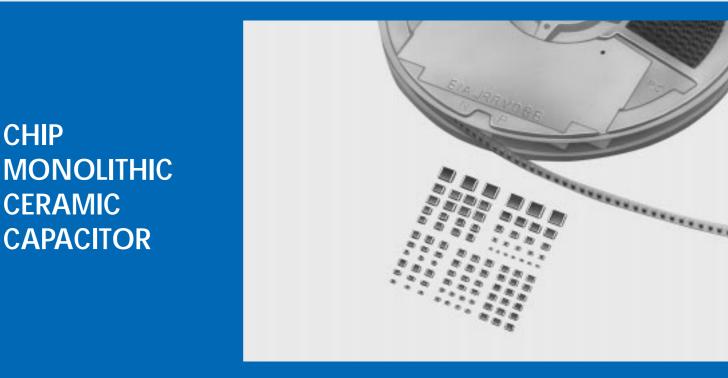
CHIP MONOLITHIC CERAMIC CAPACITOR





Murata Manufacturing Co., Ltd.



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DataSheet4U.com • Please refer to "Specifications and Test Methods" at the end of each chapter of 5 - 16 except for GRM series.



Part Numbering

(.) GRM40 C	0G 151 J 50		PT	GHM3045	X7R 101	K - GC		
,		Murata's control no.	9	Туре		3 6		
Temperature Cha Temperature com								
Code	C0G	СОН	P2H	R2H	S2H	T2H	U2J	SL
Temp. range	—55 to	125°C		1	−55 to 85°C		1	
Temp. coeff. (ppm/ ℃)	0±30	0±60	-150±60	-220±60	-330±60	-470±60	-750±120	+350 to
High dielectric co	nstant							
Code	X7R	X5	R	Z5U	Y5V		в	R
Temp. range	-55 to 125°C	; −55 to	85℃	10 to 85℃	—30 to 85°	C	-25 to 8	5℃
Cap. change (%) ±15		±1	5	+22 -56	+22 -82	±	10	±15
(%)		d Recognition			• For ultrasonic	:	·	
	250V type/Safety st	a. Rooogintion					ZLM	
	250V type/Safety st	R/X7R		В	code			
ligh-Voltage/AC				B to 85°C	code Temp.rang	e —25	to 20°C	20 to 85°C

2Capacitance (Ex.)

3Capacitance Tolerance

(Ex.)		Data	Sheet4U.com	I]
Code	Capacitance (pF)	Туре	Temperature Characteristic	Code	Capaci Toler		Capacitance Step
0R5	0.5		C0G to U2J	с		±0.25pF	0.5, 1, 1.5, 2, 3, 4, 5 (pF)
R75	0.75				≦10 pF		
010	1	Temperature compensating type	(NP0) (N750)	D	•	±0.5pF	6, 7, 8, 9, 10 (pF)
010	I		and SL	J	>10 pF	±5%	E12 series
100	10			× ×		00/	EQ a serie s
101	100		X7R, X5R, B, R	ĸ	±10	0%	E6 series
		High dielectric constant	Z5U	M	±20%		E6 series
103	10000		Z5U, Y5V	z	+80, -	-20%	E3 series
			SL	D	≦10 pF	±0.5pF	10 (pF)
		High-Voltage/AC250V type/	3L	J	\geq 10 pF	±5%	E12 series
		Safety Standard Recognition	X7R, B, R	к	±10%		E6 series
			В	м	±20%		E3 series

et4U.com

A Rated 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.)]

Packing Code (only for chip type)

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

Type Designation (Apply to GHM3000 Series.)

Code	Type Designation
-GB	Type GB
-GC	Type GC

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CHIP MONOLITHIC CERAMIC CAPACITOR

muRata

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).

Application

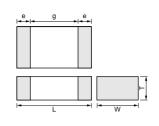
General electronic equipment.

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Temperature Compensating Type GRM36 Series

	Part Number					GRM36					
	L x W(mm)					1.00x0.50					
	TC Code	COG	COH	P2H	R2H	S2H		SL	T2H	U2J	
	Rated Volt.(Vdc)	50	25	50	50	50	25	50	50	50	
com	Capacitance and	l T(mm)									DataShe
	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	
Shee	et4U.com47pF	0.50						0.50	0.50 ₩₩	vw.Dats&heet	t4U.com
	56pF	0.50						0.50	0.50	0.50	





Part Number		Din	nensions (n	וm)		
Fait Number	L	W	Т	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	
			0.6 ±0.1			
GRM40	2.0 ±0.1	1.25 ±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.∠ ±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 \pm 0.07(L)×0.8 \pm 0.07(W)×0.8 \pm 0.07(T)

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Part Number					GRM36				
L x W(mm)					1.00x0.50				
TC Code	C0G	СОН	P2H	R2H	S2H	S	SL	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	SL.		T2H	U2J	-
	Rated Volt.(Vdc)	50	100	200	25	50	50	50	25	50	100	200	50	50	-
	Capacitance and	T(mm)						-			1	1		1	
	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 ata	aS10:80t4	U.0.801					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	-
4U.com	18pF	0.80	0.80			0.80	0.80	0.80				0.80	0.80	0.80	DataShe
-	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	-
ataShee	et4U.cor820pF				0.80				0.80				www.D	ataShed	et4U.com
	1000pF				0.80				0.80						-

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Continued from the preceding page.

Part Number		GRM39													
L x W(mm)		1.60x0.80													
TC Code		C0G		COH	P2H	R2H	S2H		S		T2H	U2J			
Rated Volt.(Vdc)	ated Volt.(Vdc) 50 100 200		25	50	50	50	25	25 50 100 200			50	50			
Capacitance and	l T(mm)														
1200pF								0.80							
1500pF								0.80							

Temperature Compensating Type GRM40 Series

	Part Number							GRM40							
1	L x W(mm)							2.00x1.25							_
1	TC Code		C0G		C0H	P2H	R2H	S2H		S	SL.		T2H	U2J	_
1	Rated Volt.(Vdc)	50	100	200	25	50	50	50	25	50	100	200	50	50	_
	Capacitance and	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		Data	Sheet4	U.com				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		
com -	680pF	0.85	1.25				1.25	1.25			0.85		1.25		DataShe
_	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						_

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Temperature Compensating Type GRM42-6 Series

Part Number	 							GRM42-6								_
L x W(mm)	ļ				1	1	1	3.20x1.6)						1	_
TC Code	ļ	1)G	1	COH	P2H	R2H	S2H		1	SL			T2H	U2J	_
Rated Volt.(Vdc)		100	200	500	25	50	50	50	25	50	100	200	500	50	50	-
Capacitance and	d T(mm)	1	1	1	1	1	1	1		1	1	1	1	1	1	
1.0pF	ļ			1.15												_
2.0pF				1.15												_
3.0pF	ļ			1.15												_
4.0pF				1.15												_
5.0pF				1.15												_
6.0pF	L			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		Datas	Sheet4	U.com								_
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													Data
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	<u> </u>			1		1	1		1.15							_

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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			

 4.7μ 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.

T:1.25±0.1mm is also available for GRM40 10V 1.0 μF type.

 3.3μ F for 10V rated is replaced with GRM42-631 series of L:3.2±0.2, W:1.6±0.2, T:1.3+0/-.3mm.

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

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 2.2µF type.

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

	TC Code									X7R									
	Part Number		GR	M36				GR	M39				GRM40			GRM	142-6		-
	L x W(mm)		1.00	x0.50				1.60	x0.80			2	2.00x1.2	5		3.20	x1.60		-
	Rated Volt.(Vdc)	10	16	25	50	10	16 🛛)a t25 Sh	1e 50 4L	1.000 n	200	16	25	50	10	16	25	50	-
	Capacitance and	l 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								
n	2200pF				0.50				0.80	0.80									DataSh
	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			

0.10µF, 50V rated are GRM40-034 series of L:2±0.15, W:1.25±0.15, T:1.25±0.15.

DataSheet 1.25+0.1 mm is also available for GRM42-6 1.0 μ F for 16V.

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

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

TC Code								Y	5V							
Part Number		GRM36				GRM39				GR	M40			GRM	142-6	
L x W(mm)	1	.00x0.5	0		1	l.60x0.8	0			2.00	x1.25		3.20x1.60			
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 \pm 0.1mm is also available for GRM40 16V 1.0 μ F type.

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

TC Code	I.			Z	25U				
Part Number	GF	RM39		GRM40			GRM42-6		_
L x W(mm)	1.60	0x0.80		2.00x1.25			3.20x1.60		_
Rated Volt.(Vdc)	50	100	50 Da	ataShe i00 4U.c	om 200	50	100	200	_
Capacitance and	J T(mm)	mm)							
2200pF	0.80	0.80 0.80			1.25				_
4700pF	0.80			0.85				1.15	_
10000pF	0.80			1.25					_
22000pF			0.60				0.85		_
47000pF									_
0.10µF			0.85						
n 0.22μF						0.85			- [

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Features

migration.

PCBs.

ranging from C0G to Y5V.

automatic placement.

Application

are suited to only reflow soldering.

4. Stringent dimensional tolerances allow highly reliable, high speed automatic chip placements on

5. The GRM series is available in plastic embossed tape or paper taping and reel packaging for

CHIP MONOLITHIC CERAMIC CAPACITOR

for Reflow Soldering GRM Series

1. Terminations are made of metal highly resistant to

2. The GRM series is a complete line of chip ceramic capacitors in 25V,50V,100V,200V and 500V rated. These capacitors have temperature characteristics

3. This series consists of type GRM42-2(LxWxT:3.2x2.5x 0.85mm) to type GRM44-1(LxWxT:5.7x5.0x2.0mm). These



e	l ⊲ g	e ►I ► I	
			L L
◄	L		≪ w ►

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Dimensions (mm)										
L	W	Т	e min.	g min.						
		0.85 ±0.1								
		1.15 ±0.1								
3.2 ±0.3	2.5 ±0.2	1.35 ±0.15	0.3	1.0						
		1.8 ±0.2								
		2.5 ±0.2								
4.5 ±0.4	3.2 ±0.3	2.0 max.	0.3	2.0						
5.7 ±0.4	5.0 ±0.4	2.0 max.	0.3	2.0						
	4.5 ±0.4	L W 3.2 ±0.3 2.5 ±0.2 4.5 ±0.4 3.2 ±0.3	L W T 0.85 ±0.1 1.15 ±0.1 3.2 ±0.3 2.5 ±0.2 4.5 ±0.4 3.2 ±0.3 2.0 max.	L W T e min. 3.2 ±0.3 2.5 ±0.2 1.35 ±0.15 0.3 1.8 ±0.2 2.5 ±0.2 0.3 0.3 4.5 ±0.4 3.2 ±0.3 2.0 max. 0.3						

General electronic equipment.	
Temperature Compensating Type GRM42-2 Series	

	Part Number			Dat	taSheet4l GR I	M42-2				
	L x W(mm)				3.20	x2.50				
	TC Code		C	0G			S	L		
	Rated Volt.(Vdc)	50	100	200	500	50	100	200	500	
	Capacitance and	T(mm)								
	150pF				1.35					
	180pF				1.35					
	330pF								1.15	
om	390pF								1.15	DataShe
	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				GRM	43-2			
L x W(mm)				4.50x	3.20			
TC Code		C)G			S	L	
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	Dat	aSheet4U.co	m	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		C	:0G			SL		DataSh
Rated Volt.(Vdc)	50	100	200	500	50	100	200	
Capacitance and	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		_

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High Dielectric Constant Type GRM42-2 Series

Part Number					GRM	142-2				
L x W(mm)					3.20	x2.50				
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			GRM	M43-2			
	L x W(mm)			4.50	x3.20			
	TC Code		X7R	DataSheet4U.c	om	Z5U		
	Rated Volt.(Vdc)	50	100	200	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		
J.com-	0.22µF		2.00			2.00		DataSh
-	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	RM44-1 70x5.00		
L x W(mm)			5.70			
TC Code		X7R			Z5U	
Rated Volt.(Vdc)	50	100	200	50	100	200
Capacitance and	I T(mm)					
0.15µF			2.00		í	2.00
0.22µF			2.00		ĺ	2.00
0.33µF		2.00			2.00	
0.47µF		2.00			2.00	
0.68µF	2.00				2.00	
1.0µF	2.00				ĺ	
eet4U.con1.5µF	2.00			2.00		www.DataSheet4



CHIP MONOLITHIC CERAMIC CAPACITOR

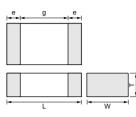


Ultra-small Type GRM33 Series

Features

3

- 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		Din	nensions (n	nm)	
Part Number	L	W	Т	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	DataSheet4U.com		_
-	1pF	0.3			_
-	2pF	0.3			_
	3pF	0.3			_
	4pF	0.3			
	5pF	0.3			
	6pF	0.3			_
- 411	7pF	0.3			
et4U.com	орг	0.3			DataShe
	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			_
ı .	82pF	0.3			
I	100pF	0.3	0.3		_
I	150pF		0.3		_
	220pF		0.3		_
I	330pF		0.3		_
I	470pF		0.3		_
I	680pF		0.3		
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I	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)	c) 25 16 10								
Capacitance and	d T(mm)								
4700pF			0.3						
10000pF			0.3						

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CHIP MONOLITHIC CERAMIC CAPACITOR

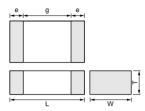
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Thin Type for Flow/Reflow GRM Series

Features

- 1. 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.





Part Number		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	GRM36-01	9				
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	DataSheet4U.com	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	ataShe			
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					

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			Specification		-	-		
No	D.	Ite	m	Temperature Compensating Type	High Dielectric Type		Test Method	
1	1 Opera Temp			−55 to +125℃	X5R : -55 to +85℃ X7R : -55 to +125℃ Z5U : +10 to +85℃ Y5V : -30 to +85℃			
2	2 R	Rated Vol	ltage	See the previous page.		The rated voltage is of may be applied contin When AC voltage is s whichever is larger, s range.	nuously to the capac superimposed on DC	vitor.
3	B A	Appearan	ice	No defects or abnormalities.		Visual inspection.		
4	l D	Dimensio	ns	Within the specified dimensions		Using calipers on mic	rometer.	
5	5 D	Dielectric	Strength	No defects or abnormalities.				
6		nsulation Resistanc		More than 10,000MΩ or 500Ω •	F (Whichever is smaller)	The insulation resista not exceeding the rat within 2 minutes of ch	ed voltage at 25℃ a	
7	' C	Capacitance		Within the specified tolerance.		The capacitance/Q/D.F. shall be measured at 25°C at		
					[X5R,X7R] W.V. : 25Vmin. : 0.025max.	frequency and voltage		Voltage
			ation Factor		W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max.(C<3.3µF) 0.1max (C≥3.3µF)	C0∆ toU2J,SL (1000pF and below)	1±0.1MHz	0.5 to 5Vrms
8		Q/ Dissipation Fac		30pFmin. : Q≧1000 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)		C : Nominal Capacitance (pF)	[Y5V] Data Sheet4U.com 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) : 0.09max (C>1.0µF)	X5R,X7R,Y5V (more than 10µF)	120±24Hz	0.5±0.1Vrms
ł					: 0.09max.(C≧1.0µF) W.V. : 10Vmax. : 0.125max. X5R : Within±15%	Z5U The capacitance char each specified tempe		0.5±0.05Vrms ed after 5 Min. at
com		Capacitance Change	Within the specified tolerance. (Table A)	(-55 to +85℃) X7R : Within±15% (-55 to +125℃) Z5U : Within +22/-56% (+10 to +85℃) Y5V : Within +22/-82% (-30 to +85℃)	(1) Temperature Con The temperature coe Capacitance measure When cycling the tem $5 (C0\Delta : +25$ °C to +1 +85°C) the capacitant for the temperature of	npensating Type fficient is determined ad in step 3 as a refe aperature sequential 25°C : other temp. co ce shall be within the	erence. ly from step 1 through peffs. : +25°C to e specified tolerance	
	Ca	apacitance	Tomporatura	Within the operified televones		Table A. The capacitance drift is caluculated 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.		asured values in the
9		mperature naracteristics	Temperature Coefficient	Within the specified tolerance. (Table A)		Step 1	Tempera 25	
	CIR	เสายจารการแบร				2	 	J2J/SL/X5R/X7R) for Y5V)
						3	255	
						4	125±3 (for 85±3 (for 0	
			Capacitance	Within $\pm 0.2\%$ or ± 0.05 pF (Whichever is larger.)		5	255	
			Drift	*Not apply to SL/25V		(2) High Dielectric Co The ranges of capaci 25℃ value over the te shall be within the sp	tance change compa emperature ranges s	

Continued on the following page.

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		Specif	ication	
lo. Item		Temperature Compensating Type	High Dielectric Type	Test Method
Adhesive Strength of Termination No removal of the terminations o		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 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 gree of defects such as heat shock. *2N (GRM33) 5N (GRM36,GRM39)	
	Appearance	No defects or abnormalities.		
	Capacitance	Within the specified tolerance.	1	_
Vibration Resistanc	Q/D.F.	.F. 30pFmin. : Q≥1000 W.V. : 6.3V : 30pFmax. : Q≥400+20C 0.05max. (C<3.3)		Solder the capacitor to the test jig (glass epoxy board) in the 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 crack or marked defect shal	l occur.	Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direc- tion 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		Type a GRM33 0.3 GRM36 0.4 GRM39 1.0 GRM40 1.2 GRM42-6 2.2 GRM42-2 2.2	04.5 0 1 0.9 0.3 1.5 3.0 1.2 4.0 5.0 2.0 5.0	Pressurizing speed : 1.0mm/sec. Pressurize Flexure : ≤1 Fig.3
	Adhesiv of Term Vibration Resistance	Adhesive Strength of Termination Appearance Capacitance Q/D.F.	Temperature Compensating Type Adhesive Strength of Termination No removal of the terminations Appearance No defects or abnormalities. Capacitance Within the specified tolerance. Vibration Resistance Q/D.F. 30pFmin.: Q≥1000 30pFmax.: Q≥400+20C C : Nominal Capacitance (pF) Vibration Less Q/D.F. 30pFmin.: Q≥1000 30pFmax.: Q≥400+20C C : Nominal Capacitance (pF) Deflection No crack or marked defect shall Image: Type a GRM33 0.3 GRM39 1.0 GRM40 1.2 0.3 GRM39 1.0 GRM40 1.2	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. Image: Appearance of Termination No defects or abnormalities. Image: Appearance of Termination No defects or abnormalities. Image: Capacitance Optimized and the specified tolerance. [X5R,X7R] WV.: 25Vmin:: 0.025max. WV.: 163W:: 0.035max. WV.: 163W:: 0.035max. WV.: 163W:: 0.035max. WV.: 163W:: 0.035max. WV.: 163W:: 0.035max. WV.: 163W:: 0.035max. WV.: 163W:: 0.025max. WV.: 163W:: 0.035max. WV.: 163W:: 0.035max. WV.: 163W:: 0.025max. WV.: 16W:: 0.025max. WV.: 16W:: 0.025max. WV.: 16W:: 0.025max. WV.: 11W:: 0.025max



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			Speci	fication		
No	. Ite	em	Temperature Compensating Type	High Dielectric Type	Test Method	
13	13 Solderability of Termination		75% of the terminations is to be continuously.	e soldered evenly and	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and 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.		-	
14		Capacitance Change	Within $\pm 2.5\%$ or ± 0.25 pF (Whichever is larger)	X5R,X7R : Within ±7.5% Z5U,Y5V : Within ±20%	Preheat the capacitor at 120 to 150℃ for 1 minute.	
	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 : 0.05max. (C<3.3µF) 0.1max. (C≥3.3µF) [Z5U] W.V. : 25Vmin. : 0.025max. [Y5V] W.V. : 25Vmin. : 0.05max. (C<1.0µF) : 0.09max. (C≥1.0µF) W.V.:16V : 0.09max. (C≥1.0µF) : 0.09max. (C≥1.0µF) W.V. : 10Vmax. : 0.125max.	1 100°C to 120°C 1 min. 2 170°C to 200°C 1 min.	
		I.R.	More than 10,000M Ω or 500 Ω \circ	F (Whichever is smaller)		
		Dielectric Strength	No failure	DeteCheet/U		
			The measured and observed ch specifications in the following ta			
		Appearance	No marking defects.			
		Capacitance Change	Within $\pm 2.5\%$ or ± 0.25 pF (Whichever is larger)	X5R,X7R : Within ±7.5% Z5U,Y5V : Within ±20%	Fix the capacitor to the supporting jig in the same manner and	
com 15	Temperature Cycle	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 0.05max. (C<3.3µF) 0.1max. (C≥3.3µF) [Z5U] W.V. : 2.5Vmin. : 0.025max. [Y5V] W.V. : 25Vmin. : 0.05max. (C<1.0µF) : 0.09max. (C≥1.0µF) W.V. : 16V : 0.09max. (C≥1.0µF) : 0.09max. (C≥1.0µF) W.V. : 10Vmax. : 0.125max.	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. $\begin{array}{c c c c c c c c c c c c c c c c c c c $	
				1		
		I.R.	More than 10,000M Ω or 500 Ω	 F (Whichever is smaller) 		

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			Specif	fication		
No	. Ite	em	Temperature Compensating Type	High Dielectric Type	Test Method	
			The measured and observed ch 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	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Sit the capacitor at 40±2°C 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 tem- perature, 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% t4U.com Y5V : Within ±30% [W.V. : 10Vmax.] Y5V : Within +30/-40%		
17 n	, 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) : 0.025max. (C<1.0µF)	 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 (temperatu 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. 	
				: 0.0125max. (C≧1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≧1.0μF) W.V. : 10Vmax. : 0.15max.		
		I.R.	More than 500MΩ or 25Ω • F(W	W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≧1.0μF) W.V. : 10Vmax. : 0.15max.		

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			Specif	fication	
No.	lte	em	Temperature Compensating Type	High Dielectric Type	Test Method
			The measured and observed characteristics shall satisfy the specifications in the following table.		
		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 maximum 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 : 0.125max. (C≥1.0µF) : 0.125max. (C≥1.0µF) W.V. : 10Vmax. : 0.15max.	 Intaining temperature 13°C. Let strift 24±2 floors (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°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. *150% for 500V and C≥10µF
		I.R.	More than 1,000M Ω or 50 Ω •F(Whichever is smaller)	
		Dielectric Strength	No failure		
19	Notice		When mounting capacitor of 50	0V rated voltage, perform the epo DataSheet4U.com	oxy resin coating(min.1.0mm thickness)

Table A

				(Capacitance Cha	nge from 25℃ (%	.)		
	Char.	Nominal Values (ppm/℃)*		-55	_	30	-	-10	
			Max.	Min.	Max.	Min.	Max.	Min.	
	C0G	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	
et4U.com	P2H	-150 ± 60	2.33	0.72	1.61	0.50	1.02	0.32	DataShee
-	R2H	-220 ± 60	3.02	1.28	2.08	0.88	1.32	0.56	
-	S2H	$-330\pm$ 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℃ to 125℃ (for Co∆)/85℃ (for other TC).



