	630
GHM1030 R 471 K 630				470															
GHM1030 R 681 K 630			1.25 <sup>+</sup> <sub>0.3</sub>	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	on			
No.	l·	tem	Temperature Compensating Type(SL Char.)	High Dielectric Constant Type (R Char.)		Test Method	
1	Operating Temperature Ra	nge	-55 to +125℃			_	
2	Appearance		No defects or abnormalities.		Visual inspection.		
3	Dimensions		Within the specified dimension	n.	Using Calipers.		
4	Dielectric		No defects or abnormalities.			ved when voltage in Table is applied	
	Strength					s for 1 to 5 s, provided the charge/	
	Ū				discharge current is less		
					l — -	Test voltage	
					Rated 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	e shall be measured with 500±50V	
	Resistance (I.R.)	١	Word than 10000Will		and within 60±5 s of cha		
6	Capacitance	<i>)</i>	Within the specified tolerance			shall be measured at 20℃ at the	
7	Q/		C≥30pF : Q≥1000	D.F.≦0.01	frequency and voltage s		
	Dissipation		C<30pF : Q≥400+20C	D.1 .≡0.01	(1) Temperature Compe		
	Factor (D.F.)		C : Nominal Capacitance (pF)		Frequency :1±0.2M	· .	
	. 40.01 (D.1 .)		O . Nominal Supasitation (pr		Voltage :0.5 to 5		
					(2) High Dielectric Cons	,	
					Frequency :1±0.2kl		
					Voltage :1±0.2V		
8	Canacitanas		Tomp Coofficient	Can Change	(1) Temperature Compe	,	
0	Capacitance Temperature		Temp. Coefficient +350 to −1000 ppm/°C	Cap. Change Within ±15%		risating Type  Ifficient is determined using the	
	•				•	9	
	Characteristics		(Temp. Range: +20 to +85℃	γ	· •	ed in step 3 as a reference.	
						nperature sequentially from step 1	
						35 °C) the capacitance shall be within	
					the specified tolerand	ce for the temperature coefficient.	
					Step	Temperature (℃)	
					1	20±2	
					2	Min. Operating Temp.±3	
					3	20±2	
					4	Max. Operating Temp.±2	
					5	20±2	
					(2) High Dielectric Const		
						ance change compared to the 20℃	
					value within -55 to 12	25℃ shall be within the specified	
					range.		
					<ul><li>Pretreatment</li></ul>		
						ment 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 Streng	gth	No removal of the termination	s or other	Solder the capacitor to the	ne testing jig (glass epoxy board)	
	of Termination		defects shall occur.		shown in Fig.1 using a e	utectic solder.	
					Then apply 10N force in	the direction of the arrow.	
					The soldering shall be d	one 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.	
					<i></i>	10N 10+10	
					41110	10N, 10±1s Speed : 1.0mm/s	
						Glass Epoxy Board	
					Fig. 1		
			No defects or abnormalities.		Solder the capacitor to t	ne test jig (glass epoxy board).	
10	Vibration	Appearance	140 dolocto oi abiloililantico.				
10	Vibration Resistance	Appearance Capacitance	Within the specified tolerance		The capacitor shall be s	ubjected to a simple harmonic motion	
10				D.F.≦0.01	•	ubjected to a simple harmonic motion of 1.5mm, the frequency being varied	
10		Capacitance	Within the specified tolerance		having a total amplitude	,	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000		having a total amplitude uniformly between the a frequency range, from 1	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be ely 1 min. This motion shall be applied	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in eac	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in each (total of 6 h).	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be ely 1 min. This motion shall be applied th 3 mutually perpendicular directions	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in eac	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be ely 1 min. This motion shall be applied	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in each (total of 6 h).	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be ely 1 min. This motion shall be applied th 3 mutually perpendicular directions	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in each (total of 6 h).	of 1.5mm, the frequency being varied pproximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be ely 1 min. This motion shall be applied th 3 mutually perpendicular directions	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in eac (total of 6 h).	of 1.5mm, the frequency being varied proximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be aly 1 min. This motion shall be applied th 3 mutually perpendicular directions	
10		Capacitance	Within the specified tolerance C≥30pF : Q≥1000 C<30pF : Q≥400+20C		having a total amplitude uniformly between the a frequency range, from 1 traversed in approximate for a period of 2 h in each (total of 6 h).	of 1.5mm, the frequency being varied proximate limits of 10 and 55Hz. The 0 to 55Hz and return to 10Hz, shall be ely 1 min. This motion shall be applied th 3 mutually perpendicular directions	

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

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G-8101) on). 5±5℃.
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<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

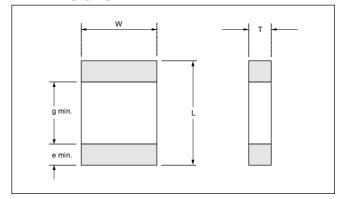
### **■FEATURES**

- 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)	٦	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.																			
i ait itullibei	L	W	Т	(pF)	ToÌ.	(V)	(pcs./reel)																		
GHM1525 B 102 K 250				1,000																					
GHM1525 B 152 K 250				1,500																					
GHM1525 B 222 K 250			$1.0  ^{+0.0}_{-0.3}$	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 $^{+0.0}_{-0.3}$	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> <sub>0.3</sub>	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 <sup>+</sup> <sub>0.3</sub>	68,000			2,000																		
GHM1535 B 104 K 250	0.2.0.0	2.0±0.2	$2.0  {}^{+0.0}_{-0.3}$	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	4.020.4	0.2±0.0	$2.5 \begin{array}{l} + & 0 \\ -0.3 \end{array}$	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	0.7±0.4	0.0±0.4		470,000	±1070		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> 0.3	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	0.220.0	2.020.2	$1.5 \begin{array}{l} + & 0 \\ -0.3 \end{array}$	22,000			2,000																		
GHM1540 B 333 K 630			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	1.020.1	0.2	$2.0  ^{+}_{-0.3}^{0}$	68,000																					
GHM1540 B 104 K 630			$2.6 \begin{array}{c} + & 0 \\ -0.3 \end{array}$	100,000			500																		
GHM1545 B 154 K 630	5.7±0.4	5.0±0.4	$2.0 \begin{array}{c} + & 0 \\ -0.3 \end{array}$	150,000			1,000																		
GHM1545 B 224 K 630	0.7±0.4	0.010.4	$2.7 \begin{array}{c} + & 0 \\ -0.3 \end{array}$	220,000			500																		





