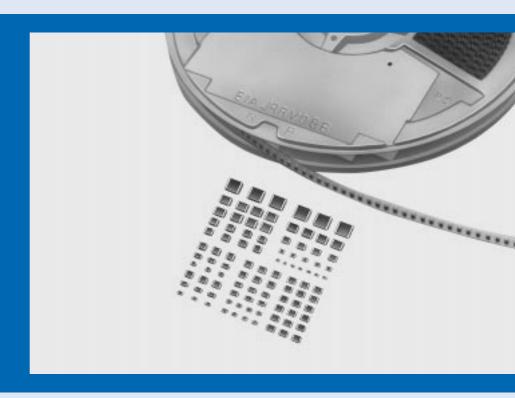
CHIP MONOLITHIC CERAMIC CAPACITOR





CONTENTS

Part Numbering	2
1 for Flow/Reflow Soldering GRM Series	3
2 for Reflow Soldering GRM Series	9
3 Ultra-small Type GRM33 Series	12
Thin Type for Flow/Reflow GRM Series	14
GRM Series Specifications and Test Methods	15
5 High-power Type GRM600 Series	20
GRM Series Data	25
6 Low ESL Wide-width Type LL Series	27
7 Monolithic Microchip GM Series	33
8 Capacitor Arrays GNM Series	36
9 for Ultrasonic Sensors ZLM Type	 41
10 High-frequency for Flow/Reflow Soldering GRQ Series	44
11 High-Q & High-power GRH/RPN100 Series —	— 49
12 High-frequency GRH/RPN700 Series	55
GRH/RPN Series Data	— 61
Package	63
Notice	 67
Reference Data	 7 6
13 for High-voltage Low Dissipation Type GHM1000 Series —	83
14 for High-voltage High-capacitance Type GHM1500 Series —	88
15 for High-voltage GHM2000 Series AC250V r.m.s.	— 91
16 for High-voltage GHM3000 Series Safety Recognized	— 95
GHM Series Data	— 99
Package	101
	104
Notice	107

• Please refer to "Specifications and Test Methods" at the end of each chapter of 5 - 16 except for GRM series.

10

Part Numbering

(Please specify the part number when ordering.)

(Ex.) GRM40

C0G 151 J

Murata's control no.

PT **⑤**

GHM3045 X7R 101 K - Type **1 2 3**

1 Temperature Characteristic

• Temperature compensating type

Code	COG	C0H	P2H	R2H	S2H	T2H	U2J	SL
Temp. range	−55 to	າ 125℃	−55 to 85°C					
Temp. coeff. (ppm/ ℃)	0±30	0±60	-150±60	-220±60	-330±60	-470±60	-750±120	+350 to -1000

• High dielectric constant

Code	X7R	X5R	Z5U	Y5V	В	R
Temp. range	-55 to 125℃	−55 to 85°C	10 to 85℃	−30 to 85°C	-25 t	:o 85℃
Cap. change (%)	±15	±15	+22 -56	+22 -82	±10	±15

• High-Voltage/AC250V type/Safety std. Recognition

Code SL		R/X7R	В		
Temp. range	20 to 85℃	-55 to 125℃	–25 to 85℃		
Cap. change	+350 to −1000ppm/°C	±15%	±10%		

For ultrasonic

code	ZLM				
Temp.range	−25 to 20°C	20 to 85℃			
Temp. coeff. (ppm/°C)	-4700 +1000 -2500	-4700 +500 -1000			

Capacitance (Ex.)

103

 Code
 Capacitance (pF)

 0R5
 0.5

 R75
 0.75

 010
 1

 100
 10

 101
 100

10000

3Capacitance Tolerance

Туре	Temperature Characteristic	Code	Capacitance Tolerance		Capacitance Step	
	C0G to U2J	С	≦10 pF	±0.25pF	0.5, 1, 1.5, 2, 3, 4, 5 (pF)	
Temperature compensating type	(NP0) (N750)	D	≥ 10 pr	±0.5pF	6, 7, 8, 9, 10 (pF)	
	and SL	J	>10 pF	±5%	E12 series	
	X7R, X5R, B, R	K	±10%		E6 series	
High dielectric constant	Z5U	М	±20%		E6 series	
	Z5U, Y5V	Z	+80, -20%		E3 series	
	SL	D	≦10 pF	±0.5pF	10 (pF)	
High-Voltage/AC250V type/	SL	J	>10 pF	±5%	E12 series	
Safety Standard Recognition	X7R, B, R	K	±10%		E6 series	
	В	М	±20%		E3 series	

4Rated Voltage

Code	Rated voltage	Code	Rated voltage	Code	Rated voltage
6.3	DC6.3V	50	DC50V	3K	DC3.15kV
10	DC10V	250	DC250V	AC250	AC250V(r.m.s.)
16	DC16V	630	DC630V		
25	DC25V	2K	DC2kV		

Not apply to GHM3000 Series [Rated voltage : AC250V (r.m.s.)]

5Packing Code (only for chip type)

Code	Packaging				
PB	Bulk packaging in a bag				
PT	Tape carrier packaging				
PC	Bulk case packaging				
PM	Bulk packaging in a tray				

6Type Designation (Apply to GHM3000 Series.)

Code	Type Designation				
-GB	Type GB				
-GC	Type GC				

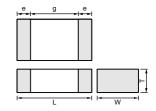


for Flow/Reflow Soldering GRM Series

■ Features

- 1. Terminations are made of metal highly resistant to migration.
- 2. The GRM series is a complete line of chip ceramic capacitors in 10V,16V,25V,50V,100V,200V and 500V ratings. These capacitors have temperature characteristics ranging from C0G to Y5V.
- 3. A wide selection of sizes is available, from the miniature GRM36(LxWxT:1.0x0.5x0.5mm) to GRM42-6 (LxWxT:3.2x1.6x1.25mm). GRM39, 40 and GRM42-6 types are suited to flow and reflow soldering. GRM36 types is applied to only reflow soldering.
- 4. Stringent dimensional tolerances allow highly reliable, high speed automatic chip placement on PCBs.
- 5. The GRM series is available in paper or plastic embossed tape and reel packaging for automatic placement. Bulk case packaging is also available for GRM36,GRM39,GRM40(T:0.6,1.25).





Part Number	Dimensions (mm)							
Part Number	L W		T	е	g min.			
GRM36	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4			
GRM39*	1.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.2 to 0.5	0.5			
		1.25 ±0.1	0.6 ±0.1					
GRM40	2.0 ±0.1		0.85 ±0.1	0.2 to 0.7	0.7			
			1.25 ±0.1					
	2 2 +0 15	1.6 ±0.15	0.85 ±0.1					
GRM42-6	3.2 ±0.15	1.0 ±0.15	1.15 ±0.1	0.3 to 0.8	1.5			
	3.2 ±0.2 1.6 ±0.2		1.6 ±0.2					

* Bulk Case : 1.6 ±0.07(L) × 0.8 ±0.07(W) × 0.8 ±0.07(T)

■ Application

General electronic equipment.

Temperature Compensating Type GRM36 Series

Part Number					GRM36				
L x W(mm)		1.00x0.50							
TC Code	COG	C0H	P2H	R2H	S2H		SL	T2H	U2J
Rated Volt.(Vdc)	50	25	50	50	50	25	50	50	50
Capacitance and	T(mm)						•		
0.5pF	0.50								
0.75pF	0.50								
1.0pF	0.50								
2.0pF	0.50								
3.0pF	0.50		0.50	0.50	0.50			0.50	0.50
4.0pF	0.50		0.50	0.50	0.50			0.50	0.50
5.0pF	0.50		0.50	0.50	0.50			0.50	0.50
6.0pF	0.50		0.50	0.50	0.50			0.50	0.50
7.0pF	0.50		0.50	0.50	0.50			0.50	0.50
8.0pF	0.50		0.50	0.50	0.50			0.50	0.50
9.0pF	0.50		0.50	0.50	0.50			0.50	0.50
10.0pF	0.50		0.50	0.50	0.50			0.50	0.50
12.0pF	0.50		0.50	0.50	0.50			0.50	0.50
15.0pF	0.50		0.50	0.50	0.50			0.50	0.50
18.0pF	0.50		0.50	0.50	0.50			0.50	0.50
22.0pF	0.50		0.50	0.50	0.50			0.50	0.50
27.0pF	0.50		0.50	0.50	0.50			0.50	0.50
33.0pF	0.50			0.50	0.50			0.50	0.50
39.0pF	0.50				0.50			0.50	0.50
47pF	0.50						0.50	0.50	0.50
56pF	0.50						0.50	0.50	0.50

Continued from the preceding page.

_	p 3 p-									
Part Number	GRM36									
L x W(mm)		1.00x0.50								
TC Code	C0G	C0H	P2H	R2H	S2H	S	L	T2H	U2J	
Rated Volt.(Vdc)	50	25	50	50	50	25	50	50	50	
Capacitance and	T(mm)									
68pF	0.50						0.50	0.50	0.50	
82pF	0.50						0.50	0.50	0.50	
100pF	0.50						0.50	0.50	0.50	
120pF	0.50						0.50		0.50	
150pF	0.50						0.50		0.50	
180pF		0.50					0.50		0.50	
220pF		0.50				0.50				
270pF		0.50				0.50				
330pF						0.50				
390pF						0.50				

Temperature Compensating Type GRM39 Series

Part Number							GRM39						
L x W(mm)							1.60x0.80)					
TC Code		C0G		C0H	P2H	R2H	S2H		S	L		T2H	U2J
Rated Volt.(Vdc)	50	100	200	25	50	50	50	25	50	100	200	50	50
Capacitance and	I T(mm)		'			•		•	'				
0.5pF	0.80												
1.0pF	0.80		0.80										
2.0pF	0.80		0.80										
3.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
4.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
5.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
6.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
7.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
8.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
9.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
10.0pF	0.80		0.80		0.80	0.80	0.80					0.80	0.80
12pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
15pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
18pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
22pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
27pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
33pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
39pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
47pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
56pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80
68pF	0.80	0.80			0.80	0.80	0.80		0.80		0.80	0.80	0.80
82pF	0.80	0.80			0.80	0.80	0.80		0.80		0.80	0.80	0.80
100pF	0.80	0.80			0.80	0.80	0.80		0.80		0.80	0.80	0.80
120pF	0.80	0.80			0.80	0.80	0.80		0.80	0.80		0.80	0.80
150pF	0.80	0.80			0.80	0.80	0.80		0.80	0.80		0.80	0.80
180pF	0.80					0.80	0.80		0.80	0.80		0.80	0.80
220pF	0.80						0.80		0.80	0.80		0.80	0.80
270pF	0.80								0.80	0.80		0.80	0.80
330pF	0.80								0.80	0.80		0.80	0.80
390pF	0.80								0.80	0.80		0.80	0.80
470pF	0.80								0.80				0.80
560pF	0.80			0.80					0.80				0.80
680pF				0.80					0.80				0.80
820pF				0.80				0.80					
1000pF				0.80				0.80					

Continued from the preceding page.

Part Number							GRM39						
L x W(mm)							1.60x0.80)					
TC Code		COG COH P2H R2H S2H SL									T2H	U2J	
Rated Volt.(Vdc)	50										50		
Capacitance and	I T(mm)												
1200pF								0.80					
1500pF								0.80					

Temperature Compensating Type GRM40 Series

Part Number	GRM40												
L x W(mm)							2.00x1.25	5					
TC Code		C0G		C0H	P2H	R2H	S2H		S	SL		T2H	U2J
Rated Volt.(Vdc)	50	100	200	25	50	50	50	25	50	100	200	50	50
Capacitance and	l T(mm)												
12pF			0.85										
15pF			0.85										
18pF			0.85										
22pF			0.85										
27pF			0.85										
33pF			0.85										
39pF			0.85										
47pF			0.85										
56pF			0.85										
68pF		0.85	1.25										
82pF		0.85	1.25										
100pF		0.85	1.25										
120pF		0.85	1.25								0.85		
150pF		0.85	1.25								1.25		
180pF		0.85	1.25		0.85						1.25		
220pF		0.85	1.25		0.85	0.85					1.25		
270pF		0.85			0.85	0.85	0.85				1.25		
330pF		0.85			0.85	0.85	0.85				1.25		
390pF		1.25			1.25	0.85	0.85				1.25		
470pF		1.25			1.25	0.85	0.85			0.85	1.25		
560pF	0.60	1.25			1.25	1.25	1.25			0.85		1.25	
680pF	0.85	1.25				1.25	1.25			0.85		1.25	
820pF	0.85	1.25					1.25		0.60	1.25		1.25	0.60
1000pF	0.85	1.25							0.60	1.25		1.25	0.60
1200pF	0.85								0.60	1.25		1.25	0.60
1500pF	0.85								0.85	1.25		1.25	0.85
1800pF	1.25								0.85	1.25		1.25	0.85
2200pF	1.25								0.85				0.85
2700pF				1.25					1.25				1.25
3300pF				1.25					1.25				1.25
3900pF				1.25				0.85					
4700pF								0.85					
5600pF								1.25					
6800pF								1.25					

Temperature Compensating Type GRM42-6 Series

Part Number								GRM42-6	 3						
L x W(mm)							- ;	3.20x1.60	0						
TC Code		C	0G		C0H	P2H	R2H	S2H			SL			T2H	U2J
Rated Volt.(Vdc)	50	100	200	500	25	50	50	50	25	50	100	200	500	50	50
Capacitance and	T(mm)							'							
1.0pF				1.15											
2.0pF				1.15											
3.0pF				1.15											
4.0pF				1.15											
5.0pF				1.15											
6.0pF				1.15											
7.0pF				1.15											
8.0pF				1.15											
9.0pF				1.15											
10.0pF				1.15											
12pF				1.15											
15pF				1.15											
18pF				1.15											
22pF				1.15											
27pF				1.15											
33pF				1.15											
39pF				1.15											
47pF				1.15											
56pF				1.15											
68pF				1.15											
82pF				1.15											
100pF				1.15											
120pF				1.15											
150pF													1.15		
180pF													1.15		
220pF													1.15		
270pF			1.15										1.15		
330pF			1.15												
390pF			1.15												
470pF			1.15												
560pF												1.15			
680pF						0.85						1.15			
820pF						0.85	0.85					1.15			
1000pF						1.15	1.15	0.85				1.15			
1200pF		1.15				1.15	1.15	1.15				1.15			
1500pF		1.15				1.15	1.15	1.15							
1800pF		1.15						1.15							
2200pF		1.15									1.15			1.15	
2700pF	0.85										1.15			1.15	
3300pF	0.85										1.15			1.15	
3900pF	1.15									0.85	1.15			1.15	0.85
4700pF	1.15									0.85	1.15				0.85
5600pF	1.15									0.85					0.85
6800pF					0.85					1.15					1.15
8200pF					1.15					1.15					1.15
10000pF					1.15				1.15						
12000pF									1.15						
15000pF									1.15						
·											•				

High Dielectric Constant Type X5R GRM36/40/42-6 Series

TC Code				X5R			
Part Number	GRM36	GRM39	GR	M40		GRM42-6	
L x W(mm)	1.00x0.50	1.60x0.80	2.00	x1.25		3.20x1.60	
Rated Volt.(Vdc)	10	6.3	6.3	10	6.3	10	16
Capacitance and	T(mm)						
33000pF	0.50						
47000pF	0.50						
68000pF	0.50						
0.1μF	0.50						
0.47μF		0.80					
1.0µF		0.80		0.85			
2.20μF			1.25				1.15
3.3µF						1.30	
4.7μF			1.25		1.60	1.60	
10.0μF					1.60		

 $^{4.7\}mu F$ for 6.3V is replaced with GRM40-034 series of L:2±0.15, W:1.25±0.15, T:1.25±0.15.

The torelance will be changed to L:3.2 \pm 0.2, W:1.6 \pm 0.2, T:1.15 \pm 0.15 for GRM42-6 16V 2.2 μ F type.

High Dielectric Constant Type X7R GRM36/39/40/42-6 Series

TC Code		X7R															
Part Number		GR	M36				GR	M39				GRM40			GRI	142-6	
L x W(mm)		1.00	x0.50				1.60	x0.80			2	.00x1.2	5		3.20	x1.60	
Rated Volt.(Vdc)	10	16	25	50	10	16	25	50	100	200	16	25	50	10	16	25	50
Capacitance and	d T(mm)																
220pF				0.50				0.80		0.80							
330pF				0.50				0.80		0.80							
470pF				0.50				0.80		0.80							
680pF				0.50				0.80		0.80							
1000pF				0.50				0.80		0.80							
1500pF				0.50				0.80		0.80							
2200pF				0.50				0.80	0.80								
3300pF				0.50				0.80	0.80								
4700pF				0.50				0.80									
6800pF			0.50					0.80									
10000pF			0.50					0.80									
15000pF		0.50						0.80									
22000pF		0.50						0.80									
33000pF	0.50						0.80						0.85				
47000pF	0.50						0.80						1.25				
68000pF							0.80										
0.10μF						0.80	0.80					1.25	1.25				
0.15μF					0.80							1.25	1.25				
0.22μF					0.80							0.85	1.25				1.15
0.33μF												1.25					0.85
0.47μF											0.85	1.25					1.15
0.68μF											0.85					0.85	
1.00μF											1.25			0.85	0.85	1.15	
1.5µF															1.15		
2.2μF														1.15	1.15		

 $^{0.10\}mu F$, 50V rated are GRM40-034 series of L:2±0.15, W:1.25±0.15, T:1.25±0.15.

T:1.25 \pm 0.1mm is also available for GRM40 10V 1.0 μ F type.

 $^{3.3 \}mu F \ \text{for 10V rated is replaced with GRM42-631 series of L:} \\ 3.2 \pm 0.2, \ W: 1.6 \pm 0.2, \ T: 1.3 + 0/-.3 mm.$

T:1.15mm is also available for GRM42-6 16V 1.0 μF type.

 $T{:}1.25{\pm}0.1 mm$ is also available for GRM42-6 $1.0\mu F$ for 16V.

The torelance will be changed to L:3.2 \pm 0.2, W:1.6 \pm 0.2, T:1.15 \pm 0.15 for GRM42-6 16V 2.2 μ F type.

High Dielectric Constant Type Y5V GRM36/39/40/42-6 Series

TC Code								Υ:	5V							
Part Number		GRM36				GRM39				GR	M40			GRN	142-6	
L x W(mm)	1	.00x0.5	0		1	.60x0.8	0			2.00	x1.25			3.20	x1.60	
Rated Volt.(Vdc)	16	25	50	10	16	25	50	100	10	16	25	50	6.3	10	16	25
Capacitance and	d T(mm)															
2200pF			0.50													
4700pF			0.50					0.80								
10000pF			0.50				0.80									
22000pF		0.50					0.80									
47000pF	0.50						0.80									
0.10μF	0.50					0.80						0.85				
0.22μF					0.80						0.85	1.25				
0.47μF				0.80	0.80						1.25					
1.0µF				0.80					0.85	0.85	0.85				0.85	1.15
1.5µF										1.25	1.25					
2.2μF									1.25	1.25	1.25			0.85	1.15	
4.7μF									1.25					1.15	1.15	
10.0μF													1.15	1.15		

 $T:1.25\pm0.1$ mm is also available for GRM40 16V $1.0\mu F$ type.

High Dielectric Constant Type Z5U GRM39/40/42-6 Series

TC Code		_	_	Z	5U	_		
Part Number	GR	M39		GRM40			GRM42-6	
L x W(mm)	1.60	x0.80		2.00x1.25			3.20x1.60	
Rated Volt.(Vdc)	50	100	50	100	200	50	100	200
Capacitance and	T(mm)							
2200pF	0.80	0.80			1.25			
4700pF	0.80			0.85				1.15
10000pF	0.80			1.25				
22000pF			0.60				0.85	
47000pF			0.60					
0.10μF			0.85					
0.22μF						0.85		

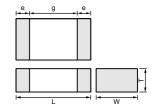


for Reflow Soldering GRM Series

■ Features

- 1. Terminations are made of metal highly resistant to migration.
- The GRM series is a complete line of chip ceramic capacitors in 25V,50V,100V,200V and 500V rated.
 These capacitors have temperature characteristics ranging from C0G to Y5V.
- This series consists of type GRM42-2(LxWxT:3.2x2.5x 0.85mm) to type GRM44-1(LxWxT:5.7x5.0x2.0mm). These are suited to only reflow soldering.
- 4. Stringent dimensional tolerances allow highly reliable, high speed automatic chip placements on PCBs.
- 5. The GRM series is available in plastic embossed tape or paper taping and reel packaging for automatic placement.





Part Number		Dir	nensions (m	nm)	
Part Number	L	W	Т	e min.	g min.
			0.85 ±0.1		
			1.15 ±0.1		
GRM42-2	3.2 ±0.3	2.5 ±0.2	1.35 ±0.15	0.3	1.0
			1.8 ±0.2		
			2.5 ±0.2		
GRM43-2	4.5 ±0.4	3.2 ±0.3	2.0 max.	0.3	2.0
GRM44-1	5.7 ±0.4	5.0 ±0.4	2.0 max.	0.3	2.0

■ Application

General electronic equipment.

Temperature Compensating Type GRM42-2 Series

Part Number				GR	M42-2			
L x W(mm)				3.20	0x2.50			
TC Code		C0	G			S	SL	
Rated Volt.(Vdc)	50	100	200	500	50	100	200	500
Capacitance and	T(mm)				•			
150pF				1.35				
180pF				1.35				
330pF								1.15
390pF								1.15
470pF								1.35
560pF			1.35					
680pF			1.35					
820pF			1.35					
1000pF			1.35					
1500pF							1.35	
2700pF		1.35						
3300pF		1.35						
3900pF		1.35						
5600pF						1.35		
6800pF	1.35					1.35		
10000pF					1.35			
12000pF					1.35			

Temperature Compensating Type GRM43-2 Series

Part Number				GRI	M43-2			
L x W(mm)				4.50	x3.20			
TC Code		C)G			S	iL	
Rated Volt.(Vdc)	50	100	200	500	50	100	200	500
Capacitance and	T(mm)							
220pF				2.00				
270pF				2.00				
330pF				2.00				
390pF				2.00				
470pF				2.00				
560pF								2.00
680pF								2.00
820pF								2.00
1000pF								2.00
1200pF			2.00					2.00
1500pF			2.00					
1800pF			2.00				2.00	
2200pF			2.00				2.00	
2700pF			2.00				2.00	
3300pF							2.00	
3900pF							2.00	
4700pF		2.00						
5600pF		2.00						
6800pF		2.00						
8200pF	2.00	2.00				2.00		
10000pF	2.00	2.00				2.00		
12000pF	2.00	2.00				2.00		
15000pF					2.00	2.00		

Temperature Compensating Type GRM44-1 Series

Part Number				GRM44-1	_		
L x W(mm)				5.70x5.00			
TC Code		(COG			SL	
Rated Volt.(Vdc)	50	100	200	500	50	100	200
Capacitance and	l T(mm)					•	
560pF				2.00			
680pF				2.00			
820pF				2.00			
1000pF				2.00			
3300pF			2.00				
3900pF			2.00				
4700pF			2.00				2.00
5600pF			2.00				2.00
6800pF							2.00
8200pF							2.00
15000pF	2.00	2.00					
18000pF	2.00	2.00			2.00	2.00	
22000pF	2.00	2.00			2.00	2.00	
27000pF	2.00	2.00			2.00	2.00	
33000pF	2.00				2.00	2.00	
39000pF	2.00				2.00	2.00	

High Dielectric Constant Type GRM42-2 Series

Part Number					GRI	142-2				
L x W(mm)	3.20x2.50									
TC Code	X5R			X7R			Y5V		Z5U	
Rated Volt.(Vdc)	10	16	25	50	100	200	50	50	100	200
Capacitance and	T(mm)									
10000pF										1.15
15000pF										1.35
22000pF										1.35
33000pF						1.35				
47000pF						1.35			1.35	
68000pF					1.35				1.35	
0.10μF					1.35				1.35	
0.33μF								1.15		
0.47μF				1.15						
0.68µF				1.35						
1.00µF				1.80			1.8	1.80		
2.2μF		1.15	1.80							
3.3µF		1.35								
4.7μF		1.80								
10.0μF	2.50									

High Dielectric Constant Type GRM43-2 Series

Part Number	GRM43-2					
L x W(mm)			4.50	0x3.20		
TC Code		X7R			Z5U	
Rated Volt.(Vdc)	50 100 200 50		50	100	200	
Capacitance and	T(mm)					
33000pF						2.00
47000pF						2.00
68000pF			2.00			2.00
100000pF			2.00			2.00
0.15μF		2.00			2.00	
0.22μF		2.00			2.00	
0.33µF	2.00					
0.47μF	2.00			1.50		
0.68µF				1.50		
1.0µF				2.00		

High Dielectric Constant Type GRM44-1 Series

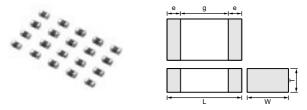
Part Number			GRN	144-1				
L x W(mm)	5.70x5.00							
TC Code		X7R			Z5U			
Rated Volt.(Vdc)	50	100	200	50	100	200		
Capacitance and	T(mm)							
0.15μF			2.00			2.00		
0.22μF			2.00			2.00		
0.33μF		2.00			2.00			
0.47μF		2.00			2.00			
0.68μF	2.00				2.00			
1.0μF	2.00							
1.5µF	2.00			2.00				



Ultra-small Type GRM33 Series

■ Features

- 1. Small chip size (LXWXT: 0.6X0.3X0.3mm).
- 2. Terminations are made of metal highly resistant to migration.
- 3. GRM33 type is suited to only reflow soldering.
- 4. Stringent dimensional tolerances are allow highly reliable, high speed autom atic chip placements on PCBs.
- 5. GRM33 series are suited to miniature micro wave module, portable equipment and high-frequency circuit.



Part Number	Dimensions (mm)					
Part Number	L	W	T	е	g min.	
GRM33	0.6 ±0.03	0.3 ±0.03	0.3 ±0.03	0.1 to 0.2	0.2	

■ Application

- •Miniature micro wave module.
- •Portable equipment.
- •High-frequency circuit.

Part Number	GRM33					
L x W(mm)		0.6x0.3				
TC Code	C0G	X7R	Y5V			
Rated Volt.(Vdc)	25	16	10			
Capacitance and T(mm)						
0.5pF	0.3					
1pF	0.3					
2pF	0.3					
3pF	0.3					
4pF	0.3					
5pF	0.3					
6pF	0.3					
7pF	0.3					
8pF	0.3					
9pF	0.3					
10pF	0.3					
12pF	0.3					
15pF	0.3					
18pF	0.3					
22pF	0.3					
27pF	0.3					
33pF	0.3					
39pF	0.3					
47pF	0.3					
56pF	0.3					
68pF	0.3					
82pF	0.3					
100pF	0.3	0.3				
150pF		0.3				
220pF		0.3				
330pF	<u> </u>	0.3				
470pF		0.3				
680pF		0.3				
1000pF		0.3				
2200pF			0.3			

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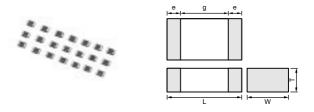
Part Number		GRM33	_
L x W(mm)		0.6x0.3	_
TC Code	COG	X7R	Y5V
Rated Volt.(Vdc)	25	16	10
Capacitance and	d T(mm)		
4700pF			0.3
10000pF			0.3



Thin Type for Flow/Reflow GRM Series

■ Features

- This series is suited to flow and reflow soldering.
 Capacitor terminations are made of metal highly resistant to migration.
- 2. Large capacitance values enable excellent bypass effects to be realized.
- 3. Its thin package makes this series ideally suited for the production of small electronic products and for mounting underneath ICs.



Dant Neuralean	Dimensions (mm)					
Part Number	L	W	Т	е	g min.	
GRM36-019	1.0 ±0.05	0.5 ±0.05	0.25 ±0.05	0.15 to 0.3	0.4	

■ Application

Thin equipment such as IC cards.