CHIP MONOLITHIC CERAMIC CAPACITOR



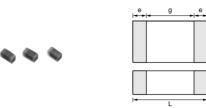
High-power Type GRM600 Series

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



I	-	 L	 -	W	

Part Number		Dir	nensions (ı	nm)	
Part Number	L	W	Т	е	g min.
GRM615	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4

GRM615C0001050 50 C0G 10-01pF 100 0.50 0.50 GRM615C0002055 50 COG 10-025pF 100 0.50 0.50 GRM615C0002050 50 COG 20-01pF 100 0.50 0.50 GRM615C0002050 50 COG 30-01pF 100 0.50 0.50 GRM615C0002050 50 COG 30-025pF 100 0.50 0.50 GRM615C0002050 50 COG 40-025pF 100 0.50 0.50 GRM615C0009050 50 COG 50-025pF 100 0.50 0.50 GRM615C0009050 50 COG 6.0-025pF 100 0.50 0.50 GRM615C00		Part Number	Rated Voltage (Vdc)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	
GRM615C00020E90 50 C0G 2.0 - 0.1pF 1.00 0.50 0.50 GRM615C00020C50 50 C0G 2.0 - 0.2pF 1.00 0.50 0.50 GRM615C00030C50 50 C0G 3.0 - 0.2pF 1.00 0.50 0.50 GRM615C0040050 50 C0G 4.0 - 0.1pF 1.00 0.50 0.50 GRM615C0060050 50 C0G 4.0 - 0.2pF 1.00 0.50 0.50 GRM615C0060050 50 C0G 5.0 - 0.2pF 1.00 0.50 0.50 GRM615C0060050 50 C0G 6.0 - 0.2pF 1.00 0.50 0.50 GRM615C0060050 50 C0G 7.0 - 0.2pF 1.00 0.50 0.50 GRM615C00600505 50 C0G 7.0 - 0.2pF 1.00 0.50 0.50 GRM615C00600505 50 C0G 7.0 - 0.2pF 1.00 0.50 0.50 GRM615C00600505 50 C0G 7.0 - 0.5pF 1.00 0.50 0		GRM615C0G010B50	50	C0G	1.0 –0.1pF	1.00	0.50	0.50	1
GRMs15C0G020C50 50 COG 2.0 - 0.25pF 1.00 0.50 0.50 GRMs15C0G030B50 50 COG 3.0 - 0.25pF 1.00 0.50 0.50 GRMs15C0G030B50 50 COG 4.0 -0.1pF 1.00 0.50 0.50 GRMs15C0G040C50 50 COG 4.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G040C50 50 COG 4.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G050C50 50 COG 6.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G050D50 50 COG 6.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G050D50 50 COG 7.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G050D50 50 COG 8.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G050D50 50 COG 7.0 -0.25pF 1.00 0.50 0.50 GRMs15C0G050D50 50 COG 9.0 -0.5pF 1.00 0.50		GRM615C0G010C50	50	C0G	1.0 –0.25pF	1.00	0.50	0.50	
GRM615C0G030E50 50 C0G 3.0 -0.1pF 1.00 0.50 0.50 GRM615C0G030C50 50 C0G 3.0 -0.25pF 1.00 0.50 0.50 GRM615C0G040C50 50 C0G 4.0 -0.25pF 1.00 0.50 0.50 GRM615C0G050E50 50 C0G 5.0 -0.25pF 1.00 0.50 0.50 GRM615C0G050E50 50 C0G 5.0 -0.25pF 1.00 0.50 0.50 GRM615C0G050050 50 C0G 6.0 -0.25pF 1.00 0.50 0.50 GRM615C0G050050 50 C0G 7.0 -0.25pF 1.00 0.50 0.50 GRM615C0G050050 50 C0G 8.0 -0.25pF 1.00 0.50 0.50 GRM615C0G060050 50 C0G 8.0 -0.25pF 1.00 0.50 0.50 GRM615C0G060050 50 C0G 8.0 -0.25pF 1.00 0.50 0.50 GRM615C0G060050 50 C0G 8.0 -0.25pF 1.00 0.50 <		GRM615C0G020B50	50	C0G	2.0 –0.1pF	1.00	0.50	0.50	
GRM615C0G030C50 50 C0G 3.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G040E50 50 C0G 4.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050E50 50 C0G 2.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050E50 50 C0G 5.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050E50 50 C0G 6.0 - 0.35pF 1.00 0.50 0.50 GRM615C0G050D50 50 C0G 6.0 - 0.35pF 1.00 0.50 0.50 GRM615C0G050D50 50 C0G 7.0 -0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 C0G 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 C0G 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 C0G 1.0 - 0.25pF 1.00 0.50 <td></td> <td>GRM615C0G020C50</td> <td>50</td> <td>C0G</td> <td>2.0 –0.25pF</td> <td>1.00</td> <td>0.50</td> <td>0.50</td> <td></td>		GRM615C0G020C50	50	C0G	2.0 –0.25pF	1.00	0.50	0.50	
GRM615C0G04050 50 C0G 4.0 - 0.1pF 1.00 0.50 0.50 GRM615C0G040C50 50 C0G 4.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050B50 50 C0G DataSheeJS0L-0.4pF 1.00 0.50 0.50 GRM615C0G050B50 50 C0G 6.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G060D50 50 C0G 6.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G070D50 50 C0G 7.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G070D50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 C0G 0.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 C0G 1.0 - 0.25pF 1.00 0.5		GRM615C0G030B50	50	COG	3.0 –0.1pF	1.00	0.50	0.50	
GRM615C0G040C50 50 COG 4.0 -0.28pF 1.00 0.50 0.50 GRM615C0G0500E50 50 COG DataSheetBi0L4.04pF 1.00 0.50 0.50 GRM615C0G0500E50 50 COG 6.0 -0.25pF 1.00 0.50 0.50 GRM615C0G0500E50 50 COG 6.0 -0.25pF 1.00 0.50 0.50 GRM615C0G0070E50 50 COG 7.0 -0.25pF 1.00 0.50 0.50 GRM615C0G0070E50 50 COG 7.0 -0.25pF 1.00 0.50 0.50 GRM615C0G070D50 50 COG 8.0 -0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 COG 9.0 -0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 COG 9.0 -0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 COG 0.0 -0.25pF 1.00 0.50 0.50 GRM615C0G000D50 50 COG 1.0 -0.25pF 1.00 0.50<		GRM615C0G030C50	50	COG	3.0 –0.25pF	1.00	0.50	0.50	
GRM615C0G050B50 50 COG DataShee364-0.1pF 1.00 0.50 0.50 GRM615C0G050C50 50 COG 5.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 6.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 6.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 7.0 - 0.5pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 9.0 - 0.5pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 0.50 - 0.25pF 1.00 0.50 0.50 GRM615C0G050D50 50 COG 0.50 - 0.25pF 1.00 0.		GRM615C0G040B50	50	COG	4.0 –0.1pF	1.00	0.50	0.50	
GRM615C0G050C50 50 C0G 5.0-0.25pF 1.00 0.50 0.50 GRM615C0G060C50 50 C0G 6.0-0.25pF 1.00 0.50 0.50 GRM615C0G007050 50 C0G 7.0-0.25pF 1.00 0.50 0.50 GRM615C0G07050 50 C0G 7.0-0.25pF 1.00 0.50 0.50 GRM615C0G080C50 50 C0G 8.0-0.25pF 1.00 0.50 0.50 GRM615C0G080C50 50 C0G 8.0-0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 9.0-0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 0.5-0.15PF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 0.5-0.15PF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 1.0-0.25pF 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 1.0-0.25pF 1.00 0.50 0.50 <td></td> <td>GRM615C0G040C50</td> <td>50</td> <td>COG</td> <td>4.0 –0.25pF</td> <td>1.00</td> <td>0.50</td> <td>0.50</td> <td></td>		GRM615C0G040C50	50	COG	4.0 –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 GRM615C0G070C50 50 C0G 7.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G080C50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G080C50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G080C50 50 C0G 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G0805050 50 C0G 0.5 - 0.5pF 1.00 0.50 0.50 GRM615C0G087550 50 C0G 0.5 - 0.25pF 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 10 - 0.25pF 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 11 - 2% 1.00 0.50		GRM615C0G050B50	50	COG D	ataShee1510_00pFi	1.00	0.50	0.50	
GRM615C0G060D50 50 C0G 6.0-0.5pF 1.00 0.50 0.50 GRM615C0G70D50 50 C0G 7.0-0.25pF 1.00 0.50 0.50 GRM615C0G70D50 50 C0G 7.0-0.5pF 1.00 0.50 0.50 GRM615C0G080D50 50 C0G 8.0-0.5pF 1.00 0.50 0.50 GRM615C0G080D50 50 C0G 8.0-0.5pF 1.00 0.50 0.50 GRM615C0G080D50 50 C0G 9.0-0.25pF 1.00 0.50 0.50 GRM615C0G080D50 50 C0G 0.5-0.1pF 1.00 0.50 0.50 GRM615C0G080D50 50 C0G 0.5-0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 C0G 10.0-0.5pF 1.00 0.50 0.50 GRM615C0G100D50 50 C0G 11-2% 1.00 0.50 0.50 GRM615C0G1203050 50 C0G 12-5% 1.00 0.50 0.50		GRM615C0G050C50	50	COG	5.0 –0.25pF	1.00	0.50	0.50	
GRM615C0G070C50 50 C0G 7.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 7.0 - 0.5pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 0.50 - 0.25pF 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 10.0 - 0.5pF 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 11 - 2% 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 12 - 2% 1.00 0.50 0.50 GRM615C0G100C50 50 C0G 13 - 2% 1.00 0.50		GRM615C0G060C50	50	C0G	6.0 –0.25pF	1.00	0.50	0.50	
GRM615C06070D50 50 COG 7.0 - 0.5pF 1.00 0.50 0.50 GRM615C06080C50 50 COG 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C06080D50 50 COG 8.0 - 0.25pF 1.00 0.50 0.50 GRM615C06090D50 50 COG 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C06090D50 50 COG 9.0 - 0.25pF 1.00 0.50 0.50 GRM615C06090D50 50 COG 0.50 - 0.25pF 1.00 0.50 0.50 GRM615C06100D50 50 COG 10.0 - 0.5pF 1.00 0.50 0.50 GRM615C06100D50 50 COG 112 - 2% 1.00 0.50 0.50 GRM615C061100D50 50 COG 112 - 2% 1.00 0.50 0.50 GRM615C06120J50 50 COG 13 - 2% 1.00 0.50 0.50 GRM615C06130G50 50 COG 15 - 5% 1.00 0.50 0.		GRM615C0G060D50	50	C0G	6.0 –0.5pF	1.00	0.50	0.50	
GRM615C0G080C50 50 C0G 8.0 -0.25pF 1.00 0.50 0.50 GRM615C0G080D50 50 C0G 8.0 -0.5pF 1.00 0.50 0.50 GRM615C0G090C50 50 C0G 9.0 -0.25pF 1.00 0.50 0.50 GRM615C0G09050 50 C0G 9.0 -0.25pF 1.00 0.50 0.50 GRM615C0G0R5B50 50 C0G 0.5 -0.1pF 1.00 0.50 0.50 GRM615C0G0R5C50 50 C0G 0.5 -0.25pF 1.00 0.50 0.50 GRM615C0G10050 50 C0G 10 -0.25pF 1.00 0.50 0.50 GRM615C0G10050 50 C0G 11 -2% 1.00 0.50 0.50 GRM615C0G10050 50 C0G 11 -2% 1.00 0.50 0.50 GRM615C0G10050 50 C0G 12 -5% 1.00 0.50 0.50 GRM615C0G10050 50 C0G 15 -2% 1.00 0.50 0.50 <		GRM615C0G070C50	50	C0G	7.0 –0.25pF	1.00	0.50	0.50	
GRM615C0G080D50 50 COG 8.0 -0.5pF 1.00 0.50 0.50 GRM615C0G090D50 50 COG 9.0 -0.25pF 1.00 0.50 0.50 GRM615C0G090D50 50 COG 9.0 -0.25pF 1.00 0.50 0.50 GRM615C0G0R5ES0 50 COG 0.5 -0.1pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 0.5 -0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 10.0 -0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 10.0 -0.5pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 11 -2% 1.00 0.50 0.50 GRM615C0G100D50 50 COG 12 -2% 1.00 0.50 0.50 GRM615C0G130G50 50 COG 13 -2% 1.00 0.50 0.50 GRM615C0G180G50 50 COG 15 -2% 1.00 0.50 0.50 <td></td> <td>GRM615C0G070D50</td> <td>50</td> <td>C0G</td> <td>7.0 –0.5pF</td> <td>1.00</td> <td>0.50</td> <td>0.50</td> <td></td>		GRM615C0G070D50	50	C0G	7.0 –0.5pF	1.00	0.50	0.50	
et4U.com GRMe15C0G090C50 50 COG 9.0 -0.25pF 1.00 0.50 0.50 GRMe15C0G090D50 50 COG 9.0 -0.25pF 1.00 0.50 0.50 GRMe15C0G0R5B50 50 COG 0.5 -0.1pF 1.00 0.50 0.50 GRMe15C0G0R5C50 50 COG 0.5 -0.25pF 1.00 0.50 0.50 GRMe15C0G100C50 50 COG 10 -0.25pF 1.00 0.50 0.50 GRMe15C0G100D50 50 COG 10 -0.25pF 1.00 0.50 0.50 GRMe15C0G12050 50 COG 11 -2% 1.00 0.50 0.50 GRMe15C0G12050 50 COG 12 -2% 1.00 0.50 0.50 GRMe15C0G12050 50 COG 13 -2% 1.00 0.50 0.50 GRMe15C0G130G50 50 COG 15 -3% 1.00 0.50 0.50 GRMe15C0G180J50 50 COG 18 -2% 1.00 0.50 0		GRM615C0G080C50	50	C0G	8.0 –0.25pF	1.00	0.50	0.50	
GRM613C00390D50 50 COG 9.0-2.25pF 1.00 0.30 0.30 GRM613C00390D50 50 COG 9.0-0.5pF 1.00 0.50 0.50 GRM615C0G090D50 50 COG 0.50-0.25pF 1.00 0.50 0.50 GRM615C0G100C50 50 COG 0.50-0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 10-0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 11-2% 1.00 0.50 0.50 GRM615C0G100D50 50 COG 11-2% 1.00 0.50 0.50 GRM615C0G120J50 50 COG 12-2% 1.00 0.50 0.50 GRM615C0G130G50 50 COG 13-2% 1.00 0.50 0.50 GRM615C0G130G50 50 COG 15-5% 1.00 0.50 0.50 GRM615C0G160G50 50 COG 18-2% 1.00 0.50 0.50		GRM615C0G080D50	50	C0G	8.0 –0.5pF	1.00	0.50	0.50	
GRM615C0G0R5B50 50 COG 0.5 - 0.1pF 1.00 0.50 0.50 GRM615C0G0R5C50 50 COG 0.50 - 0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 10 - 0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 10 - 0.25pF 1.00 0.50 0.50 GRM615C0G100D50 50 COG 11 - 2% 1.00 0.50 0.50 GRM615C0G120G50 50 COG 12 - 2% 1.00 0.50 0.50 GRM615C0G130G50 50 COG 13 - 2% 1.00 0.50 0.50 GRM615C0G180G50 50 COG 15 - 5% 1.00 0.50 0.50 GRM615C0G180G50 50 COG 18 - 2% 1.00 0.50 0.50 GRM615C0G180G50 50 COG 1.2 - 0.1pF 1.00 0.50 0.50 GRM615C0G180G50 50 COG 1.8 - 2% 1.00 0.50 0.50 <td>et4U.com</td> <td>GRM615C0G090C50</td> <td>50</td> <td>C0G</td> <td>9.0 –0.25pF</td> <td>1.00</td> <td>0.50</td> <td>0.50</td> <td>DataShee</td>	et4U.com	GRM615C0G090C50	50	C0G	9.0 –0.25pF	1.00	0.50	0.50	DataShee
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 GRM615C0G100D50 50 C0G 11-2% 1.00 0.50 0.50 GRM615C0G120G50 50 C0G 12-2% 1.00 0.50 0.50 GRM615C0G120J50 50 C0G 12-5% 1.00 0.50 0.50 GRM615C0G130G50 50 C0G 13-2% 1.00 0.50 0.50 GRM615C0G150J50 50 C0G 15-5% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 18-2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 18-5% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 1.1-0.1pF 1.00 0.50 0.50 GR		GRM615C0G090D50	50	COG	9.0 –0.5pF	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 C0G 12 - 2% 1.00 0.50 0.50 GRM615C0G120J50 50 C0G 12 - 5% 1.00 0.50 0.50 GRM615C0G130G50 50 C0G 13 - 2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15 - 5% 1.00 0.50 0.50 GRM615C0G160G50 50 C0G 16 - 2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 18 - 2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 1.1 - 0.1pF 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 1.2 - 0.1pF 1.00 0.50 0.50		GRM615C0G0R5B50	50	COG	0.5 –0.1pF	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 C0G 12 -2% 1.00 0.50 0.50 GRM615C0G120J50 50 C0G 12 -5% 1.00 0.50 0.50 GRM615C0G130G50 50 C0G 13 -2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15 -2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15 -5% 1.00 0.50 0.50 GRM615C0G160G50 50 C0G 18 -2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 1.1 -0.1pF 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 1.2 -0.1pF 1.00 0.50 0.50 GRM615C0G1R1B50 50 C0G 1.3 -0.1pF 1.00 0.50 0.50		GRM615C0G0R5C50	50	COG	0.50 –0.25pF	1.00	0.50	0.50	_
GRM615C0G110G50 50 C0G 11-2% 1.00 0.50 0.50 GRM615C0G120G50 50 C0G 12-2% 1.00 0.50 0.50 GRM615C0G120J50 50 C0G 12-5% 1.00 0.50 0.50 GRM615C0G130G50 50 C0G 13-2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15-2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15-2% 1.00 0.50 0.50 GRM615C0G160G50 50 C0G 15-5% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 18-2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 1.1-0.1pF 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 1.2-0.1pF 1.00 0.50 0.50 GRM615C0G18BJ50 50 C0G 1.3-0.1pF 1.00 0.50 0.50 GRM615C0G		GRM615C0G100C50	50	COG	10 –0.25pF	1.00	0.50	0.50	_
GRM615C0G120G50 50 C0G 12 - 2% 1.00 0.50 0.50 GRM615C0G120J50 50 C0G 12 - 5% 1.00 0.50 0.50 GRM615C0G130G50 50 C0G 13 - 2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15 - 2% 1.00 0.50 0.50 GRM615C0G160G50 50 C0G 15 - 5% 1.00 0.50 0.50 GRM615C0G160G50 50 C0G 16 - 2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 18 - 2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 1.1 - 0.1pF 1.00 0.50 0.50 GRM615C0G1R1B50 50 C0G 1.1 - 0.1pF 1.00 0.50 0.50 GRM615C0G1R3B50 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		GRM615C0G100D50	50	COG	10.0 –0.5pF	1.00	0.50	0.50	-
GRM615C0G120J50 50 C0G 12-5% 1.00 0.50 0.50 GRM615C0G130G50 50 C0G 13-2% 1.00 0.50 0.50 GRM615C0G150G50 50 C0G 15-2% 1.00 0.50 0.50 GRM615C0G150J50 50 C0G 15-2% 1.00 0.50 0.50 GRM615C0G160G50 50 C0G 16-2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 18-2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 1.1-0.1pF 1.00 0.50 0.50 GRM615C0G1R1B50 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 GRM615C0G1R3B50 50 C0G 1.5-0.1pF 1.00 0.50 0.50 GRM615C0G1R3B50 50 C0G 1.5-0.25pF 1.00 0.50 0.50		GRM615C0G110G50	50	C0G	11 –2%	1.00	0.50	0.50	
GRM615C0G130G50 50 C0G 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 C0G 18 -2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 18 -2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 1.1 -0.1pF 1.00 0.50 0.50 GRM615C0G1R1B50 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 -0.25pF 1.00 0.50 0.50 GRM615C0G1R6B50 50 C0G 1.5 -0.25pF 1.00 0.50 0.50 <		GRM615C0G120G50	50	C0G	12 –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 C0G 18 - 2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 18 - 5% 1.00 0.50 0.50 GRM615C0G1818J50 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 GRM615C0G1R3B50 50 C0G 1.5 - 0.1pF 1.00 0.50 0.50 GRM615C0G1R5E50 50 C0G 1.5 - 0.25pF 1.00 0.50 0.50 DataSheet GRM615C0G1R6B50 50 C0G 1.6 - 0.1pF 1.00 0.50 0.50		GRM615C0G120J50	50	C0G	12 –5%	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 C0G 18-2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 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 GRM615C0G1R3B50 50 C0G 1.5-0.1pF 1.00 0.50 0.50 GRM615C0G1R5B50 50 C0G 1.5-0.25pF 1.00 0.50 0.50 DataSheet GRM615C0G1R6B50 50 C0G 1.6-0.1pF 1.00 0.50 0.50		GRM615C0G130G50	50	C0G	13 –2%	1.00	0.50	0.50	_
GRM615C0G160G50 50 C0G 16 - 2% 1.00 0.50 0.50 GRM615C0G180G50 50 C0G 18 - 2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 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 GRM615C0G1R5B50 50 C0G 1.5 - 0.25pF 1.00 0.50 0.50 DataShee_GRM615C0G1R6B50 50 C0G 1.6 - 0.1pF 1.00 0.50 0.50		GRM615C0G150G50	50	C0G	15 –2%	1.00	0.50	0.50	_
GRM615C0G180G50 50 C0G 18 - 2% 1.00 0.50 0.50 GRM615C0G180J50 50 C0G 18 - 5% 1.00 0.50 0.50 GRM615C0G1R1B50 50 C0G 1.1 - 0.1pF 1.00 0.50 0.50 GRM615C0G1R2B50 50 C0G 1.1 - 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 DataSheet GRM615C0G1R6B50 50 C0G 1.6 - 0.1pF 1.00 0.50 1.50		GRM615C0G150J50	50	COG	15 –5%	1.00	0.50	0.50	_
GRM615C0G180J50 50 C0G 18 -5% 1.00 0.50 0.50 GRM615C0G1R1B50 50 C0G 1.1 -0.1pF 1.00 0.50 0.50 GRM615C0G1R2B50 50 C0G 1.1 -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 DataSheet GRM615C0G1R6B50 50 C0G 1.6 -0.1pF 1.00 0.50 1.00 0.50		GRM615C0G160G50	50	COG	16 –2%	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 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 DataSheet GRM615C0G1R6B50 50 C0G 1.6 -0.1pF 1.00 0.50 0.50		GRM615C0G180G50	50	COG	18 –2%	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 GRM615C0G1R5D50 50 C0G 1.5 -0.25pF 1.00 0.50 0.50 DataSheet GRM615C0G1R6B50 50 C0G 1.6 -0.1pF 1.00 0.50 0.50		GRM615C0G180J50	50	COG	18 –5%	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 DataSheet GRM615C0G1R6B50 50 C0G 1.6 -0.1pF 1.00 0.50 0.50		GRM615C0G1R1B50	50	COG	1.1 –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 DataSheet GRM615C0G1R6B50 50 C0G 1.6 -0.1pF 1.00 0.50 0.50		GRM615C0G1R2B50	50	COG	1.2 –0.1pF	1.00	0.50	0.50	_
GRM615C0G1R5C50 50 C0G 1.5 - 0.25pF 1.00 0.50 0.50 DataSheet GRM615C0G1R6B50 50 C0G 1.6 - 0.1pF 1.00 0.50 WWW.DataSheet 4		GRM615C0G1R3B50	50	COG	1.3 –0.1pF	1.00	0.50	0.50	_
DataSheet GRM615C0G1R6B50 50 C0G 1.6-0.1pF 1.00 0.50 WWW.DataSheet 4		GRM615C0G1R5B50	50	C0G	1.5 –0.1pF	1.00	0.50	0.50	_
		GRM615C0G1R5C50	50	COG	1.5 –0.25pF	1.00	0.50	0.50	_
GRM615C0G1R8B50 50 C0G 1.8 –0.1pF 1.00 0.50 0.50	DataShee	GRM615C0G1R6B50	50	COG	1.6 –0.1pF	1.00	0.50	www.DataShee	t4U.com
		GRM615C0G1R8B50	50	COG	1.8 –0.1pF	1.00	0.50	0.50	-

