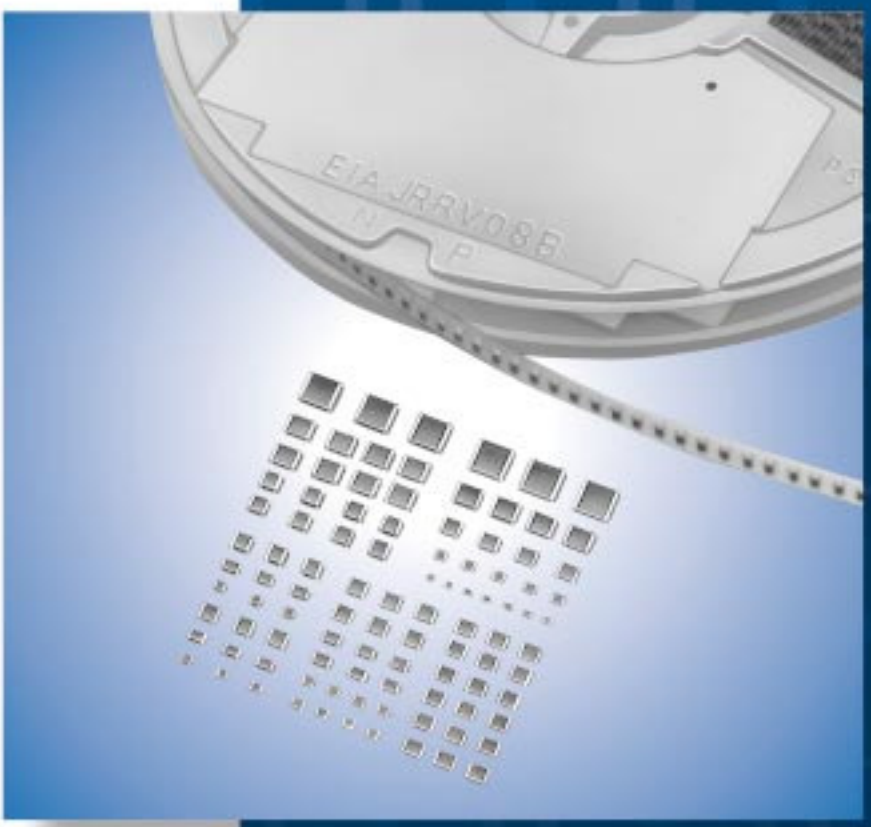
Chip Monolithic Ceramic Capacitors



Innovator in Electronics

Murata Manufacturing Co., Ltd.

Cat.No.C02E-14

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● Please refer to "Specifications and Test Methods" at the end of each chapter of 11 – 16 .

for EU RoHS Compliant

· All the products in this catalog comply with EU RoHS.
· EU RoHS is "the European Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment".
· For more details, please refer to our website 'Murata's Approach for EU RoHS' (http://www.murata.com/info/rohs.html).

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● Part Numbering

Chip Monolithic Ceramic Capacitors

(Part Number)

GR	M	18	8	B1	1H	102	K	A01	K
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶Product ID

❷Series

Product ID	Code	Series
GR	M	Tin Plated Layer
	4	Only for Information Devices /Tip & Ring
	7	Only for Camera Flash Circuit
ER	B	High Frequency Type
GQ	M	High Frequency for Flow/Reflow Soldering
GM	A	Monolithic Microchip
	D	for Bonding
GN	M	Capacitor Array
LL	L	Low ESL Wide Width Type
	A	Eight-termination Low ESL Type
	M	Ten-termination Low ESL Type
GJ	M	High Frequency Low Loss Type
GA	2	for AC250V (r.m.s.)
	3	Safety Standard Recognized Type

❸Dimension (L×W)

Code	Dimension (L×W)	EIA
02	0.4×0.2mm	01005
03	0.6×0.3mm	0201
05	0.5×0.5mm	0202
08	0.8×0.8mm	0303
0D	0.38×0.38mm	015015
0M	0.9×0.6mm	0302
11	1.25×1.0mm	0504
15	1.0×0.5mm	0402
18	1.6×0.8mm	0603
1M	1.37×1.0mm	0504
21	2.0×1.25mm	0805
22	2.8×2.8mm	1111
31	3.2×1.6mm	1206
32	3.2×2.5mm	1210
42	4.5×2.0mm	1808
43	4.5×3.2mm	1812
52	5.7×2.8mm	2211
55	5.7×5.0mm	2220