Part Number	GRM	M36-019				
L x W(mm)	1.00x0.50					
TC Code	(COG				
Rated Volt.(Vdc)	25	50				
Capacitance and T(mm)						
1pF		0.25				
2pF		0.25				
3pF		0.25				
4pF		0.25				
5pF		0.25				
6pF		0.25				
7pF		0.25				
8pF		0.25				
9pF		0.25				
10pF		0.25				
12pF		0.25				
15pF		0.25				
18pF		0.25				
22pF		0.25				
27pF		0.25				
33pF		0.25				
39pF		0.25				
47pF		0.25				
56pF		0.25				
68pF		0.25				
82pF		0.25				
100pF		0.25				
120pF	0.25					
150pF	0.25					
180pF	0.25					
220pF	0.25					

			Specification							
No.	lte	em	Temperature Compensating Type	High Dielectric Type		Test Method				
1	Operating Tempera		-55 to +125℃	X5R: −55 to +85℃ X7R: −55 to +125℃ Z5U: +10 to +85℃ Y5V: −30 to +85℃						
2	Rated Vo	ltage	See the previous page.		may be applied conf When AC voltage is	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{P-P} or V ^{O-P} , whichever is larger, shall be maintained within the rated voltage				
3	Appearar	nce	No defects or abnormalities.		Visual inspection.					
4	Dimensio	ns	Within the specified dimensions	i.	Using calipers on m	crometer.				
5	Dielectric	: Strength	No defects or abnormalities.		No failure shall be observed when *300% of the rated voltage (C0\(\Delta\) to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V		d voltage (X5R, X7R, minations for 1 to 5			
6	Insulation Resistant		More than 10,000M Ω or 500 Ω •	F (Whichever is smaller)		ance shall be measur ited voltage at 25℃ ai charging.				
7	Capacita	nce	Within the specified tolerance.	I		D.F. shall be measure				
				[X5R,X7R] W.V.: 25Vmin.: 0.025max.	frequency and volta	ge shown in the table. Frequency	Voltage			
				W.V.: 16/10V: 0.035max. W.V.: 6.3V 0.05max.(C<3.3µF)	W.V.: 6.3V 0.05max.(C<3.3µF)	W.V.: 6.3V 0.05max.(C<3.3µF)	W.V.: 6.3V 0.05max.(C<3.3μF)	C0∆ toU2J,SL (1000pF and below)	1±0.1MHz	0.5 to 5Vrms
8	Q/	30pFmin. : Q≥1000 vissipation Factor 30pFmax. : Q≥400+20C	0.1max.(C≥3.3μF) [Z5U] W.V. : 25Vmin. : 0.025max.	C0∆ toU2J,SL (more than 1000pF)	1±0.1kHz	1±0.2Vrms				
	(D.F.)		C : Nominal Capacitance (pF)	[Y5V] W.V.: 25Vmin. : 0.05max.(C<10µF)	X5R,X7R,Y5V (10µF and below	1±0.1kHz	1±0.2Vrms			
				: 0.09max.(C≧1.0μF) W.V. : 16V : 0.07max.(C<1.0μF)	X5R,X7R,Y5V (more than 10μF	<u></u>	0.5±0.1Vrms			
				: 0.09max.(C≧1.0µF) W.V. : 10Vmax. : 0.125max.	Z5U	1±0.1kHz	0.5±0.05Vrms			
	Capacitance Change Within the specified tolerance. (Table A) X5R: Within±15' (-55 to +85°C) X7R: Within±15°C) (-55 to +125°C) Z5U: Within +22' (+10 to +85°C) Y5V: Within +22' (+20 to +25 to		X7R : Within±15% (−55 to +125°C) Z5U : Within +22/−56%	The capacitance change shall be measured after 5 Min. at each specified temperature stage. (1) Temperature Compensating Type The temperature coefficient is determined using the Capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 throug 5 (C0∆: +25℃ to +125℃: other temp. coeffs.: +25℃ to +85℃) the capacitance shall be within the specified tolerance for the temperature coefficient and capacitance change as						
	Capacitance	Temperature	Within the specified tolerance.		between the maximustep 1,3 and 5 by th	it is caluculated by div um and minimum mea e cap value in step 3.	asured values in the			
9	Temperature Characteristics	Coefficient	(Table A)	_	Step 1	Tempera 25±				
	Cital actoristics				2	-55±3 (for C∆ to U -30±3 (for 10±3 (for	J2J/SL/X5R/X7R) or Y5V)			
					3	25±				
					4	125±3 (for 85±3 (for 6	,			
		Capacitance	Within ±0.2% or ±0.05pF (Whichever is larger.)		5	25±	-2			
		Drift	(Whichever is larger.)			citance change compa temperature ranges s				

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			Speci	fication				
No.	lte	em	Temperature Compensating Type	High Dielectric Type	Test Method			
			Adhesive Strength			ctic solder. The 10±1sec. The 10±1sec. The reflow me soldering is k. *2N (GRM3	en apply 10N* soldering shall nethod and shall uniform and gr	force in parallel I be done either II be conducted ee of defects
10	Adhesive	Strength	No removal of the terminations	or other defect shall occur			Sold	er resist
10	of Termin	ation	INO Terrioval of the terminations	of other defect shall occur.				ed electrode or er foil
					Туре	a	b	С
					GRM33	0.3	0.9	0.3
					GRM36	0.4	1.5	0.5
					GRM39 GRM40	1.0	3.0 4.0	1.2 1.65
					GRM42-6	2.2	5.0	2.0
					GRM42-2	2.2	5.0	2.9
					GRM43-2	3.5	7.0	3.7
					GRM44-1	4.5	8.0	5.6
						Fig	.1	(in mm)
		Appearance	No defects or abnormalities.					
		Capacitance	Within the specified tolerance.					
11	Resistance	Q/D.F.	30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF)	W.V.: 25Vmin.: 0.025max. W.V.: 16/10V: 0.035max. W.V.: 6.3V:	same manner and capacitor shall be having a total amp uniformly between frequency range, fi traversed in approapplied for a period	Solder the capacitor to the test jig (glass epoxy board) in th same manner and under the same conditions as (10). The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being variuniformly between the approximate limits of 10 and 55Hz. I frequency range, from 10 to 55Hz and return to 10Hz, shall traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendic directions (total of 6 hours).		
			No crack or marked defect shal	l occur.	Solder the capacite in Fig.2 using a eu tion shown in Fig. iron or using the recare so that the so	tectic solder. T 3. The solderireflow method a	Then apply a fong shall be don Ing shall be don Ind shall be cor	rce in the direc- e either with an nducted with
12	2 Deflection		Type a GRM33 0.3 GRM36 0.4 GRM39 1.0	t:1.6mm (GRM33/36:0.8mm) b c 0.9 0.3 1.5 0.5 3.0 1.2	heat shock.			

Fig.2

(in mm)

Continued from the preceding page.

			Specia	fication					
Vo.	lte	em	Temperature Compensating Type	High Dielectric Type	Test Method				
13	Solderab Terminati	•	75% of the terminations is to be continuously.	soldered evenly and	Immerse the capacitor in a solution of ethanol (JIS-K-8101) an rosin (JIS-K-5902) (25% rosin in weight propotion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C.				
			The measured and observed ch specifications in the following ta	•					
		Appearance	No marking defects.						
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	X5R,X7R : Within ±7.5% Z5U,Y5V : Within ±20%	Preheat the capacitor at 120 to 150°C for 1 minute.				
14	Resistance to Soldering Heat	Q/D.F.	30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF)	[X5R,X7R] W.V.: 25Vmin.: 0.025max. W.V.: 16/10V: 0.035max. W.V.: 6.3V:	Immerse the capacitor in a eutectic solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 ± 18°C for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. *Preheating for GRM42-2/43-2/44-1 Step Temperature Time 1 100°C to 120°C 1 min. 2 170°C to 200°C 1 min.				
		I.R.	More than $10,000\text{M}\Omega$ or 500Ω	F (Whichever is smaller)	-				
		Dielectric Strength	No failure	(
		,	The measured and observed ch specifications in the following ta	•					
		Appearance	No marking defects.						
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	X5R,X7R : Within ±7.5% Z5U,Y5V : Within ±20%	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type or 48±4 hour (high dielectric constant type) at room temperature, then measure.				
		(VIIII)		[X5R,X7R] W.V.: 25Vmin.: 0.025max. W.V.: 16/10V: 0.035max. W.V.: 6.3V 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF)					
15	Temperature		00.5 : 05.:222	[Z5U]	Step 1 2 3 4 Min. _ Max. _				
15	Cycle	Q/D.F.	30pFmin.: Q≧1000 30pFmax.: Q≥400+20C C: Nominal Capacitance (pF)	W.V.: 2.5Vmin.: 0.025max. [Y5V]	Temp.(°C) Operating Temp.+0/-3 Poom Temp. Room Temp.+3/-0 Room Temp.				
		C. NORTHIN	O . Normal Capacitance (pr)	W.V.: 25Vmin. : 0.05max. (C<1.0μF) : 0.09max. (C≥1.0μF) W.V.: 16V : 0.07max. (C<1.0μF)	Time(min.) 30±3 2 to 3 30±3 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150 ± 18°C for one hour and then let sit for 48±4 hours at room temperature.				
				: 0.09max. (C≥1.0µF) : 0.09max. (C≥1.0µF) W.V.: 10Vmax.: 0.125max.	Perform the initial measurement.				
		I.R.	More than 10,000M Ω or 500 Ω	: 0.09max. (C≧1.0µF) W.V. : 10Vmax. : 0.125max.	Perform the initial measurement.				



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			Specif	ication	
No.	lte	em	Temperature Compensating Type	High Dielectric Type	Test Method
			The measured and observed chaptering specifications in the following ta		
		Appearance	No marking defects.		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	X5R,X7R : Within ±12.5% Z5U,Y5V : Within ±30%	
16	Humidity Steady State	Q/D.F.	30pF and over : Q≥350 10pF and over 30pF and below : Q≥275+5C/2 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	[X5R,X7R] W.V.: 25Vmin.: 0.05max. W.V.: 16/10V: 0.05max. W.V.: 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [Z5U] W.V.: 25Vmin.: 0.05max. [Y5V] W.V.: 25Vmin. : 0.075max. (C<1.0μF) : 0.0125max. (C≥1.0μF) W.V.: 16V : 0.1max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V.: 10Vmax.: 0.15max.	Sit the capacitor at 40±2℃ and 90 to 95% humiduty for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.
		I.R.	More than 1,000M Ω or 50 Ω • F	Whichever is smaller)	
		Dielectric Strength	No failure		
			The measured and observed characteristics shall satisfy the specifications in the following table.		
		Appearance	No marking defects.		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	X5R,X7R: Within ±12.5% Z5U: Within ±30% Y5V: Within ±30% [W.V.: 10Vmax.] Y5V: Within +30/-40%	
17	Humidity Load	Q/D.F.	30pF and over : Q≥200 30pF and below : Q≥100±10C/3 C : Nominal Capacitance (pF)	[X5R,X7R] W.V.: 25Vmin.: 0.05max. W.V.: 16/10V: 0.05max. W.V.: 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [Z5U] W.V.: 25Vmin.: 0.05max. [Y5V] W.V.: 25Vmin. : 0.075max. (C<1.0μF) : 0.0125max. (C≥1.0μF) W.V.: 16V : 0.1max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V.: 10Vmax.: 0.15max.	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then muasure. The charge/discharge current is less than 50mA. •Initial measurement for Y5V/10Vmax. Apply the rated DC voltage for 1 hour at 40±2°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.
		I.R.	More than $500 \mathrm{M}\Omega$ or $25 \Omega \bullet \mathrm{F}(\mathrm{W})$	/hichever is smaller)	
		Dielectric Strength	No failure		



Continued from the preceding page.

			Specif	ication	
No.	lte	em	Temperature Compensating Type	High Dielectric Type	Test Method
			The measured and observed che specifications in the following ta	,	
		Appearance	No marking defects.		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	X5R,X7R : Within ±12.5% Z5U : Within ±30% Y5V : Within ±30% (Cap<1.0μF) Y5V : Within +30/−40%(Cap≥1.0μF)	Apply 200% of the rated voltage for 1000±12 hours at the maximun operating temperature ±3°C. Let sit for 24±2 hours
18	High Temperature Load	Q/D.F.	30pF and over : Q≥350 10pF and over 30pF and below : Q≥275±5C/2 10pF and below : Q≥200±10C C : Nominal Capacitance (pF)	X5R,X7R W.V.: 25Vmin.: 0.05max. W.V.: 16/10V: 0.05max. W.V.: 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) (Z5U] W.V.: 25Vmin.: 0.05max (Y5V] W.V.: 25Vmin. : 0.075max. (C<1.0μF) : 0.0125max. (C≥1.0μF) W.V.: 16V : 0.1max. (C≥1.0μF) : 0.125max. (C≥1.0μF) : 0.125max. (C≥1.0μF) W.V.: 10Vmax.: 0.15max.	(temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximun operating temperature ±3℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. *150% for 500V and C≥10μF
		I.R.	More than 1,000MΩ or 50Ω•F(\	Whichever is smaller)	
		Dielectric Strength	No failure		
19	Notice		When mounting capacitor of 50	0V rated voltage, perform the epo	oxy resin coating(min.1.0mm thickness)

Table A

		Capacitance Change from 25℃ (%)						
Char.	Nominal Values (ppm/°C)*	-55		-30		-10		
		Max.	Min.	Max.	Min.	Max.	Min.	
COG	0± 30	0.58	-0.24	0.40	-0.17	0.25	-0.11	
COH	0± 60	0.87	-0.48	0.59	-0.33	0.38	-0.21	
P2H	-150± 60	2.33	0.72	1.61	0.50	1.02	0.32	
R2H	-220± 60	3.02	1.28	2.08	0.88	1.32	0.56	
S2H	-330± 60	4.09	2.16	2.81	1.49	1.79	0.95	
T2H	-470± 60	5.46	3.28	3.75	2.26	2.39	1.44	
U2J	-750±120	8.78	5.04	6.04	3.47	3.84	2.21	
SL	+350 to -1000	_	_	_	_	_	_	

^{*}Nominal values denote the temperature coefficient within a range of 25°C to 125°C (for Co Δ)/85°C (for other TC).



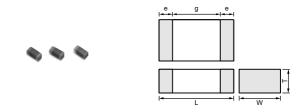
High-power Type GRM600 Series

■ Features

- 1. Mobile Telecommunication and RF module, mainly.
- 2. Quality improvement of telephone call, Low power Consumption, yield ratio improvement.

■ Application

VCO, PA, Mobile Telecommunication



Dort Number	Dimensions (mm)						
Part Number	L	W	T	е	g min.		
GRM615	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4		

Part Number	Rated Voltage (Vdc)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM615C0G010B50	50	COG	1.0 -0.1pF	1.00	0.50	0.50
GRM615C0G010C50	50	COG	1.0 -0.25pF	1.00	0.50	0.50
GRM615C0G020B50	50	C0G	2.0 -0.1pF	1.00	0.50	0.50
GRM615C0G020C50	50	COG	2.0 -0.25pF	1.00	0.50	0.50
GRM615C0G030B50	50	COG	3.0 -0.1pF	1.00	0.50	0.50
GRM615C0G030C50	50	COG	3.0 -0.25pF	1.00	0.50	0.50
GRM615C0G040B50	50	COG	4.0 -0.1pF	1.00	0.50	0.50
GRM615C0G040C50	50	COG	4.0 -0.25pF	1.00	0.50	0.50
GRM615C0G050B50	50	COG	5.0 –0.1pF	1.00	0.50	0.50
GRM615C0G050C50	50	COG	5.0 -0.25pF	1.00	0.50	0.50
GRM615C0G060C50	50	C0G	6.0 -0.25pF	1.00	0.50	0.50
GRM615C0G060D50	50	C0G	6.0 -0.5pF	1.00	0.50	0.50
GRM615C0G070C50	50	C0G	7.0 –0.25pF	1.00	0.50	0.50
GRM615C0G070D50	50	COG	7.0 –0.5pF	1.00	0.50	0.50
GRM615C0G080C50	50	COG	8.0 -0.25pF	1.00	0.50	0.50
GRM615C0G080D50	50	COG	8.0 -0.5pF	1.00	0.50	0.50
GRM615C0G090C50	50	COG	9.0 -0.25pF	1.00	0.50	0.50
GRM615C0G090D50	50	COG	9.0 -0.5pF	1.00	0.50	0.50
GRM615C0G0R5B50	50	C0G	0.5 -0.1pF	1.00	0.50	0.50
GRM615C0G0R5C50	50	C0G	0.50 -0.25pF	1.00	0.50	0.50
GRM615C0G100C50	50	C0G	10 -0.25pF	1.00	0.50	0.50
GRM615C0G100D50	50	C0G	10.0 -0.5pF	1.00	0.50	0.50
GRM615C0G110G50	50	C0G	11 –2%	1.00	0.50	0.50
GRM615C0G120G50	50	COG	12 –2%	1.00	0.50	0.50
GRM615C0G120J50	50	C0G	12 –5%	1.00	0.50	0.50
GRM615C0G130G50	50	COG	13 –2%	1.00	0.50	0.50
GRM615C0G150G50	50	C0G	15 –2%	1.00	0.50	0.50
GRM615C0G150J50	50	C0G	15 –5%	1.00	0.50	0.50
GRM615C0G160G50	50	C0G	16 –2%	1.00	0.50	0.50
GRM615C0G180G50	50	COG	18 –2%	1.00	0.50	0.50
GRM615C0G180J50	50	COG	18 –5%	1.00	0.50	0.50
GRM615C0G1R1B50	50	C0G	1.1 –0.1pF	1.00	0.50	0.50
GRM615C0G1R2B50	50	C0G	1.2 –0.1pF	1.00	0.50	0.50
GRM615C0G1R3B50	50	C0G	1.3 –0.1pF	1.00	0.50	0.50
GRM615C0G1R5B50	50	C0G	1.5 –0.1pF	1.00	0.50	0.50
GRM615C0G1R5C50	50	C0G	1.5 -0.25pF	1.00	0.50	0.50
GRM615C0G1R6B50	50	C0G	1.6 -0.1pF	1.00	0.50	0.50
GRM615C0G1R8B50	50	COG	1.8 -0.1pF	1.00	0.50	0.50



(2) Continued from the preceding page.

Part Number	Rated Voltage (Vdc)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM615C0G200G50	50	COG	20 –2%	1.00	0.50	0.50
GRM615C0G2R2B50	50	C0G	2.2 –0.1pF	1.00	0.50	0.50
GRM615C0G2R4B50	50	COG	2.4 -0.1pF	1.00	0.50	0.50
GRM615C0G2R7B50	50	COG	2.7 -0.1pF	1.00	0.50	0.50
GRM615C0G3R3B50	50	COG	3.3 -0.1pF	1.00	0.50	0.50
GRM615C0G3R6B50	50	COG	3.6 -0.1pF	1.00	0.50	0.50
GRM615C0G3R9B50	50	COG	3.9 -0.1pF	1.00	0.50	0.50
GRM615C0G4R3B50	50	COG	4.3 –0.1pF	1.00	0.50	0.50
GRM615C0G4R7B50	50	COG	4.7 –0.1pF	1.00	0.50	0.50
GRM615C0G5R1C50	50	COG	5.1 -0.25pF	1.00	0.50	0.50
GRM615C0G5R6C50	50	COG	5.6 -0.25pF	1.00	0.50	0.50
GRM615C0G6R2C50	50	COG	6.2 -0.25pF	1.00	0.50	0.50
GRM615C0G6R8C50	50	COG	6.8 -0.25pF	1.00	0.50	0.50
GRM615C0G7R5C50	50	COG	7.5 –0.25pF	1.00	0.50	0.50
GRM615C0G8R2C50	50	COG	8.2 -0.25pF	1.00	0.50	0.50
GRM615C0G9R1C50	50	COG	9.1 -0.25pF	1.00	0.50	0.50

Samplearance No defects or abnormalities. Visual inspection.				Specification											
Temperature Range Rated Voltage See the previous pages. The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V* or V**, whichever is larger, shall be maintained within the rated voltage range. John defects or abnormalities. Dielectric Strength No defects or abnormalities. Dielectric Strength No defects or abnormalities. No failure shall be observed when 300% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/distance current is less than 50mA. The insulation resistance applied continuously of the capacitors of the charge-distance purrent is less than 50mA. The insulation resistance applied obtains the charge-distance purrent is less than 50mA. The insulation resistance applied obtains the charge-distance purrent is less than 50mA. The insulation resistance applied obtains the charge-distance purrent is less than 50mA. The capacitance of charging: The capacitance of charging: Distance of the control of the capacitance of the capacitance of the preparate obtained in the specified tolerance (Table A-1) The capacitance change shall be measured after 5 min. at each specified tolerance applied below) Frequency 1:40.1MHz Update of 1:5 min. 2 min. at each specified tolerance of the capacitance change shall be measured after 5 min. at each specified the preparate obtained in the capacitance change shall be measured after 5 min. at each specified the preparate obtained in the capacitance change at a february of the capacitance obtained in the capacitance change at a february of the capacitance change at a f	No.	lte	em	Temperature Compensating Type		Test Method									
Rated Voltage See the previous pages. When AC voltage is superimosed on DC voltage, V* or V**, whichever is larger, shall be maintained within the rated voltage range. No failure shall be maintained within the rated voltage range. No failure shall be observed when 200% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the changedischerope current is less than 50mA. The insulation resistance shall be measured with a DC voltage in supplied between the terminations for 1 to 5 seconds, provided the changedischerope current is less than 50mA. The insulation resistance shall be measured with a DC voltage in changedischerope current is less than 50mA. The insulation resistance shall be measured with a DC voltage in changedischerope current is less than 50mA. The insulation resistance shall be measured with a DC voltage in changed shall be measured at 25° cat 75°RRH max and within 2 minutes of charging. The capacitance of shall be measured at 25° cat 75°RRH max and within 2 minutes of charging. Soft max: (Dx 400+DCC C) Normania (Capacitance (F)) The capacitance of shall be measured at 25° cat 75°RRH max and within 2 minutes of charging in the capacitance shall be measured after 5 min. at each seportined temperature sequentially from step 1 through 5, (COG 1-425°C to 1425°C softer temp. coeffs.: 1-25°C to 85°C the capacitance change as Table A. The capacitance change as a reference. Data to the capacitance change as the capacitance change as Table A. The capacitance change as the capacitance change as Table A. The capacitance change as Table A. The capacitance change as the capacitance change as the capacitance shows the desired of the capacitance shows the accordance change as the capacitance shows	1	, , ,		–55 to +125℃											
Dimensions Within the specified dimensions. Using calipers.	2	2 Rated Voltage		See the previous pages.	may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{p.p} or V ^{o.p} , whichever is larger, shall be maintained within the rated voltage										
No failure shall be observed when 300% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge(discharge current is less than 50mA.	3	3 Appearance		No defects or abnormalities.	Visual inspection.										
5 Dielectric Strength 6 Insulation Resistance (I.R.) 7 Capacitance 8 Q Within the specified tolerance. 8 Q Operation (I.R.) 8 Q Operation (I.R.) 8 Q Operation (I.R.) 9 Capacitance (I.R.) 10,000M12 min. or 50002 • F min. (Whichever is smaller) 10 Capacitance (I.R.) 10,000M12 min. or 50002 • F min. (Whichever is smaller) 10 Capacitance (I.R.) 10,000M12 min. or 50002 • F min. (Whichever is smaller) 10 Adhesive Strength of Termination 10 Type a b c Capacitance (I.R.) 10,000M12 min. or 50002 • Final, (Whichever is smaller) 10 Adhesive Strength of Termination 10 Type a b c Capacitance (I.R.) 10,000M12 min. or 50002 • Final, (Whichever is smaller) 10 Adhesive Strength of Termination (I.R.) 10 Type a b c Capacitance (I.R.) 10,000M12 min. or 50002 • Final, (Whichever is smaller) 10 Type a b c Capacitance (I.R.) 10,000M12 min. or 50002 • Final, (Whichever is smaller) 10 Adhesive Strength of Termination or other defect shall occur.	4	Dimensions		Within the specified dimensions.	Using calipers.										
10,000MΩ min. or 500Ω + F min. (Whichever is smaller) 10,000MΩ min. or 500Ω + F min. (Whichever is smaller) 10,000MΩ min. or 500Ω + F min. (Whichever is smaller) 10,000MΩ min. or 500Ω + F min. (Whichever is smaller) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + F min. (Whichever is larger.) 10,000MΩ min. or 500Ω + Min. or 500Ω	5	Dielectric	Strength	No defects or abnormalities.	applied between the te	erminations for 1 to 5 seconds, provided									
and voltage shown in the table. Item	6		Resistance	10,000MΩ min. or 500Ω • F min. (Whichever is smaller)	not exceeding the rate	d voltage at 25℃ and 75%RH max. and									
8 Q 30pF min.: ○2≥1.000 30pF max.: ○2≥4.00+20C C: Nominal Capacitance (pF) 1±0.1MHz Voltage 0.5 to 5Vr.ms. Capacitance Change Temperature Coefficient Within the specified tolerance. (Table A-1) The capacitance change shall be measured after 5 min. at each specified temperature stage. Temperature Coefficient Section 2 of the temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, (COG: +25C: 125C: other temperature coefficient is calculated by dividing the differences between the maximum and minimum measured values in the step 1, 3 and 5 by the capacitance maximum and minimum measured values in the step 1, 3 and 5 by the capacitance than 1 and 2 of the capacitance change as 7 able A. The capacitance shall be within the specified tolerance for the temperature coefficient is calculated by dividing the differences between the maximum and minimum measured values in the step 1, 3 and 5 by the cap value in step 3. Step	7	Capacita	nce	Within the specified tolerance.											
Solder the capacitance of the termination of Termination				30pF min. : Q≥1.000											
Capacitance Change Within the specified tolerance. (Table A-1) The capacitance change shall be measured after 5 min. at each specified temperature stage. Temperature Compensating Type Temperature Conflicent The temperature conflicient is determined using the capacitance measured in step 3 as a reference. Within the specified tolerance. (Table A-1) The temperature conflicient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, (COG: +25°C tol+125°C: other temp. coeffs.: +25°C to 85°C) the capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1, 3 and 5 by the capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1, 3 and 5 by the cap value in step 3.	8	Q													
Change Temperature Coefficient Temperature Coefficient Coeff				C : Nominal Capacitance (pF)	Voltage	0.5 to 5Vr.m.s.									
Capacitance measured in step 3 as a reference. When cycling the temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, (COG: +25°C to+125°C; other temp, coeffs: +25°C to 85°C) The product of the temperature sequentially from step 1 through 5, (COG: +25°C to+125°C; other temp, coeffs: +25°C to 85°C) Within ±0.2% or ±0.05pF (Whichever is larger.) Within ±0.2% or ±0.05pF (Whichever is larger.) Within ±0.2% or ±0.05pF (Whichever is larger.) Adhesive Strength of Termination No removal of the terminations or other defect shall occur. Adhesive Strength of Termination No removal of the terminations or other defect shall occur. 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. 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. 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. 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. 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. 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.				Within the specified tolerance. (Table A-1)	each specified temperature stage.										
Capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, (COC) +25°C to+125°C : other temp. coeffs.: +25°C to 85°C) the capacitance shall be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1, 3 and 5 by the capacitan temperature(°C) 1				Within the specified tolerance. (Table A-1)											
Step Temperature(tc)	9	Temperature		Capacitance	W(II) 10.00 v 10.05 5	5, (COG: +25℃ to+125℃: other temp. coeffs.: +25℃ to 85℃) the capacitance shall be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the									
10 Adhesive Strength of Termination Adhesive Strength of Termination No removal of the terminations or other defect shall occur. Type a b c GRM615 0.4 1.5 0.5 (in mm)							•	•	•		•		·		· · · · · · · · · · · · · · · · · · ·
3 25±2 4 125±3 5 25±2 Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply a 5N force in parallel with the test jig for 10±1 sec. 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. Adhesive Strength of Termination No removal of the terminations or other defect shall occur. Type a b c GRM615 0.4 1.5 0.5 (in mm)							25±2								
Adhesive Strength of Termination Adhesive Strength of Termination No removal of the terminations or other defect shall occur.						-55±3									
Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply a 5N force in parallel with the test jig for 10±1sec. 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. Adhesive Strength of Termination No removal of the terminations or other defect shall occur. Type a b c GRM615 0.4 1.5 0.5 (in mm)															
Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply a 5N force in parallel with the test jig for 10±1sec. 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. Adhesive Strength of Termination No removal of the terminations or other defect shall occur. Type a b c GRM615 0.4 1.5 0.5 (in mm)															
Fig.1	10			No removal of the terminations or other defect shall occur.	Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply a 5N force in parallel with the test jig for 10±1sec. 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. Solder resist Baked electrode or copper foil Type a b c GRM615 0.4 1.5 0.5 (in mm)										



ı	Continued	from	the	preceding	page
•					1

		Specification	_			
o. It	em	Temperature Compensating Type	Test Method			
	Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board) in the			
1 Vibration Resistance	Capacitance Q	Within the specified tolerance. 30pF min.: Q≥1,000 30pF max.: Q≥400+20C C: Nominal Capacitance (pF)	same manner and under the same conditions as (10). 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 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicula directions (total of 6 hours).			
		No cracking or marking defects shall occur.	Solder the capacitor to the test jig (glass epoxy boards) 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			
2 Deflection	n	Type a b c GRM615 0.4 1.5 0.5 Fig.2	20 50 Pressurizing speed: 1.0mm/sec. Pressurize R230 Flexure: ≦1 Capacitance meter 45 45 (in mm) Fig.3			
3 Solderab Terminat	•	75% of the terminations is 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). Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃			
		The measured and observed characteristics shall satisfy the specifications in the following table.				
	Appearance	No marking defects.				
Resistance	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃			
4 to Soldering Heat	Q 30pF and over : Q≥1,000 30pF and below : Q≥400+20C C : Nominal Capacitance (pF)		for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.			
	I.R.	More than $10,000 \text{M}\Omega$ or $500 \Omega \cdot \text{F}$ (Whichever is smaller)				
	Dielectric Strength	No failure				
		The measured and observed characteristics shall satisfy the specifications in the following table.				
	Appearance	No marking defects.	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles			
	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	according to the four heat treatments listed in the following table Let sit for 24±2 hours at room temperature, then measure.			
5 Temperature Cycle		30pF and over : Q≥1,000	Step 1 2 3 4			
7,	Q	30pF and below : Q≥400+20C C : Nominal Capacitance (pF)	Temp. (°C) Min. Operating Temp. Operating Temp. Operating Temp. Operating Temp. Operating Temp. Operating Temp.			
	I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)	Time(min.) 30±3 2 to 3 30±3 2 to 3			
	Dielectric Strength	No failure				
		The measured and observed characteristics shall satisfy the specifications in the following table.				
	Appearance	No marking defects.				
Humidity, Steady	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±1 hours. Remove and let sit for 24±2 hours (temperature compensating)			
State	Q	30pF and over. : Q≧350 10pF and over, 30pF and below : Q≧275+ ½ C 10pF and below : Q≧200+10C C : Nominal Capacitance (pF)	Remove and let sit for 24±2 hours (temperature compensating type) at room temperature, then measure.			
	I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)				

Continued from the preceding page

			Specification		
No.	lte	em	Temperature Compensating Type	Test Method	
			The measured and observed characteristics shall satisfy the specifications in the following table.		
		Appearance	No marking defects.		
	I I completite c	Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	Apply the rated voltage at 40±2°c and 90 to 95% humidity for 500±12 hours.	
17	Humidity Load	Q	30pF and over : Q≧200 30pF and below : Q≧100+ ½ C C : Nominal Capacitance (pF)	Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.	
		I.R.	More than $500 \mathrm{M}\Omega$ or 25Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
	The measured and observed characteristics shall satisfy the specifications in the following table.		The measured and observed characteristics shall satisfy the specifications in the following table.		
		Appearance	No marking defects.		
	Hi-h	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	Apply 200% of the rated voltage for 1000±12 hours at the	
18	Temperature Load	10nF and ayer 20nF and below, 0>27F 5 C		maximum operating temperature ±3°C. Let sit for 24±2 hours (temperature compensating type) at room temperature, then measure. The charge/discharge current is less than 50mA.	
		I.R.	More than 1,000M Ω or 50 Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
19	ESR		$0.5 pF \le C \le 1 pF$: $350 M\Omega$. pF below $1 pF < C \le 5 pF$: $300 M\Omega$ below $5 pF < C \le 10 pF$: $250 M\Omega$ below	The ESR shall be measured at room Temp. and frequency 1±0.2GHz with the equivalent of BOONTON Model 34A.	
.5			10pF <c≦20pf 400mω="" :="" below<="" td=""><td colspan="2">The ESR shall be measured at room Temp. and frequency 500±50MHz with the equivalent of HP8753B.</td></c≦20pf>	The ESR shall be measured at room Temp. and frequency 500±50MHz with the equivalent of HP8753B.	