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

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

No.		Item	Specification	Test Method			
1	Operating		-55 to +125℃	_			
_	Temperature R	ange	No. de Control de la constitución de la constitució	Manual in an action			
2 3	Appearance Dimensions		No defects or abnormalities.  Within the specified dimension.	Visual inspection. Using Calipers.			
3 4	Dielectric		No defects or abnormalities.	No failure shall be observed when 150% of the rated voltage			
•	Strength		No defects of abhormalities.	(200% of the rated voltage in case of rated voltage: DC 250V)			
				is applied between the terminations for 1 to 5 s, provided the			
				charge/discharge current is less than 50mA.			
5	Insulation		C≧0.01µF : More than 100MΩ · µF	The insulation resistance shall be measured with 500±50V			
	Resistance (I.R	l.)	C<0.01μF : More than 10000MΩ	(250±50V in case of rated voltage: DC 250V) and within 60±5			
6	Capacitance		Within the specified tolerance.	s of charging.  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.)		1 -1				
3	Capacitance		Cap. Change	The range of capacitance change compeared with the 20°C			
	Temperature		Within ±10%	value within −25 to 85°C shall be within the specified range.			
	Characteristics	•	(Temp. Range: −25 to 85°C)	Pretreatment			
				Perform a heat treatment at 150 <sup>+</sup> <sub>-10</sub> °C for 60±5 min and ther			
9	Adhanis - Ct	4h	No removal of the terminations and the	let sit for 24±2 h at room condition.  Solder the capacitor to the testing jig (glass epoxy board)			
9	Adhesive Strer of Termination	igu1	No removal of the terminations or other defects shall occur.	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±1s			
				Speed: 1.0mm/s			
				Fig. 1 Glass Epoxy Board			
0	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>			
				Solder resist			
				Glass Epoxy Board			
4	Defication		No analiza an analiza defecto de all accom	· ·			
1	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.			
			b a45	Then apply a force in the direction shown in Fig. 3.			
			ø4.5 /	The soldering shall be done either with an iron or using the			
			///// + / / IT	reflow method and shall be conducted with care so that the			
				soldering is uniform and free of defects such as heat shock.			
			100 t: 1.6 Fig. 2	ro.			
				20 <sup>50</sup> Pressurizing speed : 1.0mm/s			
			LXW Dimension (mm)	R230 Pressurize			
			(mm) a b c d				
			2.0×1.25 1.2 4.0 1.65 3.2×1.6 2.2 5.0 2.0	Flexure=1			
			3.2×1.6 2.2 5.0 2.0 3.2×2.5 2.2 5.0 2.9 1.0				
			4.5×3.2 3.5 7.0 3.7	Capacitance meter 45 (in mm) Fig. 3			
			5.7×5.0 4.5 8.0 5.6	45 45 (in mm) Fig. 3			
2	Caldanal III	Townsin of :		Immoreo the capacitor in a solution of othersal / IIS I/ 9404			
12	Solderability of	r rermination	75% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion).			
			Gverily and continuously.	Immerse in eutectic solder solution for $2\pm0.5$ s at $235\pm5$ °C.			
				Immersing speed : 25±2.5mm/s			

 $"room\ condition"\ \ Temperature: 15\ to\ 35^\circ\!C,\ \ Relative\ humidity: 45\ to\ 75\%,\ \ Atmosphere\ pressure: 86\ to\ 106\ kPa$ 