❹Dimension (T)

Code	Dimension (T)
2	0.2mm
2	2-elements (Array Type)
3	0.3mm
4	4-elements (Array Type)
5	0.5mm
6	0.6mm
7	0.7mm
8	0.8mm
9	0.85mm
A	1.0mm
B	1.25mm
C	1.6mm
D	2.0mm
E	2.5mm
F	3.2mm
M	1.15mm
N	1.35mm
Q	1.5mm
R	1.8mm
S	2.8mm
X	Depends on individual standards.

With the array type GNM series, "Dimension (T)" indicates the number of elements.

Continued on the following page.

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❺Temperature Characteristics

Temperature Characteristic Codes			Temperature Characteristics			Operating Temperature Range
Code	Public STD Code		Referance Temperature	Temperature Range	Capacitance Change or Temperature Coefficient	
1X	SL *1	JIS	20°C	20 to 85°C	+350 to -1000ppm/°C	-55 to 125°C
2C	CH *1	JIS	20°C	20 to 125°C	0±60ppm/°C	-55 to 125°C
2P	PH *1	JIS	20°C	20 to 85°C	-150±60ppm/°C	-25 to 85°C
2R	RH *1	JIS	20°C	20 to 85°C	-220±60ppm/°C	-25 to 85°C
2S	SH *1	JIS	20°C	20 to 85°C	-330±60ppm/°C	-25 to 85°C
2T	TH *1	JIS	20°C	20 to 85°C	-470±60ppm/°C	-25 to 85°C
3C	CJ *1	JIS	20°C	20 to 125°C	0±120ppm/°C	-55 to 125°C
3P	PJ *1	JIS	20°C	20 to 85°C	-150±120ppm/°C	-25 to 85°C
3R	RJ *1	JIS	20°C	20 to 85°C	-220±120ppm/°C	-25 to 85°C
3S	SJ *1	JIS	20°C	20 to 85°C	-330±120ppm/°C	-25 to 85°C
3T	TJ *1	JIS	20°C	20 to 85°C	-470±120ppm/°C	-25 to 85°C
3U	UJ *1	JIS	20°C	20 to 85°C	-750±120ppm/°C	-25 to 85°C
4C	CK *1	JIS	20°C	20 to 125°C	0±250ppm/°C	-55 to 125°C
5C	C0G *1	EIA	25°C	25 to 125°C	0±30ppm/°C	-55 to 125°C
5G	X8G *1	EIA	25°C	25 to 150°C	0±30ppm/°C	-55 to 150°C
6C	C0H *1	EIA	25°C	25 to 125°C	0±60ppm/°C	-55 to 125°C
6P	P2H *1	EIA	25°C	25 to 85°C	-150±60ppm/°C	-55 to 125°C
6R	R2H *1	EIA	25°C	25 to 85°C	-220±60ppm/°C	-55 to 125°C
6S	S2H *1	EIA	25°C	25 to 85°C	-330±60ppm/°C	-55 to 125°C
6T	T2H *1	EIA	25°C	25 to 85°C	-470±60ppm/°C	-55 to 125°C
7U	U2J *1	EIA	25°C	25 to 125°C	-750±120ppm/°C	-55 to 125°C
B1	B *2	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C
B3	B	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C
C7	X7S	EIA	25°C	-55 to 125°C	±22%	-55 to 125°C
C8	X6S	EIA	25°C	-55 to 105°C	±22%	-55 to 105°C
D7	X7T	EIA	25°C	-55 to 125°C	+22, -33%	-55 to 125°C
D8	X6T	EIA	25°C	-55 to 105°C	+22, -33%	-55 to 105°C
E7	X7U	EIA	25°C	-55 to 125°C	+22, -56%	-55 to 125°C
F1	F *2	JIS	20°C	-25 to 85°C	+30, -80%	-25 to 85°C
F5	Y5V	EIA	25°C	-30 to 85°C	+22, -82%	-30 to 85°C
L8	X8L	EIA	25°C	-55 to 150°C	+15, -40%	-55 to 150°C
R1	R *2	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C
R3	R	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C
R6	X5R	EIA	25°C	-55 to 85°C	±15%	-55 to 85°C
R7	X7R	EIA	25°C	-55 to 125°C	±15%	-55 to 125°C
R9	X8R	EIA	25°C	-55 to 150°C	±15%	-55 to 150°C
9E	ZLM	*3	20°C	-25 to 20°C	-4700+1000/-2500ppm/°C	-25 to 85°C
				20 to 85°C	-4700+500/-1000ppm/°C	
W0	-	-	25°C	-55 to 125°C	±10% *4	-55 to 125°C
					+22, -33% *5	