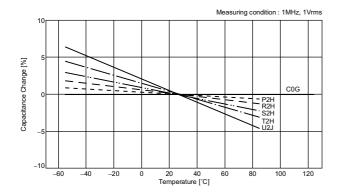
Table A

	T O		Capacitance Change from 25°C Value (%)						
Char.	Temp. Coeff. (ppm/℃) Note 1	−55 ℃		−30℃		−10 °C			
	(ppin/ e) Note 1	Max.	Min.	Max.	Min.	Max.	Min.		
C0G	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11		

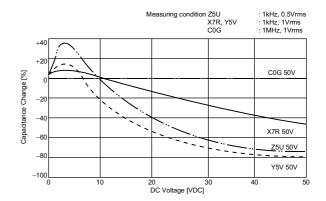
Note 1 : Nominal values denote the temperature coefficient within a range of 25 to 125 $^{\circ}\!C.(for~C0\Delta)$

GRM Series Data

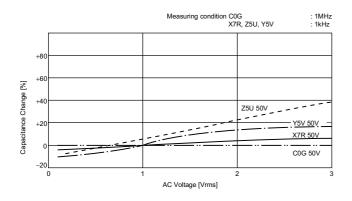
■ Capacitance-Temperature Characterstics



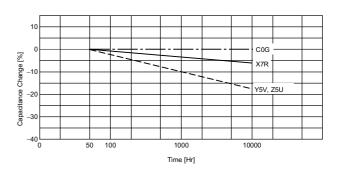
■ Capcitance-DC Voltage Characteristics



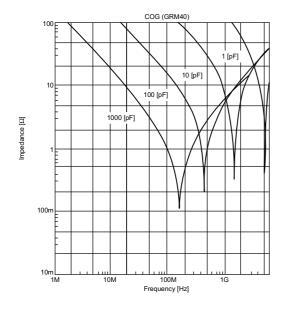
■ Capcitance-AC Voltage Characteristics



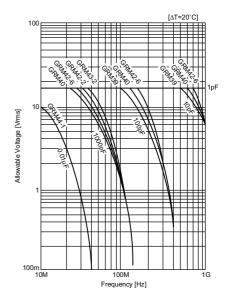
■ Capacitance Change-Aging



■ Impedance-Frequency Characteristics



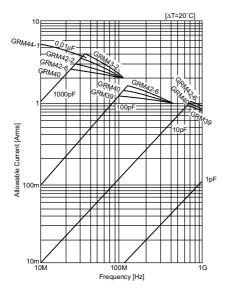
■ Allowable Voltage-Frequency



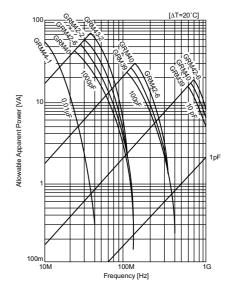
GRM Series Data

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■ Allowable Current-Frequency



■ Allowable Appearant Power





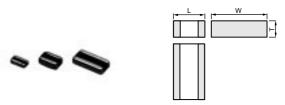
Low ESL Wide-width Type LL Series

■ Features

- 1. Low ESL, good for noise reduction for high frequency.
- 2. Small, high cap.

■ Application

- · High speed micro processor.
- High frequency digital equipment



Part Number	Dimensions (mm)					
rait Nullibei	L	W	Т			
LL0306	0.8 ±0.1	1.6 ±0.1	0.6 max.			
110500	1 25 10 1	20101	0.6 ±0.1			
LL0508	1.25 ±0.1	2.0 ±0.1	0.85 ±0.1			
LL0612	1.6 ±0.15	3.2 ±0.15	0.7 ±0.1			
LLU012	1.0 ±0.15	3.2 ±0.15	1.15 +0.1			

LL0306 Series

Part Number				LL	.0306			
L x W(mm)	0.8x1.6							
TC Code		X.	7R		Y	5V	Z	5U
Rated Volt.(Vdc)	10	16	25	50	16	50	25	50
Capacitance and	l T(mm)							
2200pF				0.6				
2700pF				0.6				
3300pF				0.6				
3900pF				0.6				
4700pF				0.6				
5600pF				0.6				
6800pF			0.6					
8200pF			0.6					
10000pF			0.6					0.6
12000pF			0.6					
15000pF			0.6			0.6	0.6	
18000pF			0.6					
22000pF			0.6			0.6	0.6	
27000pF		0.6						
33000pF		0.6			0.6			
39000pF		0.6						
47000pF		0.6			0.6			
56000pF		0.6						
68000pF		0.6			0.6			
82000pF	0.6							
0.1μF	0.6							

LL0508 Series

Part Number		LL0508							
L x W(mm)		1.25x2.0							
TC Code X7R Y5V			Z:	5U					
Rated Volt.(Vdc) 10 16 25 50 16 25		50	25	50					
Capacitance and	T(mm)								
0.15pF								0.85	
0.22pF	0.6								
4700pF				0.6					

(Variable) Continued from the preceding page.

Part Number	LL0508								
L x W(mm)					1.25x2.0				
TC Code		X	7R		Y5V			Z	5U
Rated Volt.(Vdc)	10	16	25	50	16	25	50	25	50
Capacitance and	T(mm)								
5600pF				0.6					
6800pF				0.6					
8200pF				0.6					
10000pF				0.6					
12000pF				0.6					
15000pF				0.6					
18000pF				0.6					
22000pF				0.6					
27000pF			0.6	0.85					
33000pF		0.6	0.6	0.85					0.6
39000pF		0.6	0.6	0.85					
47000pF		0.6	0.6					0.6	0.85
56000pF		0.6	0.6						
68000pF		0.6	0.6				0.6	0.6	0.85
82000pF		0.6	0.6						
0.1μF		0.6	0.6			0.6	0.85	0.85	
0.12μF		0.6							
0.15μF		0.6	0.85		0.6	0.85		0.85	
0.18μF		0.6							
0.22μF		0.85			0.6				
0.27μF	0.6								
0.33µF	0.6				0.85				
0.39µF	0.85								
0.47μF	0.85								
0.56μF	0.85								

LL0612 Series

Part Number					LL0612				
L x W(mm)					1.6x3.2				
TC Code	X7R					Y5V		Z5U	
Rated Volt.(Vdc)	10	16	25	50	16	25	50	25	50
Capacitance and T	(mm)								
10000pF				0.7					
12000pF				0.7					
15000pF				0.7					
18000pF				0.7					
22000pF				0.7					
27000pF				0.7					
33000pF				0.7					
39000pF				0.7					
47000pF				0.7					
56000pF				0.7					
68000pF				0.7					
82000pF			0.7	1.15					
0.1μF		0.7	0.7	1.15					0.7
0.12μF		0.7	0.7	1.15					
0.15μF		0.7	0.7					0.7	1.15
0.18μF		0.7	0.7						
0.22μF		0.7	1.15				0.7	0.7	1.15
0.27μF		0.7	1.15						
0.33μF		0.7	1.15				1.15	1.15	
0.39µF		0.7							

Continued from the preceding page.

Part Number					LL0612					
L x W(mm)	1.6x3.2									
TC Code		X	7R		Y5V Z5U		5U			
Rated Volt.(Vdc)	10	16	25	50	16 25 50		50	25	50	
Capacitance and T(mm)										
0.47μF		0.7	1.15		0.7	1.15		1.15		
0.56μF	0.7	1.15								
0.68μF	0.7	1.15			0.7					
0.82μF	0.7	1.15								
1000000pF	0.7	1.15			1.15					
1.2μF	1.15									
1.5μF	1.15									
1.8µF	1.15									
2.2μF	1.15									

No.	Item	Specification	Test Method		
1	Operating Temperature Range	X7R: −55°C to +125°C Z5U: +10°C to +85°C Y5V: −30°C to +85°C			
2	Rated Voltage	See the previous pages.	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{p,p} or V ^{0,p} , whichever is larger, shall be maintained within the rated voltage range.		
3	Appearance	No defects or abnormalities.	Visual inspection.		
4	Dimensions	Within the specified dimension.	Using calipers.		
5	Dielectric Strength	No defects or abnormalities.	No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.		
6	Insulation Resistance (I.R.)	More than 10,000M Ω or 500 Ω • F (Whichever is smaller)	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 2 minutes of charging.		
7	Capacitance Dissipation Factor	Within the specified tolerance. Char. 25V min. 16V X7R 0.025 max. 0.035 max. Z5U 0.025 max. —	The capacitance/D.F. shall be measured at 25°C at the frequency and voltage shown in the table. X7R · Y5V Z5U		
0	(D.F.)	Y5V 0.05 max. 0.07 max. (C<1.0μF) 0.09 max. (C≥1.0μF)	Frequency 1±0.1kHz 1±0.1kHz Voltage 1±0.2Vr.m.s. 0.5±0.05Vr.m.s.		
9	Capacitance Temperature Characteristics	Char. Temp. Range (°C) Reference Temp. Cap. Change. X7R −55 to +125 Within±15% Z5U +10 to +85 25°C Within±22%/−56% Y5V −30 to +85 Within±22%/−82%	The ranges of capacitance change compared with the 25℃ value over the temperature ranges shown in the table shall be within the specified ranges. The capacitance change shall be measured after 5 min. at each specified temperature stage.		
10	Adhesive Strength of Termination No removal of the terminations or other defect shall occur.		Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N* force in the direction of the arrow. *5N:LL0306 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. Solder resist Baked electrode or copper foil Type a b c LL0306 0.3 1.2 2.0 LL0508 0.6 1.6 2.4 LL0612 1.0 3.0 3.7 (in mm)		
		N	Fig.1		
	Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10).		
	Capacitance	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion		
11	Vibration Resistance D.F.	Char. 25V min. 16V X7R 0.025 max. 0.035 max. Z5U 0.025 max. — Y5V 0.05 max. 0.07 max. (C<1.0μF) 0.09 max. (C≥1.0μF) 0.09 max. (C≥1.0μF)	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 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular		
			directions (total of 6 hours).		



Continued from the preceding page

No.	lte	em	Specification	Test Method			
12	Deflection	n	No crack or marked defect shall occur. Type a b c LL0306 0.3 1.2 2.0 LL0508 0.6 1.6 2.4 LL0612 1.0 3.0 3.7 (in mm)	Solder the capacitor to the test jig (glass epoxy boards) 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/sec. Pressurize Capacitance meter 45 Flexure: ≤1 (in mm)			
			Fig.2	T			
13	Solderab Terminati	•	75% of the terminations is 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). Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.			
		Appearance	No defects or abnormalities.				
		Capacitance Change	X7R: Within±7.5% Z5U · Y5V: Within±20%	Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5			
14	Resistance to Soldering Heat	D.F.	Char. 25V min. 16V X7R 0.025 max. 0.035 max. Z5U 0.025 max. — Y5V 0.05 max. 0.07 max. (C<1.0μF)	seconds. Let sit at room temperature for 48±4 hours , then measure. •Initial measurement. Perform a heat treatment at 150±0 0 for one hour and then			
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)	let sit for 48±4 hours at room temperature. Perform the initial measurement.			
		Dielectric Strength	No failure				
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting jig in the same manner and			
		Capacitance Change	X7R : Within±7.5% Z5U · Y5V : Within±20%	under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 48±4 hours at room tem-			
			Char. 25V min. 16V X7R 0.025 max. 0.035 max.	perature, then measure.			
15	Temperature	D.F.	Z5U 0.025 max. —	Step 1 2 3 4 Toma (%) Min. Operating Room Max. Operating Room			
13	Cycle		Y5V 0.05 max. 0.07 max. (C<1.0μF) 0.09 max. (C≥1.0μF)	Temp. $\stackrel{+\circ}{-3}$ Temp. $\stackrel{+\circ}{-3}$ Temp. $\stackrel{+3}{-6}$ Temp.			
		I.R.	More than $10,000M\Omega$ or $500\Omega \cdot F$ (Whichever is smaller)	Time(min.) 30±3 2 to 3 30±3 2 to 3			
	Dieler Stren		No failure	•Initial measurement. Perform a heat treatment at 150 ⁺ / ₁₀ ℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.			
		Appearance	No defects or abnormalities.				
		Capacitance Change	X7R : Within±12.5% Z5U · Y5V : Within±30%				
16	Humidity, Steady State	D.F.	Char. 25V min. 16V X7R 0.05 max. 0.05 max. Z5U 0.05 max. — Y5V 0.075 max. 0.1 max. (C<1.0μF)	Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 48±4 hours at room temperature, then measure.			
		i.K.	INDIE MAIT 1,000 INIX OF 3032 • F (WINCHEVER IS SMAILER)				



Continued from the preceding page.

No.	Ite	em	Specification	Test Method		
17	Humidity Load	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA.		
		Dielectric Strength	No failure			
		Appearance	No defects or abnormalities.			
18		Capacitance Change	X7R : Within±12.5% Z5U : Within±30% Y5V : Within±30% (C<1.0μF) Within $\pm \frac{1}{4}$ 8% (C≥1.0μF)	Apply 200% of the rated voltage for 1,000±12 hours at maximum operating temperature ±3°C. Let sit for 48±4 hours at room temperature, then measure.		
	High Temperature Load	D.F.	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	The charge/discharge current is less than 50mA. •Initial measurement. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.		
		Dielectric Strength	No failure			



Monolithic Microchip GM Series

■ Features

- 1. Better micro wave characteristics.
- 2. Suitable for by-passing.
- 3. High density mounting.

■ Application

- Optical device for telecommunication.
- IC, IC packaging built-in.
- Measuring equipment.





Part Number	Dimensions (mm)					
Part Number	L	W	T			
GM250	0.5 ±0.05	0.5 ±0.05	0.35 ±0.05			
GM260	0.8 ±0.05	0.8 ±0.05	0.5 ±0.1			

Part Number	Rated Voltage (Vdc)	TC Code	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)
GM250X7R102M16	16	X7R	1000pF	0.5	0.5	0.35
GM250X7R152M16	16	X7R	1500pF	0.5	0.5	0.35
GM250X7R222M16	16	X7R	2200pF	0.5	0.5	0.35
GM250X7R471M50	50	X7R	470pF	0.5	0.5	0.35
GM250Y5V153Z10	10	Y5V	15000pF	0.5	0.5	0.35
GM250Y5V472Z16	16	Y5V	4700pF	0.5	0.5	0.35
GM250Y5V682Z16	16	Y5V	6800pF	0.5	0.5	0.35
GM260X7R103M16	16	X7R	10000pF	0.8	0.8	0.5
GM260Y5V104Z10	10	Y5V	0.1μF	0.8	0.8	0.5
GM260Y5V473Z16	16	Y5V	47000pF	0.8	0.8	0.5

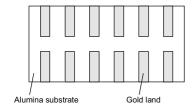
No.	lte	em	S	pecification	Test Method		
1	Operating Tempera	•	X7R : −55℃ to +125℃ Y5V : −30℃ to +85℃				
2	Rated Vo		See the previous pages.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{p-p} or V ^{0-p} , whichever is larger, shall be maintained within the rated voltage range.		
3	Appearar	nce	No defects or abnormalitie	S.	Visual inspection.		
4	Dimensio	ns	See the previous pages.		Visual inspection.		
5	Dielectric	Strength	No defects or abnormalitie	S.	No failure shall be observed when a voltage of 250% of the rated voltage is applied between the both terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.		
6	Insulation (I.R.)	Resistance	10,000M $Ω$ min.		The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 2 minutes of charging.		
7	Capacita	nce	Within the specified toleral	nce.	The capacitance shall be measured at 25℃ with 1±0.1kHz in frequency and 1±0.2Vr.m.s. in voltage.		
8	Dissipatio (D.F.)	n Factor	X7R: 0.035 max. Y5V: 0.09 max. (for 16V) : 0.125 max. (for 10V))	D.F. shall be measured under the same conditions at the capacitance.		
9	Capacitar Temperat Character	ure	Char. Temp. Range X7R −55 to +125℃ Y5V −30 to +85℃		The range of capacitance change in reference to 25°C within the temperature range shown in the table shall be within the specified ranges. The capacitance change shall be measured after 5 min. at each specified temperature stage.		
10	Mechanical Strength	Bond Strength	Pull force : 3.0g min.		MIL-STD-883 Method 2011 Condition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20) and bond a 20µm (0.0008 inch) gold wire to the capacitor terminal using an ultrasonic wedge bond. Then, pull wire.		
		Die Shear Strength	Die Shear force : 200g mir	ì.	MIL-STD-883 Method 2019 Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20). Apply the force parallel to the substrate.		
		Appearance	No defects or abnormalitie	s.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude : 1.5 mm (0.06 inch) max. total excursion.		
	Vibration	Capacitance	Within the specified tolerar	nce.			
11	Resistance	D.F.	X7R: 0.035 max. Y5V: 0.09 max. (for 16V) : 0.125 max. (for 10V)		Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).		
			The measured values shatable.	all satisfy the values in the following Specification	The capacitor shall be set for 48 ± 4 hours at room temperature after one hour heat of treatment at 150^{+0}_{-10} °C, then measure for the initial measurement. Fix the capacitor to the supporting		
			Appearance	No marked defect	jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the temperatures and		
12	Temperat	ture Cycle	Capacitance Change	X7R ······ Within±7.5% Y5V ····· Within±20%	time shown in the following table. Set it for 48±4 hours at room		
12	rempera	uic Oyeic	I.R.	More than 10,000M Ω	temperature, then measure.		
			D.F.	X7R ······ 0.035 max. Y5V ····· 0.09 max.(for 16V)	Step 1 2 3 4 To a Min. Operating Room Max. Operating Room		
				0.125 max.(for 10V)	Temp. (°C) Temp. +3 Temp. Temp. +3 Temp.		
			Dielectric Strength	No failure	Time(min.) 30±3 2 to 3 30±3 2 to 3		
			The measured values shatable.	all satisfy the values in the following Specification			
			Appearance	No marked defect	Set the capacitor for 500±12 hours at 40±20℃, in 90 to 95%		
12	Humidity		Capacitance Change	X7R ······ Within±12.5%	humidity.		
13	(Steady S		I.R.	Y5V ······ Within±30% More than 1,000MΩ	Take it out and set it for 48±4 hours at room temperature, then		
			D.F.	X7R ······ 0.05 max. Y5V ····· 0.125 max.(for 16V) 0.15 max.(for 10V)	measure.		
			Dielectric Strength	No failure			

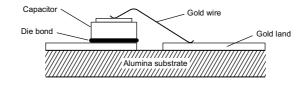


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No.	Item	S	pecification	Test Method
14	Humidity Load	The measured values shall satisfy the values in the following table. Item		Apply the rated voltage for 500±12 hours at 40±20°C, in 90 to 95% humidity and set it for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA. • Initial measurement for Y5V Perform a heat treatment at 150±0 °C for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.
15	High Temperature Load	The measured values shable. Item Appearance Capacitance Change I.R. D.F. Dielectric Strength	all satisfy the values in the following $\frac{Specification}{No \ marked \ defect}$ $X7R \cdots Within\pm 12.5\%$ $Y5V \cdots Within\pm \frac{30\%}{40\%}$ $More \ than \ 1,000M\Omega$ $X7R \cdots 0.05 \ max.$ $Y5V \cdots 0.125 \ max.(for \ 16V)$ $0.15 \ max.(for \ 10V)$ $No \ failure$	A voltage treatment shall be given to the capacitor, in which a DC voltage of 200% the rated voltage is applied for one hour at the maximum operating temperature ±3°C then it shall be set for 48±4 hours at room temperature and the initial measurement shall be conducted. Then apply the above mentioned voltage continuously for 1000±12 hours at the same temperature, remove it from the bath, and set it for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA.

Mounting for testing: The capacitors shall be mounted on the substrate as shown below using die bonding and wire bonding when tests No. 11 to 15 are performed.





CHIP MONOLITHIC CERAMIC CAPACITOR



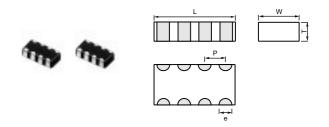
Capacitor Arrays GNM Series

■ Features

- 1. High density mounting due to mounting space saving.
- 2. Mounting cost saving.

■ Application

General electronic equipment



Part Number		Dimensions (mm)					
Part Number	L	W	Т	Р	е		
GNM30-401	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	0.8 ±0.1	0.4 ±0.15		

Temperature Compensating Type

Part Number	GNM30-401					
L x W(mm)	3.2x1.6					
TC Code		COG				
Rated Volt.(Vdc)	50	100				
Capacitance and T(mm)						
10pF	0.8	0.8				
11pF	0.8	0.8				
12pF	0.8	0.8				
13pF	0.8	0.8				
15pF	0.8	0.8				
16pF	0.8	0.8				
18pF	0.8	0.8				
20pF	0.8	0.8				
22pF	0.8	0.8				
24pF	0.8	0.8				
27pF	0.8	0.8				
30pF	0.8	0.8				
33pF	0.8	0.8				
36pF	0.8	0.8				
39pF	0.8	0.8				
43pF	0.8	0.8				
47pF	0.8	0.8				
51pF	0.8	0.8				
56pF	0.8	0.8				
62pF	0.8	0.8				
68pF	0.8	0.8				
75pF	0.8	0.8				
82pF	0.8	0.8				
91pF	0.8	0.8				
100pF	0.8	0.8				
110pF	0.8	0.8				
120pF	0.8	0.8				
130pF	0.8	0.8				
150pF	0.8	0.8				
160pF	0.8					
180pF	0.8					
200pF	0.8					
220pF	0.8					



Continued from the preceding page.

Part Number	GNM3	GNM30-401				
L x W(mm)	3.2)	x1.6				
TC Code	CC	OG				
Rated Volt.(Vdc)	50 100					
Capacitance and	d T(mm)					
240pF	0.8					
270pF	0.8					
300pF	0.8					
330pF	0.8					
360pF	0.8					

High Dielectric Constant Type

Part Number			1	GNM30-401			
L x W(mm)	3.2x1.6						
TC Code	X7R			Y5V			
Rated Volt.(Vdc)	16	25	50	100	16	50	100
Capacitance and T	(mm)	•					
220pF				0.8			
240pF				0.8			
270pF				0.8			
300pF				0.8			
330pF				0.8			
360pF				0.8			
390pF			0.8	0.8			
470pF			0.8	0.8			
560pF			0.8	0.8			
680pF			0.8	0.8			
820pF			0.8	0.8			
1000pF			0.8	0.8			
1200pF			0.8	0.8			
1500pF			0.8	0.8			
1800pF			0.8	0.8			
2200pF			0.8	0.8			0.8
2700pF			0.8	0.8			
3300pF			0.8	0.8			0.8
3900pF			0.8	0.8			
4700pF			0.8	0.8			0.8
5600pF			0.8				
6800pF			0.8				
8200pF			0.8				
10000pF			0.8				
12000pF			0.8				
15000pF			0.8				
18000pF		0.8					
22000pF	0.8					0.8	
27000pF	0.8						
33000pF	0.8					0.8	
39000pF	0.8						
47000pF						0.8	
68000pF					0.8		
100000pF					0.8		
150000pF					0.8		

				Specification			
No.	lte	em	Temperature Compensating Type	High Dielectric Constant Type		Test Method	
1	Operatino Temperat	•	C0G : −55 to +125°C	X7R : −55 to +125°C Y5V : −30 to +85°C			
2	2 Rated Voltage		See the previous page.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{P-P} or V ^{O-P} , whichever is larger, shall be maintained within the rated voltage range.		
3	Appearar	nce	No defects or abnormaliti	es.	Visual inspection.		
4	Dimensio	ns	Within the specified dime	nsion.	Using calipers.		
5	Dielectric	Strength	No defects or abnormaliti	es.	No failure shall be obset (C0G) or 250% of the between the termination charge/discharge currents.	rated voltage (X7R ns for 1 to 5 second	and Y5V) is applied ds, provided the
6	Insulation I	Resistance	More than 10,000M Ω or	500Ω • F (Whichever is smaller)	The insulation resistan not exceeding the rate within 2 minutes of cha	d voltage at 25℃ an	•
7	Capacita	nce	Within the specified tolera	ance.	The capacitance/Q/D.F		d at 25℃ at the fre-
8	Q/Dissipat (D.F.)	ion Factor	30pF min. : Q≥1,000 30pF max. : Q≥400+20C C : Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.025 max. 0.035 max. Y5V 0.05 max. 0.07 max.	Item Char. Frequency Voltage	COG 1±0.1MHz 0.5 to 5Vr.m.s.	X7R, Y5V 1±0.1MHz 1±0.2Vr.m.s.
		Capacitance Change	Within the specified tolerance. (Table A-5)	Char. Temp. Range. Reference Temp. Change X7R −55to +125°C Y5V −30to +85°C 25°C Within±15% Within±22%	The capacitance change each specified tempera (1) Temperature Comp The temperature cocapacitance measu	ge shall be measure ature stage. ensating Type efficient is determin	ed using the
		Temperature Coefficient	Within the specified tolerance. (Table A-5)		When cycling the temperature sequentially from step through 5, the capacitance shall be within the specifi		ally from step 1 nin the specified
9	Capacitance Temperature Characteristics	Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)		tolerance for the ter change as Table A. The capacitance dri differences betweer values in the step 1 Step 1 2 3 4 5 (2) High Dielectric Control The ranges of capa value over the temp be within the specific	ft is calculated by di the maximum and 3 and 5 by the cap Temperat 25±: -55± 25±: 125± 25±: stant Type citance change comerature ranges show	ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 3. ividing the minimum measured of value in step 4. ividing the minimum measured of value in step
10	Adhesive Strength of Termination				Solder the capacitor to Fig.1 using a eutectic s with the test jig for 10± The soldering shall be reflow method and sha dering is uniform and fig	older. Then apply 5 1 sec. done either with an Il be conducted with	N force in parallel iron or using the n care so that the solars heat shock.

7	Continued	from the	prece	eding	page

_			01 0				
				Specification			
No.	Ite	em	Temperature Compensating Type	High Dielectric Constant Type	Test Method		
		Appearance	No defects or abnormaliti	es.	Solder the capacitor to the test jig (glass epoxy board) in the		
11	Vibration Resistance	Capacitance Q/D.F.	Within the specified tolers 30pF min.: Q≥1000 30pF max.: Q≥400+20C C: Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.025 max. 0.035 max. Y5V 0.05 max. 0.07 max.	same manner and under the same conditions as (10). 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 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).		
			No cracking or marking d	efects shall occur.	Solder the capacitor to the test jig (glass epoxy boards) 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		
12	Deflection		0.4±0.05-II-	100	heat shock. 20 50 Pressurizing speed: 1.0mm/sec. Pressurize Capacitance meter 45 45 (in mm) Fig.3		
13	Solderabi Terminati		75% of the terminations i continuously.	s to be soldered evenly and	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.		
			The measured and obserspecifications in the follow	ved characteristics shall satisfy the wing table.			
		Appearance No marking defects.			Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	X7R ······· Within±7.5% Y5V ······ Within±20%	capacitor in a eutectic solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant		
14	Resistance to Soldering Heat	Q/D.F.	30pF and over : Q≥1,000 30pF and below : Q≥400+20C C : Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.025 max. 0.035 max. Y5V 0.05 max. 0.07 max.	type), then measure. • Initial measurement for high dielectric constant type Perform a heat treatment at 150±9₀ ℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial		
		I.R.	More than 10,000MΩ or	500Ω • F (Whichever is smaller)	measurement.		
		Dielectric Strength	No failure				
			The measured and obserspecifications in the follow	ved characteristics shall satisfy the wing table.	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles		
		Appearance	No marking defects.		according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type)		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	X7R ······· Within±7.5% Y5V ······ Within±20%	or 48±4 hours (high dielectric constant type) at room temperature, then measure.		
15	Temperature Cycle	Q/D.F.	30pF and over : Q≥1,000 30pF and below : Q≥400+20C C : Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.025 max. 0.035 max. Y5V 0.05 max. 0.07 max.	Step 1 2 3 4 Temp.(℃) Min. Operating Temp. ⁺ ⊙ Room Temp. ⁺ ⊙ Room Temp. ⁺ ⊙ Temp. ⁺ ⊙ Temp. Time(min.) 30±3 2 to 3 30±3 2 to 3		
		I.R.	More than 10,000MΩ or	500Ω • F (Whichever is smaller)	Initial measurement for high dielectric constant type Perform a heat treatment at 150 ⁺ 0 °C for one hour and then		
		Dielectric Strength No failure			let sit for 48±4 hours at room temperature. Perform the initial measurement.		