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

No.		Item	Specification		Test Metho	d		
13	Resistance to	Appearance	No marking defects	Preheat t	Preheat the capacitor at 120 to 150°C* for 1 min.			
	Soldering	Capacitance	Within ±10%	Immerse	the capacitor in eutectic so	lder solution at 26	60±5℃	
	Heat	Change		for 10±1	s. Let sit at room condition	for 24±2 h, then n	neasure.	
		D.F.	0.025 max.	•Immersi	ing speed: 25±2.5mm/s			
		I.R.	C≧0.01μF : More than 100MΩ · μF	Pretreat	• .			
			C<0.01μF : More than 10000MΩ		a heat treatment at 150+1	0°C for 60±5 min	and then	
		Dielectric	Pass the item No.4.		r 24±2 h at room condition.	J - 121 22		
		Strength						
		ou ongui		*Preheat	ting for more than 3.2×2.5m	nm		
				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 ca	apacitor to the supporting jig	ı (alass epoxy bo	ard)	
	Cycle	Capacitance	Within ±7.5%		Fig.4 using a eutectic solde		,	
	-,	Change			the five cycles according to		tments	
		D.F.	0.025 max.		he following table.			
		I.R.	C≧0.01μF : More than 100MΩ · μF		24±2 h at room condition,	then measure		
			C<0.01 $\mu$ F : More than 10000M $\Omega$	Step	Temperature (℃)	Time (min)	1	
		Dielectric	Pass the item No.4.	1 1	Min. Operating Temp.±3	30±3	-	
		Strength	. 230 110 1011 110.11	2	Room Temp.	2 to 3	1	
		Judigui			Max. Operating Temp.±2	30±3	1	
				4	Room Temp.	2 to 3	-	
				4	Room remp.	2 10 3	J	
				Pretreat	tmont			
					a heat treatment at $150^{+}_{-1}$	0°C for 60±5 min	and than	
					r 24 $\pm$ 2 h at room condition.	0 C 101 00 T 2 111111	and then	
				let sit ioi				
						Fig. 4		
					Solder	resist		
					Glass Epoxy Board			
15	Humidity	Appearance	No marking defects	Sit the ca	apacitor at 40±2℃ and relat	ive humidity 90 to	95% for	
	(Steady State)	Capacitance	Within ±15%	500 <sup>±24</sup> <sub>0</sub> h		•		
	(,	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	Pretreat				
			C<0.01 $\mu$ F : More than 1000M $\Omega$		a heat treatment at 150+1	0°C for 60±5 min	and then	
		Dielectric	Pass the item No.4.		r 24±2 h at room condition.	J - 121 22		
		Strength						
16	Life	Appearance	No marking defects	Apply 120	0% of the rated voltage (15	0% of the rated v	oltage in	
		Capacitance	Within ±15%		ated voltage: DC250V) for 1			
		Change	VIIIII = 10 /0		temperature±3℃. Remove			
		D.F.	0.05 max.		ndition, then measure.	, and 10t 31t 101 24	II at	
		I.R.	C≧0.01μF : More than 10MΩ · μF		ge / discharge current is les	s than 50m∆		
			$C < 0.01 \mu F$ : More than $1000 M\Omega$	•Pretreat		o dian coma.		
		Dielectric	Pass the item No.4.		st voltage for 60±5 min at t	est temperature		
		Strength	1 ass the Rent No		and let sit for 24±2 h at ro			
17	Humidity	Appearance	No marking defects		e rated voltage at 40±2℃ ar		hv 90 to	
''	•	Capacitance	Within ±15%	95% for 5		ıu relative Hüllilüli	ly 30 10	
	Loading	•	VVIIIIII ± 13%		· ·	m condition #		
		Change	0.05 may		and let sit for 24±2 h at roo	iii condition, then		
		D.F.	0.05 max.	measure.				
		I.R.	C≧0.01µF : More than 10MΩ · µF	Pretreat		1 1		
		District 2	C<0.01μF : More than 1000MΩ		st voltage for 60±5 min at t	•		
		Dielectric	Pass the item No.4.	Remove	and let sit for 24±2 h at ro	om condition.		
		Strength						

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



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

No.C16E3.pdf

### Ceramic Capacitor for AC250V GHM2000 Series

### **■FEATURES**

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

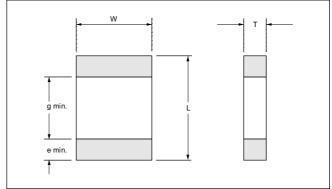
### **■**APPLICATIONS

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		Dimensi	nsion (mm)			
(EIA Code)	L	W	T	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)			Nom.Cap.		AC Rated Volt.	Packaging Qty.
Part Number	L	W	T	(pF) ·	Toì.	[ V (r.m.s.)]	(pcs./reel)
GHM2143 B 103 M AC250		2.8±0.3		10,000	±20%	250	1,000
GHM2143 B 223 M AC250	5.7±0.4		2.0±0.3	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.	Cap.	AC Rated Volt.	Packaging Qty.
Fait Number	L	W	Т	(pF)	Tol.	[ V (r.m.s.)]	(pcs./reel)
GHM2243 B 471 M AC250		2.8±0.3		470	±20%	250	1,000
GHM2243 B 102 M AC250	5.7±0.4		2.0±0.3	1,000			
GHM2243 B 222 M AC250	5.7±0.4			2,200			
GHM2243 B 472 M AC250				4,700			