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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	C0G	2.4 –0.1pF	1.00	0.50	0.50
GRM615C0G2R7B50	50	C0G	2.7 –0.1pF	1.00	0.50	0.50
GRM615C0G3R3B50	50	C0G	3.3 –0.1pF	1.00	0.50	0.50
GRM615C0G3R6B50	50	C0G	3.6 –0.1pF	1.00	0.50	0.50
GRM615C0G3R9B50	50	C0G	3.9 –0.1pF	1.00	0.50	0.50
GRM615C0G4R3B50	50	C0G	4.3 –0.1pF	1.00	0.50	0.50
GRM615C0G4R7B50	50	C0G	4.7 –0.1pF	1.00	0.50	0.50
GRM615C0G5R1C50	50	C0G	5.1 –0.25pF	1.00	0.50	0.50
GRM615C0G5R6C50	50	C0G	5.6 –0.25pF	1.00	0.50	0.50
GRM615C0G6R2C50	50	C0G	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	C0G	9.1 –0.25pF	1.00	0.50	0.50

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			Specification	-				
No	. It∈	em	Temperature Compensating Type		Test Method			
1	Operating Temperati	ure Range	−55 to +125℃					
2	Rated Vo	ltage	See the previous pages.	may be applied continu When AC voltage is su	efined as the maximum voltage which uously to the capacitor. uperimposed 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 dimensions.	Using calipers.		_		
5	Dielectric Strength Insulation Resistance (I.R.) Capacitance		No defects or abnormalities.	applied between the te	erved when 300% of the rated voltage is erminations for 1 to 5 seconds, provided current is less than 50mA.	_		
6			10,000M Ω min. or 500 Ω • F min. (Whichever is smaller)		nce shall be measured with a DC voltage d voltage at 25°c and 75%RH max. and arging.	_		
7			Within the specified tolerance.	The capacitance/Q shall be measured at 25°C at the frequency and voltage shown in the table.				
			30pF min. : Q≧1,000	Item Char.	C0G(1000pF and below)			
8	Q		30pF max. : Q≧400+20C	Frequency	1±0.1MHz			
			C : Nominal Capacitance (pF)	Voltage	0.5 to 5Vr.m.s.			
		Capacitance Change	Within the specified tolerance. (Table A-1)	The capacitance change shall be measured after 5 min. at each specified temperature stage.				
		citance erature	Within the specified tolerance. (Table A-1)	capacitance measured When cycling the temp	sating Type icient is determined using the I in step 3 as a reference. Derature sequentially from step 1 through 25°C : other temp. coeffs. : +25°C to 85°C)			
9	Capacitance Temperature Characteristics		Canacitance	DataSheet4U.com	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 cap value in step 3.			
			(Whichever is larger.)	Step	Temperature(°C)			
				1	25±2			
				2	-55±3			
				3	25±2			
com				4 5	125±3 25±2	Dat		
10	10 Adhesive Strength of Termination		No removal of the terminations or other defect shall occur.	Fig.1 using a eutectic so with the test jig for 10± The soldering shall be co method and shall be co	done either with an iron or using the reflow onducted with care so that the soldering is ects such as heat shock.			

Continued on the following page.

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Continued from the preceding page. Specification									
٢	No.	Ite	m	Temperature Compensating Type	Test Method				
-			Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board) in the				
			Capacitance	Within the specified tolerance.	same manner and under the same conditions as (10).				
	11	Vibration Resistance	Q	30pF min. : Q≥1,000 30pF max. : Q≥400+20C C : Nominal Capacitance (pF)	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).				
		12 Deflection		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				
	12				soldering is uniform and free of defects such as heat shock. $\begin{array}{c} $				
1	13	Solderabi Terminati	2	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.					
		Resistance	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	Preheat the capacitor at 120 to 150°C for 1 minute.				
	14	to Soldering Heat	Q	30pF and over : Q≧1,000 30pF and below : Q≧400+20C C : Nominal Capacitance (pF)	 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. 				
om			I.R.	More than 10,000M Ω or 500 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.	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles				
		Temporature	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.				
ľ	15	Temperature Cycle	0	30pF and over : Q≥1,000 30pF and below : Q≥400+200	Step 1 2 3 4				
			Q	30pF and below : Q≧400+20C C : Nominal Capacitance (pF)	Temp.(°C) Min. Operating Room Temp. $\stackrel{+\circ}{-3}$ Temp. $\stackrel{Max. Operating}{Temp3}$ Room Temp.				
			I.R.	More than 10,000M Ω or 500 Ω • 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.					
	16	Humidity, Steady	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Sit the capacitor at $40\pm2^{\circ}$ and 90 to 95% humidity for 500±12 hours.				
1	10	State	Steady	30pF and over. : Q≧350 10pF and over, 30pF and below : Q≧275+					
			Q	10pF and below : Q≥200+10C C : Nominal Capacitance (pF)					

Continued on the following page.



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			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.			
	l la sua i alita a	Capacitance Change	Within $\pm 7.5\%$ or ± 0.75 pF (Whichever is larger)	Apply the rated voltage at $40\pm2^{\circ}$ and 90 to 95% humidity for		
17	Humidity Load	Q	30pF and over : Q≥200 30pF and below : Q≥100+ ⅓ C C : Nominal Capacitance (pF)	 500±12 hours. 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 500M Ω or 25 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.			
	llink	Capacitance Change	Within $\pm 3\%$ or ± 0.3 pF (Whichever is larger)	Apply 200% of the rated voltage for 1000 ± 12 hours at the		
18	High Temperature Load	Q	30pF and over. : Q≥350 10pF and over, 30pF and below : Q≥275+ $\frac{5}{2}$ C 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	 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		0.5pF≦C≦1pF : 350MΩ . pF below 1pF <c≦5pf 300mω="" :="" below<br="">5pF<c≦10pf 250mω="" :="" below<="" td=""><td>The ESR shall be measured at room Temp. and frequency 1 ± 0.2GHz with the equivalent of BOONTON Model 34A.</td></c≦10pf></c≦5pf>	The ESR shall be measured at room Temp. and frequency 1 ± 0.2 GHz with the equivalent of BOONTON Model 34A.		
			10pF <c≦20pf 400mω="" :="" below="" datasheet4u.com<="" td=""><td>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 0 <i>K</i>		Capacitance Change from 25℃ Value (%)							
	Char.	Temp. Coeff. (ppm/℃) Note 1	_55℃		-:	30°C	−10°C				
			Max.	Min.	Max.	Min.	Max.	Min.			
.com -	C0G	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11	_		
COIT	Note 1 · Nominal	values denote the temperature coef	ficiont within a ra	ngo of 25 to 125°C	(for COA)				- D		

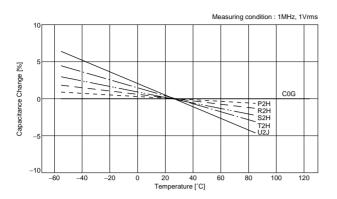
Note 1 : Nominal values denote the temperature coefficient within a range of 25 to 125°C.(for C0∆)

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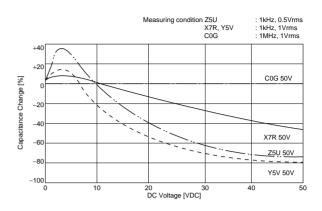
GRM Series Data

■ Capacitance-Temperature Characterstics

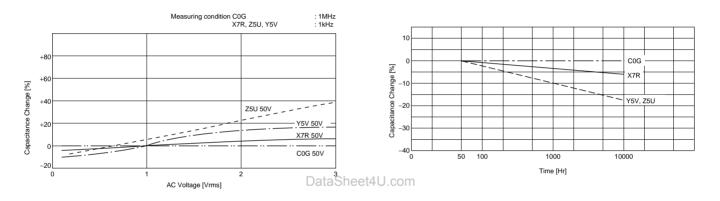


■ Capcitance-AC Voltage Characteristics

■ Capcitance-DC Voltage Characteristics



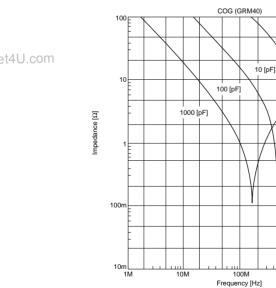
■ Capacitance Change-Aging



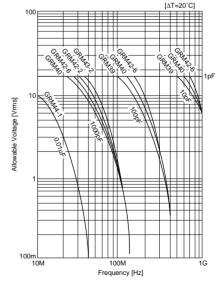
■ Impedance-Frequency Characteristics

1 [pF]

1G



Allowable Voltage-Frequency



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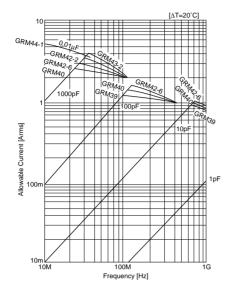
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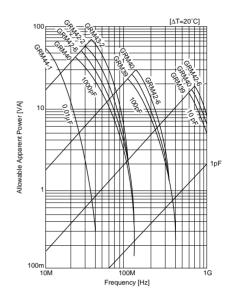
GRM Series Data

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■ Allowable Current-Frequency



■ Allowable Appearant Power



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CHIP MONOLITHIC CERAMIC CAPACITOR

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)							
	L	W	Т					
LL0306	0.8 ±0.1	1.6 ±0.1	0.6 max.					
110500		2.0 +0.1	0.6 ±0.1					
LL0508	1.25 ±0.1	2.0 ±0.1	0.85 ±0.1					
110040	1 (10 15	3.2 +0.15	0.7 ±0.1					
LL0612	1.6 ±0.15	3.2 ±0.15	1.15 ±0.1					

LL0306 Series

	Part Number				LLC)306				
	L x W(mm)				0.8	x1.6				
	L x W(mm) 1 TC Code 7 Rated Volt.(Vdc) 1 Capacitance and 7 2200pF 1 2700pF 1 3300pF 1 3900pF 1 4700pF 1 6800pF 1 6800pF 1 10000pF 1 12000pF 1		X	7R		Y	′5V	Z5U		
	Rated Volt.(Vdc)	10	16	25	50	16	50	25	50	
	Capacitance and	T(mm)								
_	2200pF				0.6					
_	2700pF				0.6					
_	3300pF				0.6					
_	3900pF			Da	ataShe e6 4U.co	om				
	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		
J.com-	18000pF			0.6						DataSh
_	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 Z5U												
Rated Volt.(Vdc)	10	16	25	50	16	25	50	25	50					
Capacitance and	d T(mm)													
0.15pF								0.85						
eet4U.co0;22pF	0.6							W	ww.DataShee	t4U.co				
4700pF				0.6						-				



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Part Number		LL0508											
L x W(mm)					1.25x2.0								
TC Code		X	7R			Y5V		Z5U					
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			DataShee	4U.com								

LL0612 Series

Part Number		LL0612										
L x W(mm)		1.6x3.2										
TC Code		X	7R			Y5V		Z	25U	_		
Rated Volt.(Vdc)	10	16	25	50	16	25	50	25	50	Data		
Capacitance and T	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		ļ		0.7								
56000pF		ļ		0.7								
68000pF		ļ		0.7								
82000pF		ļ	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									
heet4U.co0;33µF		0.7	1.15				1.15	1.15 ₩₩	ww.DataShee	t4U		
0.39µF		0.7										

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Part Number	LL0612											
L x W(mm)	1.6x3.2											
TC Code		X	7R			Y5V		Z5U				
Rated Volt.(Vdc)	10	16	25	50	16	25	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											

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	No.	Item	Specification	Test Method		
	1	Operating Temperature Range	X7R : −55℃ to +125℃ Z5U : +10℃ to +85℃ Y5V : −30℃ to +85℃			
	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	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	Within the specified tolerance.	The capacitance/D.F. shall be measured at 25℃ at the		
6			Char. 25V min. 16V	frequency and voltage shown in the table.		
0	8	Dissipation Factor	X7R 0.025 max. 0.035 max. Z5U 0.025 max. —	X7R · Y5V Z5U		
	0	(D.F.)	Y5V 0.05 max. 0.07 max. (C<1.0μF) 0.09 max. 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°C 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.		
			DataSheet4U.com	Solder the capacitor to the test jig (glass epoxy board) shown 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.		
et4U.com	10	Adhesive Strength of Termination	No removal of the terminations or other defect shall occur.	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)		
				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).		
	11	Vibration	Char. 25V min. 16V VIET 0.005	 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 		
		Resistance D.F.	X7R 0.025 max. 0.035 max. Z5U 0.025 max. —	frequency range, from 10 to 55Hz and return to 10Hz, shall be		
		D.F.	Y5V 0.05 max. 0.07 max. (C<1.0μF) 0.09 max. (C≥1.0μF) 0.09 max. (C≥1.0μF)	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).		

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No	b. Ite	em		Spe	cification	Test Method	
			No crack or m	arked defect sl	nall 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.	
1.	Deflection		Type a b c 100 t:1.6mm LL0306 0.3 1.2 2.0 LL0508 0.6 1.6 2.4 LL0612 1.0 3.0 3.7		b c 1.2 2.0 1.6 2.4 3.0 3.7	Fig.3	
1	3 Solderab Terminat	2	75% of the ten	minations is to b	e 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 eutectic solder solution for 2±0.5 seconds at 230±5°C.	
		Appearance Capacitance Change	No defects or X7R : Within± Z5U · Y5V : W			Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse th capacitor in a eutectic solder solution at 270±5℃ for 10±0.5	
14	Resistance to Soldering Heat	D.F.	Char. X7R Z5U Y5V	25V min. 0.025 max. 0.025 max. 0.05 max.	16V 0.035 max. — 0.07 max. (C<1.0μF) 0.09 max. (C≥1.0μF) 0.09 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/₋₁₀ °c for one hour and then 	
		I.R. Dielectric Strength	More than 10, No failure	000MΩ or 5009	Ω • F (Whichever is smaller)	let sit for 48±4 hours at room temperature. Perform the initial measurement.	
		Appearance Capacitance Change	X7R : Within± Z5U · Y5V : W	/ithin±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 48±4 hours at room tem-	
n 1!	Temperature Cycle	D.F.	Char. X7R Z5U Y5V	25V min. 0.025 max. 0.025 max. 0.05 max.	16V 0.035 max. 	$\begin{tabular}{ c c c c c c } \hline perature, then measure. \\ \hline \hline Step & 1 & 2 & 3 & 4 \\ \hline \hline Temp.(\degree C) & Min. Operating \\ Temp. \stackrel{+ \circ 0}{\rightarrow 3} & Room \\ \hline Temp. & Temp. \stackrel{+ \circ 0}{\rightarrow 3} & Temp. \\ \hline \hline Time(min.) & 30\pm 3 & 2 to 3 & 30\pm 3 & 2 to 3 \\ \hline \end{tabular}$	
		I.R.	More than 10,	000MΩ or 500	$\Omega \bullet F$ (Whichever is smaller)	Initial measurement.	
		Dielectric Strength	No failure			Perform a heat treatment at 150^{+0}_{-10} °C for one hour and then let sit for 48 ± 4 hours at room temperature. Perform the initial measurement.	
		Appearance Capacitance Change	No defects or X7R : Within± Z5U · Y5V : W				
1	Humidity, Steady State	D.F.	Char. X7R Z5U	25V min. 0.05 max. 0.05 max.	16V 0.05 max.	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.	
		D.F.	Y5V	0.075 max.	0.1 max. (C<1.0μF) 0.125 max. (C≧1.0μF)		

Continued on the following page.

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No.	Ite	em		Spe	cification	Test Method		
		Appearance	No defects or	abnormalities.				
		Capacitance Change	X7R : Within± Z5U · Y5V : W					
17	Humidity Load	D.F. I.R. Dielectric Strength	Char. X7R Z5U Y5V More than 500	25V min. 0.05 max. 0.05 max. 0.075 max.	16V 0.05 max. — 0.1 max. (C<1.0μF) 0.125 max. (C≥1.0μF) (Whichever is smaller)	Apply the rated voltage 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. The charge/discharge current is less than 50mA.		
		Appearance Capacitance Change		12.5% :30% :30% (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		
18	High Temperature Load	D.F.	Char. X7R Z5U Y5V	-30 % (C≥1.0μF 25V min. 0.05 max. 0.05 max. 0.075 max.	-) 16V 0.05 max. — 0.1 max. (C<1.0μF) 0.125 max. (C≥1.0μF)	 room temperature, then measure. 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. 		
		I.R.	More than 1,0	00MΩ or 50Ω •	F (Whichever is smaller)	Perform initial measurement.		
		Dielectric Strength	No failure					

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CHIP MONOLITHIC CERAMIC CAPACITOR

Monolithic Microchip GM Series

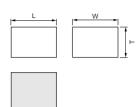
Features

- 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.





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Part Number	Dimensions (mm)					
Fait Number	L	W	Т			
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 D	ataSheet4 b lnp ∌ m	0.8	0.8	0.5
GM260Y5V473Z16	16	Y5V	47000pF	0.8	0.8	0.5

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No.	lte	em	S	specification	Test Method		
1	Operatin 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 ^{o,p} , whichever is larger, shall be maintained within the rated voltage range.		
3	Appeara	nce	No defects or abnormalitie	es.	Visual inspection.		
4	Dimensio	ons	See the previous pages.		Visual inspection.		
5	Dielectric	c Strength	No defects or abnormalitie	95.	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	10,000MΩ 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 tolera	nce.	The capacitance shall be measured at 25 $^\circ$ with 1±0.1kHz in frequency and 1±0.2Vr.m.s. in voltage.		
8	Dissipatio (D.F.)	on 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	Capacita Temperat Characte	ture	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			DotoChoot411.com	MIL-STD-883 Method 2011 Condition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20) and bond a 20μ m (0.0008 inch) gold wire to the capacitor terminal using an ultrasonic wedge bond. Then, pull wire.		
		Die Shear Strength	Die Shear force : 200g mi	DataSheet4U.com MIL-STD-883 Method 2019 0g min. 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	PS.	Down froquency from 10 to 55Us then return to 10Us off within		
11	Vibration	Capacitance	Within the specified tolera	nce.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude : 1.5 mm (0.06 inch) max. total excursion.		
	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).		
			table.	all satisfy the values in the following	The capacitor shall be set for 48 ± 4 hours at room temperature after one hour heat of treatment at $150 \pm_{0}^{+0}$ °C, then measure for the initial measurement. Fix the capacitor to the supporting		
			Item Appearance	Specification No marked defect	jig in the same manner and under the same conditions as (11)		
10	T	tuna Cuala	Capacitance Change	X7R ······ Within±7.5% Y5V ····· Within±20%	and conduct the five cycles according to the temperatures and time shown in the following table. Set it for 48±4 hours at room		
12	Tempera	ture Cycle	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 Tomp (%) Min. Operating Room Max. Operating Room		
				0.125 max.(for 10V)	$\frac{\text{Temp.}(^{\circ}\text{C})}{\text{Temp.}^{-3}} \frac{\text{Temp.}}{\text{Temp.}} \frac{\text{Temp.}(^{\circ}\text{C})}{\text{Temp.}^{-3}} \frac{\text{Temp.}}{\text{Temp.}}$		
			Dielectric Strength	No failure	Time(min.) 30±3 2 to 3 30±3 2 to 3		
		The measured values shall satisfy the values in the formation the format		, 			
					Set the experiter for 500 ± 12 hours at $40\pm20\%$ in 00 to 05%		
13	Humidity		Capacitance Change	X7R ······ Within±12.5% Y5V ····· Within±30%	Set the capacitor for 500±12 hours at 40±20°C, in 90 to 95% humidity.		
13	(Steady S	State)	I.R.	More than 1,000M Ω	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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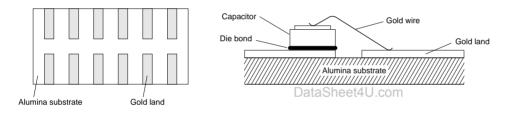
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No.	Item	S	pecification	Test Method	
14	Humidity Load	The measured values sha table. Item Appearance Capacitance Change I.R. D.F. Dielectric Strength	all satisfy the values in the following Specification No marked defect X7R ······ Within±12.5% Y5V ······ Within±38% More than 500MΩ X7R ······ 0.05 max. Y5V ······ 0.125 max.(for 16V) 0.15 max.(for 10V) No failure	 Apply the rated voltage for 500±12 hours at 40±20°C, in 90 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⁺9°° C for one hour and the let sit for 48±4 hours at room temperature. Perform the initia measurement. 	
15	High Temperature Load	The measured values sha table. Item Appearance Capacitance Change I.R. D.F. Dielectric Strength	Specification No marked defect X7R ······ Within±12.5% Y5V ······ Within±38% More than 1,000MΩ X7R ······ 0.05 max. Y5V ······ 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 $\pm 3^{\circ}$ 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.