*1 Please refer to table for Capacitance Change under reference temperature.
*2 Capacitance change is specified with 50% rated voltage applied.
*3, *4 Murata Temperature Characteristic Code.
*4 Apply DC 350V bias.
*5 No DC bias.

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●Capacitance Change from each temperature

JIS Code

Murata Code	Capacitance Change from 20°C (%)					
	−55°C		−25°C		−10°C	
	Max.	Min.	Max.	Min.	Max.	Min.
1X	−	−	−	−	−	−
2C	0.82	−0.45	0.49	−0.27	0.33	−0.18
2P	−	−	1.32	0.41	0.88	0.27
2R	−	−	1.70	0.72	1.13	0.48
2S	−	−	2.30	1.22	1.54	0.81
2T	−	−	3.07	1.85	2.05	1.23
3C	1.37	−0.90	0.82	−0.54	0.55	−0.36
3P	−	−	1.65	0.14	1.10	0.09
3R	−	−	2.03	0.45	1.35	0.30
3S	−	−	2.63	0.95	1.76	0.63
3T	−	−	3.40	1.58	2.27	1.05
3U	−	−	4.94	2.84	3.29	1.89
4C	2.56	−1.88	1.54	−1.13	1.02	−0.75

EIA Code

Murata Code	Capacitance Change from 25°C (%)					
	−55°C		−30°C		−10°C	
	Max.	Min.	Max.	Min.	Max.	Min.
5C/5G	0.58	−0.24	0.40	−0.17	0.25	−0.11
6C	0.87	−0.48	0.59	−0.33	0.38	−0.21
6P	2.33	0.72	1.61	0.50	1.02	0.32
6R	3.02	1.28	2.08	0.88	1.32	0.56
6S	4.09	2.16	2.81	1.49	1.79	0.95
6T	5.46	3.28	3.75	2.26	2.39	1.44
7U	8.78	5.04	6.04	3.47	3.84	2.21

❻Rated Voltage

Code	Rated Voltage
0G	DC4V
0J	DC6.3V
1A	DC10V
1C	DC16V
1E	DC25V
1H	DC50V
2A	DC100V
2D	DC200V
2E	DC250V
YD	DC300V
2H	DC500V
2J	DC630V
3A	DC1kV
3D	DC2kV
3F	DC3.15kV
BB	DC350V (for Camera Flash Circuit)
E2	AC250V
GB	X2, AC250V (Safety Standard Recognized Type GB)
GC	X1/Y2, AC250V (Safety Standard Recognized Type GC)
GD	Y3, AC250V (Safety Standard Recognized Type GD)
GF	Y2, X1/Y2, AC250V (Safety Standard Recognized Type GF)

❼Capacitance

Expressed by three-digit alphanumerics. The unit is pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two numbers.If there is a decimal point, it is expressed by the capital letter "**R**". In this case, all figures are significant digits.

Ex.)