Continued from the preceding page.

	Continued from the preceding page.								
				Specification					
No.	lte	em	Temperature Compensating Type	High Dielectric Constant Type	Test Method				
			The measured and obserspecifications in the follow	rved characteristics shall satisfy the wing table.					
		Appearance	No marking defects.						
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	X7R ······· Within±12.5% Y5V ······ Within±30%	Sit the capacitor at 40±2℃ and 90 to 95% humidity for 500±12				
16	Humidity, Steady State	Q/D.F.	30pF and over : Q≥350 10pF and over, 30pF and below : Q≥275+ ½-C 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.05 max. 0.05 max. Y5V 0.075 max. 0.1 max.	hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.				
		I.R.	More than 1,000MΩ or 5	0Ω • F (Whichever is smaller)					
		The measured and observed characteristics shall satisfy the specifications in the following table.							
		Appearance	No marking defects.						
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	X7R ······· Within±12.5% Y5V ····· Within±30%	Apply the rated voltage at 40±2℃ and 90 to 95% humidity for				
17	Humidity Load	Q/D.F.	30pF and over : Q≥200 30pF and below : Q≥100+ ⅓ C C : Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.05 max. 0.05 max. Y5V 0.075 max. 0.1 max.	500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA.				
		I.R.	More than 500MΩ or 250	2 • F (Whichever is smaller)					
		Dielectric Strength	No failure						
			The measured and obserspecifications in the follow	rved characteristics shall satisfy the wing table.					
		Appearance	No marking defects.						
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	X7R ······· Within±12.5% Y5V ······ Within±30%	Apply 200% of the rated voltage for 1,000±12 hours at the maximum operating temperature ±3℃. Let sit for 24±2 hours				
18	High Temperature Load	Q/D.F.	30pF and over : Q≥350 10pF and over, 30pF and below : Q≥275+ ½ C 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	Char. 25V min. 16V X7R 0.04 max. 0.05 max. Y5V 0.075 max. 0.1 max.	(temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.				
		I.R.	More than 1,000MΩ or 5	0Ω • F (Whichever is smaller)					
		Dielectric Strength	No failure						

Table A

			(Capacitance Cha	nge from 25℃ (%)	
Char.	Temp. Coeff. (ppm/℃) Note 1	-5	5℃	-30℃		−10 ℃	
	(ppin/c) Note i	Max.	Min.	Max.	Min.	Max.	Min.
COG	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11

Note 1 : Nominal values denote the temperature coefficient within a range of 25 to 125°C.

CHIP MONOLITHIC CERAMIC CAPACITOR



for Ultrasonic Sensors ZLM Type

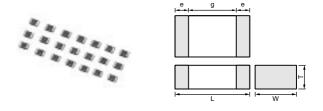
■ Features

- 1. Proper to compensate for ultrasonic sensor.
- 2. Small chip size and high cap. Value.

■ Application

Ultrasonic sensor

(Back sonar, Corner sonar and etc.)



Part Number		Dimensions (mm)						
	L	W	T	е	g min.			
GRM40	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	0.7			

Part Number	Rated Voltage (Vdc)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM40ZLM102K100	100	ZLM	1000 ±10%	2.0 ±0.1mm	1.25 ±0.1mm	0.85 ±0.1mm
GRM40ZLM152K100	100	ZLM	1500 ±10%	2.0 ±0.1mm	1.25 ±0.1mm	0.85 ±0.1mm

No.	lte	em	Specification		Test Method
1	Operating Temperat	,	-25°C to +85°C		
The rated voltage is defined as the maximum may be applied continuously to the capacitor When AC voltage is superimposed on DC vow whichever is larger, shall be maintained with range.				tinuously to the capacitor. s superimposed on DC voltage, V ^{P-P} or V ^{O-P} ,	
3	Appearan	ice	No defects or abnormalities.	Visual inspection.	
4	Dimensio	ns	Within the specified dimensions.	Using calipers.	
5	Dielectric	Strength	No defects or abnormalities.	applied between the	observed when 300% of the rated voltage is a terminations for 1 to 5 seconds, provided ge current is less than 50mA.
6	Insulation (I.R.)	Resistance	More than 10,000M Ω or 500 Ω • F. (Whichever is smaller)		tance shall be measured with a DC voltage ated voltage at 20℃ and 75%RH max. and charging.
7	Capacita	nce	Within the specified tolerance.	The capacitance/D	F. shall be measured at 20℃ with 1±0.1kHz
8	Dissipatio (D.F.)	n Factor	0.01 max.		E0.2Vr.m.s. in voltage.
9	Capacitar Temperati		Within −4,700±½:500 ppm/℃ (at −25 to +20℃)	capacitance measu When cycling the te 5, the capacitance s temperature coeffic The capacitance ch each specified temp	ange shall be measured after 5 min. at perature stage.
9	Character		Within −4,700 ±500 ppm/°C (at ±20 to ±85°C)	Step	Temperature(℃)
				1	20±2
				3	-25±3 20±2
				4	85±3
				5	20±2
10	Adhesive Strength of Termination		No removal of the terminations or other defect shall occur.	Fig.1 using a eutect direction of the arro The soldering shall reflow method and	r to the test jig (glass epoxy board) shown in tic solder. Then apply 10N force in the w. be done either with an iron or using the shall be conducted with care so that the sold free of defects such as heat shock. Solder resist Baked electrode or copper foil a b c 1.2 4.0 1.65 (in mm)
		Annogranas	No defects or appermalities	Coldor the same-"-	
		Appearance	No defects or abnormalities.		r to the test jig (glass epoxy board) in the under the same conditions as (10).
11	Vibration Resistance	D.F.	Within the specified tolerance. 0.01 max.	The capacitor shall having a total ampli uniformly between t frequency range, fro traversed in approx	be subjected to a simple harmonic motion tude of 1.5mm, the frequency being varied the approximate limits of 10 and 55Hz. The om 10 to 55Hz and return to 10Hz, shall be imately 1 minute. This motion shall be of 2 hours in each 3 mutually perpendicular

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No.	ltem			
		The state of the s		

No.	lte	m	Specification	Test Method			
			No cracking or marking defects shall occur.	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig.3.			
12	12 Deflection		Type a b c GRM40 1.2 4.0 1.65 (in mm)	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/sec. Pressurize Capacitance meter 45 45 (in mm) Fig.3			
13	3 Solderability of Termination		75% of the terminations is 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). Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.			
		Appearance	No defects or abnormalities.				
	Resistance	Capacitance Change	Within ±7.5%	Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the			
14	to Soldering	D.F.	0.01 max.	capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours , then			
	Heat	I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)	measure.			
		Dielectric Strength	No failure				
		Appearance	No defects or abnormalities.	Fix the capacitor to the supporting jig in the same manner and			
	Tomporoturo	Capacitance Change	Within ±7.5%	under the same conditions as (11). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room tem-			
15	Temperature Cycle	D.F.	0.01 max.	perature, then measure.			
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)	Step 1 2 3 4 Temp.(°C) -25^{+0}_{-3} RoomTemp. 85^{+3}_{-3} RoomTemp.			
		Dielectric Strength	No failure	Time(min.) 30±3 2 to 3 30±3 2 to 3			
		Appearance	No defects or abnormalities.				
	Humidity,	Capacitance Change	Within ±12.5%	Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours.			
16	Steady State	D.F.	0.02 max.	Remove and let sit for 24±2 hours at room temperature, then			
	State	I.R.	More than 1,000MΩ or 50Ω • F (Whichever is smaller)	measure.			
		Dielectric Strength	No failure				
		Appearance	No defects or abnormalities.				
17	Humidity Load	Capacitance Change	Within ±12.5%	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less			
	Loau	D.F.	0.02 max.	perature, then measure. The charge/discharge current is less than 50mA.			
		I.R.	More than $500 \mathrm{M}\Omega$ or 25Ω • F (Whichever is smaller)				
		Appearance	No defects or abnormalities.				
18	High Temperature	Capacitance Change	Within ±12.5%	Apply 200% of the rated voltage for 1,000±12 hours at 85±3°C. Let sit for 24±2 hours at room temperature, then measure.			
	Load	D.F.	0.02 max.	The charge/discharge current is less than 50mA.			
		I.R.	More than 1,000M Ω or 50 Ω • F (Whichever is smaller)				

CHIP MONOLITHIC CERAMIC CAPACITOR

GRQ706



High-frequency for Flow/Reflow Soldering GRQ Series

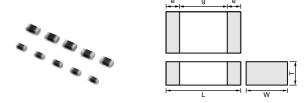
■ Features

- 1.HiQ and low ESR at VHF, UHF, Microwave.
- 2. Feature improvement, low power consumption for mobile telecommunication (Base station, terminal, etc.)



Part Number

High-frequency circuit (Mobile telecommunication, etc.)



Part Number	Dimensions (mm)						
Part Number	L	W	Т	е	g min.		
GRQ706	1.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.2 to 0.5	0.5		
GRQ708	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	0.7		

GRQ708

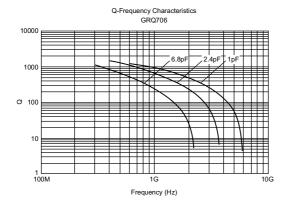
Part Number	GRQ706		GRQ708			
L x W(mm)	1.60x0.80		2.00x1.25			
TC Code	C)G		0G		
Rated Volt.(Vdc)	50	100	50	100		
Capacitance and T(mm)					
0.5pF		0.80		0.85		
0.75pF		0.80		0.85		
1.0pF		0.80		0.85		
1.1pF		0.80		0.85		
1.2pF		0.80		0.85		
1.3pF		0.80		0.85		
1.5pF		0.80		0.85		
1.6pF		0.80		0.85		
1.8pF		0.80		0.85		
2.0pF		0.80		0.85		
2.2pF		0.80		0.85		
2.4pF		0.80		0.85		
2.7pF		0.80		0.85		
3.0pF		0.80		0.85		
3.3pF		0.80		0.85		
3.6pF		0.80		0.85		
3.9pF		0.80		0.85		
4.0pF		0.80		0.85		
4.3pF		0.80		0.85		
4.7pF		0.80		0.85		
5.0pF		0.80		0.85		
5.1pF		0.80		0.85		
5.6pF		0.80		0.85		
6.0pF		0.80		0.85		
6.2pF		0.80		0.85		
6.8pF		0.80		0.85		
7.0pF	0.80			0.85		
7.5pF	0.80			0.85		
8.0pF	0.80			0.85		
8.2pF	0.80			0.85		
9.0pF	0.80			0.85		
9.1pF	0.80			0.85		
10.0pF	0.80			0.85		
11pF	0.80			0.85		
12pF	0.80			0.85		



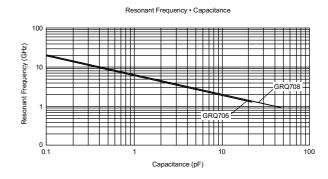
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Part Number	GRQ706 1.60x0.80		G	RQ708	
L x W(mm)			2.00x1.25		
TC Code	COG		COG		
Rated Volt.(Vdc)	.(Vdc) 50 100		50	100	
Capacitance and	T(mm)				
13pF	0.80			0.85	
15pF	0.80			0.85	
16pF	0.80			0.85	
18pF	0.80			0.85	
20pF	0.80		0.85		
22pF	0.80		0.85		
24pF	0.80		0.85		
27pF			0.85		
30pF			0.85		
33pF			0.85		
36pF			0.85		
39pF			0.85		
43pF			0.85		
47pF			0.85		

■ Q-Frequency Characteristics



■ Resonant Frequency-Capacitance



No.			Item Specification		Test Method		
1	1 Operating Temperature Range 2 Rated Voltage 3 Appearance 4 Dimensions		perature Range				
2					defined as the maximum voltage which tinuously to the capacitor. superimposed on DC voltage, V ^{P-P} or V ^{O-P} , shall be maintained within the rated voltage		
3			No defects or abnormalities.	Visual inspection.			
4	Dimensio	ns	Within the specified dimensions.	Using calipers.			
5	Dielectric	Strength	No defects or abnormalities.	applied between the	bserved when 300% of the rated voltage is eterminations for 1 to 5 seconds, provided e current is less than 50mA.		
6	Insulation (I.R.)	Resistance	More than 10,000M Ω or 500 Ω • F. (Whichever is smaller)		ance shall be measured with a DC voltage ated voltage at 25°C and 75%RH max. and charging.		
7	Capacita	nce	Within the specified tolerance.	•	shall be measured at 25°C at the frequency		
				and voltage shown i			
8	Q		Q≥1000	Frequency	1±0.1MHz		
				Voltage	0.5 to 5Vrms		
		Capacitance Change	Within the specified tolerance. (Table A-1)	tance measured in s	efficient is determined using the capaci- step 3 as a reference.		
		Temperature Coefficent	Within the specified tolerance. (Table A-1)	5, the capacitance s	mperature sequentially from step 1 through thall be within the specified tolerance for the ent and capacitance change as Table A.		
9				The capacitance drift between the maximustep 1, 3 and 5 by the	ft is caluculated by dividing the differences um and minimum measured values in the ne cap. value in step 3.		
		Capacitance	Within ±0.2% or ±0.05pF	Step 1	Temperature(°C) 25±2		
		Drift	(Whichever is larger.)	2			
				3	25±2		
				4	125±3		
				5 25±2			
10	Adhesive Streng of Termination		dhesive Strength f Termination No removal of the terminations or other defect shall occur.		to the test jig (glass epoxy board) shown in c solder. Then apply 10N* force in parallel b±1sec. le done either with an iron or using the reflow conducted with care so that the soldering is lefects such as heat shock. *5N (GRQ706) Solder resist Baked electrode or copper foil a b c 1.0 3.0 1.2 1.2 4.0 1.65 (in mm)		
		A	No defeate as also supply	Caldio di	Fig.1		
		Appearance	No defects or abnormalities.		to the test jig (glass epoxy board) in the nder the same conditions as (10).		
11	Vibration Resistance	Capacitance Q	Within the specified tolerance. Q≥1000	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 minute. This motion shall be			



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	Continued fr			Took Mathod			
No.	Ite	ern	Specification	Test Method			
12	12 Deflection		No cracking or marking defects shall occur.	Solder the capacitor to the test jig (glass epoxy board) shown Fig.2 using a eutectic solder. Then apply a force in the directi shown in Fig.3. The soldering shall be done either with an iro or using the reflow method and shall be conducted with care that the soldering is uniform and free of defects such as heat shock. 20 50 Pressurizing speed: 1.0mm/sec. Pressurize			
			Type a b c	Flexure: ≤1			
			GRQ706 1.0 3.0 1.2 GRQ708 1.2 4.0 1.65				
			(in mm)	Capacitance meter 45 45 (in mm)			
			Fig.2	Fig.3			
				Immerse the capacitor in a solution of ethanol (JIS-K-8101) and			
13	Solderability of Termination 75% of the terminations is to be soldered evenly and continuously			rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C.			
			The measured and observed characteristics shall satisfy the specifications in the following table.				
		Appearance	No marking defects.	Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.			
14	Resistance to Soldering	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)				
17	Heat	Q	Q≧1000				
		I.R.	More than $10,000 \text{M}\Omega$ or $500 \Omega \cdot \text{F}$ (Whichever is smaller)				
		Dielectric Strength	No failure				
			The measured and observed characteristics shall satisfy the specifications in the following table.	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10).			
		Appearance	No marking defects.	Perform the five cycles according to the four heat treatments			
15	Temperature	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	listed in the following table. Let sit for 24±2 hours at room temperature, then measure.			
13	Cycle	Q	Q≥1000	Step 1 2 3 4			
		I.R.	More than 10,000M Ω or 500 Ω • F (Whichever is smaller)	Temp.(℃) Min. Operating Room Max. Operating Room Temp.+0/-3 Temp. Temp.+3/-0 Temp.			
		Dielectric Strength	No failure	Time(min.) 30±3 2 to 3 30±3 2 to 3			
			The measured and observed characteristics shall satisfy the specifications in the following table.				
		Appearance	No marking defects.				
16	Humidity, Steady	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours.			
	State	Q	Q≥350	Remove and let sit for 24±2 hours (temperature compensating type) at room temperature, then measure.			
		I.R.	More than 1,000M Ω or 50 Ω • F (Whichever is smaller)				
		Dielectric Strength	No failure				
			The measured and observed characteristics shall satisfy the specifications in the following table.				
		Appearance	No marking defects.				
17	Humidity Load	Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less			
	Loau	Q	Q≥200	than 50mA.			
		I.R.	More than $500 \mathrm{M}\Omega$ or 25Ω • F (Whichever is smaller)				
		Dielectric Strength	No failure				



Continued from the preceding page.

No.	Item Specification		Specification	Test Method	
			The measured and observed characteristics shall satisfy the specifications in the following table.		
		Appearance	No marking defects.	Apply 200% of the rated voltage for 1,000±12 hours at the	
18	High Temperature	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	maximum operating temperature ±3℃. Let sit for 24±2 hours (temperature compensating type) at	
	Load	Q	Q≥350	room temperature, then measure.	
		I.R.	More than 1,000M Ω or $50\Omega \cdot F$ (Whichever is smaller)	The charge/discharge current is less than 50mA.	
		Dielectric Strength	No failure		

Table A

	Nominal Values (ppm/°C) Note 1	Capacitance Change from 25℃ (%)					
Char.		−55 ℃		−30 °C		−10℃	
		Max.	Min.	Max.	Min.	Max.	Min.
C0G	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11

Note 1: Nominal values denote the temperature coefficient within a range of 25°C to 125°C. (for C0G)

CHIP MONOLITHIC CERAMIC CAPACITOR



High-Q & High-power GRH/RPN100 Series

■ Features(GRH100 Series)

- 1. The dielectric is composed of low dielectric loss ceramics. This series is perfectly suited to high-frequency applications (VHS-microwave band).
- The series is ultraminiature, yet has a high-power capacity. This is the best capacitor available for transmitter and amplifier circuits such as those in broadcasting equipment and mobile base stations.
- GRH110 type is designed for both flow and reflow soldering and GRH111 type is designed for reflow soldering.
- GRH type capacitors exhibit better solderability and lower solder leaching because of its nickel barriered terminations.

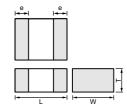
■ Application

High-frequency and high-power circuits.

■ Features(RPN100 Series)

- The dielectric is composed of low dielectric loss ceramics. This series is perfectly suited to highfrequency applications (VHS-microwave band).
- The series is ultraminiature, yet has a high-power capacity. This is the best capacitor available for transmitter and amplifier circuits such as those in broadcasting equipment and mobile base stations.
- 3. RPN type capacitors withstand high temperatures because ribbon leads are attached with silver paste.
- 4. RPN type capacitors are easily soldered and especially well suited in applications where only a soldering iron can be used.

0000



Part Number	Dimensions (mm)					
Fait Number	L	W	Т	е		
GRH110	1.4 ^{+0.6} _{-0.4}	1.4 ^{+0.6} _{-0.4}	0.8 to 1.65	0.25 ^{+0.25} _{-0.15}		
GRH111	2.8 ^{+0.6} _{-0.4}	2.8 ^{+0.6} _{-0.4}	2.0 to 2.8	0.4 + 0.4 - 0.3		



*** : Capacitance Code

Part Number	Dimensions (mm)					
Part Number	L	W	T max.	l	w	
RPN110	1.6 ±0.4	1.4 ±0.4	1.6	5.0 min.	1.3 ±0.4	
RPN111	3.2 ±0.4	2.8 ±0.4	3.0	9.0 ±2.0	2.35 ±0.15	

■ Application

High-frequency and high-power circuits.

Part Number	GRH110			GRH111		1	RPN110			RPN111		
L x W(mm)	1.40x1.40			2.80x2.80			1.60x1.40	3.20x2.80				
TC Code	C0G		-	C0G			C0G	COG				
Rated Volt.(Vdc)	50	50	100 200 300 500 50 50 10							200	300	500
Capacitance and	d T(mm)											
0.5pF	1.20					2.40	1.60					3.00
0.6pF	1.20					2.40	1.60					3.00
0.7pF	1.20					2.40	1.60					3.00
0.8pF	1.20					2.40	1.60					3.00
0.9pF	1.20					2.40	1.60					3.00
1.0pF	1.20					2.40	1.60					3.00
1.1pF	1.20					2.40	1.60					3.00
1.2pF	1.20					2.40	1.60					3.00
1.3pF	1.20					2.40	1.60					3.00
1.4pF	1.20					2.40	1.60					3.00
1.5pF	1.20					2.40	1.60					3.00

 $\begin{tabular}{|c|c|c|c|}\hline \end{tabular}$ Continued from the preceding page.

Part Number	GRH110			GRH111			RPN110			RPN111			
L x W(mm)	1.40x1.40			2.80x2.80			1.60x1.40			3.20x2.80			
TC Code	C0G			C0G			C0G			C0G			
Rated Volt.(Vdc)	50	50	100	200	300	500	50	50	100	200	300	500	
Capacitance and	I T(mm)												
1.6pF	1.20					2.40	1.60					3.00	
1.7pF	1.20					2.40	1.60					3.00	
1.8pF	1.20					2.40	1.60					3.00	
1.9pF	1.20					2.40	1.60					3.00	
2.0pF	1.20					2.40	1.60					3.00	
2.1pF	1.20					2.40	1.60					3.00	
2.2pF	1.20					2.40	1.60					3.00	
2.4pF	1.20					2.40	1.60					3.00	
2.7pF	1.20					2.40	1.60					3.00	
3.0pF	1.20					2.40	1.60					3.00	
3.3pF	1.20					2.40	1.60					3.00	
3.6pF	1.20					2.40	1.60					3.00	
3.9pF	1.20					2.40	1.60					3.00	
4.3pF	1.20					2.40	1.60					3.00	
4.7pF	1.20					2.40	1.60					3.00	
5.1pF	1.20					2.40	1.60					3.00	
5.6pF	1.20					2.40	1.60					3.00	
6.2pF	1.20					2.40	1.60					3.00	
6.8pF	1.20					2.40	1.60					3.00	
7.5pF	1.20					2.40	1.60					3.00	
8.2pF	1.20					2.40	1.60					3.00	
9.1pF	1.20					2.40	1.60					3.00	
10.0pF	1.20					2.40	1.60					3.00	
11pF	1.20					2.40	1.60					3.00	
12pF	1.20					2.40	1.60					3.00	
13pF	1.20					2.40	1.60					3.00	
15pF	1.20					2.40	1.60					3.00	
16pF	1.20					2.40	1.60					3.00	
18pF	1.20					2.40	1.60					3.00	
20pF	1.20					2.40	1.60					3.00	
22pF	1.20					2.40	1.60					3.00	
24pF	1.20					2.40	1.60					3.00	
27pF	1.20					2.40	1.60					3.00	
30pF	1.20					2.40	1.60					3.00	
33pF	1.20					2.40	1.60					3.00	
36pF	1.20					2.40	1.60					3.00	
39pF	1.20					2.40	1.60					3.00	
43pF	1.20					2.40	1.60					3.00	
47pF	1.20					2.40	1.60					3.00	
51pF	1.20					2.40	1.60					3.00	
56pF	1.20					2.40	1.60					3.00	
62pF	1.20					2.40	1.60					3.00	
68pF	1.20					2.40	1.60					3.00	
75pF	1.20					2.40	1.60					3.00	
82pF	1.20					2.40	1.60					3.00	
91pF	1.20					2.40	1.60					3.00	
100pF	1.20					2.40	1.60					3.00	
110pF	1.20				2.40	2.40	1.00				3.00	3.00	
120pF					2.40		+				3.00		
130pF					2.40		+				3.00		
					2.40		+ +				3.00		
150pF													
160pF					2.40						3.00		
180pF					2.40						3.00		

Continued from the preceding page.

Part Number	GRH110			GRH111			RPN110		RPN111						
L x W(mm)	1.40x1.40			2.80x2.80			1.60x1.40			3.20x2.80					
TC Code	C0G			C0G			C0G			C0G					
Rated Volt.(Vdc)	50	50	100	200	300	500	50	50	100	200	300	500			
Capacitance and	d T(mm)														
220pF				2.40						3.00					
240pF				2.40						3.00					
270pF				2.40						3.00					
300pF				2.40						3.00					
330pF				2.40						3.00					
360pF				2.40						3.00					
390pF				2.40						3.00					
430pF				2.40						3.00					
470pF				2.40						3.00					
510pF			2.40						3.00						
560pF			2.40						3.00						
620pF			2.40						3.00						
680pF			2.40						3.00						
750pF		2.40						3.00							
820pF		2.40						3.00							
910pF		2.40						3.00							
1000pF		2.40						3.00							

No.	lte	em	Specification		Test Method				
1	Operating Temperati		−55°C to +125°C						
2	Rated Vo	ltage	See the previous pages.	may be applied continu When AC voltage is su	fined as the maximum voltage which lously to the capacitor. perimposed on DC voltage, V ^{P-P} or V ^{O-P} , all be maintained within the rated voltage				
3	Appearar	nce	No defects or abnormalities.	Visual inspection.					
4	Dimensio	ns	Within the specified dimension.	Using calipers.					
5	Dielectric	Strength	No defects or abnormalities.	applied between the ter	erved when 250% of the rated voltage is rminations for 1 to 5 seconds, provided urrent is less than 50mA.				
6	Insulation Resistance	25℃	C≦ 470pF:1,000,000MΩ min. 470pF <c≦1,000pf: 100,000mω="" min.<="" td=""><td colspan="6" rowspan="2">The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25℃ and 125℃ standard humidity and within 2 minutes of charging.</td></c≦1,000pf:>	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25℃ and 125℃ standard humidity and within 2 minutes of charging.					
	(I.R.)	125℃	C≦ 470pF : $100,000M\Omega$ min. 470pF < C≦1,000pF : $10,000M\Omega$ min.						
7	Capacita	nce	Within the specified tolerance.		ll be measured at 25℃ at the frequency				
8	Q		C≦ 220pF: Q≥10,000 220pF <c≦ 470pf:="" 5,000<br="" q≥="">470pF<c≦1,000pf: 3,000<="" q≥="" td=""><td>and voltage shown in the Item Char Frequency</td><td>COG (1,000pF and below) 1±0.1MHz</td></c≦1,000pf:></c≦>	and voltage shown in the Item Char Frequency	COG (1,000pF and below) 1±0.1MHz				
			C : Nominal Capacitance (pF)	Voltage	0.5 to 5Vr.m.s.				
		Capacitance Variation Rate	Within the specified tolerance. (Table A-7)	tance measured in step temperature sequential	cient is determined using the capaci- o 3 as a reference. When cycling the ly from step 1 through 5, the capaci-				
		Temperature Coefficient	Within the specified tolerance. (Table A-7)	coefficient and capacita	e specified tolerance for the temperature ance change as Table A. s calculated by dividing the differences				
9	9 Capacitance Temperature Characteristics C.	Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)	between the maximum step 1, 3 and 5 by the co	and minimum measured values in the cap. value in step 3. ge shall be measured after 5 min. at				
				5	25±2				
10	Terminal	Adhesive Strength of Termination (for chip type)	No removal of the terminations or other defects shall occur.	Solder the capacitor to Fig.1 using solder conta done either with an iron care so the soldering is shock. Then apply a 10	the test jig (alumina substrate) shown in aining 2.5% silver. The soldering shall be or in furnace and be conducted with uniform and free of defects such as heat N force in the direction of the arrow.				
10	Strength	Tensile Strength (for micro- strip type)	Capacitor shall not be broken or damaged.		ixed and a load is applied gradually in its value reaches 10N (5N for RPN110).				
		Bending Strength of lead wire terminal (for micro- strip type)	Lead wire shall not be cut or broken.	nal is perpendicular, an Bend the main body by	of the capacitor so the lead wire terminal load 2.5N to the lead wire terminal. 90 degrees, bend back to original posinithe reverse direction, and then bend in.				