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CHIP MONOLITHIC CERAMIC CAPACITOR

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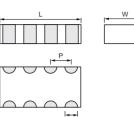
Capacitor Arrays GNM Series

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

F	Part Number		GNM30-401		
L	_ x W(mm)		3.2x1.6		
Т	C Code		COG		
F	Rated Volt.(Vdc)	50		100	
C	Capacitance and T	(mm)			
_	10pF	0.8		0.8	
	11pF	0.8		0.8	
	12pF	0.8		0.8	
_	13pF	0.8	DataSheet4U.com	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	
m —	30pF	0.8		0.8	DataShe
	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			
ieet	4U.cor200pF	0.8			www.DataSheet4U.com
	220pF	0.8			

Part Number	GN	NM30-401
L x W(mm)		3.2x1.6
TC Code		COG
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				GNM30-401				
L x W(mm)				3.2x1.6				
TC Code		X7	′R			Y5V		
Rated Volt.(Vdc)	16	25	50	100	16	50	100	
Capacitance and T	Г(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			0.8taSh	eet4U. 008 m				
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				Data
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			

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Ī					Specification				
	No.	Ite	em	Temperature Compensating Type	High Dielectric Constant Type		Test Method		
	1	Operating Tempera	-	C0G : −55 to +125°C	X7R : −55 to +125℃ Y5V : −30 to +85℃				_
	2	Rated Vo	ltage	See the previous page.		may be applied conti When AC voltage is	defined as the maxim nuously to the capaci superimposed on DC shall be maintained wi	tor.	_
-	3	Appeara	nce	No defects or abnormaliti	es.	Visual inspection.			
-	4	Dimensio	ons	Within the specified dime	nsion.	Using calipers.			_
	5	Dielectric	: Strength	No defects or abnormaliti	es.	No failure shall be ob (C0G) or 250% of th between the termina charge/discharge cu	_		
	6	Insulation (I.R.)	Resistance	More than 10,000M Ω or the second s	500 Ω • F (Whichever is smaller)	The insulation resistant not exceeding the rawithin 2 minutes of c	_		
	7	Capacita	nce	Within the specified tolera	ance.	The capacitance/Q/D.F. shall be measured at 25°C at the figure quency and voltage shown in the table.			
				30pF min. : Q≧1,000	Char. 25V min. 16V	Item Cha		X7R, Y5V	
	8		tion Factor	30pF max. : Q≧400+20C	X7R 0.025 max. 0.035 max.	Frequency	1±0.1MHz	1±0.1MHz	
		(D.F.)		C : Nominal Capacitance (pF)	Y5V 0.05 max. 0.07 max.	Voltage	0.5 to 5Vr.m.s.	1±0.2Vr.m.s.	
8	9	Capacitance Temperature Characteristics	ature	Change tolerance. (Table A-5) Temperature Coefficient Within the specified tolerance. (Table A-5)		Char. Temp. Range. Reference Temp. Cap. Change X7R -55to +125°C 25°C Within±15% Y5V -30to +85°C 25°C Within±22%	change as Table . The capacitance	red using the sference. ially from step 1 nin the specified tt and capacitance ividing the minimum measured b. value in step 3. ure(°C)	_
			Capacitance	Within $\pm 0.2\%$ or ± 0.05 pF		2	25±		
			Drift	(Whichever is larger)		3	25±		
et4U.com						4	125±		DataShe
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							pacitance change com nperature ranges sho		_
	10	Adhesive Strength of Termination No removal of the termin			ations or other defects shall occur.	Fig.1 using a eutection with the test jig for 10 The soldering shall be reflow method and solution	c solder. Then apply 5	iron or using the n care so that the sol- as heat shock.	_

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Continued from the preceding page Specification No Item Test Method Temperature High Dielectric Constant Type Compensating Type 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). Within the specified tolerance. Capacitance The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied Vibration 30pF min. : Q≧1000 uniformly between the approximate limits of 10 and 55Hz. 11 25V min. 16V Char. Resistance 30pF max. : Q≥400+20C The frequency range, from 10 to 55Hz and return to 10Hz, shall Q/D.F. X7R 0.025 max. 0.035 max. C : Nominal Capacitance be traversed in approximately 1 minute. This motion shall be 0.07 max Y5V 0.05 max (pF) applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours). Solder the capacitor to the test jig (glass epoxy boards) shown No cracking or marking defects shall occur. 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. 2.5±0.05 50 Pressurizing speed : 1.0mm/sec. 6 Pressurize Deflection ß 12 0.8±0.1 4±0.0 R230 20 Flexure : ≤1 \sim 100 Copper foil Solder resist Capacitance meter 45 (in mm) t =1.6mm Fig.2 Fig.3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) and Solderability of 75% of the terminations is to be soldered evenly and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 13 Termination 80 to 120°C for 10 to 30 seconds. After preheating, immerse in continuously. 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°C for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 Capacitance Within ±2.5% or ±0.25pF X7R Within ±7.5% seconds. Let sit at room temperature for 24±2 hours (tempera-Y5V Within±20% Change (Whichever is larger) ture compensating type) or 48±4 hours (high dielectric constant Resistance 30pF and over : Q≥1,000 type), then measure. to Soldering 14 30pF and below : Char. 25V min. 16V Heat Q/D.F. Q≥400+20C X7R 0.025 max 0.035 max Initial measurement for high dielectric constant type C : Nominal Capacitance Y5V 0.05 max. 0.07 max Perform a heat treatment at 150⁺⁰/₋₁₀ °C for one hour and then et4U.com DataShe (pF) let sit for 48±4 hours at room temperature. Perform the initial measurement I.R. More than $10,000M\Omega$ or $500\Omega \cdot F$ (Whichever is smaller) Dielectric No failure Strength The measured and observed characteristics shall satisfy the Fix the capacitor to the supporting ig in the same manner and specifications in the following table. under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following Appearance No marking defects table. Let sit for 24±2 hours (temperature compensating type) X7R Within±7.5% Capacitance Within ±2.5% or ±0.25pF or 48±4 hours (high dielectric constant type) at room tempera-Y5V ······ Within±20% Change (Whichever is larger) ture, then measure. 30pF and over : Q≥1,000 Step 2 3 4 Temperature 15 25V min 16V 30pF and below : Char. Min. Operating Max. Operating Room Room Cycle Temp.(℃) Q/D.F. Q≧400+20C 0.025 max. Temp. +03 Temp. +3 0.035 max X7R Temp. Temp. C: Nominal Capacitance Y5V 0.05 max 0.07 max 30 ± 3 30 + 3Time(min.) 2 to 3 2 to 3 (pF) Initial measurement for high dielectric constant type I.R. More than $10,000M\Omega$ or $500\Omega \cdot F$ (Whichever is smaller) Perform a heat treatment at 150 $^{+\mathrm{O}}_{-1\mathrm{O}}\,^{\mathrm{C}}$ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial Dielectric No failure measurement. Strength

Continued on the following page.



Continued from the preceding page.

				Specification					
No.	lte	em	Temperature Compensating Type	High Dielectric Co	onstant Type	Test Method			
			The measured and obser specifications in the follow		all satisfy the				
		Appearance	No marking defects.						
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	X7R ······ Within±12 Y5V ····· Within±30		Sit the capacitor at 40±2°c 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 : $Q≥275+\frac{5}{2}C$ 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	Char. 25V min. X7R 0.05 max. Y5V 0.075 max.	16V 0.05 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 1,000M Ω or 5		,		_		
			The measured and obser specifications in the follo		all satisfy the				
		Appearance	No marking defects.						
		Capacitance Change	Within ±7.5% or ±0.75pF X7R ······· Within±12.5% (Whichever is larger) Y5V ······ Within±30%			Apply the rated voltage at $40\pm2^{\circ}$ c and 90 to 95% humidity for			
17	Humidity		30pF and over : Q≧200 30pF and below :	Char. 25V min. 16V		500 ± 12 hours. Remove and let sit for 24 ± 2 hours (temperature compensating type) or 48 ± 4 hours (high dielectric constant			
	Load	d Q/D.F.	Q≧100+ 1 SOPF and below .	X7R 0.05 max.	0.05 max.	type) at room temperature, then measure. The charge/dis-			
			C : Nominal Capacitance (pF)	Y5V 0.075 max.	0.1 max.	charge current is less than 50mA.			
		I.R.	More than 500M Ω or 25 Ω	2 • F (Whichever is sma	aller)				
		Dielectric Strength	No failure						
			The measured and obser specifications in the follow		all satisfy the OM				
		Appearance	No marking defects.						
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	X7R ······ Within±12 Y5V ····· Within±30		Apply 200% of the rated voltage for 1,000 \pm 12 hours at the maximum operating temperature \pm 3°C. Let sit for 24 \pm 2 hours			
18 n	High Temperature Load	Q/D.F.	30pF and over : Q≥350 10pF and over, 30pF and below : $Q≥275+\frac{5}{2}C$ 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	Char. 25V min. X7R 0.04 max. Y5V 0.075 max.	16V 0.05 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°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. 	Data		
		I.R.	More than 1,000M Ω or 5	$0\Omega \bullet F$ (Whichever is sr	maller)				
		Dielectric Strength	No failure						

Table A

	T 0 11	Capacitance Change from 25°C (%)							
Char.	Temp. Coeff. (ppm/℃) Note 1	—55℃		-3	0°C	−10°C			
	(ppm/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.

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CHIP MONOLITHIC CERAMIC CAPACITOR

for Ultrasonic Sensors ZLM Type

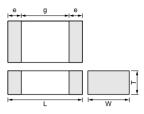
Features

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

Application

Ultrasonic sensor (Back sonar, Corner sonar and etc.)





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Part Number	Dimensions (mm)							
Part Number	L	W	Т	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

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No.	Iter	m	Specification		Test	Method	
1	Operating Temperati		-25℃ to +85℃				
2	Rated Vol	tage	See the previous pages.	may be applie When AC vol	tage is defined as ed continuously to tage is superimpo larger, shall be m	o the capacitor. osed on DC volta	-
3	Appearan	се	No defects or abnormalities.	Visual inspec	tion.		
4	Dimensior	ns	Within the specified dimensions.	Using caliper	S.		
5	Dielectric	Strength	No defects or abnormalities.	applied betwe	all be observed w een the termination scharge current is	ons for 1 to 5 sec	conds, provided
6	Insulation F (I.R.)		More than 10,000M Ω or 500 Ω • F. (Whichever is smaller)	not exceeding	n resistance shall g the rated voltag tes of charging.		
7	Capacitan	nce	Within the specified tolerance.	The capacita	nce/D F shall be	measured at 20	°⊂ with 1+0.1kHz
8	Dissipatior (D.F.)	n Factor	0.01 max.	 The capacitance/D.F. shall be measured at 20°C with 1±0.1kHz in frequency and 1±0.2Vr.m.s. in voltage. 			C WITH I TOTING
0	Capacitance 9 Temperature		Within −4,700 ^{+1,000} / _{-2,500} ppm/°C (at −25 to +20°C)	capacitance r When cycling 5, the capacit temperature of The capacitan	tance shall be wit	1 as a reference sequentially from thin the specified be measured af	e. m step 1 through I tolerance for the
9	9 Temperature Characteristics		Within $-4,700 \pm 500_{-1,000}$ ppm/°C (at ± 20 to $\pm 85^{\circ}$ C)	Step	1	Temperature(°C)
	Characteri	Sucs		1		20±2	
				2		-25±3	
				3		20±2	
			DataSheet4U.com	4		85±3	
						20±2	
10	Adhesive of Termina		No removal of the terminations or other defect shall occur.	Fig.1 using a direction of th The soldering reflow method	eutectic solder. The arrow. g shall be done eid and shall be coord and	Then apply 10N ither with an iron nducted with car lefects such as h	or using the re so that the sol-
		Appearance	No defects or abnormalities.		pacitor to the tes	,0,0	, ,
		Capacitance	Within the specified tolerance.		r and under the s		()
11	Vibration Resistance D.F.		0.01 max.	The capacitor shall be subjected to a simple harmonic motio having a total amplitude of 1.5mm, the frequency being varie uniformly between the approximate limits of 10 and 55Hz. Th 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 perpendicu directions (total of 6 hours).			ncy being varied) and 55Hz. The o 10Hz, shall be on shall be

Continued on the following page.

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No.	lte	em	Specification			Test Method	t	
			No cracking or marking defects shall occur.	Solder the capa in Fig.2 using a Then apply a for The soldering sl	a eutectic s orce in the shall be do	older. direction sho ne either with	own in Fig.3 h an iron or	3. r using the
12 Deflection 13 Solderability of Termination		ility of	Type a b c GRM40 1.2 4.0 1.65 (in mm) Fig.2	reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. $\begin{array}{c} & 20 & 50 & \text{Pressurizing} \\ & \text{speed : 1.0mm/sec.} \\ & \text{Pressurize} \\ & \text{Pressurize} \\ & \text{Flexure : } \leq 1 \\ & \text{capacitance meter} \\ & 45 & 45 & (in mm) \\ & \text{Fig.3} \\ \end{array}$ Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at				
Appearance			No defects or abnormalities.	6 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.				
	Desistance	Capacitance Change	Within ±7.5%	Preheat the cap	pacitor at 1	20 to 150℃	for 1 minut	e. Immerse the
14	Resistance to Soldering	D.F.	0.01 max.	capacitor in a et	eutectic sol	der solution a	at 270±5℃	for 10±0.5
	Heat	I.R.	More than 10,000M Ω or 500 Ω • F (Whichever is smaller)	 seconds. Let sit measure. 	t at room te	emperature i	ior 24±2 no	ours , then
		Dielectric Strength	No failure		_	_	_	
		Appearance	No defects or abnormalities.	Fix the capacito			in the same	e manner and
	Tomporature	Capacitance Change	Within ±7.5% DataSheet4U.com	under the same Perform the five listed in the follo	e cycles ac	cording to th		
15	Temperature Cycle	D.F.	0.01 max.	perature, then measure.				
		I.R.	More than 10,000M Ω or 500 Ω • F (Whichever is smaller)	Step	1 -25 ⁺⁰	2 BoomTomp	3 85 +3	4 RoomTomp
		Dielectric Strength	No failure	Temp.(°C) Time(min.)	-25 ⁺⁰ / ₋₃ 30±3	RoomTemp. 2 to 3	85 ⁺³ ₋₀ 30±3	RoomTemp. 2 to 3
		Appearance	No defects or abnormalities.	_				
	Humidity,	Capacitance Change	Within ±12.5%	Sit the capacitor	or at 40±2າ	C and 90 to §	95% humid	lity for 500±12
16	Steady State	D.F.	0.02 max.	Remove and let	t sit for 24:	±2 hours at r	room temp	erature, then
	Sidle	I.R. Dielectric	More than 1,000MΩ or 50Ω • F (Whichever is smaller)	measure.				
		Strength	No failure					
		Appearance	No defects or abnormalities.			101.0% and	1 00 to 050/	house tables for
17	Humidity Load	Capacitance Change	Within ±12.5%	Apply the rated 500±12 hours.	Remove a	and let sit for	24±2 hour	s at room tem-
	Loud	D.F.	0.02 max.	than 50mA.	1000010.	no onargo, a	lisona go s	
		I.R.	More than 500M Ω or 25 Ω • F (Whichever is smaller)					
		Appearance	No defects or abnormalities.					
18	High Temperature	Capacitance Change	Within ±12.5%	Apply 200% of t Let sit for 24±2		-		
		D.F.	0.02 max.	The charge/disc	charge cur	rent is less t	han 50mA.	

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CHIP MONOLITHIC CERAMIC CAPACITOR

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High-frequency for Flow/Reflow Soldering GRQ Series

Features

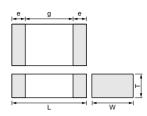
1.HiQ and low ESR at VHF, UHF, Microwave.

2.Feature improvement, low power consumption for mobile telecommunication (Base station, terminal, etc.)

Application

High-frequency circuit (Mobile telecommunication, etc.)





Part Number	Dimensions (mm)							
Fait 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			

Part Number	G	RQ706	GR	Q708	
L x W(mm)	1.6	60x0.80	2.00)x1.25	
TC Code		COG	C	COG	
Rated Volt.(Vdc)	50	100	50	100	
Capacitance and T(mm)	<u></u>			
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		Dø.80Sheet4U.com		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	DataShe
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	
et4U.com11pF	0.80			Magw.DataSh	eet4U.com
12pF	0.80			0.85	<u></u>
12pF	0.80			0.85	

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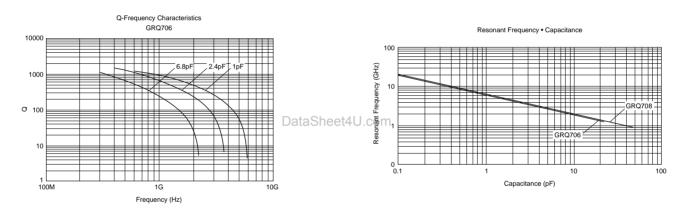
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Part Number	GRQ	706	GRO	Q708			
L x W(mm)	1.60x0.80		2.00x1.25				
TC Code	COO	Ĵ	C	COG			
Rated Volt.(Vdc)	50	100	50	100			
Capacitance and T(mm	1)						
13pF	0.80			0.85			
15pF	0.80			0.85			
16pF	0.80			0.85			
18pF	0.80			0.85			
20pF	0.80		0.85				
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

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Ν	۷o.	lte	em	Specification		Test Meth	nod		
	1	Operating Temperatu	ire Range	C0G : −55℃ to 125℃					
	2	Rated Vo		See the previous pages.	The rated voltage is may be applied cor When AC voltage is whichever is larger range.	ntinuously to the superimposed	capacitor. on DC volta	age, V ^{p.p} or V ^{o.p} ,	
	3	Appearar	ice	No defects or abnormalities.	Visual inspection.				
	4	Dimensio	ns	Within the specified dimensions.	Using calipers.				
	5	Dielectric	Strength	No defects or abnormalities.	No failure shall be applied between the charge/discharge	e terminations fo	or 1 to 5 sec	conds, provided	
	6	Insulation (I.R.)	Resistance	More than 10,000M Ω or 500 Ω • F. (Whichever is smaller)	The insulation resis not exceeding the r within 2 minutes of	rated voltage at 2		•	
_	7	Capacita	nce	Within the specified tolerance.	The capacitance/Q		red at 25℃ a	at the frequency	
	8	Q		Q≥1000	Frequency	nar. COG(1	1000pF and 1±0.1MH	Z	
					Voltage		0.5 to 5Vrn	ns	
			Capacitance Change	Within the specified tolerance. (Table A-1)	The temperature co tance measured in	step 3 as a refer	rence.		
			Temperature Coefficent	Within the specified tolerance. (Table A-1)	When cycling the te 5, the capacitance temperature coeffic	shall be within th	ne specified	tolerance for the	
	9	Capacitance Temperature Characteristics	Capacitance Drift	Within ±0.2% or ±0.05pF DataSheet4U.com (Whichever is larger.)	The capacitance dr between the maxim step 1, 3 and 5 by t Step 1 2 3 4	rift is caluculated num and minimu the cap. value in	by dividing	the differences d values in the	
					5		25±2		
) I.com	10	Adhesive of Termin	0	No removal of the terminations or other defect shall occur.	Solder the capacitor Fig.1 using a eutect with the test jig for 1 The soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of the soldering shall be uniform and free of the test of test of the soldering shall be uniform and free of the test of test	ic solder. Then an 0±1sec. be done either wi e conducted with	pply 10N* fc ith an iron of care so that neat shock.	orce in parallel r using the reflow	Data
-			Appearance	No defects or abnormalities.	Solder the capacito	Fig.1 or to the test jig (glass epoxy	v board) in the	
			Capacitance	Within the specified tolerance.	same manner and The capacitor shall			. ,	
1	11	Vibration Resistance	Q	Q≥1000	Ine capacitor shall having a total ampl uniformly between frequency range, fr traversed in approx applied for a period directions (total of 6	itude of 1.5mm, the approximate om 10 to 55Hz a kimately 1 minute I of 2 hours in ea	the frequen limits of 10 and return to e. This motio	cy being varied and 55Hz. The 0 10Hz, shall be on shall be	

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No	. Ite	em	Specification		Tes	st Metho	d	
			No cracking or marking defects shall occur.	Fig.2 using a shown in Fig. or using the re	pacitor to the te eutectic solder. 3. The soldering eflow method a	Then ap g shall be nd shall I	pply a force in the done either work of the conducted work of the second	ne direction ith an iron vith care so
12	Deflectio	n	Type a b c 100 t: 1.6mm GRQ706 1.0 3.0 1.2 GRQ708 1.2 4.0 1.65 (in mm) Fig.2 Fig.2 Fig.2	that the solde shock.	R230	150 Press spee Pressu result ce meter 45	surizing d : 1.0mm/sec.	
_					Fig.:		athered (UC 1/	(0404) and
13	Solderab Terminat		75% of the terminations is to be soldered evenly and continuously.	rosin (JIS-K-5 80 to 120℃ fo	capacitor in a se 902) (25% rosi or 10 to 30 seco or solution for 2:	n in weig nds. Afte	ht proportion). er preheating, ir	Preheat at nmerse in
			The measured and observed characteristics shall satisfy the specifications in the following table.					
		Appearance	No marking defects.	_				
14	5	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	capacitor in a	apacitor at 120 eutectic solder	solution	at 270±5℃ for	10±0.5
	Heat	Q	Q≥1000	seconds. Let	sit at room tem	perature	for 24±2 hours	i.
		I.R.	More than 10,000M Ω or 500 Ω • F (Whichever is smaller)	-				
		Dielectric Strength	No failure DataSheet4U.com					
		·	The measured and observed characteristics shall satisfy the specifications in the following table.		itor to the supponent		in the same ma	anner and
		Appearance	No marking defects.		ve cycles accoi	rding to t	he four heat tre	atments
15	Temperature	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	listed in the for Let sit for 24±	2 hours at roor	n temper	ature, then me	asure.
15	Cycle	Q	Q≥1000	Ston	1	2	2	4
		 I.R.	More than 10,000M Ω or 500 Ω • F (Whichever is smaller)	Temp.(℃)	Min. Operating Temp.+0/-3	Room Temp.	Max. Operating Temp.+3/-0	Room Temp.
m		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.					
	Humidity,	Capacitance	Within $\pm 5\%$ or ± 0.5 pF	Sit the capaci hours.	tor at 40±2℃ a	nd 90 to	95% humidity f	or 500±12
16	Steady State	Change Q	(Whichever is larger) Q≥350	Remove and	let sit for 24±2		-	npensating
		I.R.	More than 1,000M Ω or 50 Ω • F (Whichever is smaller)	type) at room	temperature, th	nen meas	sure.	
		Dielectric Strength	No failure	-				
		<u>-</u>	The measured and observed characteristics shall satisfy the specifications in the following table.					
		Appearance	No marking defects.					
17	Humidity	Capacitance Change	Within \pm 7.5% or \pm 0.75pF (Whichever is larger)	500±12 hours	ed voltage at 40 s. Remove and	let sit for	24±2 hours at	room tem-
	Load	Q	Q≥200	than 50mA.	n measure. The	unarye/(Listindige tuile	11 13 1533
		I.R.	More than 500M Ω or 25 Ω • F (Whichever is smaller)	_				

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Continued on the following page.