Code	Capacitance
R50	0.5pF
1R0	1.0pF
100	10pF
103	10000pF

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❽Capacitance Tolerance

Code	Capacitance Tolerance	TC	Series	Capacitance Step	
W	±0.05pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
B	±0.1pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
			GQM	≦1pF	0.1pF
				1.1 to 9.9pF	1pF and E24 Series
			ERB	≦9.9pF	1pF and E24 Series
C	±0.25pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
		except CΔ	**GRM**	≦5pF	*1pF
		CΔ	**ERB**	≦9.9pF	1pF and E24 Series
			GQM	≦1pF	0.1pF
				1.1 to 9.9pF	1pF and E24 Series
D	±0.5pF	CΔ	**GRM/GJM**	5.1 to 9.9pF	0.1pF
		except CΔ	**GRM**	5.1 to 9.9pF	*1pF
		CΔ	**ERB/GQM**	5.1 to 9.9pF	1pF and E24 Series
G	±2%	CΔ	**GJM**	≧10pF	E12 Series
		CΔ	**GQM/ERB**	≧10pF	E24 Series
J	±5%	CΔ-SL	**GRM/GA3**	≧10pF	E12 Series
		CΔ	**ERB/GQM/GJM**	≧10pF	E24 Series
K	±10%	B, R, X7R, X5R, ZLM	**GRM/GR7/GA3**	E6 Series	
		C0G	**GNM**	E6 Series	
		B, R, X7R, X5R, ZLM	**GR4, GMD**	E12 Series	
M	±20%	B, R, X7R, X7S	**GRM/GMA**	E6 Series	
		X5R, X7R, X7S	**GNM**	E3 Series	
		X7R	**GA2**	E3 Series	
		X5R, X7R, X7S, X6S	**LLL/LLA/LLM**	E3 Series	
Z	+80%, -20%	F, Y5V	**GRM**	E3 Series	
R	Depends on individual standards.				