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No.	lte	em	S	Specification	Test Method
		Appearance Capacitance	No defects or abnormalities Within the specified tolera		Solder the capacitor to the test jig (alumina substrate) shown in Fig.2 using solder containing 2.5% silver. The soldering shall be done either with an iron or using the reflow method and shall be
11	Vibration Resistance	Q	Satisfies the initial value. C≤ 220pF : Q≥1 220pF < C≤ 470pF : Q≥ 470pF < C≤1,000pF : Q≥ C : Nominal Capacitance	5,000 3,000	conducted with care so the soldering is uniform and free of defects such as heat shock. 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 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).
					Fig. 2
12	Solderab Terminati	•		o 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). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating immerse in solder containing 2.5% silver for 5±0.5 seconds at 230±5°C. The dipping depth for microstrip type capacitors is up to 1 mm from the root of the terminal.
			The measured and obse specifications in the follow	rved characteristics shall satisfy the	
13	Resistance to Soldering Heat		Item Appearance Capacitance Change	Specification No marked defect Within ±2.5% or ±0.25pF (Whichever is larger) C≦ 220pF : Q≥10,000 220pF <c≤ 470pf="" 5,000<="" :="" q≥="" td=""><td>Preheat the capacitor at 80 to 100°C for 2 minutes and then at 150 to 200°C for 5 minutes. Immerse in solder containing 2.5% silver for 3±0.5 seconds at 270±5°C. Set at room temperature for 24±2 hours, then mea-</td></c≤>	Preheat the capacitor at 80 to 100°C for 2 minutes and then at 150 to 200°C for 5 minutes. Immerse in solder containing 2.5% silver for 3±0.5 seconds at 270±5°C. Set at room temperature for 24±2 hours, then mea-
	to Soldering F		I.R. Dielectric Strength	470pF <c≤1,000pf: 25℃.="" 3,000="" 30%="" at="" failure<="" initial="" more="" no="" of="" q≥="" specification="" td="" than="" the="" value=""><td>sure. The dipping depth for microstrip type capacitors is up to 2mm from the root of the terminal.</td></c≤1,000pf:>	sure. The dipping depth for microstrip type capacitors is up to 2mm from the root of the terminal.
			_	C : Nominal Capacitance (pF)	
14	Tempera Cycle	ture	The measured and obse specifications in the follow Item Appearance Capacitance Change	Specification	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11). Perform the five cycles according to the four heat treatments listed in the following table. Then, repeat twice the successive cycles of immersion, each cycle consisting of immersion in a fresh water at 65^{+5}_{-5} °C for 15 minutes and immersion in a saturated uqueous solution of salt at 0 ± 3 °C for 15 minutes. The cpapcitor is promptly washed with running water, dried with a
			I.R.	470pF <c≦1,000pf 3,000<br="" :="" q≧="">More than 30% of the initial specification value at 25°C.</c≦1,000pf>	dry cloth, and allowed to sit at room temperature for 24±2 hours. Step 1 2 3 4
			Dielectric Strength	No failure	
				C : Nominal Capacitance (pF)	Apply the 24-hour heat (-10 to +65°C) and humidity (80 to 98%) treatment shown below, 10 consecutive times. Remove, set for 24±2 hours at room temperature, and measure.
			The measured and obse specifications in the follow	rved characteristics shall satisfy the ing table.	C Humidity 80–98% Humidity 80–88% Humidity 80–
			Appearance Capacitance	No marked defect Within ±5% or ±0.5pF	55 50 45
15	Humidity		Change	(Whichever is larger) C≦ 220pF : Q≥10,000	9 40 9 40 9 35 9 35 9 20 9 20
			Q 	220pF <c≤ 470pf:="" 5,000<br="" q≥="">470pF<c≤1,000pf: 3,000<br="" q≥="">More than 30% of the initial spec-</c≤1,000pf:></c≤>	15
			I.R.	ification value at 25°C. C: Nominal Capacitance (pF)	10 Initial measurement 5 0 Applied voltage 50Vdc
				- · · · · · · · · · · · · · · · · · · ·	-3 -10 One cycle 24 hours
					0 1 2 3 4 5 6 7 8 9 10 1112 13 14 15 16 17 18 19 2021 22 23 24 → Hours

Continued from the preceding page.

No.	Item		Specification	Test Method
		The measured and obser the specifications in the fo	ved characteristics shall satisfy bllowing table.	
		Item	Specification	
		Appearance	No marked defect	
		Capacitance	Within ±2.5% or ±0.25pF	Apply 150% of the rated voltage for 2,000±12 hours at 125±3℃.
4.0	High Temperature	Change	(Whichever is larger)	Remove and set for 24±2 hours at room temperature, then
16	High Temperature Load	$C \le 220 pF : Q \ge 10,000$ $Q \qquad \qquad 220 pF < C \le 470 pF : Q \ge 5,000$ $470 pF < C \le 1,000 pF : Q \ge 3,000$		measure. The charge/discharge current is less than 50mA.
		I.R.	More than 30% of the initial specification value at 25℃.	
			C : Nominal Capacitance (pF)	

Table A

	T		Capacitance Change from 25℃ Value (%)									
Char.	Temp. Coeff. (ppm/°C) Note 1	-5	5℃	-3	0℃	–10℃						
	(ррпії с) чосе т	Max.	Min.	Max.	Min.	Max.	Min.					
C0G	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11					

Note 1 : Nominal values denote the temperature coefficient within a range of 25 to 125°C.

High-frequency GRH/RPN700 Series

■ Features(GRH700 Series)

- 1. Negligible inductance is achieved by its monolithic structure so the series can be used at frequencies above 1GHz.
- 2. Nickel barriered terminations of GRH type improve solderability and decrease solder leaching.
- GRH706/GRH708 type is designed for both flow and reflow soldering and GRH710 type is designed for reflow soldering.

■ Application

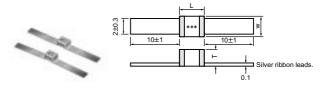
High-frequency and high-power circuits.

■ Features(RPN700 Series)

- Negligible inductance is achieved by its monolithic structure so the series can be used at frequencies above 1GHz.
- 2. RPN type capacitors withstand at high temperatures because ribbon leads are attached with silver paste.
- RPN type capacitors are easily soldered and are especially well suited in applications where only a soldering iron can be used.



Part Number		Dimensio	ns (mm)			
Part Number	L	W	T max.	е	g min.	
GRH706	1.25 ^{+0.5} _{-0.3}	1.0 +0.5	1.2	0.15 min.	0.3	
GRH708	2.0 +0.5 - 0.3	1.25 ^{+0.5} _{-0.3}	1.45	0.2 max.	0.5	
GRH710	3.2 ^{+0.6} _{-0.4}	2.5 +0.5 -0.3	1.9	0.3 max.	0.5	



*** : Capacitance Code

Part Number	Dimensions (mm)								
Part Number	L max.	W max.	T max.						
RPN710	4.0	3.0	2.3						

■ Application

High-frequency and high-power circuits.

Part Number		GRH706			GRH708			GRH710			RPN710	
L x W(mm)		1.25x1.00			2.00x1.25			3.20x2.50			4.00x3.00	
TC Code		C0G			C0G			C0G			C0G	
Rated Volt.(Vdc)	50	100	200	50	100	200	50	100	200	50	100	200
Capacitance and	T(mm)								•			
0.5pF			1.20			1.45			1.90			2.30
0.6pF			1.20			1.45			1.90			2.30
0.7pF			1.20			1.45			1.90			2.30
0.8pF			1.20			1.45			1.90			2.30
0.9pF			1.20			1.45			1.90			2.30
1.0pF			1.20			1.45			1.90			2.30
1.1pF			1.20			1.45			1.90			2.30
1.2pF			1.20			1.45			1.90			2.30
1.3pF			1.20			1.45			1.90			2.30
1.4pF			1.20			1.45			1.90			2.30
1.5pF			1.20			1.45			1.90			2.30
1.6pF			1.20			1.45			1.90			2.30
1.7pF			1.20			1.45			1.90			2.30
1.8pF			1.20			1.45			1.90			2.30
1.9pF			1.20			1.45			1.90			2.30
2.0pF			1.20			1.45			1.90			2.30
2.1pF			1.20			1.45			1.90			2.30
2.2pF			1.20			1.45			1.90			2.30
2.4pF			1.20			1.45			1.90			2.30
2.7pF			1.20			1.45			1.90			2.30

 $\begin{tabular}{|c|c|c|c|}\hline \end{tabular}$ Continued from the preceding page.

Part Number		GRH706			GRH708			GRH710			RPN710	
L x W(mm)		1.25x1.00			2.00x1.25			3.20x2.50			4.00x3.00	
TC Code		COG			C0G			COG			C0G	
Rated Volt.(Vdc)	50	100	200	50	100	200	50	100	200	50	100	200
Capacitance and	T(mm)							•				
3.0pF			1.20			1.45			1.90			2.30
3.3pF			1.20			1.45			1.90			2.30
3.6pF			1.20			1.45			1.90			2.30
3.9pF			1.20			1.45			1.90			2.30
4.3pF			1.20			1.45			1.90			2.30
4.7pF			1.20			1.45			1.90			2.30
5.1pF			1.20			1.45			1.90			2.30
5.6pF			1.20			1.45			1.90			2.30
6.2pF			1.20			1.45			1.90			2.30
6.8pF			1.20			1.45			1.90			2.30
7.5pF			1.20			1.45			1.90			2.30
8.2pF			1.20			1.45			1.90			2.30
9.1pF			1.20			1.45			1.90			2.30
10pF			1.20			1.45			1.90			2.30
11pF			1.20			1.45			1.90			2.30
12pF			1.20			1.45			1.90			2.30
13pF			1.20			1.45			1.90			2.30
15pF		1.20	20			1.45			1.90			2.30
16pF		1.20				1.45			1.90			2.30
18pF		1.20				1.45			1.90			2.30
20pF		1.20				1.45			1.90			2.30
22pF		1.20				1.45			1.90			2.30
24pF	1.20	1.20				1.45			1.90			2.30
27pF	1.20					1.45			1.90			2.30
30pF	1.20					1.45			1.90			2.30
33pF	1.20					1.45			1.90			2.30
36pF	1.20					1.45			1.90			2.30
39pF	1.20					1.45			1.90			2.30
43pF	1.20					1.45			1.90			2.30
47pF	1.20					1.45 1.45			1.90 1.90			2.30
51pF 56pF	1.20				1.45	1.45			1.90			2.30
62pF					1.45				1.90			2.30
68pF					1.45				1.90			2.30
75pF					1.45				1.90			2.30
82pF					1.45				1.90			2.30
91pF				1 45	1.45				1.90			2.30
100pF				1.45					1.90			2.30
110pF				1.45					1.90			2.30
120pF				1.45					1.90			2.30
130pF				1.45					1.90			2.30
150pF				1.45					1.90			2.30
160pF				1.45				1.00	1.90		0.00	2.30
180pF								1.90			2.30	
200pF								1.90			2.30	
220pF								1.90			2.30	
240pF								1.90			2.30	
270pF								1.90			2.30	
300pF								1.90			2.30	
330pF								1.90			2.30	
360pF								1.90			2.30	
390pF								1.90			2.30	
430pF					1			1.90			2.30	I

Part Number		GRH706			GRH708		GRH710			RPN710			
L x W(mm)		1.25x1.00			2.00x1.25			3.20x2.50		4.00x3.00			
TC Code	COG			COG			C0G			C0G			
Rated Volt.(Vdc)	50	100	200	50	100	200	50	100	200	50	100	200	
Capacitance and	T(mm)												
510pF								1.90			2.30		
560pF							1.90			2.30			
620pF							1.90			2.30			
680pF							1.90			2.30			
750pF							1.90			2.30			
820pF							1.90			2.30			
910pF							1.90			2.30			
1000pE							1.00			2.20			

No	lte	em	Specification	Test Method	
1	Operating Temperati		−55°C to +125°C		
2	2 Rated Voltage		See the previous pages.	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{p,p} or V ^{o,p} , whichever is larger, shall be maintained within the rated voltage range.	
3	Appearar	nce	No defects or abnormalities.	Visual inspection.	
4	Dimensio	ns	Within the specified dimension.	Using calipers.	
5	Dielectric	Strength	No defects or abnormalities.	No failure shall be observed when 300% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.	
6	Insulation (I.R.)	Resistance	10,000M Ω min.	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25℃ and standard humidity and within 2 minutes of charging.	
7	Capacita	nce	Within the specified tolerance.	The capacitance/Q shall be measured at 25℃ at the frequency	
8	·		C≦ 220pF: Q≧10,000 220pF <c≦ 470pf:="" 5,000<br="" q≧="">470pF<c≦1,000pf: 3,000<br="" q≧="">C: Nominal Capacitance (pF)</c≦1,000pf:></c≦>	and voltage shown in the table. Item	
		Capacitance Variation Rate	Within the specified tolerance. (Table A-6)	The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, the capacitance of t	
		Temperature Coefficient	Within the specified tolerance. (Table A-6)	tance shall be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences	
9	Capacitance Temperature Characteristics	Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)	between the maximum and minimum measured values in the step 1, 3 and 5 by the cap. value in step 3. The capacitance change shall be measured after 5 min. at each specified temperature stage. Step Temperature(°C) 1 25±2 2 -55±3 3 25±2 4 125±3 5 25±2	
10	Terminal	Adhesive Strength of Termination (for chip type)	No removal of the terminations or other defects shall occur.	Solder the capacitor to the test jig (alumina substrate) shown in Fig.1 using solder containing 2.5% silver. The soldering shall be done either with an iron or in furnace and be conducted with care so the soldering is uniform and free of defects such as heat shock. Then apply a 10N* force in the direction of the arrow. *5N (GRH 706)	
	Strength	Tensile Strength (for micro- strip type)	Capacitor shall not be broken or damaged.	The capacitor body is fixed and a load is applied gradually in the axial direction until its value reaches 5N.	
		Bending Strength of lead wire terminal (for micro- strip type)	Lead wire shall not be cut or broken.	Position the main body of the capacitor so the lead wire terminal is perpendicular, and load 2.5N to the lead wire terminal. Bend the main body by 90 degrees, bend back to original position, bend 90 degrees in the reverse direction, and then bend back to original position.	



Continued from the preceding page.

	ltem		Specification	Test Method				
	Appearance	No defects or abnormalities	es.	Solder the capa	acitor to th	e test jig (alu	ımina subs	trate) shown ir
	Capacitance	Within the specified tolera	ince.			-		-
11	Vibration Resistance Q	Satisfies the initial value. $C \le 220 pF : Q \ge 10,000$ $220 pF < C \le 470 pF : Q \ge 5,000$ $470 pF < C \le 1,000 pF : Q \ge 3,000$ $C : Nominal Capacitance (pF)$		Fig.2 using solder containing 2.5% silver. The soldering shall I done either with an iron or using the reflow method and shall I conducted with care so the soldering is uniform and free defects such as heat shock. The capacitor shall be subjected to simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate lim of 10 and 55Hz. The frequency range, from 10 to 55Hz are turn to 10Hz, shall be traversed in approximately 1 minute. The motion shall be applied for a period of 2 hours in each 3 mutual perpendicular directions (total of 6 hours). Solder resist Ag/Pd Alumina substrate Fig.2				rm and free of subjected to a of 1.5mm, the oroximate limits 0 to 55Hz and 11 minute. This
				Immerse the ca	apacitor in	a solution of	ethanol (JI	S-K-8101) and
12	Solderability of Termination	rosin (JIS-K-59 80 to 120°C for solder containing The dipping de from the root of	02) (25% r 10 to 30 seng 2.5% sil pth for mic	rosin in weigh econds. After lver for 5±0.9 crostrip type o	nt proportion preheating seconds	n). Preheat at g immerse in at 230±5℃.		
		The measured and obse	erved characteristics shall satisfy the					
		specifications in the follow	ving table.	Preheat accord	ling to the	conditions lis	ted in the t	able below.
		Item	Specification	Immerse in sole	-			
		Appearance	No marked defect	270±5℃. Set a		•		
13	Resistance	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	sure. The dippi		-	type capac	itors is up to
13	to Soldering Heat	Change	C≦ 220pF : Q≥10,000	2mm from the				
		Q	220pF <c≤ 470pf="" 5,000<="" :="" q≥="" td=""><td>Chip Siz</td><td></td><td></td><td>at Condition</td><td></td></c≤>	Chip Siz			at Condition	
			470pF <c≦1,000pf 3,000<="" :="" q≥="" td=""><td>2.0×1.25mm</td><td></td><td></td><td>at 120 to 1</td><td></td></c≦1,000pf>	2.0×1.25mm			at 120 to 1	
		Dielectric Strength	No failure	3.2×2.5mm	Each	n 1 minute at 100	to 120℃ and t	hen 170 to 200℃
			C : Nominal Capacitance (pF)					
		The measured and obsesspecifications in the follow	erved characteristics shall satisfy the					
		Item	Specification	Fix the capacito	or to the su	nnortina iia in	the same	manner and
		Appearance	No marked defect	under the same				
		Capacitance	Within ±5% or ±0.5pF	according to the		. ,		•
14	Temperature		(Whichever is larger)			oom tempera		•
14		Change	(*************************************	Let Sit 101 2412				
	Cycle		C≧30pF : Q≧350	Step	1	2	3	4
	Cycle	Change Q	C≧30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C			2 RoomTemp.		4
	Cycle	Q	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C C<10pF : Q≥200+10C	Step Temp.(℃)	1	RoomTemp.	3	4 RoomTemp.
	Cycle	Q I.R.	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ $\frac{5}{2}$ C C<10pF : Q≥200+10C 1,000MΩ min.	Step	1 -55 ⁺⁰ ₋₃		3 125 ⁺³ _o	4
	Cycle	Q	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C C<10pF : Q≥200+10C 1,000MΩ min. No failure	Step Temp.(℃)	1 -55 ⁺⁰ ₋₃	RoomTemp.	3 125 ⁺³ _o	4 RoomTemp.
	Cycle	Q I.R.	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ $\frac{5}{2}$ C C<10pF : Q≥200+10C 1,000MΩ min.	Step Temp.(℃)	1 -55 ⁺⁰ / ₃ 30±3	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive	3 125+3 30±3 and humidi	4 RoomTemp. 2 to 3
	Cycle	Q I.R. Dielectric Strength	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r	1 -55 ⁺⁰ / ₃ 30±3	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive returner, and returner, and returner with the returner w	3 125+3 30±3 30±3 and humidite times. Reineasure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
	Cycle	Q I.R. Dielectric Strength The measured and obse	C≧30pF : Q≧350 10pF≦C<30pF : Q≧275+ ½ C C<10pF : Q≥200+10C 1,000MΩ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r	1 -55±3 30±3 our heat (- n below, 10 room tempe Huminumidity 80-90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive returner, and returner, and returner with the returner w	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
	Cycle	I.R. Dielectric Strength The measured and obsespecifications in the follow ltem Appearance	C≧30pF : Q≧350 10pF≦C<30pF : Q≧275+ ½ C C<10pF : Q≧200+10C 1,000MΩ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification No marked defect	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r	1 -55±3 30±3 our heat (- n below, 10 room tempe Huminumidity 80-90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive returner, and returner, and returner with the returner w	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C C<10pF : Q≥200+10C 1,000MΩ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r	1 -55±3 30±3 our heat (- n below, 10 room tempe Huminumidity 80-90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive returner, and returner, and returner with the returner w	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
15	Cycle	I.R. Dielectric Strength The measured and obsespecifications in the follow ltem Appearance	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C C<10pF : Q≥200+10C 1,000MΩ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger)	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r	1 -55±3 30±3 our heat (- n below, 10 room tempe Huminumidity 80-90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive returner, and returner, and returner with the returner w	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance Change	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C C<10pF : Q≥200+10C 1,000MΩ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger) C≥30pF : Q≥350	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C TO FS	1 -55±3 30±3 30±3 our heat (– m below, 10 room temper umidity 80–90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive erature, and ridity Humidity 90-98%	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C C<10pF : Q≥200+10C 1,000MΩ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger)	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C TO ES	1 -55±3 30±3 30±3 our heat (– m below, 10 room temper umidity 80–90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive returner, and returner, and returner with the returner w	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance Change	C≥30pF : Q≥350 $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ$ min. No failure C : Nominal Capacitance (pF) erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger) $C \ge 30pF : Q \ge 350$ $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C 70 65 60 55 50 44 40 45 40 45 40 45 40 45 40 45 40 45 40 40	1 -55±3 30±3 30±3 our heat (– m below, 10 room temper umidity 80–90	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive greature, and redity 90-98% 10 to +65°C) 11 to +65°C) 12 to 3	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance Change Q	C≥30pF : Q≥350 10pF≤C<30pF : Q≥275+ ½ C	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C 70 65 60 55 40 45 45 45 45 45 45 45 45 45 45 46 55 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18	1 -55±3 30±3 our heat (— n below, 10 room tempe umidity 80-99 0-98% 1	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive greature, and redity 90-98% 10 to +65°C) 11 to +65°C) 12 to 3	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance Change Q	C≥30pF : Q≥350 $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ \text{ min.}$ No failure $C : \text{Nominal Capacitance (pF)}$ erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger) $C \ge 30pF : Q \ge 350$ $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ \text{ min.}$	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C TO FINAL TO SEPTIMENT STATES	1 -55±3 30±3 our heat (— n below, 10 room tempe umidity 80-99 0-98% 1	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive erature, and right Humidity 89% 440 499-88% 410 c -2 c	3 125+3 30±3 and humidi times. Rei measure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance Change Q	C≥30pF : Q≥350 $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ \text{ min.}$ No failure $C : \text{Nominal Capacitance (pF)}$ erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger) $C \ge 30pF : Q \ge 350$ $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ \text{ min.}$	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C 70 65 60 90 45 40 40 40 40 40 40 40 40 40 40 40 40 40	1 -55±3 30±3 our heat (— n below, 10 room tempe umidity 80-99 0-98% 1	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive erature, and right Humidity 89% 440 499-88% 410 c -2 c	3 125±3 30±3 and humidi times. Remeasure.	RoomTemp. 2 to 3 ty (80 to 98%) move, set for
		I.R. Dielectric Strength The measured and obsespecifications in the follow Item Appearance Capacitance Change Q	C≥30pF : Q≥350 $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ \text{ min.}$ No failure $C : \text{Nominal Capacitance (pF)}$ erved characteristics shall satisfy the ving table. Specification No marked defect Within ±5% or ±0.5pF (Whichever is larger) $C \ge 30pF : Q \ge 350$ $10pF \le C < 30pF : Q \ge 275 + \frac{5}{2} \cdot C$ $C < 10pF : Q \ge 200 + 10C$ $1,000MΩ \text{ min.}$	Step Temp.(°C) Time(min.) Apply the 24-hot treatment show 24±2 hours at r C 70 65 60 95 50 40 45 40 25 10 Initial n 5 -10	1 -55±3 30±3 our heat (-in below, 10 room temper umidity 80-910 0-98% heasurement- Applied v.	RoomTemp. 2 to 3 10 to +65°C) 0 consecutive erature, and ridity Humidity 89% +10 consecutive erature. 10 to +65°C) 10 consecutive erature. 11 to to +65°C) 12 to 3	3 125 ± 3 30±3 and humidi times. Remeasure.	ty (80 to 98%) move, set for

Continued from the preceding page.

No.	Item		Specification	Test Method
		The measured and obsespecifications in the follow	erved characteristics shall satisfy the ving table.	
		Item	Specification	
		_Appearance	No marked defect	Apply 200% of the rated voltage for 1,000±12 hours at 125±3°C.
		Capacitance	Within ±3% or ±0.3pF	
16	High Temperature	Change	(Whichever is larger)	Remove and set for 24±2 hours at room temperature, then
	Load		C≧30pF : Q≧350	measure.
		Q	10pF≦C<30pF : Q≥275+ 5 C	The charge/discharge current is less than 50mA.
			C<10pF : Q≥200+10C	
		I.R.	1,000MΩ min.	
		C : Nominal Capacitance (pF)		

Table A

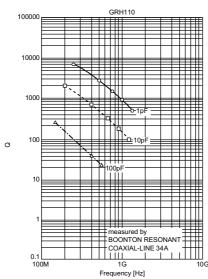
	T	Capacitance Change from 25℃ Value (%)						
Char.	Temperature Coefficient (ppm/°C) Note 1	-5	5℃	-3	0℃	−10℃		
	(ppiii/ c) Note i	Max.	Min.	Max.	Min.	Max.	Min.	
C0G	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11	

Note 1 : Nominal values denote the temperature coefficient within a range of 25 to 125°C.

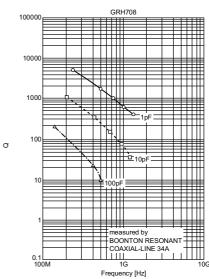
GRH/RPN Series Data

■ Q-Frequency Characteristics



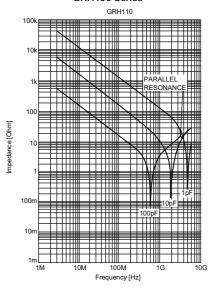


GRH700 Series

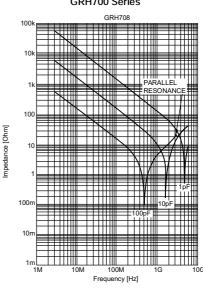


■ Impedance-Frequency Characteristics

GRH100 Series

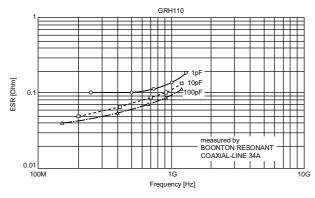


GRH700 Series

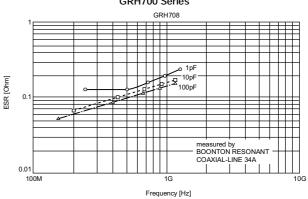


■ ESR-Frequency Characteristics

GRH100 Series





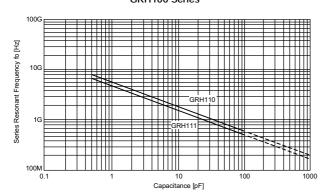


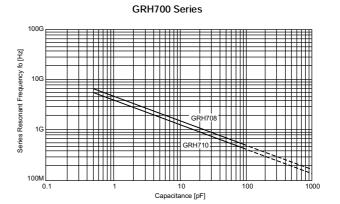
GRH/RPN Series Data

Continued from the preceding page.

■ Resonant Frequency-Capcitance

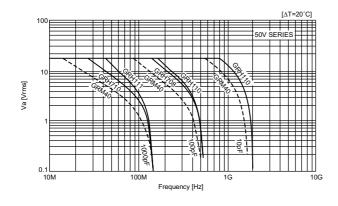
GRH100 Series

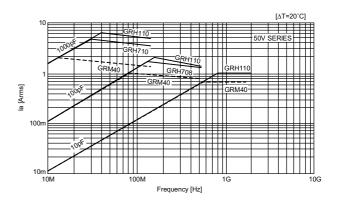




■ Allowable Voltage-Frequency

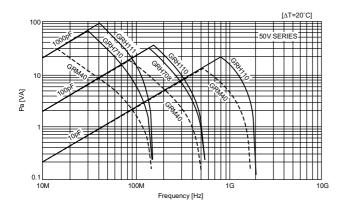
■ Allowable Current-Frequency

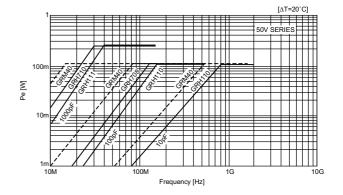




■ Allowable Appearent Power-Frequency

■ Allowable Effcteve Power-Frequency





■ Packaging Code

Dackaging Type	Tape Carrier Packaging	Bulk Coop Dookoging	Bulk Packaging		
Packaging Type	Tape Carrier Packaging	Bulk Case Packaging	Bulk Packaging in a bag	Bulk Packaging in a tray	
Packaging Code	PT	PC	РВ	PM	

■ Minimum Quantity Guide

		Dimensions (mm)			Quantity (pcs.)					
Part Nu	mber	Dilli	ensions (,111111)	φ180mm reel		φ330mm reel		Bulk Case	Dulle Dam
Ultra-miniaturized GRM33		L	W	Т	Paper Tape	Plastic Tape	Paper Tape	Plastic Tape	bulk Case	Bulk Bag
Jltra-miniaturized	GRM33	0.6	0.3	0.3	15,000	=	-	-	-	1,000
	GRM36	1.0	0.5	0.5	10,000	-	50,000	-	50,000	1,000
	GRM39	1.6	0.8	0.8	4,000	-	10,000	-	15,000 ¹⁾	1,000 1)
				0.6	4,000	=	10,000	-	10,000	1,000
Far Flam/Daffam	GRM40	2.0	1.25	0.85	4,000	-	10,000	-	-	1,000
For Flow/Reflow				1.25	-	3,000	-	10,000	5,000	1,000
				0.85	4,000	-	10,000	-	-	1,000
	GRM42-6	3.2	1.6	1.15	-	3,000	-	10,000	-	1,000
				1.6	-	2,000	-	6,000	-	1,000
				1.15	-	3,000	-	10,000	-	1,000
	0011/00		0.5	1.35	-	2,000	-	8,000	-	1,000
For Reflow	GRM42-2	3.2	2.5	1.8	-	1,000	-	4,000	-	1,000
roi Reliow				2.5	-	1,000	-	4,000	-	1,000
	GRM43-2	4.5	3.2	2.0	-	1,000	-	4,000 2)	-	1,000
	GRM44-1	5.7	5.0	2.0	-	1,000	-	4,000 2)	-	1,000
High-power Type	GRM615	1.0	0.5	0.5	10,000	-	50,000	-	50,000	1,000
	GRM420	1.6	0.8	0.8	4,000	-	10,000	-	-	1,000
				0.7	4,000	-	10,000	-	-	1,000
	GRM425	2.0	1.25	1.0	4,000	-	10,000	-	-	1,000
Low-distortion Series	GRM430	3.2	2 1.6	0.7	4,000	-	10,000	-	-	1,000
Series				1.0	4,000	-	10,000	-	-	1,000
				1.25	-	3,000	-	10,000	-	1,000
	GRM435	4.5	2.5	2.0	-	1,000	-	4,000	-	1,000
	GRQ706	1.6	0.8	0.8	4,000	-	10,000	-	-	1,000
	GRQ708	2.0	1.25	1.0	4,000	=	10,000	-	-	1,000
	GRH706	1.25	1.0	1.2	-	=	-	-	-	1,000
High-frequency	GRH708	2.0	1.25	1.45	-	3,000	-	-	-	1,000
	GRH710	3.2	2.5	1.9	-	2,000	-	-	-	1,000
	GRH110	1.4	1.4	1.65	-	2,000	-	-	-	1,000
	GRH111	2.8	2.8	2.8	-	1,000	-	-	-	1,000
For Ultrasonic	GRM40	2.0	1.25	0.85	4,000	-	10,000	-	-	1,000
N4: O1 :	GM250	0.5	0.5	0.35	-	-	-	-	-	400 ³⁾
Micro Chip	GM260	0.8	0.8	0.5	-	-	-	-	-	400 ³⁾
Array	GNM30-401	3.2	1.6	0.8	4,000	=	10,000	-	-	1,000
	LL0306	0.8	1.6	0.6	4,000	=	10,000	-	-	1,000
. 501	LL0508	1.25	2.0	1.0	-	4,000 4)	-	10,000	-	1,000
Low ESL	1100/5	4.5	0.0	0.7	-	4,000	-	10,000	-	1,000
	LL0612	1.6	3.2	1.25	-	3,000	-	10,000	-	1,000

¹⁾ $0.15~\mu\text{F}$ and $0.22~\mu\text{F}$ of X7R, 10V rated are available by taping packages only. (Applied to neither bulk case nor bag package.) 560pF of C0G, 50V rated and $0.47\mu\text{F}$ or $1.0\mu\text{F}$ of X5R, 6.3V rated are not available by bulk case. (Applied to taping or bag packages only.)