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No.	lte	em	Specification	Test Method
			The measured and observed characteristics shall satisfy the specifications in the following table.	
		Appearance	No marking defects.	Apply 2000(of the roted values for 1.000 ± 12 hours at the
18	High Temperature	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	 Apply 200% of the rated voltage for 1,000±12 hours at the maximum operating temperature ±3°C. 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 $\Omega \bullet F$ (Whichever is smaller)	 The charge/discharge current is less than 50mA.
		Dielectric Strength	No failure	

Table A

	No. 19 al Malana			Capacitance Cha	nge from 25℃ (%))	
Char.	Nominal Values (ppm/℃) Note 1	-5	5℃	-3	℃ 0°C	-1	0°C
	(ppm/c) Note 1	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°C to 125°C. (for COG)

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CHIP MONOLITHIC CERAMIC CAPACITOR

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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).
- 2. 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. GRH110 type is designed for both flow and reflow soldering and GRH111 type is designed for reflow soldering.
- 4. 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)

- 1. The dielectric is composed of low dielectric loss ceramics. This series is perfectly suited to high-frequency applications (VHS-microwave band).
- 2. The series is ultraminiature, yet has a high-power DataSheet4U capacity. This is the best capacitor available for transmitter and amplifier circuits such as those in broadcasting equipment and mobile base stations.
- RPN type capacitors withstand high temperatures because ribbon leads are attached with silver paste.
- RPN type capacitors are easily soldered and especially well suited in applications where only a soldering iron can be used.

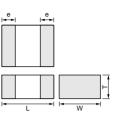
Application

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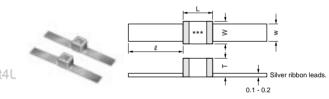
High-frequency and high-power circuits.

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			COG			C0G		
Rated Volt.(Vdc)	50	50	100	200	300	500	50	50	100	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
et4U.com.4pF	1.20					2.40	1.60				WWW.	Dat <u>a</u> 5heet4U.co
1.5pF	1.20					2.40	1.60					3.00





Part Number		Dimens	sions (mm)	
Part 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



*** : Capacitance Code

Part Number		Din	nensions (ı	nm)	
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

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	Part Number	GRH110			GRH111			RPN110			RPN111			-
_	. x W(mm)	1.40x1.40		-	2.80x2.80)		1.60x1.40		-	3.20x2.80			-
_	C Code	C0G		1	C0G	1		COG		1	C0G			_
_	Rated Volt.(Vdc)	50	50	100	200	300	500	50	50	100	200	300	500	-
C	Capacitance and			1		1								
	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				DataSh	ee240.c						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	-
	23pF	1.20					2.40	1.60					3.00	-
	22pi 24pF	1.20					2.40	1.60					3.00	-
n —	27pF	1.20					2.40	1.60					3.00	Data
_	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	-
_	43pr 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	-
_	62pF 68pF	1.20					2.40	1.60					3.00	-
	75pF	1.20					2.40	1.60					3.00	-
	75pF 82pF	1.20					2.40	1.60					3.00	-
	82pF 91pF												3.00	-
		1.20					2.40	1.60						-
_	100pF	1.20				2.40	2.40	1.60				2.00	3.00	-
	110pF					2.40						3.00		-
_	120pF					2.40						3.00		_
	130pF					2.40						3.00		_
	150pF					2.40						3.00		_
	160pF 4U.cor 1 80pF					2.40						3.00	DataShei	
	111 - 100mF			1	1	2.40		1		1		20226300	narasnei	e1411.7

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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			COG			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				

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No	. Ite	em	Specification		Test Method
1	Operating Temperat	ure Range	−55°C to +125°C		
2	Rated Vo	oltage	See the previous pages.	may be applied continu When AC voltage is su	fined as the maximum voltage which Jously to the capacitor. Iperimposed on DC voltage, V ^{P,P} or V ^{O,P} , all be maintained within the rated voltage
3	Appeara	nce	No defects or abnormalities.	Visual inspection.	
4	Dimensio	ons	Within the specified dimension.	Using calipers.	
5	Dielectric	c Strength	No defects or abnormalities.	applied between the te	erved when 250% of the rated voltage is rminations for 1 to 5 seconds, provided current is less than 50mA.
6	Insulation Resistance	25℃	C≤ 470pF :1,000,000MΩ min. 470pF <c≤1,000pf 100,000mω="" :="" min.<="" td=""><td></td><td>ce shall be measured with a DC voltage d voltage at 25°C and 125°C standard</td></c≤1,000pf>		ce shall be measured with a DC voltage d voltage at 25°C and 125°C standard
0	(I.R.)	125℃	C≦ 470pF : 100,000MΩ min. 470pF <c≦1,000pf 10,000mω="" :="" min.<="" td=""><td>humidity and within 2 n</td><td></td></c≦1,000pf>	humidity and within 2 n	
7	Capacita	ince	Within the specified tolerance.		all be measured at 25°C 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 Charter Charter</td><td>COG (1,000pF and below) 1±0.1MHz</td></c≦1,000pf></c≦>	and voltage shown in the Item Charter	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	cient is determined using the capaci- o 3 as a reference. When cycling the Ily 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	Capacitance Temperature Characteristics	Capacitance Drift	DataSheet4U.com Within ±0.2% or ±0.05pF (Whichever is larger)	step 1, 3 and 5 by the	ge shall be measured after 5 min. at
m		Adhesive Strength of Termination	No removal of the terminations or other defects shall occur.	Fig.1 using solder contr done either with an iror 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 a or in furnace and be conducted with a uniform and free of defects such as heat IN force in the direction of the arrow.
10	Terminal	(for chip type)			Fig.1
10	Strength	Tensile Strength (for micro-	Capacitor shall not be broken or damaged.		ixed and a load is applied gradually in its value reaches 10N (5N for RPN110).
		strip type)			

Continued on the following page. \square



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Continued from the preceding page.

No	. Ite	em		Specification	Test Method		
		Appearance	No defects or abnormaliti	es.	Solder the capacitor to the test jig (alumina substrate) shown in		
11	Vibration Resistance			10,000 5,000 3,000	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 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).		
12	Solderab Terminati	2	95% 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°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.		
13	Resistanc to Solderi		The measured and obse specifications in the follow Appearance Capacitance Change Q I.R. Dielectric Strength	erved characteristics shall satisfy the ving table. Specification No marked defect Within $\pm 2.5\%$ or $\pm 0.25pF$ (Whichever is larger) C $\leq 220pF : Q \geq 10,000$ $220pF < C \leq 470pF : Q \geq 5,000$ $470pF < C \leq 470pF : Q \geq 5,000$ More than 30% of the initial specification value at 25°C. No failure C : Nominal Capacitance (pF)	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 measure. The dipping depth for microstrip type capacitors is up to 2mm from the root of the terminal.		
com 14	Temperature Cycle		The measured and observations in the follow Item Appearance Capacitance Change Q I.R. Dielectric Strength	erved characteristics shall satisfy the	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 $65 \pm 5^{\circ}$ C for 15 minutes and immersion in a saturated uqueous solution of salt at $0\pm 3^{\circ}$ for 15 minutes. The cpapcitor is promptly washed with running water, dried with a dry cloth, and allowed to sit at room temperature for 24 ± 2 hours. $\boxed{\frac{\text{Step} 1 2 3 4}{\text{Temp.(°c)} -55 \pm 9 \text{RoomTemp.} 125 \pm 3 \text{RoomTemp.} \\ 125 \pm 3 2 \text{ to } 3 30\pm 3 2 \text{ to } 3 \end{aligned}}$		
15	Humidity		The measured and obse specifications in the follow <u>Item</u> <u>Appearance</u> Capacitance Change Q I.R.	erved characteristics shall satisfy the	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.		



Continued from the preceding page.

No.	Item	5	Specification	Test Method
		The measured and observed and observed the specifications in the formula litem Appearance	ved characteristics shall satisfy Illowing table. Specification No marked defect	
	High Temperature	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	Apply 150% of the rated voltage for $2,000\pm12$ hours at $125\pm3^{\circ}$ C. Remove and set for 24 ± 2 hours at room temperature, then
16	Load	Q	C≦ 220pF : Q≥10,000 220pF <c≦ 470pf="" 5,000<br="" :="" q≥="">470pF<c≦1,000pf 3,000<="" :="" q≥="" td=""><td>measure. The charge/discharge current is less than 50mA.</td></c≦1,000pf></c≦>	measure. The charge/discharge current is less than 50mA.
		I.R.	More than 30% of the initial spec- ification value at 25°C.	
			C : Nominal Capacitance (pF)	

Table A

	T 0 11	Capacitance Change from 25°C Value (%)						
Char.	Temp. Coeff. (ppm/℃) Note 1	—55℃		-3	O°C	–10℃		
	(ppm/c) 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°C.

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CHIP MONOLITHIC CERAMIC CAPACITOR



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.
- 3. 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)

- 1. 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.
- 3. RPN type capacitors are easily soldered and are especially well suited in applications where only a soldering iron can be used.

GRH706

1.25x1.00

C0G

100

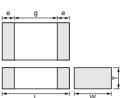
200

1.20

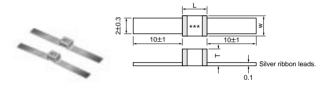
1.20

50





			L	vv						
Part Number	Dimensions (mm)									
Fait Number	L	W	T max.	е	g min.					
GRH706	1.25 ^{+0.5} - 0.3	1.0 ^{+0.5} -0.3	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	2.5 ^{+0.5} -0.3	1.9	0.3 max.	0.5					



*** : Capacitance Code

	Dimensions (mm) L max. W max. T max RPN710 4.0 3.0 2.3			
ataSheet4l	Fait Number	L max.	W max.	T max.
alaoneel4	RPN710	4.0	3.0	2.3

Application

Part Number

Rated Volt.(Vdc)

Capacitance and T(mm)

0.5pF 0.6pF

L x W(mm)

TC Code

High-frequency and high-power circuits.

50

	GRH710		RPN710				
	3.20x2.50		4.00x3.00				
	C0G		COG				
50	100	200	50	100	200		
		1.90			2.30		

1.90

DataShe

2.30

1	2

1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30 12
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	2.30
1.20	1.45	1.90	www.DataSheet4U.com
1.20	1.45	1.90	2.30
	1.20 1.20	1.20 1.45 1.20 1.45	1.20 1.45 1.90 1.20 1.45

GRH708

2.00x1.25

C0G

100

200

1.45

1.45



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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	T		C0G	1		C0G	1		C0G	T	_
Rated Volt.(Vd		100	200	50	100	200	50	100	200	50	100	200	_
Capacitance a			T	1	1			1	1		1	1	
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		「 <u> </u>	2.30	
4.7pF			1.20			1.45			1.90		「 <u> </u>	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				1.45			1.90			2.30	_
		1.20				1.45			1.90			2.30	_
		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					1.45			1.90			2.30	_
27pF						1.45			1.90			2.30	
30pF					DataSh	ee1445.cc	m		1.90			2.30	_
33pF						1.45			1.90			2.30	_
36pF						1.45			1.90			2.30	-
 39pF						1.45			1.90			2.30	_
43pF						1.45			1.90			2.30	_
47pF						1.45			1.90			2.30	_
51pF						1.45			1.90			2.30	_
56pF					1.45				1.90			2.30	_
m62pF					1.45				1.90			2.30	-Data
68pF					1.45				1.90			2.30	_
75pF					1.45				1.90			2.30	_
82pF					1.45				1.90			2.30	_
91pF					1.45				1.90			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	-
150pr 150pr				1.45					1.90			2.30	_
160pF				1.45					1.90			2.30	_
180pF				1.75				1.90	1.70		2.30	2.30	_
200pF								1.90			2.30		_
220pr 220pr								1.90			2.30		_
220pF 240pF								1.90			2.30		_
240pF 270pF								1.90			2.30		_
								-			2.30		_
300pF								1.90					_
330pF								1.90			2.30		_
360pF								1.90			2.30		_
390pF								1.90			2.30	DataShe	et/II.e
1005430pF 170pF								1.90			2:03:01:91	varasiit	6140.0
4700		1			1								

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470pF



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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			COG			COG		
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		
1000pF							1.90			2.30		

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No.	. Ite	em	Specification		Test Method		
1	Operating Temperatu		−55℃ to +125℃				
2	Rated Vo	Itage	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.	applied between the	bserved when 300% of the rated voltage is terminations for 1 to 5 seconds, provided e current is less than 50mA.	_	
6	Insulation (I.R.)	Resistance	10,000MΩ min.		ance shall be measured with a DC voltage ated voltage at 25°C and standard humidity s of charging.		
7	Capacita	nce	Within the specified tolerance.		shall be measured at 25℃ at the frequency		
			C≦ 220pF : Q≥10,000	and voltage shown i			
8	Q		$220pF < C \le 470pF : Q \ge 5,000$	Item C Frequency	har. COG (1,000pF and below) 1±0.1MHz		
			$470pF < C \le 1,000pF : Q \ge 3,000$ C : Nominal Capacitance (pF)	Voltage	0.5 to 5Vr.m.s.		
	Capacitance Variation Rate Temperature		Within the specified tolerance. (Table A-6)	The temperature coefficient is determined using the capaci- tance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, the capaci-			
			Within the specified tolerance. (Table A-6)	coefficient and capa	a the specified tolerance for the temperature citance change as Table A. ft is calculated by dividing the differences		
9	Capacitance Temperature Characteristics	Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)	step 1, 3 and 5 by th	um and minimum measured values in the ne cap. value in step 3. ange shall be measured after 5 min. at erature stage. Temperature(°C) 25±2 -55±3 25±2 125±2 125±3 25±2	_	
om	Terminal	Adhesive Strength of Termination (for chip type)	No removal of the terminations or other defects shall occur.	Fig.1 using solder co done either with an i care so the soldering	to the test jig (alumina substrate) shown in ontaining 2.5% silver. The soldering shall be ron or in furnace and be conducted with g is uniform and free of defects such as heat 10N* force in the direction of the arrow. *5N (GRH 706) 	Data	
10	Strength	Tensile Strength (for micro-	Capacitor shall not be broken or damaged.		is fixed and a load is applied gradually in ntil its value reaches 5N.	_	
		strip type) Bending Strength of lead wire terminal (for micro- strip type)	Lead wire shall not be cut or broken.	nal is perpendicular, Bend the main body	bdy of the capacitor so the lead wire termi- and load 2.5N to the lead wire terminal. by 90 degrees, bend back to original posi- es in the reverse direction, and then bend tion.	_	

Continued on the following page.

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Continued from the preceding page.

No	. Ite	em		Specification	Test Method
		Appearance	No defects or abnormaliti	es.	Solder the capacitor to the test jig (alumina substrate) shown in
11	Vibration Resistance	Q	Within the specified tolera Satisfies the initial value. C≦ 220pF : Q≧ 220pF <c≦ 470pf="" :="" q≧<br="">470pF<c≦1,000pf :="" q≧<br="">C : Nominal Capacitance</c≦1,000pf></c≦>	10,000 5,000 3,000	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 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	2	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 solder containing 2.5% silver for 5±0.5 seconds at 230±5℃. The dipping depth for microstrip type capacitors is up to 1 mm from the root of the terminal.
13	Resistance to Soldering Heat		The measured and obse specifications in the follow Item Appearance Capacitance Change Q Dielectric Strength	erved characteristics shall satisfy the ving table. Specification No marked defect Within ±2.5% or ±0.25pF (Whichever is larger) C≦ 220pF : Q≧10,000 220pF <c≦ 470pf="" 5,000<br="" :="" q≧="">470pF<c≦1,000pf :="" q≧(3,000)<br="">No failure C : Nominal Capacitance (pl</c≦1,000pf></c≦>	Preheat according to the conditions listed in the table below. Immerse in solder containing 2.5% silver for 3 ± 0.5 seconds at $270\pm5^{\circ}$. Set at room temperature for 24 ± 2 hours, then mea- sure. The dipping depth for microstrip type capacitors is up to 2mm from the root of the terminal. <u>Chip Size</u> Preheat Condition 2.0×1.25mm max. 1minute at 120 to 150°C 3.2×2.5mm Each 1 minute at 100 to 120°c and then 170 to 200°c
14	Temperat Cycle	ture	The measured and observations in the follow Item Appearance Capacitance Change Q I.R. Dielectric Strength	erved characteristics shall satisfy the ving table. No marked defect Within $\pm 5\%$ or $\pm 0.5pF$ (Whichever is larger) C \geq 30pF : Q \geq 350 10pF \leq C \leq 30pF : Q \geq 275+ $\frac{5}{2}$ C C \leq 10pF : Q \geq 200+10C 1,000M Ω min. No failure C : Nominal Capacitance (pl	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. Let sit for 24 ± 2 hours at room temperature, then measure. $\frac{\text{Step} 1 2 3 4}{\text{Temp.(°C)} -55 \stackrel{+\circ}{-3} \text{RoomTemp.} 125 \stackrel{+\circ}{-3} \text{RoomTemp.}}$ $\frac{\text{Time(min.)} 30\pm 3 2 \text{ to } 3 30\pm 3 2 \text{ to } 3}{30\pm 3} 2 \text{ to } 3$
15	5 Humidity		The measured and obse specifications in the follow Item Appearance Capacitance Change Q I.R.	erved characteristics shall satisfy the ving table. No marked defect Within ±5% or ±0.5pF (Whichever is larger) C≧30pF : Q≧350 10pF≦C<30pF : Q≧205+5 C<10pF : Q≧200+10C 1,000MΩ min. C : Nominal Capacitance (pl	1 0

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Continued from the preceding page.

No.	Item		Specification	Test Method
	High Temperature Load	The measured and observed characteristics shall satisfy the specifications in the following table.		
16		Appearance	No marked defect Within ±3% or ±0.3pF (Whichever is larger)	Remove and set for 24±2 hours at room temperature, then
		Q	C≧30pF : Q≧350 10pF≦C<30pF : Q≧275+ 5/2 C C<10pF : Q≧200+10C	
		I.R.	1,000MΩ min. C : Nominal Capacitance (pF)	

Table A

−10°C	
Min.	
-0.11	
1	

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

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12

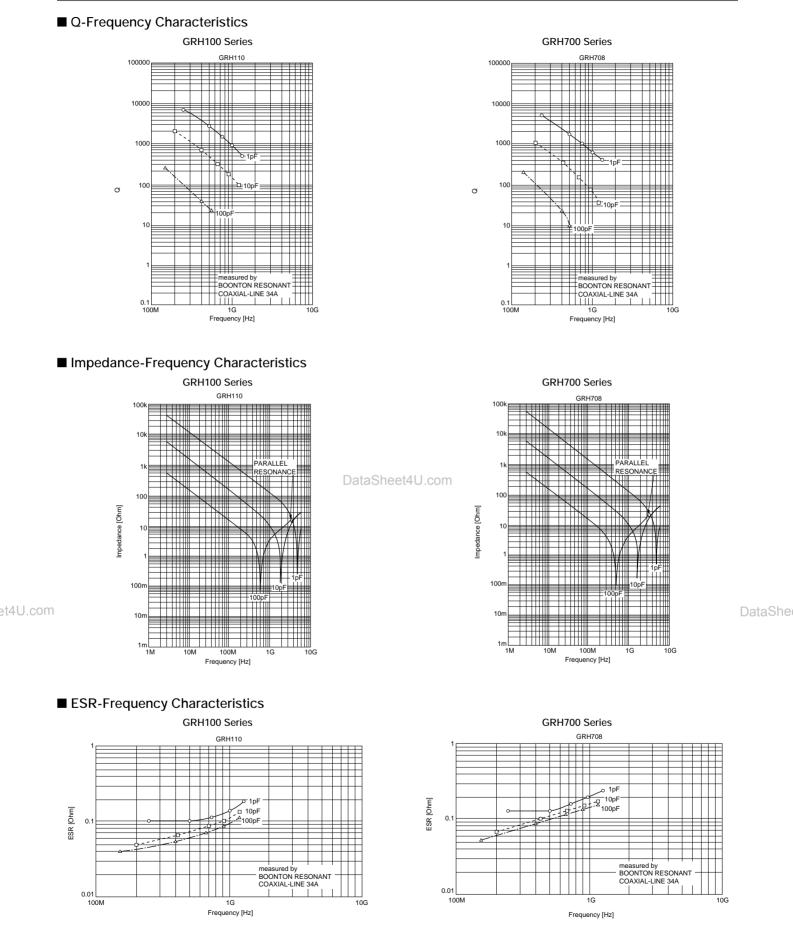
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GRH/RPN Series Data



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Continued on the following page. www.DataSheet4U.com



GRH/RPN Series Data

Continued from the preceding page.

100G

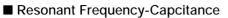
100

10

100M

0.1

Series Resonant Frequency fo [Hz]



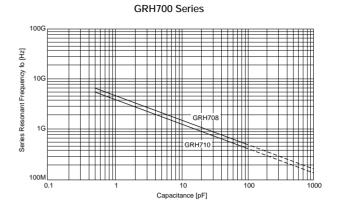
GRH100 Series

10

Capacitance [pF]

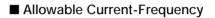
100

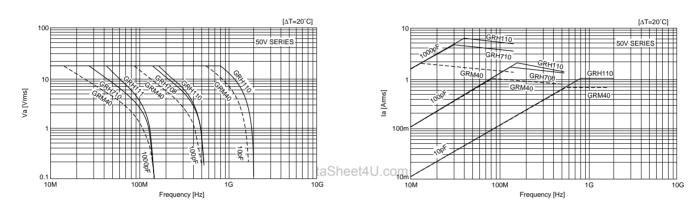
1000



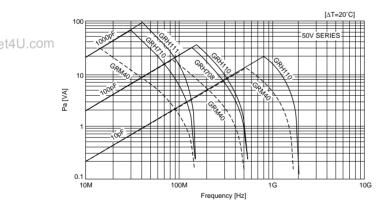


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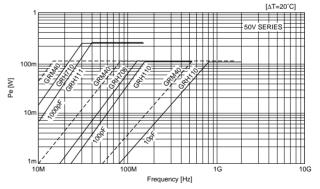




■ Allowable Appearent Power-Frequency



■ Allowable Effcteve Power-Frequency



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Packaging Code

Dackaging Type	Tana Carrier Deckaging	Bulk Coco 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	PB	РМ	

Minimum Quantity Guide

				Quantity (pcs.)						
Part Number		Dimensions (mm)		¢180mm reel		¢330mm reel		Dully Corre		
		L	w	Т	Paper Tape	Plastic Tape	Paper Tape	Plastic Tape	Bulk Case	Bulk Bag
Ultra-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
Fan Flaws (Daflass	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
	000400		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
I OF KEHOW				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
	GRM425	2.0	4.05	0.7	4,000	-	10,000	-	-	1,000
			1.25	1.0	4,000	-	10,000	-	-	1,000
Low-distortion Series	GRM430	3.2		0.7	4,000	-	10,000	-	-	1,000
Control			1.6	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
Micro Chin	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
	LL0508	1.25	2.0	1.0	-	4,000 4)	-	10,000	-	1,000
Low ESL	LL0612	16	2.0	0.7	-	4,000	-	10,000	-	1,000
	LLUGIZ	1.6	3.2	1.25	-	3,000	-	10,000	-	1,000

1) 0.15 µF and 0.22 µF of X7R, 10V rated are available by taping packages only. (Applied to neither bulk case nor bag package.) 560pF of C0G, 50V rated and 0.47µF or 1.0µF 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.