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

Specimen	N-		Specification	Took Mathad		
No defects or abnormalities.   Visual inspection.	-			rest wethod		
Soliderability of Termination   No defects or abnormalities.   Soliderability of Termination   No defects or abnormalities.   Soliderability of Termination   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects with a specified tolerance.   No defects or abnormalities.   No defects with a specified tolerance.   No defects with a specified tolerance with a specified tolerance with a specified tolerance with a specified t	$\longrightarrow$	<u>, , , , , , , , , , , , , , , , , , , </u>		Visual inspection		
No failure shall be chearment when voltage as table is applied between the termination of COLTs, provided the properties of COLTs, provided the termination of Colts is better to the control of the termination of the colts of the Colts of Colts is better to the control of the termination of the colts of the co						
between the terminations for 02.15, provided the charge-delictoring or current is less than 50 m/s.    Separation of the provided of the charge-delictoring or current is less than 50 m/s.   Capacitance (IR.)   More than 2000M/s.	-		·			
Sinsulation Resistance (I.R.)   More than 2000Mi2   More than 2000Mi2   The insulation resistance shall be measured with 500±50V and whith settles as of exception of the measured with 500±50V and whith settles as of exception of the measured with 500±50V and whith settles as of exception of the measured with 500±50V and whith settles as of exception of the ex	4	Dielectric Strength	No defects or abnormalities.	between the terminations for 60±1 s, provided the		
Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solder the capacitor to the testing [ig (glass epoxy board)   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occur.   Solderability of Termination   No cracking or marking delects shall occ				GHM21xx AC575V (r.m.s.)		
Comparison   Com				GHM22xx AC1500V (r.m.s.)		
7 Dissipation Factor (D.F.) 8 Capacitance Temperature Cap. Change Within ±10%  17 The range of page and a voltage of ±50.2V (r.m.s.) Within ±10%  18 Capacitance Temperature Cap. Change Within ±10%  19 Discharge Test Appearance Application: GHM22xx)  10 Adhesive Strength of Termination No removal of the terminations or other defects shall cocur.  10 Adhesive Strength of Termination No removal of the terminations or other defects shall cocur.  10 Adhesive Strength of Termination No removal of the terminations or other defects shall cocur.  11 Vibration Resistance Appearance D.F.  No defects or abnormalities. No defects or abnormalities. Solder the capacitor to the testing [ij (dises spoy board) that what is not or state the soldering is uniform and free or defects such as heat shock.  12 Defection  No cracking or marking defects shall cocur.  Solder the capacitor to the testing [ij (glass epoxy board). The capacitor shall be subjected to the simple harmonic motion having a total amplitude of 1.5 minorinal shall be conducted with care so that the soldering is uniform and free or defects such as heat shock.  10 Defection  No cracking or marking defects shall cocur.  No cracking or marking defects shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Solder the capacitor to the testing [ij (glass epoxy board) the short provided with care so that the soldering is uniform and free of defects such as heat shock.  Solder the capacitor to the		, ,		and within 60±5 s of charging.		
Characteristics  Characteristics  Characteristics  Within ±10%  Within ±10%  Discharge Test Appearance (GHMZ2xx)  Appearance (GHMZ2xx)  No defects or abnormalities.  No defects or abnormalities.  No defects or abnormalities.  No defects or abnormalities.  No memoral of the terminations or other defects shall occur.  Adhesive Strength of Termination  No removal of the terminations or other defects shall occur.  The temperature of the appearance (Within the specified tolerance).  Difference of defects such as heat shock.  Appearance (Within the specified tolerance).  Difference of the appearance (Within the specified tolerance).  No cracking or marking defects shall occur.  No cracking or						
Characteristics	$\vdash$					
Part   Appearance   Appearanc	8	•	_ · · · · ·	value within −25 to 85°C shall be within the specified range.  •Pretreatment		
the capacitor(Cd) charged at DC voltage of specified.  R3  R3  R1  R1  R2  R2		Dischaus Test Assessed	No defeate as absorbed William	let sit for 24±2 h at room condition.		
shall occur.  shall occur.  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.  11 Vibration  Resistance  Appearance Capacitance  Within the specified tolerance.  D.F.  O.025 max.  No defects or abnormalities.  Capacitance  Within the specified tolerance.  D.F.  O.025 max.  No cracking or marking defects shall occur.  Solder the capacitor to the testing jig (glass epoxy board). The frequency range, from 10 to 55Hz and return to 10Hz, shall be subjected to a simple harmonic motion having a total amplitude of 1.5 mm, the frequency being varied uniformly between the approximately 1 min. This motion shall be applied for a period of 2 h in each 3 mutually perpendicular directions (total of 6 h).  Deflection  No cracking or marking defects shall occur.  No cracking or marking defects shall occur.  Solder the capacitor to the testing jig (glass epoxy board) 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.  D.F.  Solder the capacitor to the testing jig (glass epoxy board) 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.  D.F.  Solder the capacitor in the testing jig (glass epoxy board) shown in Fig. 3. The soldering is uniform and free of defects such as heat shock.  D.F.  Solder the capacitor in the testing jig (glass epoxy board) 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 t		(Application: GHM22xx)		the capacitor(Cd) charged at DC voltage of specified. R3 R1 $10kV$ $V$ $V$ $V$ $V$ $V$ $V$ $V$ $V$ $V$		
Resistance  Capacitance  Within the specified tolerance.  D.F.  0.025 max.  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 hin each 3 mutually perpendicular directions (total of 6 h).    Deflection	10	Adhesive Strength of Terminal		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		
Resistance  Capacitance  Within the specified tolerance.  D.F.  0.025 max.  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 hin each 3 mutually perpendicular directions (total of 6 h).    Deflection	11	Vibration Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).		
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).    Deflection						
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.    Note		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		
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.    LXW   Dimension (mm)	12	Deflection	No cracking or marking defects shall occur.			
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.			LxW   Dimension (mm)   (mm)   a   b   c   d   5.7×2.8   4.5   8.0   3.2   1.0	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		
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.	12	Soldershility of Tormination	75% of the terminations are to be coldered	Immerse the canacitor in a solution of othero( / IIS K 9101)		
	13	Solderability of Termination		and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 2±0.5 s at 235±5°c.		

"room condition" Temperature : 15 to  $35^\circ$ C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa





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

No.C16E3.pdf

### Ceramic Capacitor for AC250V GHM2000 Series

No.		ltem	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		
15	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℃ 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 the
		Strength		let sit for 24±2 h at room condition.
		_		
				*Preheating
				Step Temperature Time
				<b>1</b> 100℃ to 120℃ 1 min
				2 170°C to 200°C 1 min
6	Temperature	Appearance	No marking defects.	Fix the capacitor to the supporting jig (glass epoxy board)
	Cycle	Capacitance	Within ±7.5%	shown in Fig.4 using a eutectic solder.
		Change		Perform the five cycles according to the four heat treatments
		D.F.	0.025 max.	listed in the following table.
		I.R.	More than 2000MΩ	Let sit for 24±2 h at room condition, then measure.
		Dielectric	Pass the item No.4.	Step   Temperature (°C)   Time (min)
		Strength	T doo and nomine.	
		Outengui		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 <sup>+</sup> <sub>-10</sub> °C for 60±5 min and ther
				let sit for 24±2 h at room condition.
				<u> </u>
				→ Solder resist
				Class Frank Board Fig. 4
				Glass Epoxy Board
7	Humidity	Appearance		0" " " 140100= 1 1 " 1 " 1" 001 050/ 5
	(Steady State)	Appearance	No marking defects.	
	(Oleady Olate)	Capacitance	No marking defects. Within ±15%	Sit the capacitor at $40\pm2\%$ and relative humidity 90 to 95% to $500^{+24}_{-0}$ h.
	(Steady State)			500 <sup>+24</sup> <sub>0</sub> h.
	(Steady State)	Capacitance		500 <sup>±24</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment
	(Gleady Glate)	Capacitance Change	Within ±15%	500 <sup>±24</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment
	(Steady State)	Capacitance Change D.F.	Within ±15%  0.05 max.	500 <sup>±24</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment
	(Gleady Glate)	Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000ΜΩ	500 <sup>+2</sup> 0/ <sub>1</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment  Perform a heat treatment at 150 <sup>+</sup> 0 <sup>0</sup> € for 60±5 min and then
8		Capacitance Change D.F. I.R. Dielectric Strength	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>±24</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • 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.
18	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance	Within ±15%  0.05 max.  More than 1000ΜΩ	500 <sup>+24</sup> / <sub>0</sub> h. Remove and let sit for 24±2 h at room condition, then measure •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.  Apply voltage and time as Table at 85±2°C. Remove and let
8		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance	Within $\pm 15\%$ 0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.	500 <sup>+24</sup> / <sub>0</sub> h. Remove and let sit for 24±2 h at room condition, then measure • 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.  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
18		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change	$Within \pm 15\%$ $0.05 \text{ max.}$ $More than 1000 M \Omega$ $Pass the item No.4.$ $No marking defects.$ $Within \pm 15\%$	500 <sup>+24</sup> / <sub>0</sub> h. Remove and let sit for 24±2 h at room condition, then measure •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.  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.
8		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F.	Within $\pm 15\%$ 0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within $\pm 15\%$ 0.05 max.	500 <sup>±2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  •Pretreatment  Perform a heat treatment at 150 <sup>±</sup> / <sub>10</sub> °C for 60±5 min and thei let sit for 24±2 h at room condition.  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
18		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R.	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ	500 <sup>+2</sup> / <sub>0</sub> h. Remove and let sit for 24±2 h at room condition, then measure •Pretreatment Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and ther let sit for 24±2 h at room condition.  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 GHM21xx 1000±48 h AC300V (r.m.s.)
18		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric	Within $\pm 15\%$ 0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within $\pm 15\%$ 0.05 max.	500 <sup>±2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  •Pretreatment  Perform a heat treatment at 150 <sup>±</sup> / <sub>10</sub> °C for 60±5 min and ther let sit for 24±2 h at room condition.  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  GHM21xx 1000 <sup>±4</sup> / <sub>8</sub> h AC300V (r.m.s.)  GHM22xx 1500 <sup>±4</sup> / <sub>8</sub> h AC500V (r.m.s.)*
8		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R.	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment  Perform a heat treatment at 150 <sup>±</sup> / <sub>10</sub> °C for 60±5 min and thet let sit for 24±2 h at room condition.  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  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
8		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment  Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and theilet sit for 24±2 h at room condition.  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  GHM21xx 1000 <sup>±4</sup> / <sub>8</sub> h AC300V (r.m.s.)  GHM22xx 1500 <sup>±4</sup> / <sub>8</sub> h AC500V (r.m.s.)*  * Except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s
18		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and ther let sit for 24±2 h at room condition.  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  GHM21xx 1000 <sup>±4</sup> / <sub>8</sub> h AC300V (r.m.s.)  GHM22xx 1500 <sup>±4</sup> / <sub>8</sub> h AC500V (r.m.s.)*  * Except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s  • Pretreatment
8		Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ	500 <sup>+24</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and ther let sit for 24±2 h at room condition.  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  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 Apply test voltage for 60±5 min at test temperature.
	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment  Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and the let sit for 24±2 h at room condition.  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  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  Apply test voltage for 60±5 min at test temperature.  Remove and let sit for 24±2 h at room condition.
	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  •Pretreatment  Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and theilet sit for 24±2 h at room condition.  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  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  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
	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change Change Change Change D.F. Companies Companies Capacitance Capacitance Capacitance	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>±2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  • 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.  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  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  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 <sup>±2</sup> / <sub>0</sub> th. Remove and let sit 24±2 h at room
	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  •Pretreatment  Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and theilet sit for 24±2 h at room condition.  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  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  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
	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change Change Change Change D.F. Companies Companies Capacitance Capacitance Capacitance	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>+2</sup> / <sub>0</sub> h.  Remove and let sit for 24±2 h at room condition, then measure  •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.  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  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  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 <sup>±2</sup> / <sub>0</sub> h. Remove and let sit 24±2 h at room
18	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance Change Change D.F. L.R. Dielectric Strength	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.	500 <sup>+2</sup> / <sub>0</sub> h. Remove and let sit for 24±2 h at room condition, then measure  •Pretreatment Perform a heat treatment at 150 <sup>+</sup> / <sub>10</sub> °C for 60±5 min and ther let sit for 24±2 h at room condition.  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  GHM21xx 1000 <sup>+4</sup> / <sub>8</sub> h AC300V (r.m.s.)  GHM22xx 1500 <sup>+4</sup> / <sub>8</sub> 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 <sup>+2</sup> / <sub>0</sub> h. Remove and let sit 24±2 h at room condition, then measure.
	Life	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance Change D.F. L.R. Dielectric Strength	Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%  0.05 max.  More than 1000MΩ  Pass the item No.4.  No marking defects.  Within ±15%	Remove and let sit for 24±2 h at room condition, then measure  • Pretreatment Perform a heat treatment at 150±10°C for 60±5 min and ther let sit for 24±2 h at room condition.  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 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±26 h. 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**

- 1. 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.
- 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

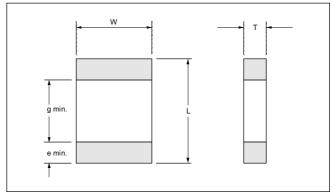
- Ideal use as Y capacitor or X capacitor for various switching power supply.
- 2. Ideal use as line filter for modem.