²⁾ Depending on capacitance, some products are supplied on the 5,000pcs./reel basis.

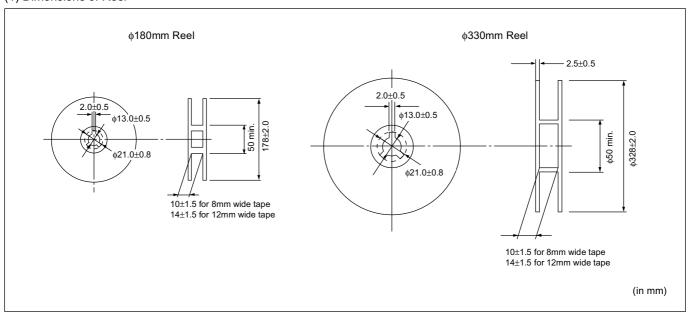
⁴⁾ Depending on capacitance, some products are supplied on the 3,000 pcs./reel basis.

Package

Continued from the preceding page.

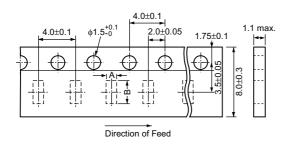
■ Tape Carrier Packaging

(1) Dimensions of Reel



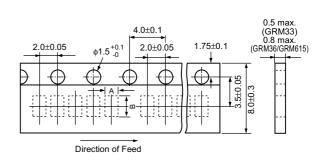
(2) Dimensions of Paper Tape





Part Number	А	В
GR(M)39 GRM420 LL0306 GRQ706	1.05±0.1	1.85±0.1
GR(M)40 GRM425 (T≦1.0mm) GRQ708	1.55±0.15	2.3±0.15
GR(M)42-6 GRM430 GNM30-401 (T≦1.0mm)	2.0±0.2	3.6±0.2
GRM42-2 (T=0.85mm)	2.8±0.2	3.6±0.2

8mm width 2mm pitch Tape

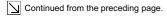


Part Number	A*	B*
GRM33	0.37	0.67
GRM615 GR(M)36	0.65	1.15

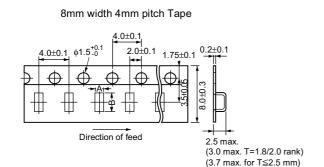
*Nominal Value

(in mm)

Package



(3) Dimensions of Plastic Tape



Part Number	А	В
GR(M)40 (T=1.25mm) LL0508	1.45±0.2	2.25±0.2
GR(M)42-6 GRM430 (T≧1.15mm) LL0612	1.9±0.2	3.5±0.2
GRM435 GR(M)42-2 (T≧1.15mm)	2.8±0.2	3.5±0.2
GRH708	1.8*	2.6*

2.8*

2.0*

3.1*

*Nominal Value

3.5*

2.1*

3.2*

12mm width 8mm pitch Tape 8.0±0.1 2.0±0.1 1.75±0.1 1.75±0.1 0.3±0.1 0.3±0.1 0.3±0.1 2.5 max. for GR(M)43-2/GR(M)44-1 (3.7 max. for T≥2.5mm)

Part Number	A*	B*
GR(M)43-2	3.6	4.9
GR(M)44-1	5.2	6.1

*Nominal Value

(in mm)

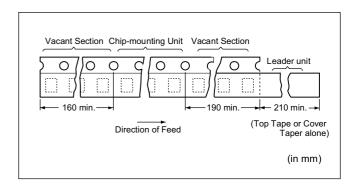
(4) Taping Method

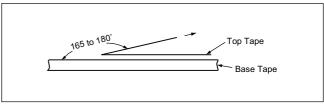
GRH710

GRH110

GRH111

- ① Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.
- ② Part of the leader and part of the empty tape shall be attached to the end of the tape as follows.
- ③ The top tape and base tape are not atteached at the end of the tape for a minimum of 5 pitches.
- 4 Missing capacitors number within 0.1% of the number per reel or 1 pc, whichever is greater, and are not continuous.
- (5) The top tape and bottom tape shall not protrude beyond the edges of the tape and shall not cover sprocked holes.
- ⑥ Cumulative tolerance of sprocket holes, 10 pitches: ±0.3mm.
- Peeling off force: 0.1 to 0.6N* in the direction shown below. *GRM33:0.05 to 0.5N

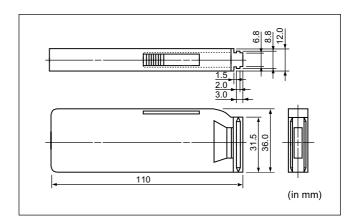




Package

Ontinued from the preceding page.

■ Dimensions of Bulk Case Packaging The bulk case used antistatic materials. Please contact Murata for details.



■ Storage and Operating Conditions

Chip monolithic ceramic capacitors (chips) can experience degradation of termination solderability when subjected to high temperature or humidity, or if exposed to sulfur or chlorine gases. (Reference Data 1. Solderability)

Rating

Die Bonding/Wire Bonding (GM Series)

(1) Die Bonding of Capacitors

Use the following materials
 Braze alloy: Au-Si (98/2) 400 to 420D in N2 atmosphere

Au-Sn (80/20) 300 to 320D in N2 atmosphere Au-Ge (88/12) 380 to 400D in N2 atmosphere

- Mounting
- 1. Control the temperature of the substrate so that it matches the temperature of the braze alloy.
- 2. Place braze alloy on substrate and place the capacitor on the alloy. Hold the capacitor and

■ Handling

1. Inspection

Thrusting force of the test probe can flex the PCB,resulting in cracked chips or open solder joints. Provide support pins on the back side of the PCB to prevent warping or flexing.

- 2. Board Separation (or Depane-lization)
- Board flexing at the time of separation causes cracked chips or broken solder.
- Severity of stresses imposed on the chip at the time of board break is in the order of:
 PushbackFSlitterFV SlotFPerforator.
- Board separation must be performed using special jigs, not with hands.

■ Others

1. Resin Coating

When selecting resin materials, select those with low contraction.

2. Circuit Design

These capacitors on this catalog are not safety recognized products

3. Remarks

gently apply the load. Be sure to complete the operation in 1 minute.

- (2) Wire Bonding
- Wire

Gold wire: 20mm (0.0008 inch), 25mm (0.001 inch) diameter

- Bonding
- 1. Thermocompression, ultrasonic wedge or ball bond ing. Required stage temperature: 150 to 250D.
- 2. Required wedge or capillary weight : 0.2N to 0.5N.
- 3. Bond the capacitor and base substrate or other devices with gold wire.

The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions. Select optimum conditions for operation as they determine the reliability of the product after assembly. The data here in are given in typical values, not guaranteed ratings.

■ Soldering and Mounting

1. PCB Design

(1) Notice for Pattern Forms

Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate.

They are also more sensitive to mechanical and thermal stresses than leaded components.

Excess solder fillet height can multiply these stresses and cause chip cracking. When designing substrates, take land patterns and dimensions into consideration to eliminate the possibility of excess solder fillet height.

Pattern Forms

	Placing Close to Chassis	Placing of Chip Components and Leaded Components	Placing of Leaded Components after Chip Component	Lateral Mounting
Incorrect	Chassis Solder (ground) Electrode Pattern	Lead Wire	Soldering Iron Lead Wire	
Correct	Solder Resist	Solder Resist	Solder Resist	Solder Resist



(2) Continued from the preceding page.

(2) Land Dimensions

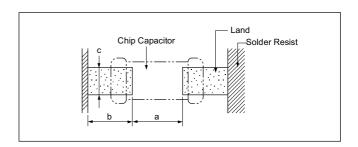


Table 1 Flow Soldering Method

Dimensions Part Number	Dimensions (L×W)	a	b	С
GRM39 GRM420 GRQ706	1.6×0.8	0.6—1.0	0.8-0.9	0.6-0.8
GRM40 GRM425 GRQ708	2.0×1.25	1.0-1.2	0.9—1.0	0.8-1.1
GRM42-6 GRM430	3.2×1.6	2.2-2.6	1.0-1.1	1.0-1.4
LL0508	1.25×2.0	0.4-0.7	0.5-0.7	1.4-1.8
LL0612	1.6×3.2	0.6-1.0	0.8-0.9	2.6-2.8
GRH706	1.25×1.0	0.4-0.6	0.6-0.8	0.8-1.0
GRH708	2.0×1.25	1.0-1.2	0.9-1.0	0.8-1.0
GRH110	1.4×1.4	0.5-0.8	0.8-0.9	1.0-1.2

(in mm)

Table 2 Reflow Soldering Method

Dimensions Part Number	Dimensions (L×W)	a	b	С
GRM33	0.6×0.3	0.2-0.3	0.2-0.35	0.2-0.4
GRM36 GRM615	1.0×0.5	0.3-0.5	0.35-0.45	0.4-0.6
GRM39 GRM420 GRQ706	1.6×0.8	0.6-0.8	0.6-0.7	0.6-0.8
GRM40 GRM425 GRQ708	2.0×1.25	1.0-1.2	0.6-0.7	0.8-1.1
GRM42-6 GRM430	3.2×1.6	2.2-2.4	0.8-0.9	1.0-1.4
GRM42-2 GRM435	3.2×2.5	2.0-2.4	1.0-1.2	1.8-2.3
GRM43-2	4.5×3.2	3.0-3.5	1.2-1.4	2.3-3.0
GRM44-1	5.7×5.0	4.0-4.6	1.4-1.6	3.5-4.8
LL0306	0.8×1.6	0.2-0.4	0.3-0.4	1.0-1.4
LL0508	1.25×2.0	0.4-0.6	0.3-0.5	1.4-1.8
LL0612	1.6×3.2	0.6-0.8	0.6-0.7	2.6-2.8
GRH706	1.25×1.0	0.4-0.6	0.6-0.8	0.8-1.0
GRH708	2.0×1.25	1.0-1.2	0.6-0.8	0.8-1.0
GRH710	3.2×2.5	2.2-2.5	0.8-1.0	1.9-2.3
GRH110	1.4×1.4	0.4-0.8	0.6-0.8	1.0-1.2
GRH111	2.8×2.8	1.8-2.1	0.7-0.9	2.2-2.6
GR530	4.5×3.8	3.2-3.4	0.9-1.2	3.0-3.8
GR535	5.6×5.0	4.2-4.5	0.9-1.2	4.0-5.0
GR540	10.6×5.0	8.5-9.0	1.3-1.5	4.0-5.0
GR545	10.6×10.0	8.5-9.0	1.3-1.5	8.0-10.0
GR550	11.8×10.6	9.0-9.5	1.8-2.0	8.0-10.0
GR555	16.0×5.0	13.0-13.5	1.8-2.0	4.0-5.0
GR580	28.1×13.2	25.0-25.5	2.2-2.4	10.0-13.0

(in mm)

Continued from the preceding page.

GNM Series for reflow soldering method

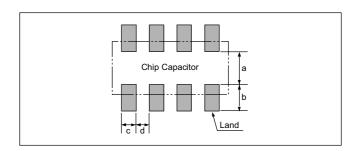
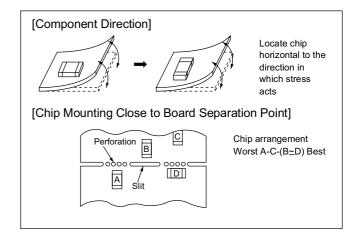


Table 3

Part Number	Dimensions (mm)						
	L	w	а	b	С	d	
GNM30-401	3.2	1.6	0.8-1.0	0.7-0.9	0.3-0.4	0.4-0.5	

(3) Mounting Position

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



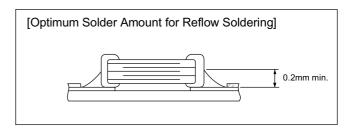
(Reference Data 2. Board bending strength for solder fillet height) (Reference Data 3. Temperature cycling for solder fillet height) (Reference Data 4. Board bending strength for board material)

2. Solder Paste Printing

 Overly thick application of solder paste results in excessive fillet height solder.

This makes the chip more susceptible to mechanical and thermal stress on the board and may cause cracked

- Too little solder paste results in a lack of adhesive strength on the outer electrode, which may result in chips breaking loose from the PCB.
- Make sure the solder has been applied smoothly to the end surface to a height of 0.2mm min.





Continued from the preceding page.

3. Chip Placing

- An excessively low bottom dead point of the suction nozzle imposes great force on the chip during mounting, causing cracked chips. So adjust the suction nozzle's bottom dead point by correcting warp in the board. Normally, the suction nozzle's bottom dead point must be set on the upper surface of the board. Nozzle pressure for chip mounting must be a 1 to 3N static load.
- Dirt particles and dust accumulated between the suction nozzle and the cylinder inner wall prevent the nozzle from moving smoothly. This imposes great force on the chip during mounting, causing cracked chips. And the locating claw, when worn out, imposes uneven forces on the chip when positioning, causing cracked chips. The suction nozzle and the locating claw must be maintained, checked and replaced periodically. (Reference Data 5. Break strength)

[Incorrect] Suction Nozzle ш Deflection Board **Board Guide** [Correct] Support Pin

4. Reflow Soldering

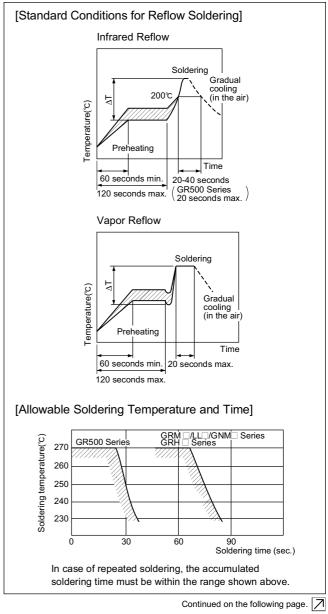
- Sudden heating of the chip results in distortion due to excessive expansion and construction forces within the chip causing cracked chips. So when preheating, keep temperature differential, ΔT , within the range shown in Table 4. The smaller the ΔT , the less stress on the chip.
- When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and solvent within the range shown in the above table.

Table 4

Part Number	Temperature Differential		
GRM33/36/39/40/42-6	ΔΤ≦190℃		
GRM420/425/430/615			
LL0306/0508/0612			
GRH706/708/110			
GRQ706/708			
GRM42-2/43-2/44-1/435			
GNM30-401	AT<120%		
GRH710/111	ΔΤ≦130℃		
GR530/535/540/545/550/555/580			

Inverting the PCB

Make sure not to impose an abnormal mechanical shock on the PCB.



Notice

Continued from the preceding page

5. Adhesive Application

- Thin or insufficient adhesive causes chips to loosen or become disconnected when flow soldered. The amount of adhesive must be more than dimension C shown in the drawing below to obtain enough bonding strength. The chip's electrode thickness and land thickness must be taken into consideration.
- Low viscosity adhesive causes chips to slip after mounting. Adhesive must have a viscosity of 5000pa-s (500ps)min. (at 25℃)

GR500 Series a : 20 to 70 μm a : 40 to 70 μm b : 30 to 35 μm c : 70 to 105 μm Chip Capacitor $b:30\ to\ 35\ \mu m$ c: 50 to 105 µm Adhesive

6. Adhesive Curing

Insufficient curing of the adhesive causes chips to disconnect during flow soldering and causes deteriorated insulation resistance between outer electrodes due to moisture absorption.

Control curing temperature and time in order to prevent insufficient hardening.

Inverting the PCB

Make sure not to impose an abnormal mechanical shock on the PCB.

7. Leaded Component Insertion

If the PCB is flexed when leaded components (such as transformers and ICs) are being mounted, chips may crack and solder joints may break.

Before mounting leaded components, support the PCB using backup pins or special jigs to prevent warping.

8. Flux Application

- An excessive amount of flux generates a large quantity of flux gas, causing deteriorated solderability. So apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering).
- Flux containing too high a percentage of halide may cause corrosion of the outer electrodes unless sufficiently cleaned. Use flux with a halide content of 0.2wt% max. But do not use strongly acidix flux.

Wash thoroughly because water soluble flux causes deteriorated insulation resistance between outer electrodes unless sufficiently cleaned.



Continued from the preceding page.

9. Flow Soldering

- Sudden heating of the chip results in thermal distortion causing cracked chips. And an excessively long soldering time or high soldering temperature results in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.
- When preheating, keep the temperature differential between solder temperature and chip surface temperature, ΔT , within the range shown in Table 5. The smaller the ΔT , the less stress on the chip. When components are immersed in solvent after mounting, be sure to maintain the temperature difference between the component and solvent within the range shown in Table 5.

Do not apply flow soldering to chips not listed in Table 5.

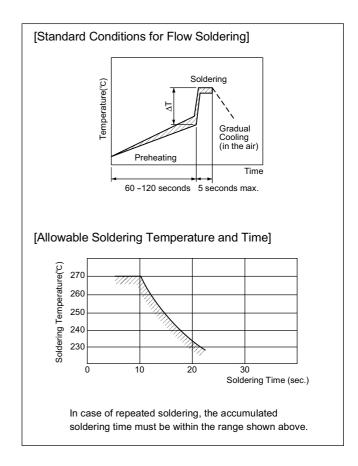
Table 5

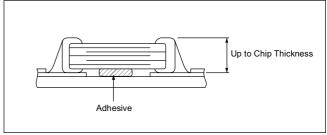
Part Number	Temperature Differential
GRM39/40/42-6	
GRM420/425/430	
LL0508/0612	ΔT≦150℃
GRH706/708/110	
GRQ706/708	

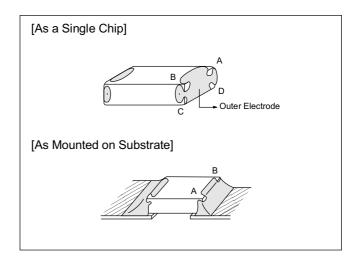
Optimum Solder Amount for Flow Soldering

• Set temperature and time to ensure that leaching of the outer electrode does not exceed 25% of the chip end area as a single chip (full length of the edge A-B-C-D shown below) and 25% of the length A-B shown below as mounted on substrate.

(Reference Data 6. Thermal shock) (Reference Data 7. Solder heat resistance)







Notice



Continued from the preceding page.

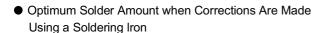
10. Correction with a Soldering Iron

(1) For Chip Type Capacitors

• Sudden heating of the chip results in distortion due to a high internal temperature differential, causing cracked chips. When preheating, keep temperature differential, ΔT , within the range shown in Table 6. The smaller the ΔT , the less stress on the chip.

Table 6

Part Number	Temperature Differential		
GRM36/39/40/42-6			
GRM420/425/430/615			
LL0306/0508/0612	ΔT≦190℃		
GRQ706/708			
GRH706/708/110			
GRM42-2/43-2/44-1/435			
GNM30-401	ΛT≤130°C		
GRH710/111	Δ1≥130 C		
GR530/535/540/545/550/555/580			



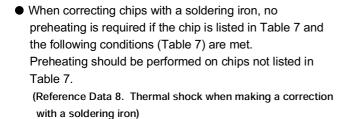
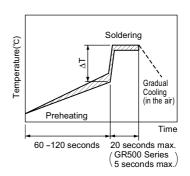


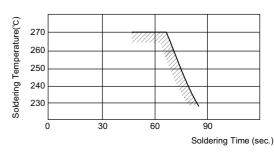
Table 7 Correction with a Soldering Iron

Part Number	Part Number Temperature of Iron Tip		Diameter of Iron Tip	Restriction		
GRM36/39/40						
GRM420/425/615						
LL0306/0508	300℃ max.		φ 3mm max.	Do not allow the iron tip to directly touch the ceramic element.		
GRQ706/708		20W max.				
GRH706/708/110						
GRM42-6						
GRM430	270°C max.					
LL0612						
GNM30-401						

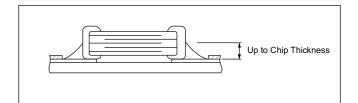
[Standard Conditions for Soldering Iron Temperature]



[Allowable Time and Temperature for Making Corrections with a Soldering Iron]



The accumulated soldering Time / temperature including reflow / flow soldering must be within the range shown above.



- Continued from the preceding page.
- (2) For Microstrip Types
- Solder 1mm away from the ribbon terminal base, being careful that the solder tip does not directly contact the capacitor. Preheating is unnecessary.
- Complete soldering within 3 seconds with a soldering tip less than 270D in temperature.

11. Washing

Excessive output of ultrasonic oscillation during cleaning causes PCBs to resonate, resulting in cracked chips or broken solder. Take note not to vibrate PCBs.

1. Solderability

(1) Test Method

Subject the chip capacitor to the following conditions. Then apply flux (a ethanol solution of 25% rosin) to the chip and dip it in 230°C eutectic solder for 2 seconds. Conditions:

Expose prepared at room temperature (for 6 months and 12 months, respectively)

Prepared at high temperature (for 100 hours at 85°C) Prepared left at high humidity (for 100 hours under 90%RH to 95%RH at 40℃)

(2) Test Samples

GRM40: Products for flow/reflow soldering.

(3) Acceptance Criteria

With a 60-power optical microscope, measure the surface area of the outer electrode that is covered with solder.

(4) Results

Refer to Table 1.

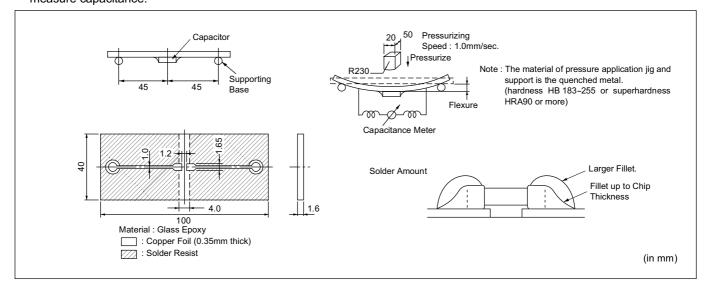
Table 1

Sample	Initial State	Prepared at Room Temperature		Prepared at High	Prepared at High Humidity for 100 Hours at 90 to	
Sample	miliai State	6 months	12 months	Temperature for 100 Hours at 85℃	95% RH and 40℃	
GRM40 for flow/reflow soldering	95 to 100%	95 to 100%	95%	90 to 95%	95%	

2. Board Bending Strength for Solder Fillet Height

(1) Test Method

Solder the chip capacitor to the test PCB with the amount of solder paste necessary to achieve the fillet heights. Then bend the PCB using the method illustrated and measure capacitance.



(2) Test Samples

GRM40 C0G/X7R/Y5V Characteristics T=0.6mm

(3) Acceptance Criteria

Products shall be determined to be defective if the change in capacitance has exceeded the values specified in Table 2.

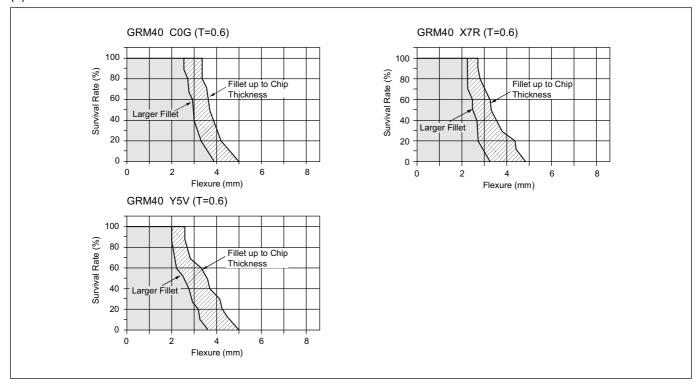
Table 2

Characteristics	Change in Capacitance			
C0G Within ±5% or ±0.5pF, whichever is greater				
X7R	Within ±12.5%			
Y5V	Within ±20%			



Continued from the preceding page.

(4) Results



3. Temperature Cycling for Solder Fillet Height

(1) Test Method

Solder the chips to the substrate various test fixtures using sufficient amounts of solder to achieve the required fillet height. Then subject the fixtures to the cycle illustrated below 200 times.

1 Solder Amount

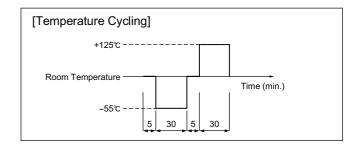
Alumina substrates are typically designed for reflow soldering.

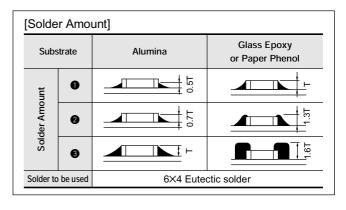
Glass epoxy or paper phenol substrates are typically used for flow soldering.

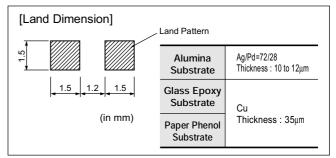
② Material

Alumina (Thickness: 0.64mm) Glass epoxy (Thickness: 1.6 mm) Paper phenol (Thickness: 1.6 mm)

3 Land Dimension







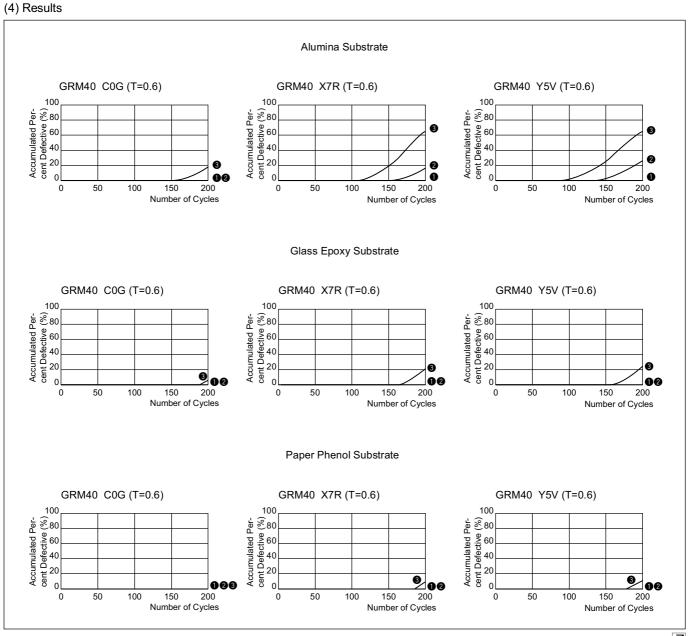
- Continued from the preceding page.
- (2) Test Samples GRM40 C0G/X7R/Y5V Characteristics T=0.6mm

(3) Acceptance Criteria

Products shall be determined to be defective if the change in capacitance has exceeded the values specified in Table 3.

Table 3

Characteristics	Change in Capacitance
C0G	Within ±2.5% or ±0.25pF, whichever is greater
X7R	Within ±7.5%
Y5V	Within ±20%



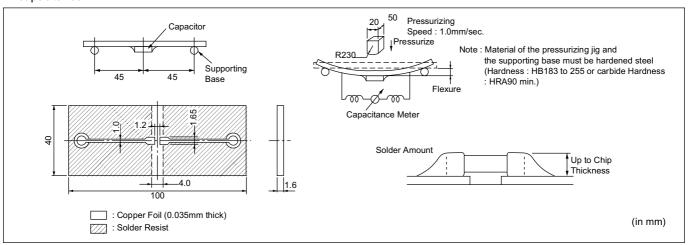


Continued from the preceding page.

4. Board Bending Strength for Board Material

(1) Test Method

Solder the chip to the test board. Then bend the board using the method illustrated below, as measure capacitance.



(2) Test Samples GRM40 C0G/X7R/Y5V Characteristics T=0.6mm typical

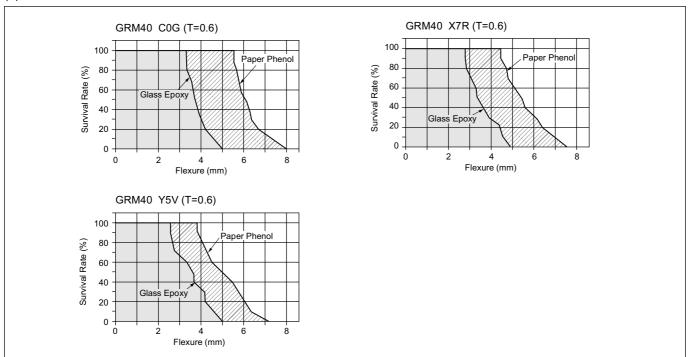
(3) Acceptance Criteria

Products shall be determined to be defective if the change in capacitance has exceeded the values specified in Table 4.

Table 4

Characteristics	Change in Capacitance
C0G	Within ±5% or ±0.5pF, whichever is greater
X7R	Within ±12.5%
Y5V	Within ±20%

(4) Results



Continued from the preceding page.