3) Tray

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

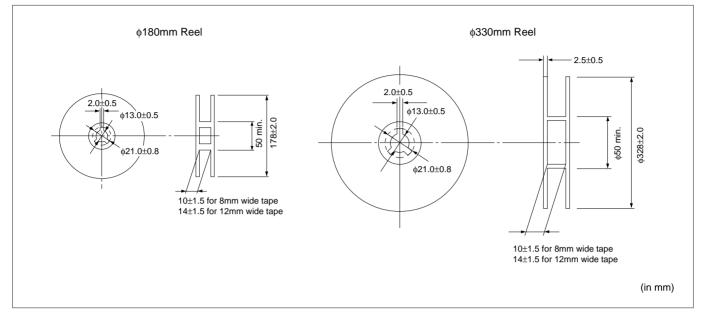
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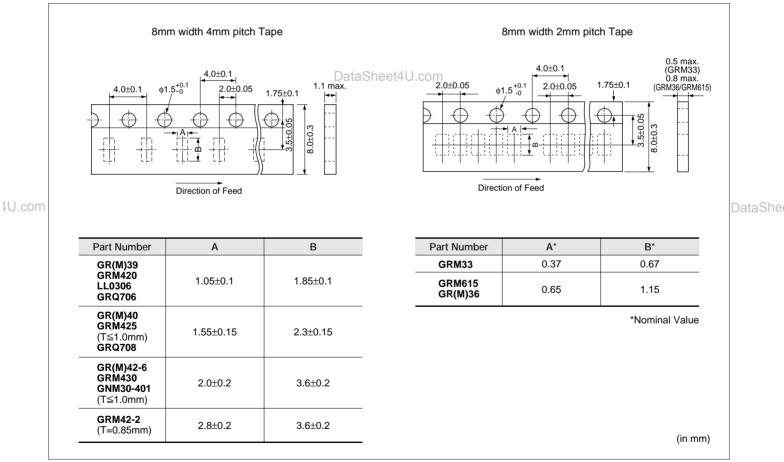
Package

Tape Carrier Packaging

(1) Dimensions of Reel



(2) Dimensions of Paper Tape



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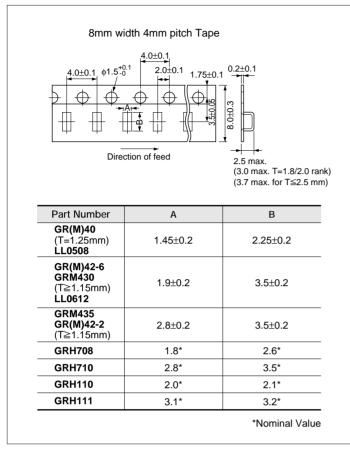
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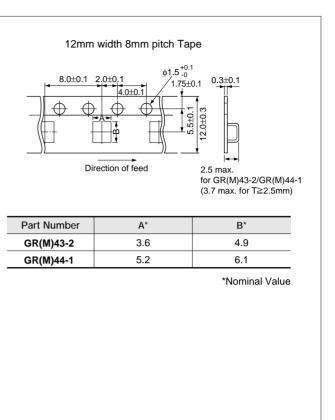


(in mm)

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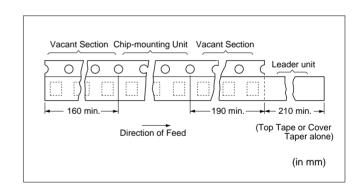
(3) Dimensions of Plastic Tape

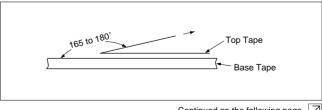




(4) Taping Method

- 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 : ± 0.3 mm.
- Peeling off force : 0.1 to 0.6N* in the direction shown below.
 *GRM33:0.05 to 0.5N





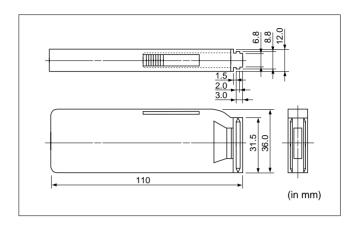
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Package

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



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Notice

■ 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

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- 1. Resin Coating When selecting resin materials, select those with
 - low contraction.
- 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.

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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

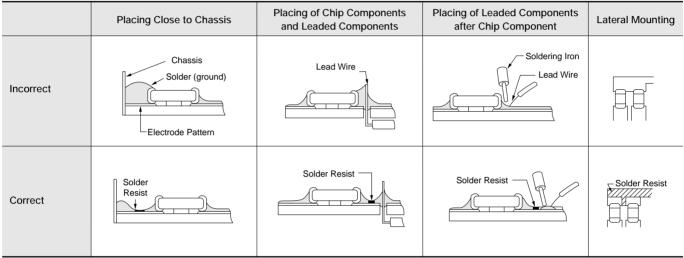
(1) Notice for Pattern Forms

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





Notice

Continued from the preceding page.

(2) Land Dimensions

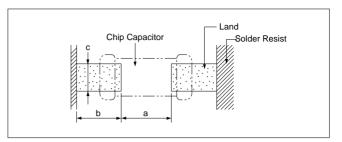


Table 1 Flow Soldering Method

Dimensions Part Number	Dimensions (L×W)	а	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 \times W)	а	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	
1U.com	GRM40 GRM425 GRQ708	2.0×1.25	1.0-1.2	0.6-0.7	0.8–1.1	DataShe
-	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	
ataShee	et4U.conGR580	28.1×13.2	25.0-25.5	2.2-2.4	10%0444y3DataSheet	4U.com

(in mm)





Notice

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• GNM Series for reflow soldering method

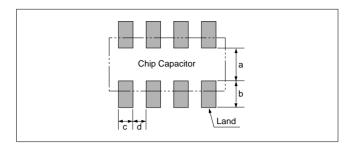


Table 3

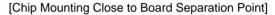
Part Number	Dimensions (mm)						
Fait Number	L	W	а	b	с	d	
GNM30-401	3.2	1.6	0.8—1.0	0.7—0.9	0.3-0.4	0.4-0.5	

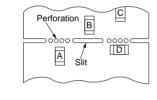
(3) Mounting Position

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

[Component Direction]

Locate chip horizontal to the direction in which stress acts

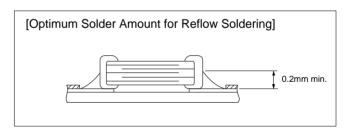




Chip arrangement Worst A-C-(B₂D) Best

(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 chips.
- 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.





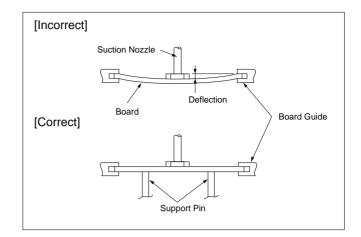
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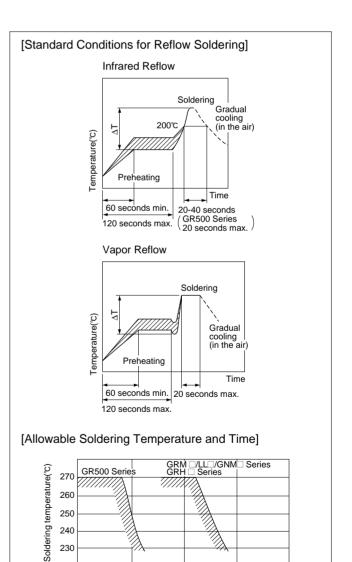
3. Chip Placing

- 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)
- 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
Tuble	-

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





Inverting the PCB

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

230 0

30

60

In case of repeated soldering, the accumulated

90

soldering time must be within the range shown above ta Sheet 4U.com

Soldering time (sec.)

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°C)
- 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

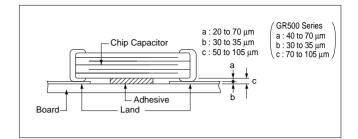
If the PCB is flexed when leaded components (such as transformers and ICs) are being mounted, chips may crack and solder joints may break.

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 on the following page.



Continued from the preceding page.

9. Flow Soldering

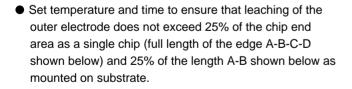
- Sudden heating of the chip results in thermal distortion causing cracked chips. And an excessively long soldering time or high soldering temperature results in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end 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.

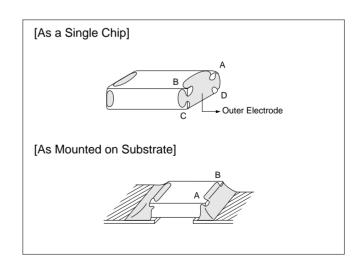
Do not apply flow soldering to chips not listed in Table 5.

Та	ble	e 5

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

Optimum Solder Amount for Flow Soldering

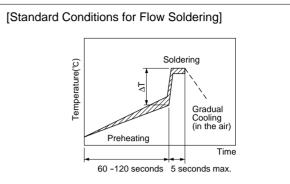




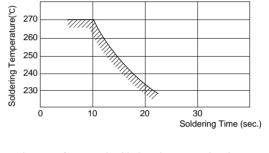
(Reference Data 6. Thermal shock) (Reference Data 7. Solder heat resistance)

Continued on the following page.

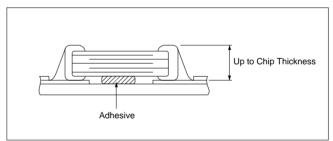
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[Allowable Soldering Temperature and Time]



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

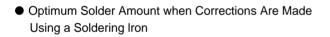


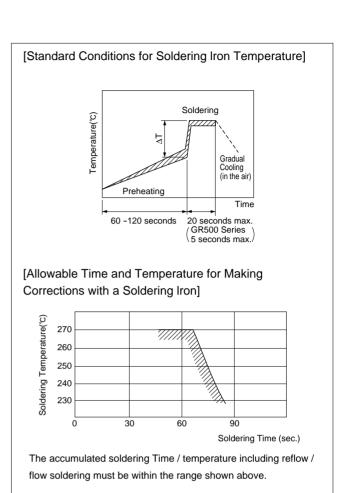


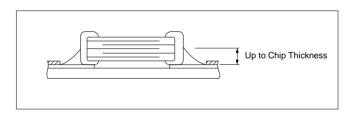
Notice

- 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 theΔT, the less stress on the chip.

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







 When correcting chips with a soldering iron, no preheating is required if the chip is listed in Table 7 and the following conditions (Table 7) are met.
 Preheating should be performed on chips not listed in Table 7.

(Reference Data 8. Thermal shock when making a correction with a soldering iron)

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

Continued on the following page.



- 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.



Reference Data

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°C)

Table 1

oparoa ion an ingli inalian) (ii				
%RH to 95%RH at 40℃)				
e 1				
	Prenared at Ro	om Temperature	Prepared at High	Prepared at High

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

(2) Test Samples

(4) Results

(3) Acceptance Criteria

Refer to Table 1.

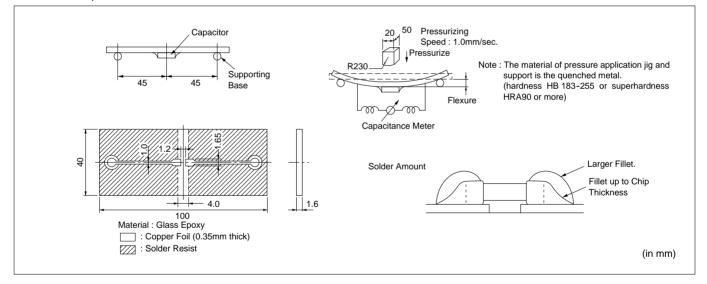
GRM40 : Products for flow/reflow soldering.

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

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

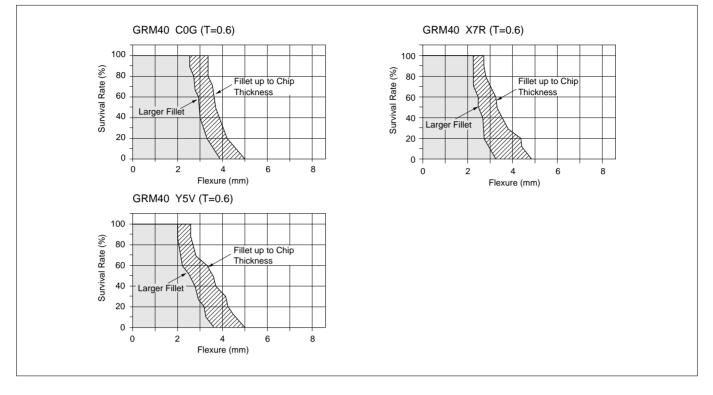
Products shall be determined to be defective if the change in capacitance has exceeded the values specified in Table 2.

Table 2

Characteristics	Change in Capacitance	
COG	Within \pm 5% or \pm 0.5pF, whichever is greater	
X7R	Within $\pm 12.5\%$	
Y5V	Within ±20%	

 \fbox Continued from the preceding page.

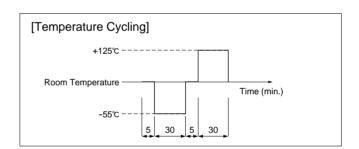
(4) Results

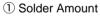


3. Temperature Cycling for Solder Fillet Height

(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.





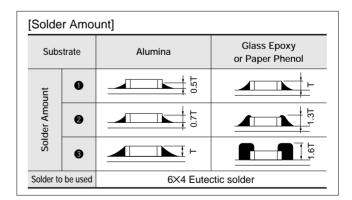
Alumina substrates are typically designed for reflow soldering.

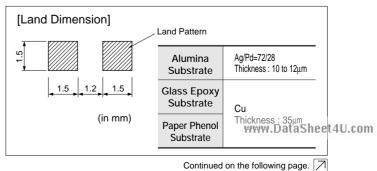
Glass epoxy or paper phenol substrates are typically used for flow soldering.

2 Material

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

3 Land Dimension







Reference Data

Continued from the preceding page.

(2) Test Samples

GRM40 C0G/X7R/Y5V Characteristics T=0.6mm

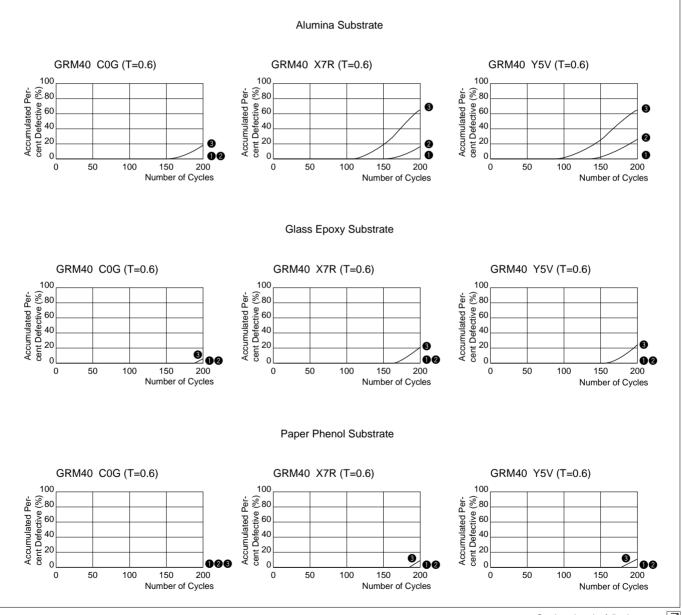
(3) Acceptance Criteria

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	
COG	Within $\pm 2.5\%$ or ± 0.25 pF, whichever is greater	
X7R	Within ±7.5%	
Y5V	Within ±20%	

(4) Results



Continued on the following page.

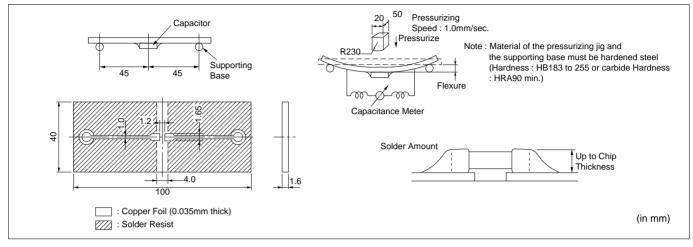


Continued from the preceding page.

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

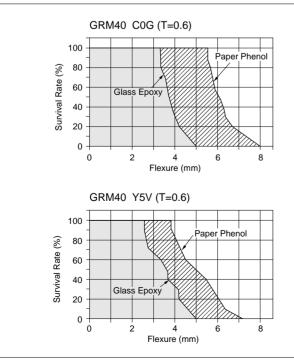
(3) Acceptance Criteria

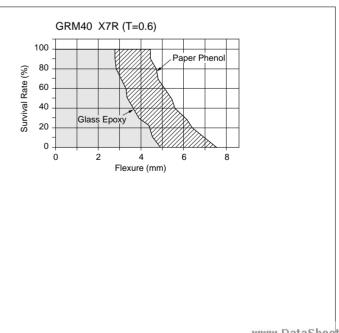
Products shall be determined to be defective if the change in capacitance has exceeded the values specified in Table 4.

Table 4

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

(4) Results







Reference Data

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.

 (N/mm^2)

X7R

Y5V

1.2

1.6

C0Ġ

0.8

Thickness of Ceramic Element (mm)

The formula is :

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

W: Width of ceramic element (mm)

- T : Thickness of element (mm)
- L : Distance between fulcrums (mm)

GRM40

 γ : Bending stress

140

120

100

80

60

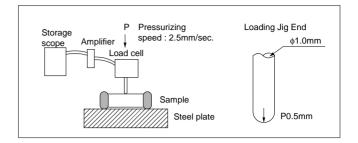
40

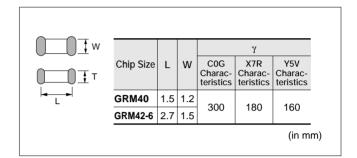
20

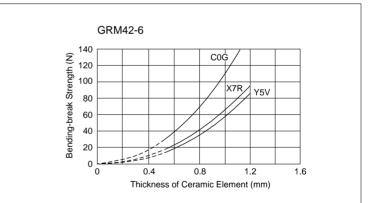
0 6

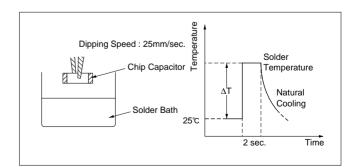
Bending-break Strength (N)

(5) Results









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6. Thermal Shock

(1) Test method

After applying flux (an ethanol solution of 25% rosin), dip the chip in a solder bath (6×4 eutectic solder) in accordance with the following conditions :

0.4

(2) Test samples

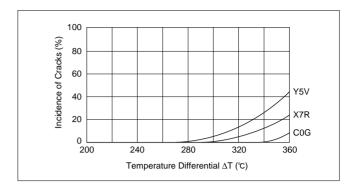
GRM40 C0G/X7R/Y5V Characteristics T=0.6mm typical

(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 μ m 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.

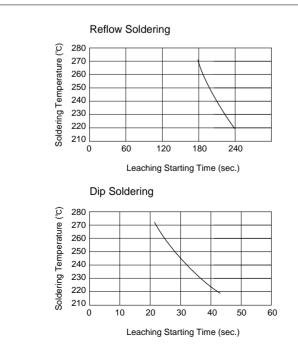
(2) Test samples

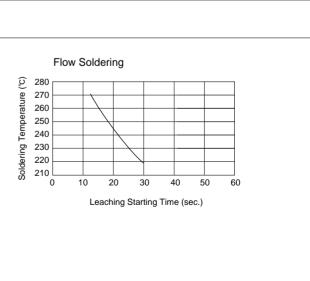
GRM40 : For flow/reflow soldering T=0.6mm

(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 :

(4) Results

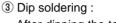




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Outer Electrode





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.

Reference Data

Continued from the preceding page.

- 8. Thermal Shock when Making Corrections with a Soldering Iron
- (1) Test Method

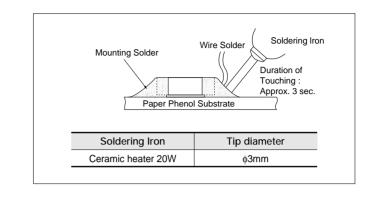
Apply a soldering iron meeting the conditions below to the soldered joint of a chip that has been soldered to a paper phenol board, while supplying wire solder. (Note: the soldering iron tip shall not directly touch the ceramic element of the chip.)

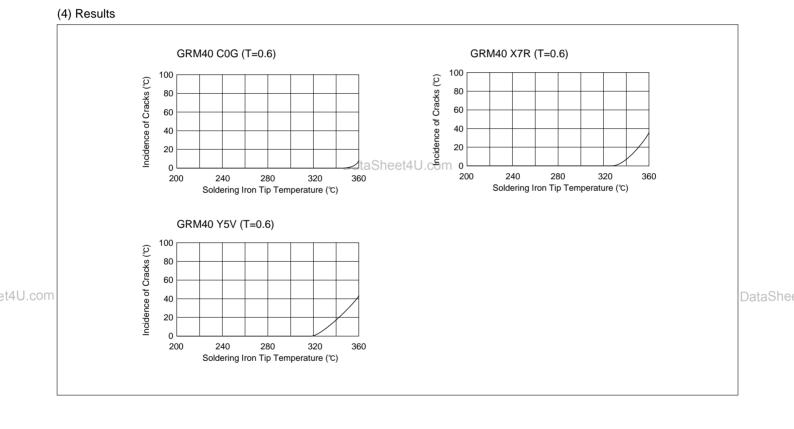
(2) Test Samples

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.







CHIP MONOLITHIC CERAMIC CAPACITOR

muRata

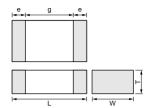
for High-voltage Low Dissipation Type GHM1000 Series

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		Dim	ensions (mm)	
Part Number	L	W	Т	e min.	g min.
GHM1030	3.2 ±0.2	1.6 ±0.2	1.0 ⁺⁰ -0.3		1.5*
GHM1030	J.Z <u>⊥</u> 0.Z	1.0 ±0.2	1.25 ⁺⁰ -0.3		1.5
GHM1035	3.2 ±0.2	2.5 ±0.2	1.5 ⁺⁰ -0.3	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
GHM1040	4.5 ±0.5	5.2 <u>1</u> 0.5	2.5 +0		

* SL 2kV : 1.8mm min.