#### ■STANDARD NO.

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

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

### **■**DIMENSIONS



Type		Dimension (mm)					
Type (EIA Code)	L	W	T	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)		Nom.Cap.	Сар.	AC Rated Volt.	Packaging Qty. (pcs./reel)
Part Number	L	W	T	(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.	Cap.	AC Rated Volt.	Packaging Qty.
Part Number	L	W	Т	(pF) ·	Cap. Tol.	[V (r.m.s.)]	(pcs./reel)
GHM3145 X7R 103K -GB				10,000		250	1,000
GHM3145 X7R 153K -GB	5.7±0.4	5.0±0.4	2.0±0.3	15,000	±10%		
GHM3145 X7R 223K -GB	5.7±0.4	5.0±0.4		22,000	±10%		
GHM3145 X7R 333K -GB			2.7±0.3	33,000			500

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

No.		tem	Specification 55 to 1425°0	Test Method		
1	Operating Temp	erature Range	-55 to +125℃			
2	Appearance		No defects or abnormalities.	Visual inspection.		
3	Dimensions		Within the specified dimension.	Using Calipers.		
4	Dielectric Strength		No defects or abnormalities.	No failure shall be observed when voltage as table is applied		
				between the terminations for 60±1 s, provided the		
				charge/discharge current is less than 50mA.		
				Test voltage		
				Type GB DC1075V		
				Type GC AC1500V (r.m.s.)		
_	Inculation Desig	tones (LD.)	More than $6000 \text{M}\Omega$	The insulation resistance shall be measured with 500±50V		
5	Insulation Resis	tance (i.k.)	More than 6000ivis2			
	0		NACAL in the consection of the language	and within 60±5 s of charging.  The capacitance/D.F. shall be measured at 20°C at a		
6	Capacitance	(D.F.)	Within the specified tolerance.	frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)		
8	Dissipation Factorial Capacitance Telescope		0.025 max. Cap. Change	The range of capacitance change compeared with the 25°C		
$\mid$ $^{\circ}\mid$	Capacitance rei	nperature	Within ±15%	value within -55 to 125°C shall be within the specified range.		
	Citatacteristics		VVIIIIII ± 13 /6	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		
9	(Application:	I.R.	No detects or abnormalities.  More than 1000MΩ	the capacitor(Cd) charged at DC voltage of specified.		
	(Application: Type GC)	Dielectric	Pass the item No. 4.	<b>-</b>		
	Type GC)		1 ass the item INO. 4.	R3 R1		
		Strength				
				<u> </u>		
				$\equiv$ Ct $\perp$ $\leq$ R2		
				$\frac{1}{2}$ 10kV $\bigcirc$ $\downarrow$ Cd		
				Ct : Capacitor under test Cd : 0.001µF		
				R1 : $1000\Omega$ R2 : $100M\Omega$ R3 : Surge resistance		
10	Adhesive Streng	ath of Termination	No removal of the terminations or other defects	Solder the capacitor to the testing jig (glass epoxy board)		
'0	Adhesive Strength of Termination		shall occur.	shown in Fig.1 using a eutectic solder. Then apply 10N force in		
		snall occur.		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.		
				of defects such as fleat shock.		
				77772		
				10N, 10±1s Speed : 1.0mm/s		
				Class Ensur Beard		
				Fig. 1		
11	Vibration	Annearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).		
' '	Resistance	Appearance Capacitance	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion		
	resistance	D.F.	0.025 max.	having a total amplitude of 1.5mm, the frequency being varied		
		D.F.	U.UZJ IIIdX.	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		
				for a period of 2 h in each 3 mutually perpendicular directions (total of 6 h).		
				·		
				***************************************		
12	Deflection		No cracking or marking defects shall occur	Solder resist  Glass Epoxy Board		
12	Deflection		No cracking or marking defects shall occur.	Solder the capacitor to the testing jig (glass epoxy board)		
12	Deflection		. b ,	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in		
12	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. Then apply a force in the direction shown in Fig. 3. The soldering shall be done		
12	Deflection		. b ,	Solder resist  Glass Epoxy Board  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		
12	Deflection		. b ,	Solder resist  Glass Epoxy Board  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		
12	Deflection		04.5	Solder resist  Cu  Glass Epoxy Board  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.		
12	Deflection		Ø4.5	Solder resist  Glass Epoxy Board  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		
12	Deflection		04.5	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  1 Pressurize		
12	Deflection		04.5 04.5 100 t: 1.6 Fig. 2	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		
12	Deflection		### ### ### ### #### #################	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		
12	Deflection		04.5   04.5	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  1 Pressurize		
12	Deflection		### ### ### ### #### #################	Solder resist  Cu  Glass Epoxy Board  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  Flexure=1  Capacitance meter  Fig. 3		
12	Deflection		04.5   04.5	Solder resist  Class Epoxy Board  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  Flexure=1		
		Towning 6:	Dimension (mm)	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 Pressurizing Speed: 1.0mm/s Pressurize  Capacitance meter  (in mm)  Fig. 3		
12	Deflection  Solderability of	Termination	Dimension (mm)	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  Capacitance meter  45 (in mm) Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101)		
		Termination	Dimension (mm)	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 Pressurizie  Capacitance meter (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)	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  Capacitance meter  45 (in mm) Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101)		