***** E24 series is also available.

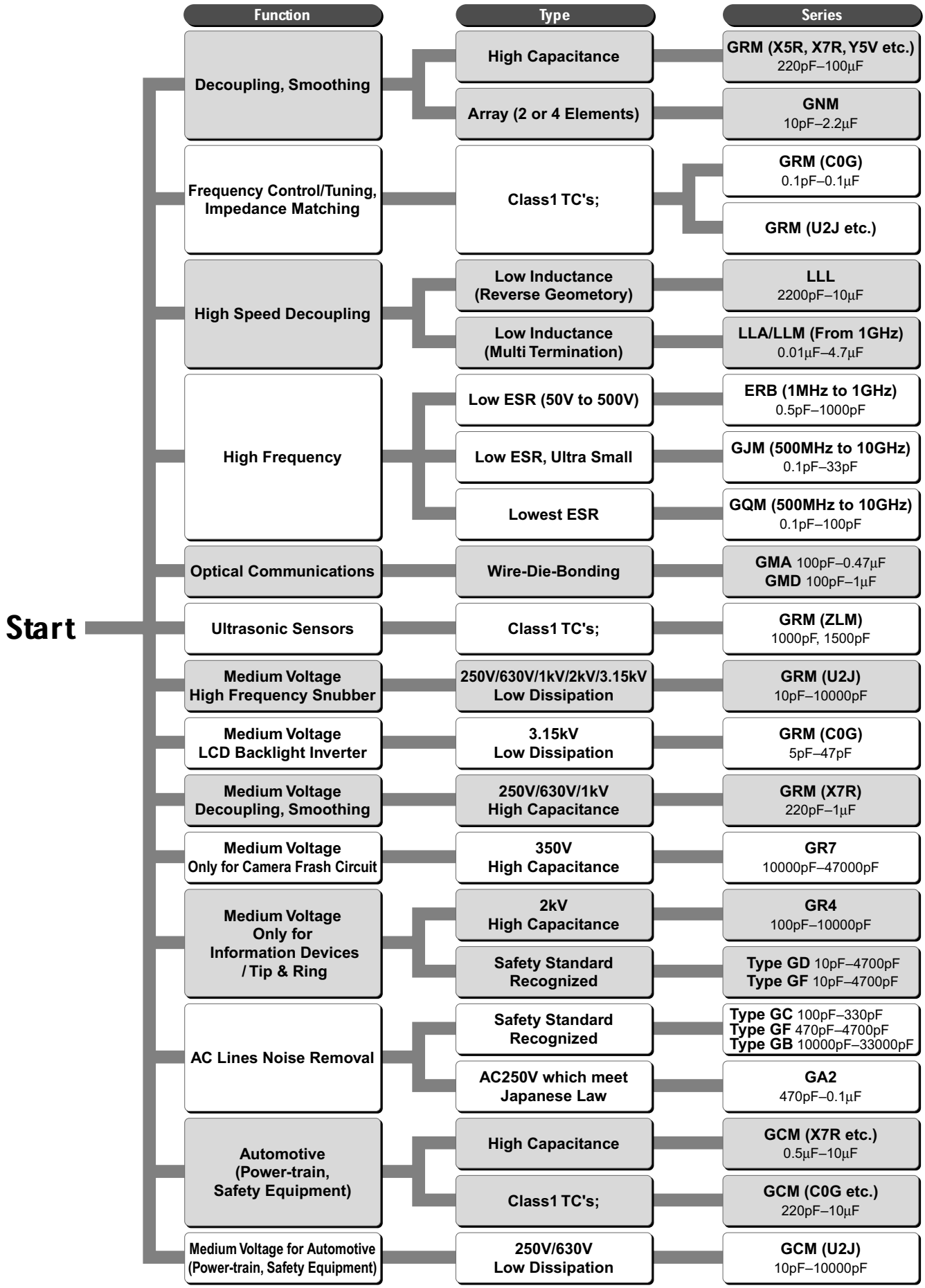
❾Individual Specification Code

Expressed by three figures.

❿Packaging

Code	Packaging
L	ø180mm Embossed Taping
D	ø180mm Paper Taping
E	ø180mm Paper Taping (LLL15)
K	ø330mm Embossed Taping
J	ø330mm Paper Taping
F	ø330mm Paper Taping (LLL15)
B	Bulk
C	Bulk Case
T	Bulk Tray

Selection Guide of Chip Monolithic Ceramic Capacitors



Chip Monolithic Ceramic Capacitors

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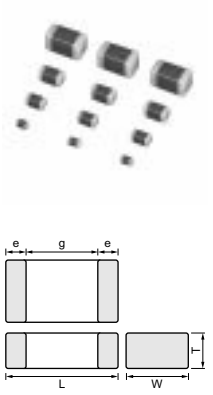
for General Purpose GRM Series (Temperature Compensating Type)

■ Features

1. Highter resistance of solder-leaching due to the Ni-barriered termination, applicable for reflow-soldering, and flow-soldering (GRM18/21/31 type only).
2. The GRM series is lead free product.
3. Smaller size and higher capacitance value.
4. High reliability and no polarity.
5. Excellent pulse responsibility and noise reduction due to the low impedance at high frequency.
6. The GRM series is available in paper or embossed tape and reel packaging for automatic placement. Bulk case packaging is also available for GRM15/18/21(T=0.6,1.25).
7. Ta replacement.

Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRM022	0.4±0.02	0.2±0.02	0.2±0.02	0.07 to 0.14	0.13
GRM033	0.6±0.03	0.3±0.03	0.3±0.03	0.1 to 0.2	0.2
GRM15X	1.0±0.05	0.5±0.05	0.25±0.05	0.1 to 0.3	0.4
GRM153			0.3±0.03		
GRM155			0.5±0.05	0.15 to 0.35	0.3
GRM185	1.6±0.1	0.8±0.1	0.5 +0/-0.1	0.2 to 0.5	0.5
GRM188*			0.8±0.1		
GRM216	2.0±0.1	1.25±0.1	0.6±0.1	0.2 to 0.7	0.7
GRM219			0.85±0.1		
GRM21A			1.0 +0/-0.2		
GRM21B			1.25±0.1		
GRM316	3.2±0.15	1.6±0.15	0.6±0.1	0.3 to 0.8	1.5
GRM319			0.85±0.1		
GRM31M			1.15±0.1		
GRM31C	3.2±0.2	1.6±0.2	1.6±0.2		
GRM329	3.2±0.3	2.5±0.2	0.85±0.1	0.3min.	1.0
GRM32A			1.0 +0/-0.2		
GRM32M			1.15±0.1		
GRM32N			1.35±0.15		
GRM32C			1.6±0.2		
GRM32R			1.8±0.2		
GRM32D			2.0±0.2		
GRM32E			2.5±0.2		