				DataSheet4U.c	com					
	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.	
t4U.com	GHM1030R681K630	DC630	R	680 +10,-10%	3.2	1.6	1.25	1.5 min.	0.3 min.	DataShe
	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.	13
	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.	
DataShee	GHM1035SL820J2K	DC2000	SL	82 +5,-5%	3.2	2.5	1.5	1.8 min. WW	w.DataShee	t4U.com
	GHM1040SL121J2K	DC2000	SL	120 +5,-5%	4.5	3.2	2.0	2.9 min.	0.3 min.	



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Continued from the prece	ding page.							
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.

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			Specif	lication				
lo.	Iten	n	Temperature Compensating Type (SL Char.)	High Dielectric Constant Type (R Char.)	-	Test Method		
	Operating Temperature	e Range	-55 to +125℃	Constant Type (it char)				
		5						
					•			
			No defects or abnormalities.	ge Test voltage 1kV 120% of the rated voltage				
5	Insulation Re (I.R.)	esistance	More than 10,000MΩ			tance shall be measured with 500±50V and		
		Ce.	Within the specified tolerance.			D.F. shall be measured at 20°C at the		
7	Q/ Dissipatior	n	C≥30pF : Q≥1,000 C<30pF : Q≥400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	 frequency and voltage shown as follows. (1) Temperature Compensating Type Frequency : 1±0.2MHz Voltage : 0.5 to 5V (r.m.s.) (2) High Dielectric Constant Type Frequency : 1±0.2kHz Voltage : 1±0.2V (r.m.s.) (1) Temperature Compensating Type The temperature coefficient is determined using the 			
							When cycling the through 5 (+20 to	asured in step 3 as a reference. e temperature sequentially from step 1 to +85 °C) the capacitance shall be within the ce for the temperature coefficient. Temperature(°C)
				Cap. ChangeSheet4U.com	1	20±2		
	•				2	Min. Operating Temp.±3		
	•			Within ±15%	3	20±2		
	Ondi dotti	1103	(10		4	Max. Operating Temp.±2		
					5	20±2		
					 (2) High Dielectric Constant Type The range of capacitance change compared to the 20℃ value within -55 to +125℃ shall be within the specified range. Pretreatment Perform a heat treatment at 150⁺C for 60±5 min and then let sit for 24±2 h at room condition. 			
			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.			
		Appearance	No defects or abnormalities.			r to the test jig (glass epoxy board).		
		Capacitance	Within the specified tolerance.			be subjected to a simple harmonic motion tude of 1.5mm, the frequency being varied		
$10 \pm$	Vibration Resistance	Q/D.F.	30pF min. : Q≥1,000 30pF max. : Q≥400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	uniformly between the frequency range, fro traversed in approximal period of 2 h in each of 6 h).	the approximate limits of 10 and 55Hz. The om 10 to 55Hz and return to 10Hz, shall be imately 1 min. This motion shall be applied for ach 3 mutually perpendicular directions (total		
	1 2 3 4 5 6 7 7 8 8	0 Operating Temperature 1 Operating Temperature 2 Appearance 3 Dimension 4 Dielectric S 5 Insulation Ref 6 Capacitance 7 Q/ 7 Q/ 8 Capacitance 8 Capacitance 9 Adhesive S of Termina 0 Vibration Resistance	0 Operating Temperature Range 2 Appearance 3 Dimensions 4 Dielectric Strength 5 Insulation Resistance (I.R.) 6 Capacitance 7 O/ Dissipation Factor (D.F.) 8 Capacitance Temperature Characteristics 9 Adhesive Strength of Terminion 1 Appearance 2 Adhesive Strength 1 Appearance 2 Appearance 2 Appearance 3 Appearance 4 Appearance 5 Appearance 6 Capacitance	0 Item Temperature Compensating Type (SL Char.) 1 Operating Temperature Range -55 to +125°C 2 Appeararce No defects or abnormalities. 3 Dimension Within the specified dimension. 4 Dielectric Strength No defects or abnormalities. 5 Insulation Resistance More than 10,000MΩ 6 Capacitarce (I.R.) Vithin the specified tolerance. 7 O/ Dissipation Factor (D.F.) C≥30pF : Q≥1,000 C<30pF : Q≥400+20C C : Nominal Capacitance (pF) 8 Capacitarce Temperature Characteristics Temp. Coefficient +350 to -1,000 ppm/c (Temp. Range : +20 to +85°c) 8 Capacitarce tremperature Characteristics Temp. Coefficient +350 to -1,000 ppm/c (Temp. Range : +20 to +85°c) 9 Adhesive Strength of Termination sites No removal of the terminations sites 9 Adhesive Strength Resistance No defects or abnormalities. 0 Vibration of Termination sites 30pF min. : Q≥1,000 30pF max. : Q≥400+20C	Image and the second secon	0 Item Temperature Compensating Type (SL Char.) High Dielectric Constant Type (R Char.) 2 Operating Type (SL Char.) -55 to +125°C Visual inspection. 2 Appearance Modelects or abnormalities. Visual inspection. Using calipers. 3 Dimensions Within the specified dimension. No failure shall be of the the thromio discharge current is mated using more than 10.000MQ2 No failure shall be of the tam DC Less than DC 6 Insulation Resistance (R,R) More than 10.000MQ2 The tapacitance of the tamper y and vite within 60±55 of dr/s The capacitance of C = 30pF : Q≥1.000 C <30pF : Q≥1.000 C <3		

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

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		Specification		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.				
11	Deflection	n		¢4.5 ↓ ↓ ↓ t: 1.6 ↓ ↓	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.				
			LXW C (mm) a	b c d	Flexure=1				
			3.2×1.6 2.2	5.0 2.0	Capacitance meter				
				5.0 2.9 1.0	l - 45 +l- 45 + l (in mm) Fig.3				
				7.0 2.4 7.0 3.7					
				g.2	-				
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°C. Immersing speed : 25±2.5mm/s				
		Appearance	No marking defects.		Preheat the capacitor at 120 to 150°C* for 1 min.				
		Capacitance	Within ±2.5% or ±0.25pF		Immerse the capacitor in eutectic solder solution at 260±5°C for				
		Change	(Whichever is larger)	Within ±10%	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	•Pretreatment for high dielectric constant type Perform a heat treatment at $150 \frac{-9}{-9}$ °C for 60 ± 5 min and then let sit for 24 ± 2 h at room condition.				
	Tiedi	I.R.	More than 10,000M Ω		*Preheating for more than 3.2×2.5mm				
				DataSheet4U.con	Step Temperature Time				
		Dielectric	Pass the item No.4.		1 100°C to 120°C 1 min.				
		Strength			2 170°C to 200°C 1 min.				
		Appearance	No marking defects.		Fix the capacitor to the supporting jig (glass epoxy board) shown				
		Capacitance	Within ±2.5% or ±0.25pF	Within ±10%	in Fig.4 using a eutectic solder. Perform the five cycles according to the four heat treatments				
		Change	(Whichever is larger)		 listed in the following table. 				
		0/5 5	C≧30pF : Q≧1,000		Let sit for 24±2 h at room condition, then measure.				
		Q/D.F.	C<30pF : Q≧400+20C C : Nominal Capacitance (pF)	D.F.≦0.01	Step Temperature (°C) Time (min)				
					1 Min. Operating Temp.±3 30±3 2 Room Temp. 2 to 3				
		I.R.	More than 10,000MΩ		2 Room Temp. 2 to 3 3 Max. Operating Temp.±2 30±3				
	Temperature				4 Room Temp. 2 to 3				
14	Cycle				•Pretreatment for high dielectric constant type Perform a heat treatment at $150 \pm 0_{0}^{\circ}$ ° for 60 ± 5 min and then let sit for 24±2 h at room condition.				
		Dielectric Strength	Pass the item No.4.		E2 E2 E2 E2 E2 E2 E2 E2 → Solder resist E2 E2 E2 E2 Cu Glass Epoxy Board				
		Annooronoo	No marking defects		Fig.4				
		Appearance No marking defects.			_				
		Capacitance Change	Within ±5.0% or ±0.5pF (Whichever is larger)	Within ±10%	Sit the capacitor at 40±2°C and relative humidity 90 to 95% for				
15	Humidity (Steady State)	Q/D.F.	C≧30pF : Q≧350 C<30pF : Q≧275+ $\frac{5}{2}$ C C : Nominal Capacitance (pF)	D.F.≦0.01	 500^{±2}% h. Remove and let sit for 24±2 h at room condition, then measure. Pretreatment for high dielectric constant type Perform a heat treatment at 150[±]18°C for 60±5 min and then 				
		I.R.	More than 1,000M Ω		let sit for 24 ± 2 h at room condition.				
		Dielectric Strength	Pass the item No.4.						

"Room condition" Temperature : 15 to 35°C, Relative humidity : 45 to 75%, Atmosphere pressure : 86 to 106kPa DataSheet4U.com

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			Specif	ication			
No.	. Item		Temperature Compensating Type (SL Char.)	High Dielectric Constant Type (R Char.)	Test Method		
		Appearance	No marking defects.		Apply the voltage in follow	ing table for 1,000 $^{+48}_{-0}$ at maximum	
		Capacitance Change	Within $\pm 3.0\%$ or ± 0.3 pF (Whichever is larger)	Within ±10%		2 h at room condition, then measure.	
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	 The charge/discharge curr Pretreatment for high diel Apply test voltage for 60± Remove and let sit for 24. 	ectric constant type 5 min at test temperature.	
		I.R.	More than 1,000M Ω		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	

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

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CHIP MONOLITHIC CERAMIC CAPACITOR

muRata

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.

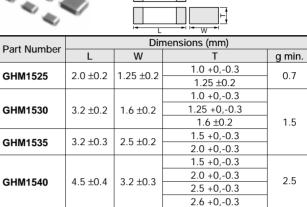
Application

- 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.



GHM1545

5.7 ±0.4



5.0 ±0.4

2.0 +0,-0.3

2.7 +0,-0.3

3.5

g 0.3 min.

0.3 min.

	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	3300pFh+10,F40%C	pm2.0	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.	- - DataShee - - -
41.1	GHM1530B473K250	DC250	В	47000pF +10,-10%	3.2	1.6	1.6	1.5 min.		
4U.com	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.	_
14	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.	_
ataShee	GHM1545B224K630	DC630	В	0.22µF +10,-10%	5.7	5.0	2.7	3.5 min. WW	w.DataShee	et4U.com



No.	Item	1	Specification	Test Method			
1	Operating Temperature	Range	−55 to +125℃	-	_		
2	Appearance	е	No defects or abnormalities.	Visual inspection.	_		
3	Dimensions	5	Within the specified dimensions.	Using calipers.	_		
4	Dielectric S	trength	No defects or abnormalities.	fects 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 Res (I.R.)	sistance	C≧0.01μF : More than 100MΩ • μF C<0.01μF : More than 10,000MΩ	The insulation resistance shall be measured with 500±50V (250±50V in case of rated voltage: DC 250V) and within 60±5 s of charging.	_		
6	Capacitance	е	Within the specified tolerance.	The capacitance/D.F. shall be measured at 20°C at a frequency of			
7	Dissipation Factor (D.F.		0.025 max.	1 \pm 0.2kHz and a voltage of 1 \pm 0.2V (r.m.s.)			
8	Capacitance Temperature Characterist	е	Cap. Change Within ±10% (Temp. Range : −25 to +85℃)	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 $150^{+0}_{-10}^{\circ}$ C for 60±5 min and then let sit for 24±2 h at room condition.	_		
9	Adhesive St of Terminati		No removal of the terminations or other defect shall occur. DataSheet4U.com	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.			
10	Vibration Resistance	ppearance capacitance	No defects or abnormalities. Within the specified tolerance. 0.025 max.	Solder the capacitor to the test jig (glass epoxy board). The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 min. This motion shall be applied for a period of 2 h in each 3 mutually perpendicular directions (total of 6 h).	-		
				122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 122 123 122 122 122 122 123 123 123 123 123 124 123 123 123 123 124 123 123 123 123 124 123 123 123 123 124 123 123 123 123 124 123 123 123 123 125 123 123 123 123 125 123 123 123 123 125 123 123 123 123 125 123 123 123 123 125 123 123 123 123 125 123 123 123	Data		
			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 reflow method and shall be conducted with care so that the soldering is	-		
11	Deflection		$\begin{array}{c c c c c c c c c c c c c c c c c c c $	method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. $\begin{array}{c} 20 & 50 & \text{Pressurizing} \\ \text{speed}: 1.0\text{mm/s} \\ \text{Flexure=1} \\ \text{Capacitance meter} \\ \text{45} & \text{(in mm)} \end{array}$ Fig.3	l		

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

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	Specification	Test N	Nethod					
12 Solderability of Termination	75% of the terminations is to be soldered evenly and continuously.	Immerse the capacitor in a soluti rosin (JIS-K-5902) (25% rosin in Immerse in eutectic solder soluti Immersing speed : 25±2.5mm/s	weight proportion). on for 2 ± 0.5 s at 23					
Appearance	No marking defects.	Preheat the capacitor at 120 to 150°C° for 1 min. Immerse the capacitor in eutectic solder solution at 260±5°C for						
Capacitance Change	Within ±10%	10±1 s. Let sit at room condition •Immersing speed : 25±2.5mm/	n for 24±2 h, then r					
Resistance D.F.	0.025 max.	Pretreatment						
13 to Soldering Heat	C≧0.01μF : More than 100MΩ • μF C<0.01μF : More than 10,000MΩ	Perform a heat treatment at 150 let sit for 24±2 h at room condit		nin and then				
		*Preheating for more than 3.2X2						
Dielectric Strength	Pass the item No.4.	Step Temperate 1 100℃ to 12		Time min.				
		2 170°C to 20		min.				
Appearance	No marking defects.	Fix the capacitor to the supportin	ng jig (glass epoxy b	ooard) shown				
Capacitance	Within +7 5%	in Fig.4 using a eutectic solder.	a to the four heat tr	o otmonto				
Change	Within ±7.5%	Perform the five cycles according listed in the following table.	g to the four heat the	eatments				
D.F.	0.025 max.	Let sit for 24±2 h at room conditi	ion, then measure.					
I.R.	C≧0.01µF : More than 100MΩ • µF	Step Temperatur 1 Min. Operating		ne (min) 30±3				
	C<0.01μF : More than 10,000MΩ	2 Room Ten		2 to 3				
		3 Max. Operating 4 Room Ten		30±3 2 to 3				
14 Temperature Cycle Dielectric Strength	Pass the item No.4. DataSheet4U.com	Pretreatment Perform a heat treatment at 150 [±] ₁ 8°C for 60±5 min and then let sit for 24±2 h at room condition.						
Appearance	No marking defects.							
Capacitance Change	Within ±15%	Sit the capacitor at $40\pm2^{\circ}$ C and relative humidity 90 to 95% for $500\pm^{23}$ h.						
15 (Steady D.F.	0.05 max.	Remove and let sit for 24 ± 2 h at	t room condition, the	en measure.				
State) I.R.	C≥0.01μF : More than 10MΩ • μF C<0.01μF : More than 1,000MΩ	Pretreatment Perform a heat treatment at 150 [±] ₁ 8 [°] C for 60±5 r let sit for 24±2 h at room condition.		nin and then				
Dielectric Strength	Pass the item No.4.							
Appearance	No marking defects.		//					
		Apply 120% of the rated voltage (150% of the rated voltage in case of rated voltage: DC250V) for 1,000 ⁺⁴⁸ / ₋ h at maximum						
Capacitance Change	Within ±15%			operating temperature \pm 3°C. Remove and let sit for 24 \pm 2 h at room condition, then measure.				
Capacitance Change	Within ±15% 0.05 max.	operating temperature±3°C. Rem room condition, then measure.	nove and let sit for 2	24 ±2 h at				
Capacitance Change		operating temperature±3°C. Ren room condition, then measure. The charge/discharge current is •Pretreatment	nove and let sit for 2 less than 50mA.					
16 Life	0.05 max. C≧0.01μF : More than 10MΩ • μF	operating temperature±3°C. Rem room condition, then measure. The charge/discharge current is	nove and let sit for 2 less than 50mA. at test temperature					
16 Life Capacitance Change D.F. I.R. Dielectric	0.05 max. C≥0.01μF : More than 10MΩ • μF C<0.01μF : More than 1,000MΩ	operating temperature±3°C. Ren room condition, then measure. The charge/discharge current is •Pretreatment Apply test voltage for 60±5 min	nove and let sit for 2 less than 50mA. at test temperature					
16 Life Capacitance Change D.F. I.R. Dielectric Strength	0.05 max. C≥0.01μF : More than 10MΩ • μF C<0.01μF : More than 1,000MΩ	operating temperature±3°C. Rem room condition, then measure. The charge/discharge current is •Pretreatment Apply test voltage for 60±5 min Remove and let sit for 24±2 h a Apply the rated voltage at 40±2°	nove and let sit for 2 less than 50mA. at test temperature at room condition.	9.				
16 Life Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Change	0.05 max. C≥0.01µF : More than $10M\Omega • µF$ C<0.01µF : More than $1,000M\Omega$ Pass the item No.4. No marking defects.	operating temperature±3°C. Rem room condition, then measure. The charge/discharge current is •Pretreatment Apply test voltage for 60±5 min Remove and let sit for 24±2 h at Apply the rated voltage at 40±2° 95% for 500 ^{+2°} ₀ h. Remove and let sit for 24±2 h at	nove and let sit for 2 less than 50mA. at test temperature at room condition. C and relative humi	e. idity 90 to				
16 Life Capacitance Change D.F. I.R. Dielectric Strength Appearance Capacitance Capacitance Capacitance Capacitance	$\begin{array}{c} 0.05 \text{ max.} \\ C \geqq 0.01 \mu\text{F} : \text{More than } 10 \text{M}\Omega \bullet \mu\text{F} \\ C < 0.01 \mu\text{F} : \text{More than } 1,000 \text{M}\Omega \\ \end{array}$ Pass the item No.4. No marking defects. Within $\pm 15\%$	operating temperature±3°C. Rem room condition, then measure. The charge/discharge current is •Pretreatment Apply test voltage for 60±5 min Remove and let sit for 24±2 h a Apply the rated voltage at 40±2° 95% for 500 ⁺² ° ₀ h.	nove and let sit for 2 less than 50mA. a at test temperature at room condition. C and relative humi t room condition, the a t test temperature	e. idity 90 to en measure.				

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

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CHIP MONOLITHIC CERAMIC CAPACITOR

muRata

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.

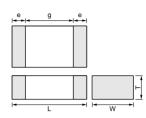
■ Reference Standard

JIS C 5102

JIS C 5150

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





Part Number	Dimensions (mm)								
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							

Part Number	Rated Voltage (V)	TC Code	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g (mm)	Electrode e (mm)
GHM2243B471MAC250	AC250 (r.m.s.)	В	D470pE+20,-20% C	om5.7	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.

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No	. Ite	em	Specification	Test Method		
1	Operating Temperati		-25 to +85℃	_	-	
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. 5 Insulation Resistance (I.R.) More than 2,000MΩ 6 Capacitance Within the specified tolerance. 7 Dissipation Factor (D.F.) 0.025 max.			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. GHM21xx AC575V (r.m.s.) GHM22xx AC1500V (r.m.s.)	-	
5			More than 2,000MΩ	The insulation resistance shall be measured with $500\pm50V$ and within 60 ± 5 s of charging.	_	
6			Within the specified tolerance.		-	
7			0.025 max.	The capacitance/D.F. shall be measured at 20°C at a frequency of 1 ± 0.2 kHz and a voltage of 1 ± 0.2 V (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°C shall be within the specified range. •Pretreatment Perform a heat treatment at 150 [±] 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. DataSheet4U.com	As in Fig., discharge is made 50 times at 5 s intervals from the capacitor(Cd) charged at DC voltage of specified. $\begin{array}{c} R3 \\ \hline \\ $		
10 com	Adhesive of Termir	e Strength nation	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.	Data	
		Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).	-	
11	Vibration	Capacitance Within the specified tolerance.	Within the specified tolerance.	The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 min. This motion shall be applied for a period of 2 h in each 3 mutually perpendicular directions (total of 6 h).		
	Resistance	D.F.	0.025 max.	Image: Solder resist		

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

Continued on the following page.

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No.	lte	em	Specification		Test Method		
			No cracking or marking defects shall occur.	in Fig.2 using direction show	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering shall be done either with an iron or using the reflow method and shall be conducted with		
12			$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	care so that the soldering is uniform and free of defects such as heat shock. $\begin{array}{c} 20 & 50 \\ \hline Pressurize \\ \hline Pressurize \\ \hline Pressurize \\ \hline Flexure=1 \\ \hline capacitance meter \\ \hline 45 \end{array} (in mm) \\ \hline Fig.3 \end{array}$			
13	Solderab Terminati	2	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). Immerse in eutectic solder solution for 2±0.5 s at 235±5°C. Immersing speed : 25±2.5mm/s		portion).	
		Appearance	No marking defects.	_			
	Humidity	Capacitance Change	Within ±15%	The capacitor shall be subjected to 40±2°C, relative humidity of 90 to 98% for 8 h, and then removed in room condition for 16 h until 5 cycles.			
14	Insulation	D.F.	0.05 max.				
		I.R. Dielectric	More than $1,000M\Omega$ Pass the item No.4.	until 0 cycles.			
		Strength	No marking defects.	Preheat the capacitor as table.			
		Appearance Capacitance Change	Within ±10%	Immerse the of 10±1 s. Let s	capacitor in eutectic solder so it at room condition for 24±2 peed : 25±2.5mm/s		
	Resistance	D.F.	0.025 max.	•Pretreatment Perform a heat treatment at 150 [±] ₁ 8℃ for 60±5 min and then			
15	to Soldering	I.R.	More than 2,000MΩ		2° h at room condition.	r 60±5 min and then	
	Heat			*Preheating			
		Dielectric Strength	Pass the item No.4.	Step	Temperature	Time	
		3		1 2	100°C to 120°C 170°C to 200°C	1 min. 1 min.	
		Appearance	No marking defects.	Fix the capaci	tor to the supporting jig (glass	s epoxy board) shown	
		Capacitance Change	Within ±7.5%	in Fig.4 using	a eutectic solder. ve cycles according to the fou		
		D.F.	0.025 max.		2 h at room condition, then n		
		I.R.	More than 2,000MΩ	Step 1	Temperature (°C) Min. Operating Temp.±3	Time (min) 30±3	
11	Temperature				Room Temp. Max. Operating Temp.±2 Room Temp.	2 to 3 30±3 2 to 3	
16	Temperature Cycle	Dielectric Strength	Pass the item No.4.		eat treatment at $150 \pm_1 \%$ °C fo =2 h at room condition.	r 60±5 min and then der resist	

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

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Continued from the preceding page.

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 $500 \pm {}^{24}_{O}h$.
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 1,000MΩ	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 ChangeWithin ±15%D.F.0.05 max.		for 24 ±2 h at room condition, then measure. The charge / discharge current is less than 50mA.
				Test Time Test voltage GHM21xx 1,000 ⁺⁴ ₀ h AC300V (r.m.s.)
18	Life	I.R.	More than 1,000M Ω	GHM22xx 1,500 ⁻⁴⁸ h AC500V (r.m.s.)*
		Dielectric Strength	Pass the item No.4.	 * 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 $500\pm2^{\circ}_{0}$ 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.