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





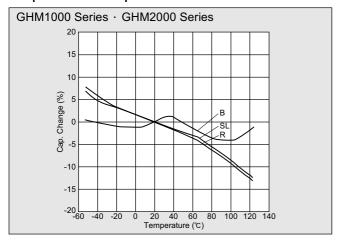
### Safety Standard Recognized GHM3000 Series

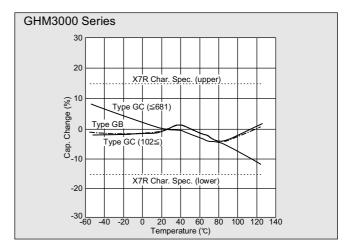
No.		Item	Specification	Test Method
14	Resistance to	Appearance	No marking defects.	Preheat the capacitor as table. Immerse the capacitor in
	Soldering	Capacitance	Within ±10%	eutectic solder solution at 260±5℃ for 10±1 s. Let sit at room
	Heat	Change		condition for 24±2 h, then measure.
		I.R.	More than 1000MΩ	•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.
				*Preheating
				Step Temperature Time
				1 100°C to 120°C 1 min
				2 170°C to 200°C 1 min
15	Temperature	Appearance	No marking defects.	Fix the capacitor to the supporting jig (glass epoxy board)
.	Cycle	Capacitance	Within ±15%	shown in Fig.4 using a eutectic solder.
	<b>G y G I G</b>	Change	VVIIII = 10 /0	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	1 dos the item No.4.	Step Temperature (°C) Time (min)
		Sueligui		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 $150^{+}_{-10}$ °C for $60\pm5$ min and then
				let sit for 24±2 h at room condition.
				<u> </u>
				<u> </u>
				Solder resist
				Class France Parad
				Glass Epoxy Board
16	Humidity	Appearance	No marking defects.	Sit the capacitor at 40±2°C and relative humidity 90 to 95% for
	(Steady State)	Capacitance	Within ±15%	500±12h.
		Change		Remove and let sit for 24±2 h at room condition, then measure.
		D.F.	0.05 max.	
		I.R.	More than 3000MΩ	
		Dielectric	Pass the item No.4.	
		Strength		
17	Life	Appearance	No marking defects.	Impulse Voltage
		Capacitance	Within ±20%	Each individual capacitor shall be T <sub>1=1.2µs=1.67T</sub>
		Change		subjected to a 2.5kV (Type GC:5kV)
		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
				GB AC312.5V (r.m.s.), except that once each hour the
				voltage is increased to AC1000V (r.m.s.) for 0.1s.
				GC 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
"	Loading	Capacitance	Within ±15%	95% for 500 <sup>+24</sup> <sub>0</sub> h. Remove and let sit 24±2 h at room
	_ouding	Change		condition, then measure.
		D.F.	0.05 max.	Sofidition, alon models.
		I.R.	More than 3000MΩ	
		Dielectric	Pass the item No.4.	
			i ass the iterit INU.4.	
		Strength	Relative humidity : 45 to 75% Atmosphere	

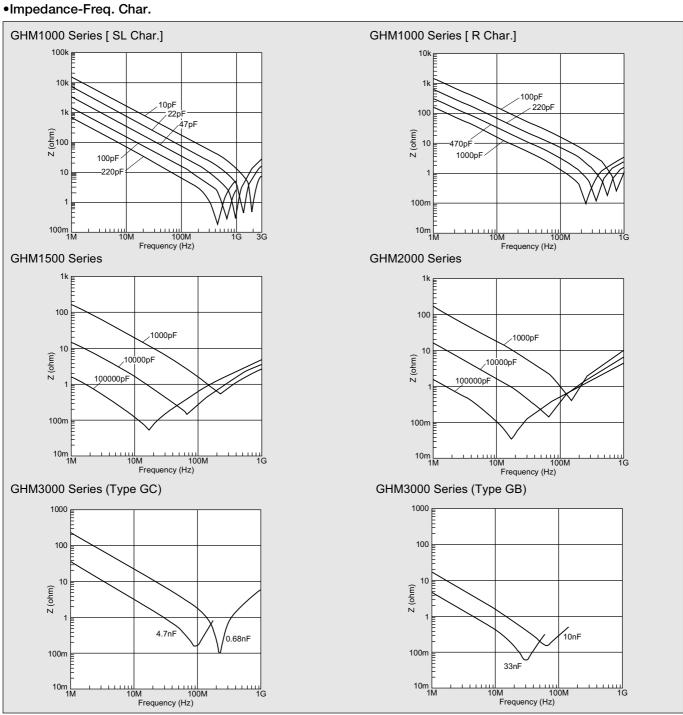
<sup>&</sup>quot;room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

### TYPICAL CHARACTERISTICS DATA

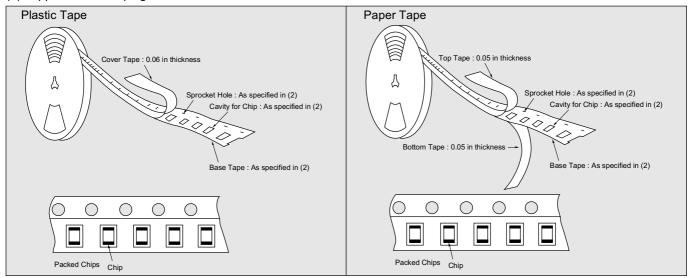
### •Capacitance-Temp. Char.