5. Break Strength

(1) Test Method

Place the chip on a steel plate as illustrated on the right. Increase load applied to a point near the center of the test sample.

(2) Test Samples

GRM40 C0G/X7R/Y5V Characteristics GRM42-6 C0G/X7R/Y5V Characteristics

(3) Acceptance Criteria

Define the load that has caused the chip to break or crack, as the bending force.

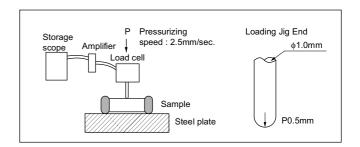
(4) Explanation

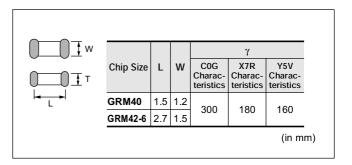
Break strength, P, is proportionate to the square of the thickness of the ceramic element and is expressed as a curve of secondary degree.

The formula is:

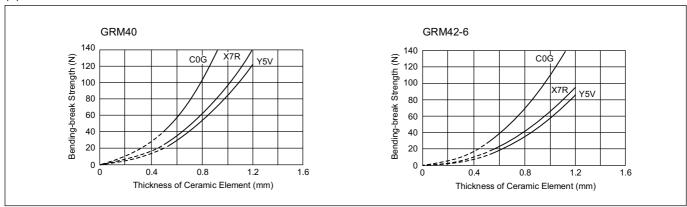
$$P = \frac{2\gamma WT^2}{3L} \quad (N)$$

W: Width of ceramic element (mm) T: Thickness of element (mm) L : Distance between fulcrums (mm) γ: Bending stress (N/mm²)





(5) Results



6. Thermal Shock

(1) Test method

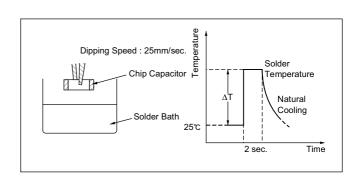
After applying flux (an ethanol solution of 25% rosin), dip the chip in a solder bath (6X4 eutectic solder) in accordance with the following conditions:

(2) Test samples

GRM40 C0G/X7R/Y5V Characteristics T=0.6mm typical

(3) Acceptance criteria

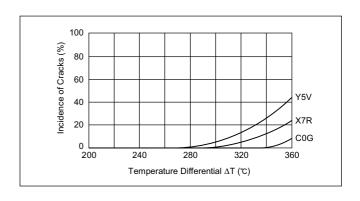
Visually inspect the test sample with a 60-power optical microscope. Chips exhibiting breaks or cracks shall be determined to be defective.





Continued from the preceding page.

(4) Results



7. Solder Heat Resistance

(1) Test Method

① Reflow soldering:

Apply about 300 μm of solder paste over the alumina substrate. After reflow soldering, remove the chip and check for leaching that may have occurred on the outer electrode.

2 Flow soldering:

After dipping the test sample with a pair of tweezers in wave solder (eutectic solder), check for leaching that may have occurred on the outer electrode.

(2) Test samples

GRM40: For flow/reflow soldering T=0.6mm

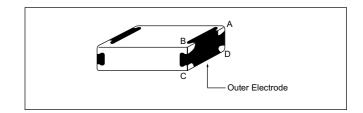
(3) Acceptance criteria

The starting time of leaching shall be defined as the time when the outer electrode has lost $25\,\%$ of the total edge length of A-B-C-D as illustrated :

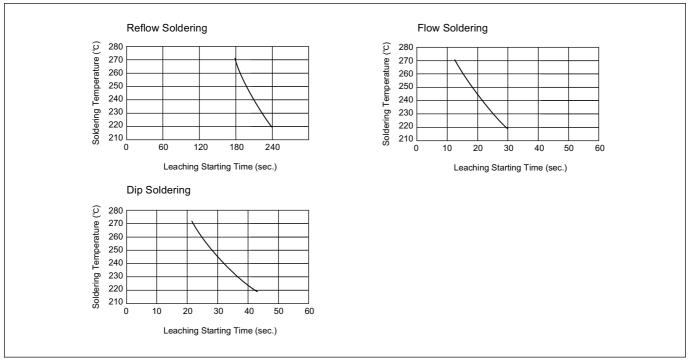
3 Dip soldering:

After dipping the test sample with a pair of tweezers in static solder (eutectic solder), check for leaching that may have occurred on the outer electrode.

4 Flux to be used: An ethanol solution of 25 % rosin.



(4) Results



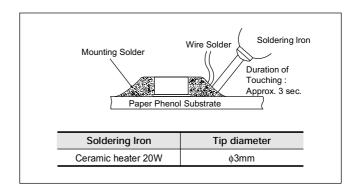
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8. Thermal Shock when Making Corrections with a Soldering Iron

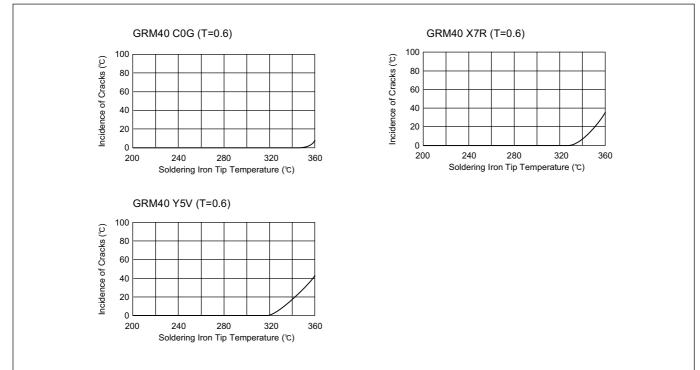
(1) Test Method

Apply a soldering iron meeting the conditions below to the soldered joint of a chip that has been soldered to a paper phenol board, while supplying wire solder. (Note: the soldering iron tip shall not directly touch the ceramic element of the chip.)

- (2) Test Samples
 GRM40 C0G/X7R/Y5V Characteristics T=0.6mm
- (3) Acceptance Criteria for Defects Observe the appearance of the test sample with a 60-power optical microscope. Those units displaying any breaks cracks shall be determined to be defective.



(4) Results



CHIP MONOLITHIC CERAMIC CAPACITOR



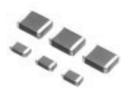
for High-voltage Low Dissipation Type GHM1000 Series

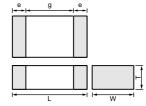
■ Features

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

■ Application

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





Part Number	Dimensions (mm)						
Fait Nullibei	L	L W T		e min.	g min.		
GHM1030	3.2 +0.2	1.6 ±0.2	1.0 +0 -0.3		1.5*		
GHW1030	3.2 ±0.2	1.0 ±0.2	1.25 +0		1.5		
GHM1035	3.2 ±0.2	2.5 ±0.2	1.5 +0	0.3	1.8		
GHM1038	4.5 ±0.3	2.0 ±0.2	2.0 ±0.3				
GHM1040	4.5 ±0.3	3.2 ±0.3	2.0 +0 - 0.3		2.9		
GITWITO40	4.5 ±0.5	3.2 ±0.3	2.5 +0 -0.3				

* SL 2kV : 1.8mm min.

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

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

			Specif	ication			
No.	lte	em	Temperature Compensating Type (SL Char.)	High Dielectric Constant Type (R Char.)		Test Method	
1	Operating Temperatu	ıre Range	-55 to +125℃				
2	Appearar	ice	No defects or abnormalities.	nalities. Visual inspection.			
3	Dimensio	ns	Within the specified dimension.		Using calipers.		
4	4 Dielectric Strength		No defects or abnormalities.		No failure shall be observed when voltage in Table is applied between the terminations for 1 to 5 s, provided the charge/ discharge current is less than 50mA. Rated voltage More than DC 1kV Less than DC 1kV 150% of the rated voltage		
5	Insulation F (I.R.)	Resistance	More than 10,000M Ω		The insulation resistant within 60±5 s of chargin	ee shall be measured with 500±50V and ng.	
6	Capacitance Within the specified tolerance.			· ·	. shall be measured at 20°C at the		
7	Q/ Dissipation Factor (D		C≥30pF : Q≥1,000 C<30pF : Q≥400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	frequency and voltage s (1) Temperature Compounts Frequency: 1±0.2M Voltage: 0.5 to 5V (in a constant of the constant of th	ensating Type IHz r.m.s.) stant Type Hz	
8	Capacitance 8 Temperature Characteristics		ture +350 to -1,000 ppm/°C Cap. Change		capacitance measur When cycling the ter through 5 (+20 to + specified tolerance Step 1 2 3 4 5 (2) High Dielectric Cons The range of capaci within -55 to +125% • Pretreatment	efficient is determined using the red in step 3 as a reference. Imperature sequentially from step 1 85 °C) the capacitance shall be within the for the temperature coefficient. Temperature(°C) 20±2 Min. Operating Temp.±3 20±2 Max. Operating Temp.±2 20±2 stant Type tance change compared to the 20°C value C shall be within the specified range. ment at 150 ±0 °C for 60±5 min and	
9	9 Adhesive Strength of Termination		No removal of the terminations or other defect shall occur.		Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N force in the direction of the arrow. The soldering shall be done either with an iron or using the reflowmethod 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 Fig.1		
		Appearance	No defects or abnormalities.			the test jig (glass epoxy board).	
		Capacitance	Within the specified tolerance.			subjected to a simple harmonic motion e of 1.5mm, the frequency being varied	
10	Vibration Resistance Q/D.F.	Q/D.F.	30pF min. : Q≥1,000 30pF max. : Q≥400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	uniformly between the a frequency range, from 1 traversed in approximat a period of 2 h in each 3 of 6 h).	approximate limits of 10 and 55Hz. The 10 to 55Hz and return to 10Hz, shall be 10 to 55Hz and return to 10Hz, shall be 10 to 10Hz, shall be 10Hz, shal	
			. ,				

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

\overline{A}	Continued fr	om the prec	eding page.						
			Specif	ication					
No.	lt€	em	Temperature Compensating Type (SL Char.)	High Dielectric Constant Type (R Char.)		Test Method			
			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 either with an iron or using the reflo				
11	Deflection		(mm) a 3.2×1.6 2.2 3.2×2.5 2.2 4.5×2.0 3.5 4.5×3.2 3.5	t: 1.6 t: 1.6 t: 1.6 t: 1.6 t: 1.0 t: 1.0 t: 1.0	uniform and free of defects such as heat shock. 20 50 Pressurizing speed: 1.0mm/s Pressurize Pressurize Capacitance meter 45 45 (in mm) Fig.3				
12	Solderab Terminati	•	75% of the terminations are to be and continuously.	e soldered evenly	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				
		Appearance Capacitance Change	No marking defects. Within ±2.5% or ±0.25pF (Whichever is larger)	Within ±10%	Preheat the capacitor at 120 to 150°C* for 1 min. Immerse the capacitor in eutectic solder solution at 260±5°C for 10±1 s. Let sit at room condition for 24±2 h, then measure. •Immersing speed: 25±2.5mm/s				
13	Resistance to Soldering Heat	Q/D.F.	C≥30pF : Q≥1,000 C<30pF : Q≥400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	Perform a he	for high dielectric constant typat treatment at $150^{\pm}_{10}^{\circ}$ °C for 2 h at room condition.			
	Ticat	I.R.	More than 10,000MΩ		*Preheating fo	or more than 3.2×2.5mm			
		Dielectric Strength	Pass the item No.4.		Step 1 2	Temperature 100°C to 120°C 170°C to 200°C	Time 1 min. 1 min.		
		Appearance	No marking defects.		Fix the capaci	tor to the supporting jig (glass	epoxy board) shown		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger) Within ±10%		in Fig.4 using a eutectic solder. Perform the five cycles according to the four heat treatments listed in the following table.				
		Q/D.F.	C≥30pF : Q≥1,000 C<30pF : Q≥400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	Step 1	2 h at room condition, then more Temperature (°C) Min. Operating Temp.±3	Time (min) 30±3		
		I.R.	More than 10,000MΩ		2	Room Temp.	2 to 3		
14	Temperature Cycle				Perform a he	Max. Operating Temp.±2 Room Temp. for high dielectric constant typat treatment at 150 + 0 for 2 h at room condition.			
		Dielectric Strength	Pass the item No.4.		Solder resist Glass Epoxy Board Fig. 4				
		Appearance	No marking defects.						
		Capacitance Change	Within ±5.0% or ±0.5pF (Whichever is larger)	Within ±10%	Sit the capacit	or at 40±2℃ and relative hum	nidity 90 to 95% for		
15	Humidity (Steady State)	Q/D.F.	C≥30pF : Q≥350 C<30pF : Q≥275+ ½ C C : Nominal Capacitance (pF)	D.F.≦0.01	Remove and I •Pretreatment	et sit for 24±2 h at room cond for high dielectric constant typ at treatment at 150±₁8°C for	oe .		
		I.R.	More than 1,000MΩ		let sit for 24±2 h at room condition.				
		Dielectric Strength	Pass the item No.4.						

[&]quot;Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa



Continued from the preceding page.

			Specif	ication			
No.	lte	em	Temperature Compensating Type (SL Char.)	High Dielectric Constant Type (R Char.)	Test Method		
		Appearance	No marking defects.		Apply the voltage in follow	ving table for 1,000 ±48 at maximum	
		Capacitance Change	Within ±3.0% or ±0.3pF (Whichever is larger)	Within ±10%		±2 h at room condition, then measure. rrent is less than 50mA. electric constant type ±5 min at test temperature.	
16	Life	Q/D.F.	C≥30pF : Q≥350 C<30pF : Q≥275+ $\frac{5}{2}$ C C : Nominal Capacitance (pF)	D.F.≦0.02	•Pretreatment for high die		
		I.R.	More than 1,000MΩ		Rated voltage	Test voltage	
		Dielectric Strength	Pass the item No.4.		More than DC 1kV Less than DC 1kV	Rated voltage 120% of the rated voltage	

[&]quot;Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa



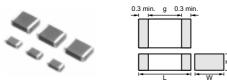
for High-voltage High-capacitance Type GHM1500 Series

■ 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 and GHM1530 type for flow and reflow soldering, and other types for reflow soldering.

■ Application

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



Dank Namehan		Din	nensions (mm)			
Part Number	L	W	T	g min.		
GHM1525	2.0 ±0.2	1.25 ±0.2	1.0 +0,-0.3	0.7		
GHW1525	2.0 ±0.2	1.25 ±0.2	1.25 ±0.2	0.7		
			1.0 +0,-0.3			
GHM1530	3.2 ±0.2	1.6 ±0.2	1.25 +0,-0.3	1.5		
			1.6 ±0.2			
GHM1535	3.2 ±0.3	2.5 ±0.2	1.5 +0,-0.3			
GUMIOSO	3.2 ±0.3	2.5 ±0.2	2.0 +0,-0.3			
			1.5 +0,-0.3			
GHM1540	4.5 ±0.4	3.2 ±0.3	2.0 +0,-0.3	2.5		
GHW1540	4.3 ±0.4	3.2 ±0.3	2.5 +0,-0.3			
			2.6 +0,-0.3			
GHM1545	5.7 ±0.4	5.0 ±0.4	2.0 +0,-0.3	3.5		
GEINI 1949	5.7 ±0.4	5.0 ±0.4	2.7 +0,-0.3	3.5		

Part Number	Rated Voltage (V)	TC Code	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)
GHM1525B102K250	DC250	В	1000pF +10,-10%	2.0	1.25	1.0	0.7 min.	0.3 min.
GHM1525B152K250	DC250	В	1500pF +10,-10%	2.0	1.25	1.0	0.7 min.	0.3 min.
GHM1525B222K250	DC250	В	2200pF +10,-10%	2.0	1.25	1.0	0.7 min.	0.3 min.
GHM1525B332K250	DC250	В	3300pF +10,-10%	2.0	1.25	1.0	0.7 min.	0.3 min.
GHM1525B472K250	DC250	В	4700pF +10,-10%	2.0	1.25	1.0	0.7 min.	0.3 min.
GHM1525B682K250	DC250	В	6800pF +10,-10%	2.0	1.25	1.0	0.7 min.	0.3 min.
GHM1525B103K250	DC250	В	10000pF +10,-10%	2.0	1.25	1.25	0.7 min.	0.3 min.
GHM1530B153K250	DC250	В	15000pF +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1530B223K250	DC250	В	22000pF +10,-10%	3.2	1.6	1.0	1.5 min.	0.3 min.
GHM1530B333K250	DC250	В	33000pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B473K250	DC250	В	47000pF +10,-10%	3.2	1.6	1.6	1.5 min.	0.3 min.
GHM1535B683K250	DC250	В	68000pF +10,-10%	3.2	2.5	1.5	1.5 min.	0.3 min.
GHM1535B104K250	DC250	В	0.1μF +10,-10%	3.2	2.5	2.0	1.5 min.	0.3 min.
GHM1540B154K250	DC250	В	0.15μF +10,-10%	4.5	3.2	2.0	2.9 min.	0.3 min.
GHM1540B224K250	DC250	В	0.22μF +10,-10%	4.5	3.2	2.5	2.9 min.	0.3 min.
GHM1545B334K250	DC250	В	0.33μF +10,-10%	5.7	5.0	2.0	3.5 min.	0.3 min.
GHM1545B474K250	DC250	В	0.47μF +10,-10%	5.7	5.0	2.0	3.5 min.	0.3 min.
GHM1530B102K630	DC630	В	1000pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B152K630	DC630	В	1500pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B222K630	DC630	В	2200pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B332K630	DC630	В	3300pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B472K630	DC630	В	4700pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B682K630	DC630	В	6800pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1530B103K630	DC630	В	10000pF +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.
GHM1535B153K630	DC630	В	15000pF +10,-10%	3.2	2.5	1.5	1.5 min.	0.3 min.
GHM1535B223K630	DC630	В	22000pF +10,-10%	3.2	2.5	1.5	1.5 min.	0.3 min.
GHM1540B333K630	DC630	В	33000pF +10,-10%	4.5	3.2	1.5	2.5 min.	0.3 min.
GHM1540B473K630	DC630	В	47000pF +10,-10%	4.5	3.2	1.5	2.5 min.	0.3 min.
GHM1540B683K630	DC630	В	68000pF +10,-10%	4.5	3.2	2.0	2.5 min.	0.3 min.
GHM1540B104K630	DC630	В	0.1μF +10,-10%	4.5	3.2	2.6	2.5 min.	0.3 min.
GHM1545B154K630	DC630	В	0.15μF +10,-10%	5.7	5.0	2.0	3.5 min.	0.3 min.
GHM1545B224K630	DC630	В	0.22μF +10,-10%	5.7	5.0	2.7	3.5 min.	0.3 min.

No.	Ite	m	Specification	Test Method
1	Operating Temperatu	ıre Range	-55 to +125°C	-
2	Appearan	ice	No defects or abnormalities.	Visual inspection.
3	Dimension	ns	Within the specified dimensions.	Using calipers.
4	Dielectric	Strength	No defects or abnormalities.	No failure shall be observed when 150% of the rated voltage (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 R	Resistance	C≥0.01μF : More than $100M\Omega \cdot \mu F$ C<0.01μF : More than $10,000M\Omega$	The insulation resistance shall be measured with $500\pm50V$ ($250\pm50V$ in case of rated voltage: DC $250V$) and within 60 ± 5 s of charging.
6	Capacitar	псе	Within the specified tolerance.	The conscitoned /D.F. shall be madelyind at 20% at a frequency of
7	Dissipation Factor (D.	on 0.025 max		The capacitance/D.F. shall be measured at 20℃ at a frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)
8	Capacitance Cap. Change Temperature Within ±10% (Temp. Range : −25 to +85℃)		Within ±10%	The range of capacitance change compared with the 20° value within -25 to $+85^{\circ}$ shall be within the specified range. •Pretreatment Perform a heat treatment at $150^{\pm}9_{0}^{\circ}$ for 60 ± 5 min and then let sit for 24 ± 2 h at room condition.
9	Adhesive Strength of Termination		No removal of the terminations or other defect shall occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N force in the direction of the arrow. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. 10N, 10±1s Speed: 1.0mm/s Glass Epoxy Board
				Fig.1
		Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board). The capacitor shall be subjected to a simple harmonic motion
10	Capacitance Within the specified tolerance.			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).
			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.
11	Deflection	1	LXW Dimension (mm) (mm) a b c d 2.0X1.25 1.2 4.0 1.65 3.2X1.6 2.2 5.0 2.0 3.2X2.5 2.2 5.0 2.9 4.5X3.2 3.5 7.0 3.7 5.7X5.0 4.5 8.0 5.6	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 R230 Flexure=1 Capacitance meter 45 (in mm) Fig.3

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

Fig.2



Continued from the preceding page.

tem	Specification		Test Method			
	75% of the terminations is to be soldered evenly and continuously.	rosin (JIS-K-590 Immerse in eute	2) (25% rosin in weight propertic solder solution for 2±0.5	ortion).		
Appearance	No marking defects.	Preheat the capacitor at 120 to 150°C* for 1 min.				
Capacitance Change	Within ±10%	10±1 s. Let sit	at room condition for 24±2 h			
D.F.	0.025 max.	Pretreatment				
I.R.	C≥0.01μF : More than 100M Ω • μF C<0.01μF : More than 10,000M Ω			60±5 min and then		
		*Preheating for	more than 3.2×2.5mm			
Dielectric Strength Pass the item No.4.		Step 1 2	Temperature 100°C to 120°C 170°C to 200°C	Time 1 min. 1 min.		
Appearance	No marking defects.	Fix the capacitor	r to the supporting jig (glass	epoxy board) show		
Capacitance Change	Within ±7.5%	in Fig.4 using a Perform the five	eutectic solder. cycles according to the four			
D.F.	0.025 max.		•	easure.		
I P	C≧0.01μF : More than 100MΩ • μF	Step	Temperature (°C)	Time (min)		
1.1%.	C<0.01μF : More than 10,000MΩ			30±3 2 to 3		
				30±3		
Dielectric Strength	Pass the item No.4.	Perform a heat treatment at 150 ± 0 °C for 60±5 min and then let sit for 24±2 h at room condition. Solder resist Glass Epoxy Board Fig.4				
Appearance	No marking defects.					
Capacitance Change	Within ±15%	Sit the capacitor at 40±2°C and relative humidity 90 to 95% for 500±2% h				
D.F.	idity		Remove and let sit for 24±2 h at room condition, then measure			
C≧0.01μF : More than 10MΩ • μF				tion, then measure.		
I.R.		Pretreatment Perform a heat	treatment at 150±₁8 °C for 6	,		
I.R. Dielectric Strength	C≧0.01μF : More than 10MΩ • μF	Pretreatment Perform a heat	treatment at 150±₁8°C for 6 h at room condition.	,		
Dielectric	C≥0.01μF : More than 10MΩ • μF C<0.01μF : More than 1,000MΩ	Pretreatment Perform a heat let sit for 24±2	h at room condition.	50±5 min and then		
Dielectric Strength	C≥0.01μF : More than 10MΩ • μF C <0.01μF : More than 1,000MΩ Pass the item No.4.	•Pretreatment Perform a heat let sit for 24±2 Apply 120% of to		60±5 min and then e rated voltage in 8 h at maximum		
Dielectric Strength Appearance Capacitance	C≥0.01μF: More than $10MΩ • μF$ $C<0.01μF$: More than $1,000MΩ$ Pass the item No.4. No marking defects.	Pretreatment Perform a heat let sit for 24±2 Apply 120% of t case of rated vo operating tempe room condition,	h at room condition. he rated voltage (150% of th ltage: DC250V) for 1,000 ± ⁴ vrature±3°C. Remove and let then measure.	e rated voltage in 8 h at maximum sit for 24 ±2 h at		
Dielectric Strength Appearance Capacitance Change	$C≥0.01μF$: More than $10MΩ • μF$ $C<0.01μF$: More than $1,000MΩ$ Pass the item No.4. No marking defects. Within $\pm 15\%$	Apply 120% of to case of rated vo operating temperoom condition, The charge/discondress of the case of	h at room condition. the rated voltage (150% of the litage: DC250V) for 1,000 ± 4 strature±3°C. Remove and let then measure. harge current is less than 50	e rated voltage in 8 h at maximum sit for 24 ±2 h at mA.		
Dielectric Strength Appearance Capacitance Change D.F.	$C \ge 0.01 \mu F$: More than $10 M \Omega \cdot \mu F$ $C < 0.01 \mu F$: More than $1,000 M \Omega$ Pass the item No.4. No marking defects. Within ±15% 0.05 max . $C \ge 0.01 \mu F$: More than $10 M \Omega \cdot \mu F$	Apply 120% of to case of rated vo operating temper room condition, The charge/disc Pretreatment Apply test volta	h at room condition. he rated voltage (150% of th ltage: DC250V) for 1,000 ± ⁴ vrature±3°C. Remove and let then measure.	e rated voltage in 8 h at maximum sit for 24 ±2 h at maximum.		
Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric	$C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4. No marking defects. Within $\pm 15\%$ 0.05 max. $C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$	Apply 120% of to case of rated vo operating temper room condition, The charge/disc Pretreatment Apply test volta	he rated voltage (150% of the lage: DC250V) for 1,000 ± 4 erature±3°C. Remove and let then measure. harge current is less than 50 tige for 60±5 min at test temps	e rated voltage in 8 h at maximum sit for 24 ±2 h at maximum.		
Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength	$C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4. No marking defects. Within $\pm 15\%$ 0.05 max. $C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4.	Pretreatment Perform a heat let sit for 24±2 Apply 120% of to case of rated vo operating temperoom condition, The charge/disc. Pretreatment Apply test volta Remove and leterated.	h at room condition. the rated voltage (150% of th Itage: DC250V) for 1,000 ± 4 reature±3°C. Remove and let then measure. harge current is less than 50 age for 60±5 min at test temps t sit for 24±2 h at room conceptors.	e rated voltage in 8 h at maximum sit for 24 ±2 h at mA. Derature.		
Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance	$C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4. No marking defects. Within $\pm 15\%$ 0.05 max. $C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4. No marking defects.	•Pretreatment Perform a heat let sit for 24±2 Apply 120% of the case of rated volume operating tempe room condition, The charge/disc. •Pretreatment Apply test volta Remove and let Apply the rated of 95% for 500 ±250.	h at room condition. the rated voltage (150% of th Itage: DC250V) for 1,000 ± 4 reature±3°C. Remove and let then measure. harge current is less than 50 age for 60±5 min at test temps t sit for 24±2 h at room conceptors.	e rated voltage in 8 h at maximum sit for 24 ±2 h at mA. berature. lition.		
Dielectric Strength Appearance Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change	$C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4. No marking defects. Within $\pm 15\%$ $0.05 \text{ max}.$ $C {\ge} 0.01 \mu F : \text{More than } 10 \text{M}\Omega \bullet \mu F$ $C {<} 0.01 \mu F : \text{More than } 1,000 \text{M}\Omega$ Pass the item No.4. No marking defects. Within $\pm 15\%$	•Pretreatment Perform a heat let sit for 24±2 Apply 120% of the case of rated volume operating temper room condition, The charge/disc. •Pretreatment Apply test volta Remove and let •Pretreatment Apply test volta	h at room condition. the rated voltage (150% of th Itage: DC250V) for 1,000 ± 4 trature±3°C. Remove and let then measure. harge current is less than 50 trates for 60±5 min at test temps t sit for 24±2 h at room conditions.	e rated voltage in 8 h at maximum sit for 24 ±2 h at mA. Derature. lition. The humidity 90 to to tion, then measure perature.		
g	Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change D.F. I.R. Appearance Capacitance Change Appearance Change Appearance Capacitance Change	Appearance No marking defects. Capacitance Change D.F. 0.025 max. I.R. C≥0.01μF : More than 100MΩ • μF C<0.01μF : More than 10,000MΩ Dielectric Strength Appearance No marking defects. Capacitance Change D.F. 0.025 max. I.R. C≥0.01μF : More than 10,000MΩ Appearance No marking defects. Capacitance Change D.F. 0.025 max. I.R. C≥0.01μF : More than 100MΩ • μF C<0.01μF : More than 10,000MΩ Dielectric Strength Appearance No marking defects. Capacitance C<0.01μF : More than 10,000MΩ Appearance No marking defects. Capacitance Colon Unit is the money of the mone	Appearance No marking defects. Preheat the cap Immerse in eute Change D.F. 0.025 max. Pretreatment Perform a heat let sit for 24±2	Appearance No marking defects. Immerse in eutectic solder solution for 2±0.5 Immersing speed: 25±2.5mm/s		

[&]quot;Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

CHIP MONOLITHIC CERAMIC CAPACITOR



for High-voltage GHM2000 Series AC250V r.m.s.

■ 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.
- 5. Capacitance 0.01 to 0.1 uF for connecting lines and 470 to 4700 pF for connecting line to earth.

■ Application

Noise suppression filters for switching power supplies, telephones, facsimiles, modems.

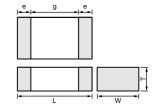
■ Reference Standard

JIS C 5102

JIS C 5150

The standards of the electrical appliance and material control law of Japan, separated table 4.