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

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CHIP MONOLITHIC CERAMIC CAPACITOR



for High-voltage GHM3000 Series Safety Recognized

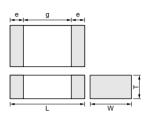
Features

- 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.
- 3. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
- 4. The type GB can be used as an X2-class capacitor.
- 5. The type GC can be used as an X1-class and Y2-class capacitor.
- 6. +125 degree C guaranteed.
- 7. Only for reflow soldering.

Application

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





Dor	t Number	Dimensions (mm)						
Pal	Infinite	L	W	Т	e min.	g min.		
GHM	M3045			2.0 ±0.3				
~	M3145	5.7 ±0.4	5.0 ±0.4	2.0 ±0.3	0.3	4.0		
GHI	VI3140			2.7 ±0.3				

Standard Recognition

		Standard No.	Status of R	ecognition	Rated
		Standard No.	Type GB	Type GC	Voltage
	UL	UL1414	_	◎*	
	BSI		_	0	
	VDE		0	0	AC250V
	SEV	EN132400	0	0	(r.m.s.)
Sheet4L	.SEMKO		0	0	
	EN132	400 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)	
4U.com	GHM3045X7R101K-GC	AC250 (r.m.s.)	X7R	100 +10,-10%	5.7	5.0	2.0	4.0 min.	0.3 min.	DataS
	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 Туре

	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.
Shee	GHM3145X7R333K-GB	AC250 (r.m.s.)	X7R	33000 +10,-10%	5.7	5.0	2.7	4.0 min. WW	n.DootaSheet4

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



0.	Ite	m	Specification	Test Method		
1	Operating Temperatu	ire Range	-55 to +125℃	_		
2	Appearan	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. Image: Constraint of the charge of the charge of the charge current is less than 50mA. Image: Constraint of the charge of the		
5	Insulation F (I.R.)	Resistance	More than 6,000MΩ	The insulation resistance shall be measured with 500 \pm 50V and within 60 \pm 5 s of charging.	-	
5	Capacitance Within the specified tolerance.			-		
7	•		0.025 max.	The capacitance/D.F. shall be measured at 20°C at a frequency 1±0.2kHz and a voltage of 1±0.2V (r.m.s.)		
Capaci 8 Tempe		ure	Cap. Change Within ±15%	The range of capacitance change compared with the 25°C value within −55 to +125°C shall be within the specified range. •Pretreatment Perform a heat treatment at 150 [±] ₁ 8°C for 60±5 min and then let sit for 24±2 h at room condition.	_	
		Appearance	No defects or abnormalities.	As in Fig., discharge is made 50 times at 5 s intervals from		
		I.R.	More than 1,000MΩ			
9	Discharge Test (Application: Type GC)	Dielectric Strength	Pass the item No.4. DataSheet4U.com	$\begin{array}{c} \overrightarrow{T} \\ \overrightarrow{T} \\ \overrightarrow{T} \\ \overrightarrow{T} \\ 10kV \\ \overrightarrow{V} \\ \overrightarrow{Cd} \\ \overrightarrow{Cd} \\ \overrightarrow{Ct} \overrightarrow{Ct} \overrightarrow{Ct} \\ \overrightarrow{Ct} C$		
0			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.	Data	
		Appearance	No defects or abnormalities.	Solder the capacitor to the test jig (glass epoxy board).	-	
		Capacitance	Within the specified tolerance.			
		ibration		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).		
	2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Operating Temperature Appearan Dimension Dialectric Insulation F (I.R.) Dissipation Factor (D) Dissipation Factor (D) Discharge Test (Application: Type GC) O Adhesive of Termin Vibration	Operating Temperature Range0Appearance0Dimension0Dimension0Diselectric Strength0Capacitance0Capacitance1Capacitance0Capacitance1Capacitance1Capacitance1Number Strength1Dissipation1Number Strength1Number Strength	Operating Temperature Range -55 to +125°C Appearance No defects or abnormalities. Dimensions Within the specified dimensions. Image: Dielectric Strength No defects or abnormalities. Image: Dielectric Strength No defects or abnormalities. Image: Discharge Test More than 6,000MQ Image: Discharge Test More than 6,000MQ Image: Discharge Test Capacitance Vithin the specified tolerance. O.25 max. Capacitance Temperature Characteristics Cap. Change Within ±15% Image: Discharge Test Apperature No defects or abnormalities. Image: Discharge Test Delectric Strength Image: Discharge Test Apperature No defects or abnormalities. Image: Discharge Test Delectric Strength Image: Discharge Test Apperature No defects or abnormalities. Image: Discharge Test Apperature No defects or abnormalities. Image: Discharge Test No removal of the terminations or other defect shall occur. Image: Discharge Test Apperature No defects or abnormalities. Image: Discharge No defects or abnorm	Operating Temperature Rage	

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

Continued on the following page.



No	lte	em	Specification	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 reflow method and shall be conducted with		
12	Deflectio	n		care so that the soldering is uniform and free of defects such as heat shock. 20^{50} Pressurizing speed : 1.0mm/s R230 Pressurize		
			100 t : 1.6			
			L×W (mm) Dimension (mm) a b c d 5.7×5.0 4.5 8.0 5.6 1.0	Capacitance meter 45 ++ 45 + (in mm)		
			Fig.2	Fig.3		
13	Solderab Terminati		75% of the terminations is to be soldered evenly and continuously.	Fig.3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) an rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 2±0.5 s at 235±5°C. Immersing speed : 25±2.5mm/s		
		Appearance	No marking defects.	Preheat the capacitor as table. Immerse the capacitor in eutectic solder solution at $260\pm5^{\circ}$ for 10 ± 1 s. Let sit at room		
		Capacitance Change	Within ±10%	 •Immersing speed : 25±2.5mm/s 		
	Resistance	I.R.	More than 1,000MΩ	•Pretreatment Perform a heat treatment at $150 \pm 18^{\circ}$ for 60±5 min and then		
	to Soldering Heat	Dielectric	Pass the item No.4.	let sit for 24±2 h at room condition.		
		Strength		Step Temperature Time		
				1 100°C to 120°C 1 min. 2 170°C to 200°C 1 min.		
_		Appearance	No marking defects. DataSheet4U.com	Fix the capacitor to the supporting jig (glass epoxy board) shown		
		Capacitance Change	Within ±15%	in Fig.4 using a eutectic solder. Perform the five cycles according to the four heat treatments listed in the following table.		
		D.F.	0.05 max.	Let sit for 24 ± 2 h at room condition, then measure.		
		I.R.	More than 3,000M Ω	Step Temperature (°C) Time (min)		
				1 Min. Operating Temp.±3 30±3 2 Room Temp. 2 to 3		
				3 Max. Operating Temp.±2 30±3		
n 15	Temperature Cycle			4 Room Temp. 2 to 3 •Pretreatment		
		Dielectric	Pass the item No.4.	Perform a heat treatment at $150 \pm 10^{\circ}$ °C for 60 ± 5 min and then let sit for 24±2 h at room condition.		
		Strength		Image: Solider resist Image: Solider resist <td< td=""></td<>		
_		Appearance	No marking defects.	Fig.4		
	Lines Line	Capacitance Change	Within ±15%	Sit the conscitute of 404.0% and relative here "it's 0.0 to 0.000" (
16	Humidity (Steady	D.F.	0.05 max.	Sit the capacitor at 40±2°c and relative humidity 90 to 95% for 500±12 h.		
	State)	I.R.	More than $3,000M\Omega$	Remove and let sit for 24 ± 2 h at room condition, then measure.		
		Dielectric	Pass the item No.4.			

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No.	Ite	em	Specification	Test Method
		Appearance Capacitance Change	No marking defects. Within ±20%	$\begin{array}{ c c c c c }\hline & Impulse Voltage & $$100 \ (\%)$ T1=1.2 \ \mu s=1.67T$ \\ \hline Each individual capacitor shall be subjected to a 2.5kV (Type GC:5kV) \\ Impulses (the voltage value means $$$100 \ (\%)$ T1=1.2 \ \mu s=1.67T$ \\ \hline $$100 \ (\%)$ T2=50 \ \mu s$ \\ \hline $$$100 \ (\%)$ T1=1.2 \ \mu s=1.67T$ \\ \hline $$$100 \ (\%)$ T1=1.2 \ \mu s=1.67T$ \\ \hline $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
		D.F.	0.05 max.	zero to peak) for three times. Then $\frac{ \tau_{\tau} }{\tau_{\tau}}$
		I.R.	More than $3,000M\Omega$	the capacitors are applied to life test.
17	Life	Dielectric Strength	Pass the item No.4.	Apply voltage as Table for 1,000 h at $125 \pm 3^{\circ}$ °C, relative humidity50% max.Type Applied voltageGBAC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1s.GCAC425V (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 $40\pm2^{\circ}$ C and relative humidity 90 to
18	Humidity Loading	D.F.	0.05 max.	95% for 500^{+24}_{-0} h. Remove and let sit for 24±2 h at room
	Loading	I.R.	More than 3,000M Ω	condition, then measure.
		Dielectric Strength	Pass the item No.4.	

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

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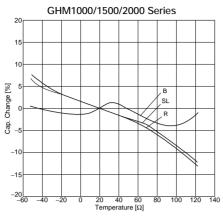
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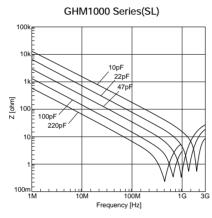


GHM Series Data

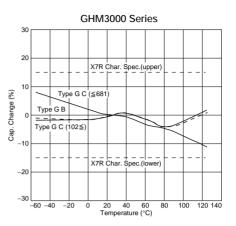
■ Capacitance-Temperature Characteristics

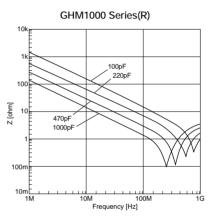


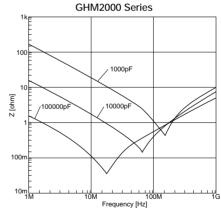
Impedance-Frequency Characteristics











Continued on the following page.



GHM1500 Series

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GHM3000 Series(GB Type)

33nF

Frequency (MHz)

10

10nF

100

1000

1000

100

10

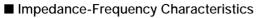
0.1

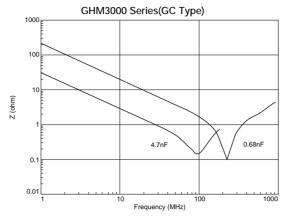
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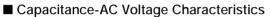
Z (ohm)

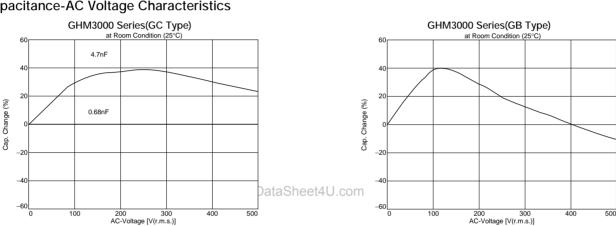
GHM Series Data

Continued from the preceding page.









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Taping is standard packaging method.

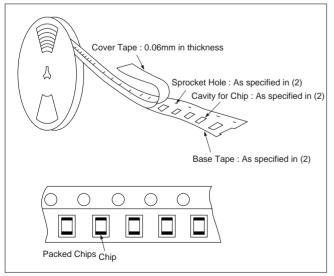
■ Minimum Quantity Guide

		C)imensions (m	m)	Quantit	
Part Number			-		φ180m	
		L	W	Т	Paper Tape	Plastic Tape
	GHM1030	3.2	1.6	1.0	4,000	-
	Chimitoso	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
	GHIMIT040	4.5	5.2	2.5	-	500
	GHM1525	2.0	1.25	1.0	4,000	-
	GHM1525	2.0	1.25	1.25	-	3,000
			1.6	1.0	4,000	-
High-voltage	GHM1530	3.2		1.25	-	3,000
				1.6	-	2,000
	GHM1535	3.2	2.5	1.5	-	2,000
		5.2	2.5	2.0	-	1,000
				1.5	-	1,000
	GHM1540	4.5	2.0	2.0	-	1,000
	GHM1540	4.5	3.2	2.5	-	500
				2.6	-	500
	CUM4E4E	F 7	5.0	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
Coffy Std	GHM3045	5.7	5.0	2.0	-	1,000
Safty Std. Recognition	GHM3145	57	5.0	2.0	-	1,000
resognition	GHW3145	5.7	5.0	2.7	-	500

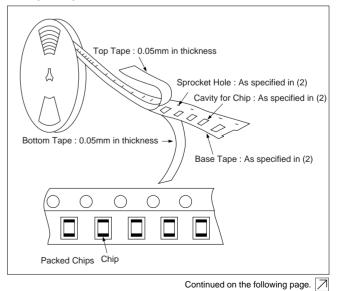
■ Tape Carrier Packaging

(1) Appearance of Taping

① Plastic Tape



2 Paper Tape



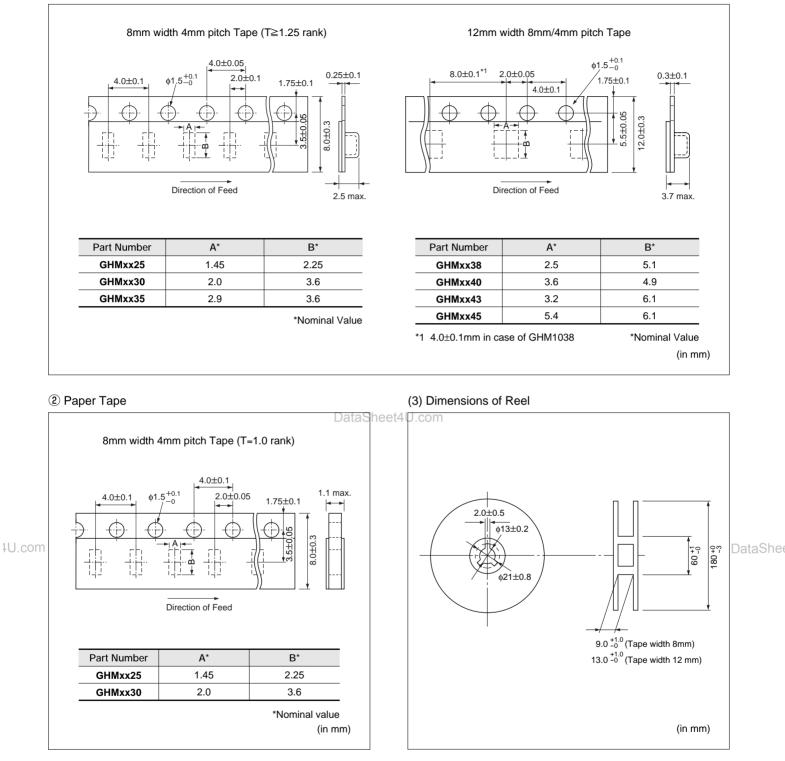


Package

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(2) Dimensions of Tape

① Plastic Tape



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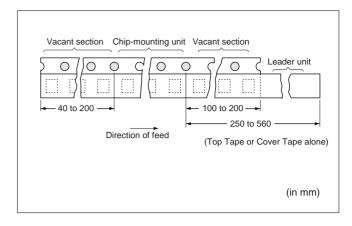
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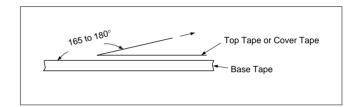


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Package

- (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.
 - $\ensuremath{\overline{\mathcal{O}}}$ Peeling off force : 0.1 to 0.7N in the direction shown on the right.





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⚠ Caution

Storage and Operating Conditions

Do not use or store capacitorsin 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.

■ 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 HeatDataSheet4U.would be applied directly to capacitor, test voltage should 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 et4U.com 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

molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40 degrees centigrade 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.

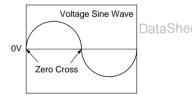
> specified voltage value is applied, the defective may be caused.

(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

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

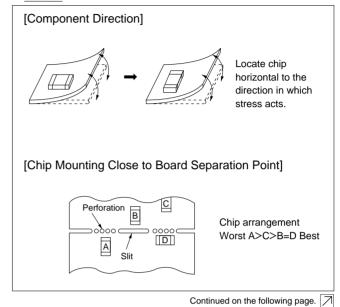
Caution (Soldering and Mounting)

 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 4.5×3.2 mm 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 <u>Choose a mounting position that minimizes the stress</u> <u>imposed on the chip during flexing or bending of the</u> board.



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A Caution

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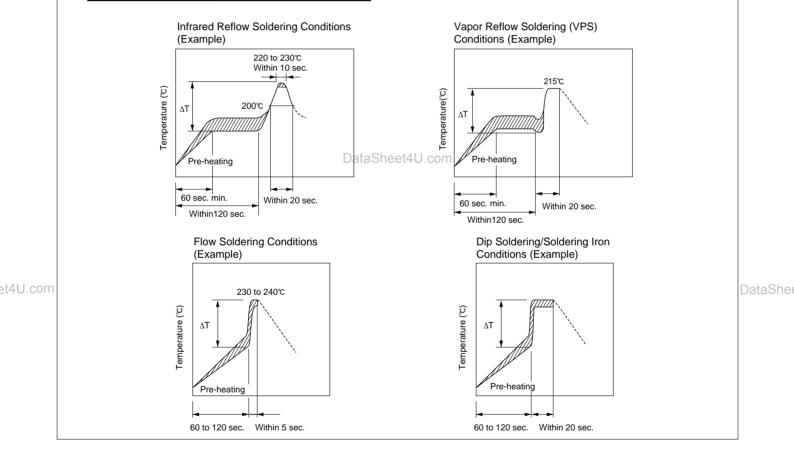
4. Soldering (Prevention of the thermal shock) <u>If a chip component is heated or cooled abruptly during</u> <u>soldering, it may crack due to the thermal shock.</u> To prevent this, adequate soldering condition should be taken following our recommendation below.

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	∆T≦190°C	∆T≦130°C
Flow Method or Dip Soldering Method	∆T≦150°C	

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

Item	Conditions		
Chip Size	≦2.0×1.25mm	3.2×1.6mm	
Temperature of Iron-tip	300°C max.	270°C max.	
Soldering Iron Wattage	20W max.		
Diameter of Iron-tip	φ 3.0mm max.		
Soldering Time	3 sec. max.		
Caution	Do not allow the iron-tip to directly touch the ceramic element.		



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 DataSheet4caserin a short circuit and fuming when the product is used.



1. Mounting of Chips

Mechanical shock of the chip placer

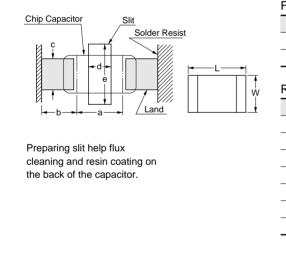
When the positioning claws and pick up nozzle are worn,the load is applied to the chip while positioning isconcentrated to one position, thus causing cracks,breakage, faulty positioning accuracy, etc.Careful checking and maintenance are necessary to

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

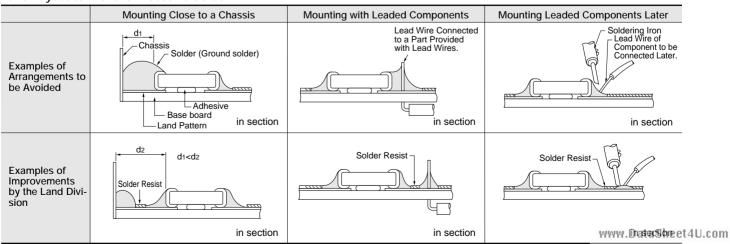
After installing chips, if solder is excessively applied to the circuit board, mechanical stress will cause destruction resistance characteristics to lower. To pre-vent this, be extremely careful in determining shape and dimension before designing the circuit board diagram.

Construction and Dimensions of Pattern (Example)



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 Sold							
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		

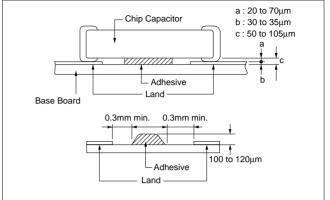
Land Layout to Prevent Excessive Solder



Continued on the following page.

(in mm)

Termination Thickness of Chip Capacitor and Desirable Thickness of Adhesives Applied





Notice

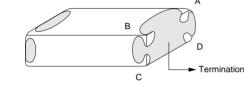
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3. Soldering

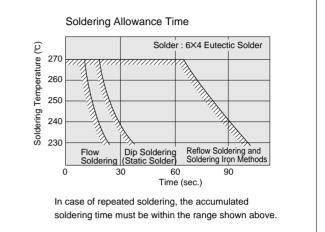
(Care for minimizing loss of the terminations.) Limit of losing effective area of the terminations and conditions needed for soldering.

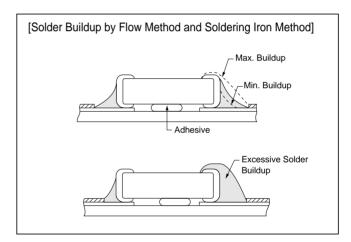
Depending on the conditions of the soldering temperature and/or immersion (melting time), effective areas may be lost in some part of the terminations.

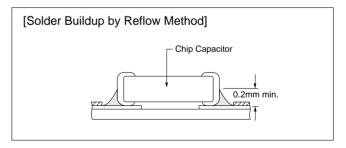
To prevent this, be careful in soldering so that any possible loss of the effective area on the terminations will securely remain minimum 25% on all edge length A-B-C-D of part with A, B, C, D, shown in the Figure below.



- (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
 - 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 Co.,Ltd.	Mar. 31, '95	RCJ★	RCJ-85M-01C
Izumo Murata Manufacturing Co.,Ltd.	May. 11, '95	ISO9001	RCJ-93M-05A
Murata Electronics Singapore (Pte.) Ltd.	Aug. 13, '92	SISIR★★ ISO9002	SG MES 91M001A
Murata Manufacturing (UK) Ltd.	Nov. 18, '92	BSI★★★ ISO9002	FM 22169
Murata Amazonia Industria Comercio Ltda.	Sep. '93	RCJ★ ISO9002	RCJ-(B)-93M-01
Murata Electronics North America State College Plant	Jun. '94	UL★★★★ ISO9002	A1734

 \star RCJ : Reliability Center for Electronic Components of Japan

 $\bigstar \bigstar$ SISIR : Singapore Institute of Standards and Industrial Research

★★★ BSI : British Standards Institution

 $\star \star \star \star$ UL : Underwriters Laboratories Inc.

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▲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

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(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.

- 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
 - 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
 - 10 Application of similar complexity and/or reliability requirements to the applications listed in the above

weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

- 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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International Division

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