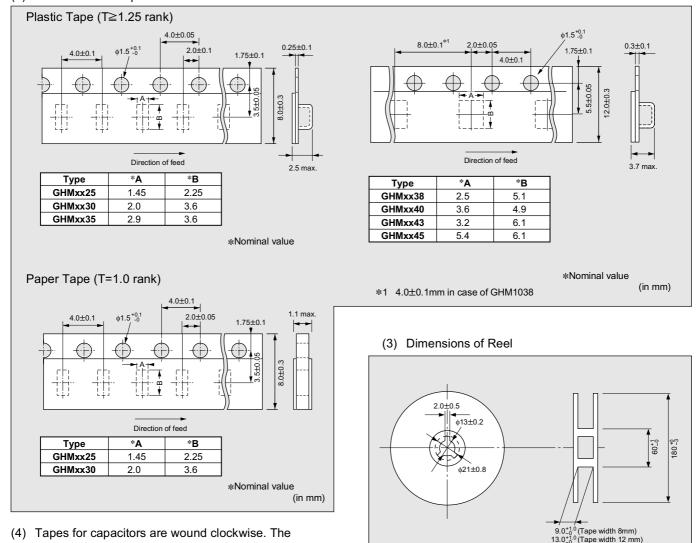




### (1) Appearance of taping



#### (2) Dimensions of Tape

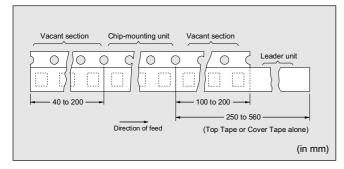


sprocket holes are to the right as the tape is pulled

toward the user.

### 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.



### 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, <u>be sure to maintain the Vp-p value of the applied voltage within the rated voltage range.</u>

#### 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  $40^{\circ}$ C and 20 to 70%. Use capacitors within 6 months.

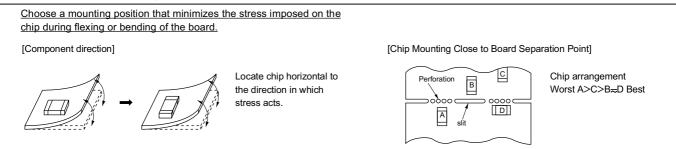
### 4. Vibration and impact

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



### **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.

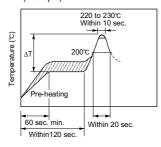
Chip Size Soldering method	3.2X1.6mm and under	3.2X2.5mm and over
Reflow method or Soldering iron method	ΔΤ≦190℃	ΔΤ≦130℃
Flow method or Dip Soldering method	ΔΤ≦150℃	

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

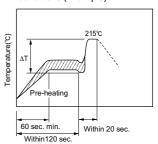
When soldering chips with a soldering iron, it should be performed in following conditions.

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 dire	ctly touch the ceramic element.			

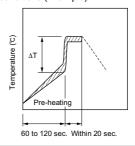
 Infrared reflow soldering conditions (Example)



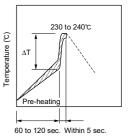
 Vapor reflow soldering (VPS) conditions (Example)



• Dip soldering/Soldering iron conditions (Example)



 Flow soldering conditions (Example)



### 8. Soldering method

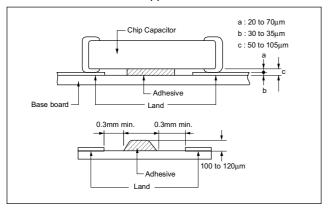
GHM products whose sizes are 3.2×1.6mm and under for flow and reflow soldering, and other sizes for reflow soldering.

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.

#### 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.

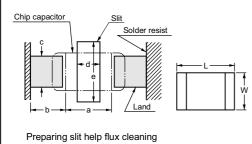
Careful checking and maintenance are necessary to prevent unexpected trouble.

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)

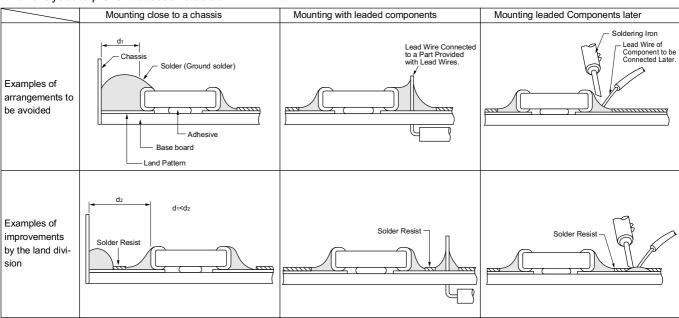


Preparing slit help flux cleaning and resin coating on the back of the capacitor.

● Flow soldering (in mr					
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 solder	ng				(in mm)
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**

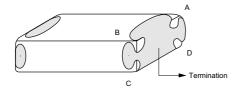
### 3. SOLDERING

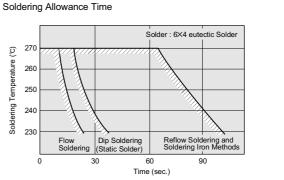
(Care for minimizing loss of the terminations)

 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).

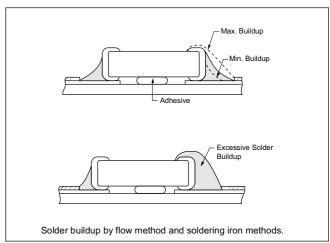


Fig.1

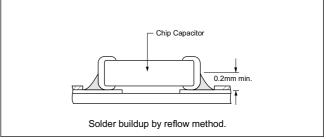


Fig.2

#### **■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



1. Export Control

⟨For customers outside Japan⟩

Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

⟨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 required for export.

- 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
  - ® 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.
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