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



■ Applications

General electronic equipment

Temperature Compensating Type C0G(5C) Characteristics

Part Number		GRM02		GRM03	GRM15
L x W [EIA]		0.4x0.2 [01005]		0.6x0.3 [0201]	1.0x0.5 [0402]
Rated Volt.		16 (1C)	6.3 (0J)	50 (1H)	50 (1H)
TC		C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension					
0.10pF (R10)	W, B			0.3 (3)	0.5 (5)
0.20pF (R20)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.30pF (R30)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.40pF (R40)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.50pF (R50)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.60pF (R60)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.70pF (R70)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.80pF (R80)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
0.90pF (R90)	W, B	0.2 (2)		0.3 (3)	0.5 (5)
1.0pF (1R0)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.1pF (1R1)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.2pF (1R2)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.3pF (1R3)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.4pF (1R4)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.5pF (1R5)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.6pF (1R6)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.7pF (1R7)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.8pF (1R8)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
1.9pF (1R9)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
2.0pF (2R0)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
2.1pF (2R1)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)
2.2pF (2R2)	W, B, C	0.2 (2)		0.3 (3)	0.5 (5)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM02		GRM03	GRM15
L x W [EIA]		0.4x0.2 [01005]		0.6x0.3 [0201]	1.0x0.5 [0402]
Rated Volt.		16 (1C)	6.3 (0J)	50 (1H)	50 (1H)
TC		C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension					
2.3pF (2R3)	W, B, C	0.2(2)		0.3(3)	0.5(5)
2.4pF (2R4)	W, B, C	0.2(2)		0.3(3)	0.5(5)
2.5pF (2R5)	W, B, C	0.2(2)		0.3(3)	0.5(5)
2.6pF (2R6)	W, B, C	0.2(2)		0.3(3)	0.5(5)
2.7pF (2R7)	W, B, C	0.2(2)		0.3(3)	0.5(5)
2.8pF (2R8)	W, B, C	0.2(2)		0.3(3)	0.5(5)
2.9pF (2R9)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.0pF (3R0)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.1pF (3R1)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.2pF (3R2)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.3pF (3R3)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.4pF (3R4)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.5pF (3R5)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.6pF (3R6)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.7pF (3R7)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.8pF (3R8)	W, B, C	0.2(2)		0.3(3)	0.5(5)
3.9pF (3R9)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.0pF (4R0)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.1pF (4R1)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.2pF (4R2)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.3pF (4R3)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.4pF (4R4)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.5pF (4R5)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.6pF (4R6)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.7pF (4R7)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.8pF (4R8)	W, B, C	0.2(2)		0.3(3)	0.5(5)
4.9pF (4R9)	W, B, C	0.2(2)		0.3(3)	0.5(5)
5.0pF (5R0)	W, B, C	0.2(2)		0.3(3)	0.5(5)
5.1pF (5R1)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.2pF (5R2)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.3pF (5R3)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.4pF (5R4)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.5pF (5R5)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.6pF (5R6)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.7pF (5R7)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.8pF (5R8)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
5.9pF (5R9)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.0pF (6R0)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.1pF (6R1)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.2pF (6R2)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.3pF (6R3)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.4pF (6R4)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.5pF (6R5)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.6pF (6R6)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.7pF (6R7)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.8pF (6R8)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