Part Number		Dime	ensions (m	nm)				
Part Number	L	W	Т	e min.	g min.			
GHM2143		2.8 ±0.3						
GHM2145	5.7 ±0.4	5.0 ±0.4	2.0 ±0.3	0.3	3.5			
GHM2243		2.8 ±0.3	1					

Part Number Rated Voltage (V) TC Code Capacita		Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)	
GHM2243B471MAC250	AC250 (r.m.s.)	В	470pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2243B102MAC250	AC250 (r.m.s.)	В	1000pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2243B222MAC250	AC250 (r.m.s.)	В	2200pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2243B472MAC250	AC250 (r.m.s.)	В	4700pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2143B103MAC250	AC250 (r.m.s.)	В	10000pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2143B223MAC250	AC250 (r.m.s.)	В	22000pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2143B473MAC250	AC250 (r.m.s.)	В	47000pF +20,-20%	5.7	2.8	2.0	3.5 min.	0.3 min.
GHM2145B104MAC250	AC250 (r.m.s.)	В	0.1μF +20,-20%	5.7	5.0	2.0	3.5 min.	0.3 min.

91

No.	lte	em	Specification	Test Method		
1	Operating Temperatu	ıre Range	−25 to +85°C	-		
2	Appearar	ice	No defects or abnormalities.	Visual inspection.		
3	Dimensio	ns	Within the specified dimensions.	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 GHM21xx AC575V (r.m.s.) GHM22xx AC1500V (r.m.s.)		
5	Insulation F	Resistance	More than $2,000 \text{M}\Omega$	The insulation resistance shall be measured with 500±50V and within 60±5 s of charging.		
6	Capacita	nce	Within the specified tolerance.	The second of th		
7	Dissipation Factor (D		0.025 max.	 The capacitance/D.F. shall be measured at 20℃ at a frequency of 1±0.2kHz and a voltage of 1±0.2V (r.m.s.) 		
8	Capacitar Temperat Character	ure	Cap. Change Within ±10%	The range of capacitance change compared with the 20°C value within -25 to $+85^{\circ}C$ shall be within the specified range. •Pretreatment Perform a heat treatment at 150^{\pm}_{-1} °C for 60 ± 5 min and then let sit for 24 ± 2 h at room condition.		
9	Discharge Test (Application: 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: 1,000Ω R2: 100ΜΩ R3: Surge resistance		
10	Adhesive of Termin		No removal of the terminations or other defect shall occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N force in the direction of the arrow. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. 10N, 10±1s Speed: 1.0mm/s Glass Epoxy Board Fig.1		
		Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).		
		Capacitance	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion		
11	Vibration Resistance	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).		

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



Continued from the preceding page.

о.	Ite	m		S	Specification	า			Test Method		
2 D	2 Deflection		No cracking or marking defects shall occur.			Solder the capacitor to the testing jig (glass epoxy board) show in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering shall be done either wan iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such theat shock. 20 50 Pressurizing speed: 1.0mm/s Pressurize Capacitance meter (in mm)		a force in the l be done either with be conducted with e of defects such as			
					Fig.2				Fig.3		
	olderabi erminati		75% of the termi	inations is t	o be soldere	d evenly and	d continuously.	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			
		Appearance	No marking def	ects.							
H	lumidity	Capacitance Change	Within ±15%					The capacitor shall be subjected to 40±2°C, relative humidity of			
41	nsulation	D.F.	0.05 max.						90 to 98% for 8 h, and then removed in room condition for 16 h until 5 cycles.		
		I.R.	More than 1,000	0ΜΩ				-			
		Dielectric Strength	Pass the item N	lo.4.							
		Appearance	No marking def	ects.					apacitor as table. apacitor in eutectic solder solu	ition at 260±5℃ for	
		Capacitance Change	Within ±10%					10±1 s. Let s	it at room condition for 24±2 hoeed: 25±2.5mm/s		
Re	esistance	D.F.	0.025 max.					Pretreatment Porform a ho	t at treatment at 150±₁8℃ for (SO+5 min and than	
	Soldering	I.R.	More than 2,000MΩ					let sit for 24±2 h at room condition.			
He	eal	Dielectric				*Preheating Step Temperature Time					
		Strength	Pass the item No.4.			Step 1	Temperature 100°C to 120°C	1 min.			
								2	170℃ to 200℃	1 min.	
		Appearance	No marking def	ects.				Fix the capaci	tor to the supporting jig (glass	epoxy board) show	
		Capacitance Change	Within ±7.5%					in Fig.4 using a eutectic solder. Perform the five cycles according to the four heat treatments listed in the following table.			
		D.F.	0.025 max.						2 h at room condition, then me	easure.	
		I.R.	More than 2,000	ΩΜΩ				Step	Temperature (°C)	Time (min)	
								12	Min. Operating Temp.±3 Room Temp.	30±3 2 to 3	
								3	Max. Operating Temp.±2	30±3	
Temperature Cycle					Pretreatment Perform a heat treatment at 150 ± 18 ℃ for 60±5 min and then let sit for 24±2 h at room condition. Solder resist Glass Epoxy Board						

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

Continued on the following page.

15

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No.	Ite	em	Specification	Test Method			
		Appearance	No marking defects.				
	Humidity	Capacitance Change	Within ±15%	Sit the capacitor at 40±2°C and relative humidity 90 to 95% for 500 ±2°a h.			
17	(Steady	D.F.	0.05 max.	Remove and let sit for 24±2 h at room condition, then measure. •Pretreatment			
	State)	I.R.	More than 1,000M Ω	Perform a heat treatment at 150 [±] ₁₀ °C for 60±5 min and then			
		Dielectric Strength	Pass the item No.4.	let sit for 24±2 h at room condition.			
		Appearance	No marking defects.	Apply voltage and time as Table at 85±2℃. Remove and let sit			
		Capacitance Change	Within ±15%	for 24 ±2 h at room condition, then measure. The charge / discharge current is less than 50mA.			
		D.F.	0.05 max.	Test Time Test voltage GHM21xx 1,000 ⁺⁴⁸ o h AC300V (r.m.s.)			
18	Life	I.R.	More than 1,000MΩ	GHM22xx 1,500 ⁺⁴ 8 h AC500V (r.m.s.) *			
10	Lile	Dielectric Strength Dielectric Strength Dielectric Strength		* Except that once each hour the voltage is increased to AC1,000V (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.			
		Appearance	No marking defects.				
		Capacitance Change	Within ±15%	Apply the rated voltage at $40\pm2^{\circ}$ C and relative humidity 90 to 95% for 500^{+24}_{0} h.			
19	Humidity Loading	D.F.	0.05 max.	Remove and let sit for 24±2 h at room condition, then measure. •Pretreatment			
	Loading	I.R.	More than 1,000M Ω	Apply test voltage for 60±5 min at test temperature.			
		Dielectric Strength	Pass the item No.4.	Remove and let sit for 24±2 h at room condition.			

[&]quot;Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

CHIP MONOLITHIC CERAMIC CAPACITOR



for High-voltage GHM3000 Series Safety Recognized

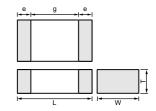
■ Features

- 1. Chip monolitic 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.
- 6. +125 degree C guaranteed.
- 7. Only for reflow soldering.

Application

- Ideal use as Y capacitor or X capacitor for various switching power supply.
- 2. Ideal use as linefilter for MODEM.





Part Number		Dimensions (mm)						
Part Number	L	W	Т	e min.	g min.			
GHM3045			2.0 ±0.3					
GHM3145	5.7 ±0.4	5.0 ±0.4	2.0 ±0.3	0.3	4.0			
GHIVI3145			2.7 ±0.3					

■ Standard Recognition

	Standard No.	Status of F	Rated	
	Standard No.	Type GB	Type GC	Voltage
UL	UL1414	_	©*	
BSI		_	0	
VDE	EN132400	0	0	AC250V
SEV		0	0	(r.m.s.)
SEMKO		0	0	
EN132400 Class		X2	X1, Y2	

*: Line By Pass only

GC Type

Part Number	Rated Voltage (V)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)
GHM3045X7R101K-GC	AC250 (r.m.s.)	X7R	100 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R151K-GC	AC250 (r.m.s.)	X7R	150 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R221K-GC	AC250 (r.m.s.)	X7R	220 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R331K-GC	AC250 (r.m.s.)	X7R	330 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R471K-GC	AC250 (r.m.s.)	X7R	470 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R681K-GC	AC250 (r.m.s.)	X7R	680 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R102K-GC	AC250 (r.m.s.)	X7R	1000 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R152K-GC	AC250 (r.m.s.)	X7R	1500 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R222K-GC	AC250 (r.m.s.)	X7R	2200 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R332K-GC	AC250 (r.m.s.)	X7R	3300 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3045X7R472K-GC	AC250 (r.m.s.)	X7R	4700 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.

GB Type

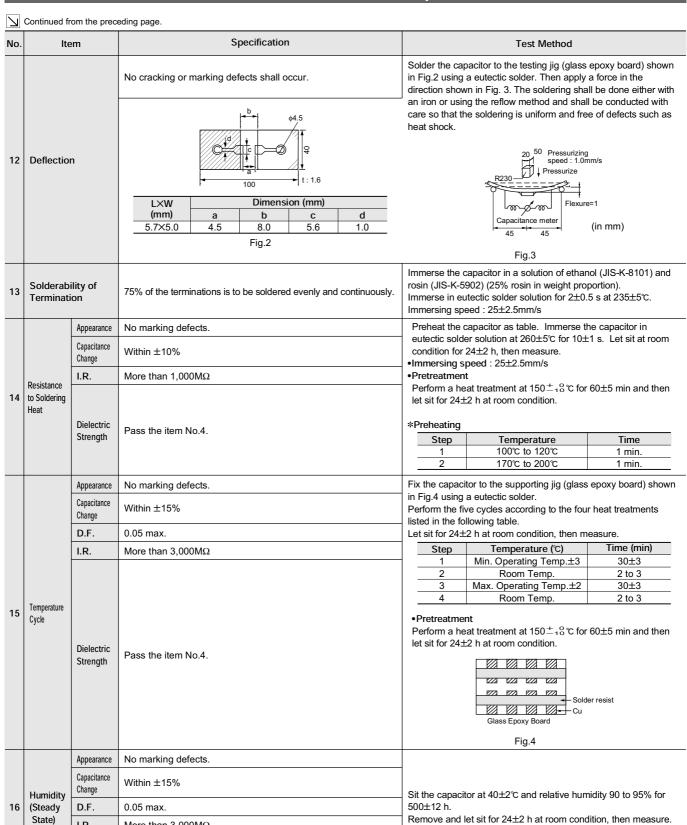
Part Number	Rated Voltage (V)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)
GHM3145X7R103K-GB	AC250 (r.m.s.)	X7R	10000 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3145X7R153K-GB	AC250 (r.m.s.)	X7R	15000 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3145X7R223K-GB	AC250 (r.m.s.)	X7R	22000 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.
GHM3145X7R333K-GB	AC250 (r.m.s.)	X7R	33000 +10,-10%	5.7	5.0	2.7	4.0 min.	0.3 min.

Dielectric Strength: DC1075V, 60+/- 1s.

No.	lte	em	Specification		Test Method	
1	Operating Temperatu	ıre Range	−55 to +125°C		_	
2	Appearar	nce	No defects or abnormalities.	Visual inspection.		
3	Dimensio	ns	Within the specified dimensions.	Using calipers.		
4	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.)		
5	Insulation F	Resistance	More than $6{,}000M\Omega$	The insulation resistance within 60±5 s of charging.	shall be measured with 500±50V and	
6	Capacita	nce	Within the specified tolerance.	Th /D F l .		
7	Dissipation Factor (D		0.025 max.	1±0.2kHz and a voltage o	ll be measured at 20℃ at a frequency of f 1±0.2V (r.m.s.)	
Capacitance Temperature Characteristics Cap. Change Within ±15%		'	within −55 to +125°C shall •Pretreatment	change compared with the 25°C value I be within the specified range. at 150 ± 10°C for 60±5 min and then condition.		
		Appearance	No defects or abnormalities.		ade 50 times at 5 s intervals from	
		I.R.	More than 1,000M Ω	, ,	at DC voltage of specified.	
9	Discharge Test (Application: Type GC)	Dielectric Strength	Pass the item No.4.		r under test Cd : 0.001μF 100MΩ R3 : Surge resistance	
10	Adhesive Strength of Termination		No removal of the terminations or other defect shall occur.	Solder the capacitor to the testing jig (glass epoxy board) in Fig.1 using a eutectic solder. Then apply 10N force in the direction of the arrow. The soldering shall be done either viron or using the reflow method and shall be conducted where so that the soldering is uniform and free of defects such a shock. 10N, 10±1s Speed: 1.0mm/s Glass Epoxy Board Fig.1		
		Appearance	No defects or abnormalities.	Solder the capacitor to the	e test jig (glass epoxy board).	
		Capacitance	Within the specified tolerance.	· •	pjected to a simple harmonic motion	
11	Vibration Resistance	D.F.	0.025 max.	uniformly between the app frequency range, from 10 traversed in approximately a period of 2 h in each 3 r of 6 h).	2 722 722	

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





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

I.R.

Dielectric

Strength

More than $3,000M\Omega$

Pass the item No.4.

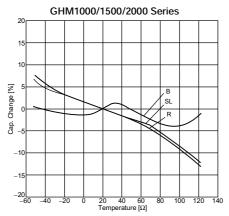
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No.	. Item		Specification	Test Method			
		Appearance	No marking defects.	Impulse Voltage 100 (%) T1=1.2µs=1.67T			
		Capacitance Change	Within ±20%	Each individual capacitor shall be subjected to a 2.5kV (Type GC:5kV) Impulses (the voltage value means			
		D.F.	0.05 max.	zero to peak) for three times. Then			
		I.R.	More than $3,000 M\Omega$	the capacitors are applied to life test.			
17	Life		Pass the item No.4.	Apply voltage as Table for 1,000 h at 125^{+2}_{0} °C, relative humidity 50% max.			
		B		Type Applied voltage			
		Dielectric Strength		GB AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s.			
				GC AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s.			
		Appearance	No marking defects.				
		Capacitance Change	Within ±15%	Apply the rated voltage at 40±2°C and relative humidity 90 to			
18	Humidity Loading	D.F.	0.05 max.	95% for 500 ⁺²⁴ h. Remove and let sit for 24±2 h at room			
	Loading	I.R.	More than $3,000 \text{M}\Omega$	condition, then measure.			
		Dielectric Strength	Pass the item No.4.				

[&]quot;Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa

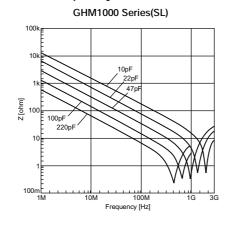
GHM Series Data

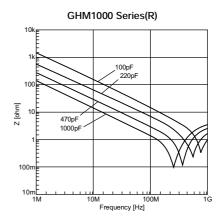
■ Capacitance-Temperature Characteristics

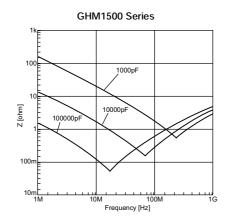


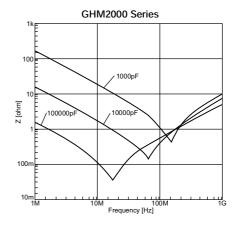
GHM3000 Series X7R Char. Spec.(upper) Cap. Change (%) Type G C (≦681 Type G B _ _ _ _ Type G C (102≦ -60 -40 20 40 60 Temperature (°C) 100 120 140

■ Impedance-Frequency Characteristics





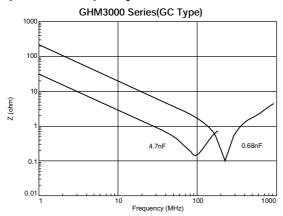


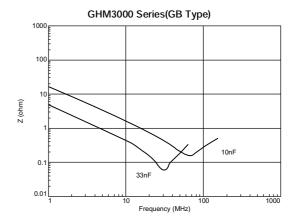


GHM Series Data

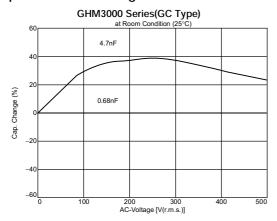
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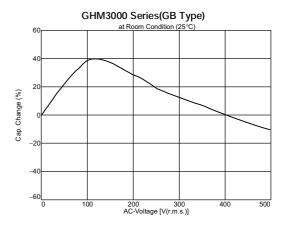
■ Impedance-Frequency Characteristics





■ Capacitance-AC Voltage Characteristics





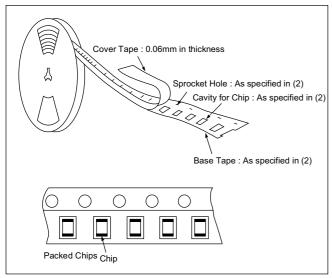
Taping is standard packaging method.

■ Minimum Quantity Guide

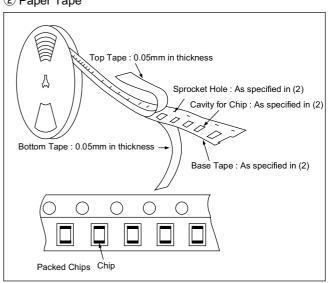
		D	imensions (mr	m)		y (pcs.)
Part Nu	ımber			1		ım reel
		L	W	T	Paper Tape	Plastic Tape
	GHM1030	3.2	1.6	1.0	4,000	-
	Criminoso	0.2	1.0	1.25	-	3,000
	GHM1035	3.2	2.5	1.5	-	2,000
	GHM1038	4.5	2.0	2.0	-	2,000
	GHM1040	4.5	3.2	2.0	-	1,000
	GHW1040	4.5	3.2	2.5	-	500
	CHM4E3E	2.0	1.25	1.0	4,000	-
	GHM1525	2.0	1.25	1.25	-	3,000
				1.0	4,000	-
High-voltage	GHM1530	3.2	1.6	1.25	-	3,000
				1.6	-	2,000
	GHM1535	3.2	2.5	1.5	-	2,000
				2.0	-	1,000
				1.5	-	1,000
	GHM1540	4.5	3.2	2.0	-	1,000
				2.5	-	500
				2.6	-	500
	CUMAFAE	F 7	F 0	2.0	-	1,000
	GHM1545	5.7	5.0	2.7	-	500
	GHM2143	5.7	2.8	2.0	-	1,000
AC250V	GHM2145	5.7	5.0	2.0	-	1,000
	GHM2243	5.7	2.8	2.0	-	1,000
	GHM3045	5.7	5.0	2.0	-	1,000
Safty Std. Recognition	011110445		5 0	2.0	-	1,000
Recognition	GHM3145	5.7	5.0	2.7	-	500

■ Tape Carrier Packaging

- (1) Appearance of Taping
- ① Plastic Tape

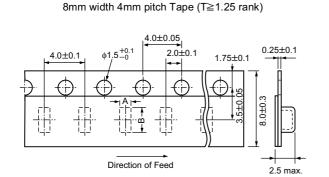


② Paper Tape



Package

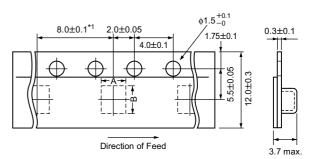
- Continued from the preceding page.
- (2) Dimensions of Tape
- ① Plastic Tape



Part Number	A *	B*
GHMxx25	1.45	2.25
GHMxx30	2.0	3.6
GHMxx35	2.9	3.6

*Nominal Value

12mm width 8mm/4mm pitch Tape



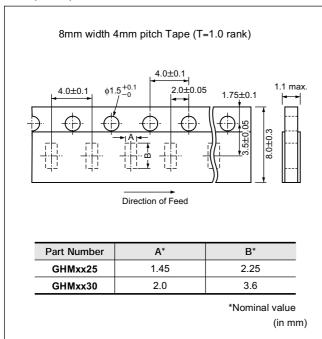
Part Number	A*	B*
GHMxx38	2.5	5.1
GHMxx40	3.6	4.9
GHMxx43	3.2	6.1
GHMxx45	5.4	6.1

^{*1 4.0±0.1}mm in case of GHM1038

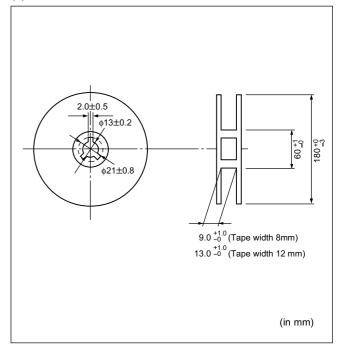
*Nominal Value

(in mm)

2 Paper Tape



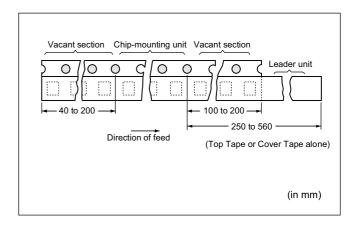
(3) Dimensions of Reel

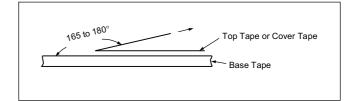


Package

(4) Taping Method

- ① Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.
- ② Part of the leader and part of the empty tape shall be attached to the end of the tape as follows.
- ③ The top tape or cover tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.
- 4 Missing capacitors number within 0.1% of the number per reel or 1 pc, whichever is greater, and are not continuous.
- (5) The top tape or cover tape and bottom tape shall not protrude beyond the edges of the tape and shall not cover sprocket holes.
- 6 Cumulative tolerance of sprocket holes, 10 pitches : ± 0.3 mm.
- Peeling off force: 0.1 to 0.7N in the direction shown on the right.





! Caution

■ Storage and Operating Conditions

Do not use or store capacitors 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

■ Handling

Vibration and impact

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

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

and 20 to 70%. Use capacitors within 6 months. Failure to follow the above cautions may result, worst case,in a short circuit and fuming when the product is used.

Store the capacitors where the temperature and rela-

tive humidity do not exceed 5 to 40 degrees centigrade

molded product in the intended equipment.

■ Caution (Rating)

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°C in B(X7R) characteristic products.

Regarding R and SL characteristic products, the applied voltage should be limited in high frequency circuit. Please contact our sales representatives or engineers for more details.

3. Test Condition for AC Withstanding Voltage

(1) Test Equipment

Test equipment for AC withstanding voltage shall be used with the performance of the wave similar to 50/60 Hz sine wave.

If the distorted sine wave or over load exceeding the

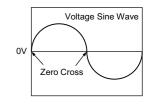
specified voltage value is applied, the defective may be caused.

(2) Voltage Applied Method

When the withstanding voltage is applied, capacitor's lead or terminal shall be firmly connected to the out-put of the withstanding voltage test equipment, and then the voltage shall be raised from near zero to the test voltage. If the test voltage without the raise from near zero voltage would be applied directly to capacitor, test voltage should be applied with the *zero cross. At the end of the test time, the test voltage shall be reduced to near zero, and then capacitor's lead or terminal shall be taken off the out-put of the withstanding voltage test equipment.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, the surge voltage may arise, and therefore, the defective may be caused. *ZERO CROSS is the point where voltage sine wave pass 0V.

-See the right figure-



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

⚠ Caution

■ Caution (Soldering and Mounting)

1. Vibration and Impact

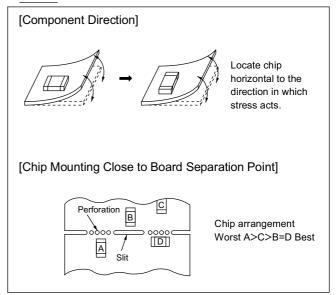
Do not expose a capacitor to excessive shock or vibration during use.

2. 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.

3. 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.





⚠ Caution

Continued from the preceding page.

4. 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.

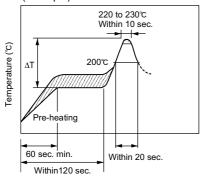
Carefully perform pre-heating so that temperature difference (ΔT) between the solder and component surface should be in the following range. When components are immersed in solvent after mounting, pay special attention to maintain the temperature difference within 100°C.

Chip Size Soldering Method	3.2×1.6mm and under	3.2×2.5mm and over
Reflow Method or Soldering Iron Method	ΔT≦190°C	ΔT≦130°C
Flow Method or Dip Soldering Method	ΔT≦150°C	

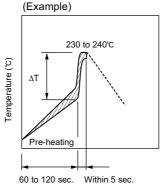
When soldering chips with a soldering iron, it should be performed in following conditions.

Item	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	φ 3.0mm max.				
Soldering Time	3 sec. max.				
Caution	Do not allow the iron-tip to directly touch the ceramic element.				

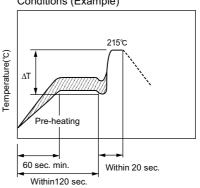
Infrared Reflow Soldering Conditions (Example)



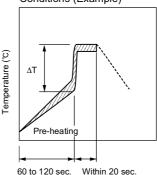
Flow Soldering Conditions



Vapor Reflow Soldering (VPS) Conditions (Example)



Dip Soldering/Soldering Iron Conditions (Example)



5. 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

Mechanical shock of the chip placer

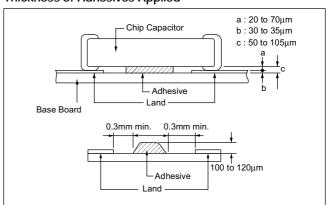
When the positioning claws and pick up nozzle are worn, the load is applied to the chip while positioning is concentrated to one position, thus causing cracks, breakage, faulty positioning accuracy, etc. Careful checking and maintenance are necessary to prevent unexpected trouble.

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.

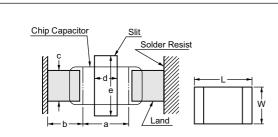
2. Construction of Board Pattern

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

Termination Thickness of Chip Capacitor and Desirable Thickness of Adhesives Applied



Construction and Dimensions of Pattern (Example)



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

Flow Soldering

L×W	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

L×W	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

(in mm)

Land Layout to Prevent Excessive Solder

	Mounting Close to a Chassis	Mounting with Leaded Components	Mounting Leaded Components Later
Examples of Arrangements to be Avoided	Chassis Solder (Ground solder) Adhesive Base board Land Pattern in section	Lead Wire Connected to a Part Provided with Lead Wires.	Soldering Iron Lead Wire of Component to be Connected Later. in section
Examples of Improvements by the Land Divi- sion	d2 d1 <d2 resist<="" solder="" td=""><td>Solder Resist</td><td>Solder Resist</td></d2>	Solder Resist	Solder Resist
	in section	in section	in section

Notice



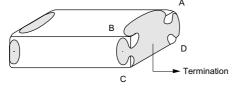
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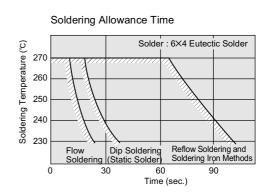
3. Soldering

(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.





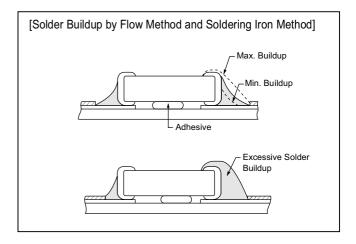
In case of repeated soldering, the accumulated soldering time must be within the range shown above.

(2) 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 6Z4 eutectic solder, or 5Z5 solder. (Do not use solder with silver.)

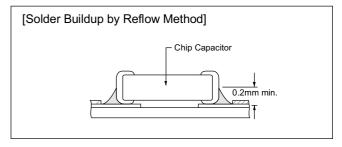
(3) Solder Buildup

① Flow soldering and iron soldering Use as little solder as possible, and confirm that the solder is securely placed.



2 Reflow soldering

When soldering, confirm that the solder is placed over 0.2mm of the surface of the terminations.



4. Cleaning

To perform ultrasonic cleaning, observe the following conditions on the right.

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).

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

■ISO9000 CERTIFICATIONS

Manufacturing plants of these products in this catalog have obtained the ISO9001 or ISO9002 certificate.

Plant	Certified Date	Organization	Registration NO.
Fukui Murata Manufacturing	Mar. 31, '95	RCJ★ ISO9001	RCJ-85M-01C
Co.,Ltd.			
Izumo Murata Manufacturing	May. 11, '95		RCJ-93M-05A
Co.,Ltd.	Way. 11, 33		
Murata Electronics	Aug. 13, '92	SISIR★★	SG MES 91M001A
Singapore (Pte.) Ltd.	Aug. 15, 92	ISO9002	
Murata Manufacturing	Nov. 18, '92	BSI★★★	FM 22169
(UK) Ltd.	1407. 10, 92	ISO9002	
Murata Amazonia	Sep. '93	RCJ★	RCJ-(B)-93M-01
Industria Comercio Ltda.	3ep. 93	ISO9002	
Murata Electronics North America	Jun. '94	UL★★★★	A1734
State College Plant	Juli. 94	ISO9002	

★ RCJ : Reliability Center for Electronic Components of Japan
 ★★ SISIR : Singapore Institute of Standards and Industrial Research

★★★ BSI : British Standards Institution ★★★★ UL : Underwriters Laboratories Inc.

⚠ Note:

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 Law" of Japan, the export license specified by the law is required for export.

- 2. Please contact our sales representatives or product engineers before using our products listed in this catalog for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our products for other applications than specified in this catalog.
 - 1) Aircraft equipment
 - 2 Aerospace equipment
 - 3 Undersea equipment
 - 4 Power plant equipment (5) Medical equipment
 - 6 Transportation equipment (vehicles, trains, ships, etc.)
 - Traffic signal equipment
 - 8 Disaster prevention / crime prevention equipment
 - 9 Data-processing equipment
 - @ Application of similar complexity and/or reliability requirements to the applications listed in the above
- 3. Product specifications in this catalog are as of July 2000. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before your ordering. If there are any questions, please contact our sales representatives or product engineers
- 4. The parts numbers and specifications listed in this catalog are for information only. You are requested to approve our product specification or to transact the approval sheet for product specification, before your ordering.
- 5. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or third party's intellectual property rights and other related rights in consideration of your using our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.
- 6. None of ozone depleting substances (ODS) under the Montreal Protocol is used in manufacturing process of us.



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