6.9pF (6R9)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.0pF (7R0)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.1pF (7R1)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.2pF (7R2)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM02		GRM03	GRM15
L x W [EIA]		0.4x0.2 [01005]		0.6x0.3 [0201]	1.0x0.5 [0402]
Rated Volt.		16 (1C)	6.3 (0J)	50 (1H)	50 (1H)
TC		C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension					
7.3pF (7R3)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.4pF (7R4)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.5pF (7R5)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.6pF (7R6)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.7pF (7R7)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.8pF (7R8)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
7.9pF (7R9)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.0pF (8R0)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.1pF (8R1)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.2pF (8R2)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.3pF (8R3)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.4pF (8R4)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.5pF (8R5)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.6pF (8R6)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.7pF (8R7)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.8pF (8R8)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
8.9pF (8R9)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.0pF (9R0)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.1pF (9R1)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.2pF (9R2)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.3pF (9R3)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.4pF (9R4)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.5pF (9R5)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.6pF (9R6)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.7pF (9R7)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.8pF (9R8)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
9.9pF (9R9)	W, B, C, D	0.2(2)		0.3(3)	0.5(5)
10pF (100)	J	0.2(2)		0.3(3)	0.5(5)
12pF (120)	J	0.2(2)		0.3(3)	0.5(5)
15pF (150)	J	0.2(2)		0.3(3)	0.5(5)
18pF (180)	J	0.2(2)		0.3(3)	0.5(5)
22pF (220)	J	0.2(2)		0.3(3)	0.5(5)
27pF (270)	J	0.2(2)		0.3(3)	0.5(5)
33pF (330)	J	0.2(2)		0.3(3)	0.5(5)
39pF (390)	J	0.2(2)		0.3(3)	0.5(5)
47pF (470)	J	0.2(2)		0.3(3)	0.5(5)
56pF (560)	J		0.2(2)	0.3(3)	0.5(5)
68pF (680)	J		0.2(2)	0.3(3)	0.5(5)
82pF (820)	J		0.2(2)	0.3(3)	0.5(5)
100pF (101)	J		0.2(2)	0.3(3)	0.5(5)
120pF (121)	J				0.5(5)
150pF (151)	J				0.5(5)
180pF (181)	J				0.5(5)
220pF (221)	J				0.5(5)
270pF (271)	J				0.5(5)
330pF (331)	J				0.5(5)
390pF (391)	J				0.5(5)
470pF (471)	J				0.5(5)
560pF (561)	J				0.5(5)
680pF (681)	J				0.5(5)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM02		GRM03	GRM15
L x W [EIA]		0.4x0.2 [01005]		0.6x0.3 [0201]	1.0x0.5 [0402]
Rated Volt.		16 (1C)	6.3 (0J)	50 (1H)	50 (1H)
TC		C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension					
820pF (821)	J				0.5(5)
1000pF (102)	J				0.5(5)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Part Number		GRM18		GRM21		GRM31	
L x W [EIA]		1.6x0.8 [0603]		2.0x1.25 [0805]		3.2x1.6 [1206]	
Rated Volt.		100 (2A)	50 (1H)	100 (2A)	50 (1H)	100 (2A)	50 (1H)
TC		C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension							
0.1pF (R10)	B		0.8(8)				
0.2pF (R20)	B		0.8(8)				
0.3pF (R30)	C		0.8(8)				
0.4pF (R40)	C		0.8(8)				
0.5pF (R50)	C	0.8(8)	0.8(8)				
0.6pF (R60)	C	0.8(8)	0.8(8)				
0.7pF (R70)	C	0.8(8)	0.8(8)				
0.8pF (R80)	C	0.8(8)	0.8(8)				
0.9pF (R90)	C	0.8(8)	0.8(8)				
1.0pF (1R0)	C	0.8(8)	0.8(8)				
2.0pF (2R0)	C	0.8(8)	0.8(8)				
3.0pF (3R0)	C	0.8(8)	0.8(8)				
4.0pF (4R0)	C	0.8(8)	0.8(8)				
5.0pF (5R0)	C	0.8(8)	0.8(8)				
6.0pF (6R0)	D	0.8(8)	0.8(8)				
7.0pF (7R0)	D	0.8(8)	0.8(8)				
8.0pF (8R0)	D	0.8(8)	0.8(8)				
9.0pF (9R0)	D	0.8(8)	0.8(8)				
10pF (100)	J	0.8(8)	0.8(8)				
12pF (120)	J	0.8(8)	0.8(8)				
15pF (150)	J	0.8(8)	0.8(8)				
18pF (180)	J	0.8(8)	0.8(8)				
22pF (220)	J	0.8(8)	0.8(8)				
27pF (270)	J	0.8(8)	0.8(8)				
33pF (330)	J	0.8(8)	0.8(8)				
39pF (390)	J	0.8(8)	0.8(8)				
47pF (470)	J	0.8(8)	0.8(8)				
56pF (560)	J	0.8(8)	0.8(8)				
68pF (680)	J	0.8(8)	0.8(8)				
82pF (820)	J	0.8(8)	0.8(8)				
100pF (101)	J	0.8(8)	0.8(8)				
120pF (121)	J	0.8(8)	0.8(8)				
150pF (151)	J	0.8(8)	0.8(8)				
180pF (181)	J	0.8(8)	0.8(8)				
220pF (221)	J	0.8(8)	0.8(8)				
270pF (271)	J	0.8(8)	0.8(8)				
330pF (331)	J	0.8(8)	0.8(8)				

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM18		GRM21		GRM31	
L x W [EIA]		1.6x0.8 [0603]		2.0x1.25 [0805]		3.2x1.6 [1206]	
Rated Volt.		100 (2A)	50 (1H)	100 (2A)	50 (1H)	100 (2A)	50 (1H)
TC		C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)	C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension							
390pF (391)	J	0.8(8)	0.8(8)				
470pF (471)	J	0.8(8)	0.8(8)				
560pF (561)	J	0.8(8)	0.8(8)				
680pF (681)	J	0.8(8)	0.8(8)				
820pF (821)	J	0.8(8)	0.8(8)				
1000pF (102)	J	0.8(8)	0.8(8)				
1200pF (122)	J	0.8(8)	0.8(8)				
1500pF (152)	J	0.8(8)	0.8(8)				
1800pF (182)	J		0.8(8)	0.6(6)			
2200pF (222)	J		0.8(8)	0.6(6)			
2700pF (272)	J		0.8(8)	0.6(6)			
3300pF (332)	J		0.8(8)	0.6(6)			
3900pF (392)	J		0.8(8)			0.85(9)	
4700pF (472)	J				0.6(6)	0.85(9)	
5600pF (562)	J				0.85(9)	0.85(9)	
6800pF (682)	J				0.85(9)	0.85(9)	
8200pF (822)	J				0.85(9)	0.85(9)	
10000pF (103)	J				0.85(9)	0.85(9)	
12000pF (123)	J				0.85(9)		
15000pF (153)	J				0.85(9)		
18000pF (183)	J				1.25(B)		
22000pF (223)	J				1.25(B)		
27000pF (273)	J						0.85(9)
33000pF (333)	J						0.85(9)
39000pF (393)	J						0.85(9)
47000pF (473)	J						1.15(M)
56000pF (563)	J						1.15(M)
68000pF (683)	J						1.6(C)
82000pF (823)	J						1.6(C)
0.10μF (104)	J						1.6(C)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type C0G(5C) Characteristics Low Profile

Part Number		GRM15
L x W [EIA]		1.0x0.5 [0402]
Rated Volt.		50 (1H)
TC		C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension		
120pF (121)	J	0.3(3)
150pF (151)	J	0.3(3)
180pF (181)	J	0.3(3)
220pF (221)	J	0.3(3)
270pF (271)	J	0.3(3)
330pF (331)	J	0.3(3)
390pF (391)	J	0.3(3)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM15
L x W [EIA]		1.0x0.5 [0402]
Rated Volt.		50 (1H)
TC		C0G (5C)
Capacitance, Capacitance Tolerance and T Dimension		
470pF (471)	J	0.3 (3)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type U2J(7U) Characteristics

Part Number		GRM03		GRM15		GRM18		GRM21		GRM31
L x W [EIA]		0.6x0.3 [0201]		1.0x0.5 [0402]		1.6x0.8 [0603]		2.0x1.25 [0805]		3.2x1.6 [1206]
Rated Volt.		50 (1H)	25 (1E)	50 (1H)	10 (1A)	50 (1H)	10 (1A)	50 (1H)	10 (1A)	50 (1H)
TC		U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)
Capacitance, Capacitance Tolerance and T Dimension										
1.0pF (1R0)	C	0.3 (3)		0.5 (5)		0.8 (8)				
2.0pF (2R0)	C	0.3 (3)		0.5 (5)		0.8 (8)				
3.0pF (3R0)	C	0.3 (3)		0.5 (5)		0.8 (8)				
4.0pF (4R0)	C	0.3 (3)		0.5 (5)		0.8 (8)				
5.0pF (5R0)	C	0.3 (3)		0.5 (5)		0.8 (8)				
6.0pF (6R0)	D	0.3 (3)		0.5 (5)		0.8 (8)				
7.0pF (7R0)	D	0.3 (3)		0.5 (5)		0.8 (8)				
8.0pF (8R0)	D	0.3 (3)		0.5 (5)		0.8 (8)				
9.0pF (9R0)	D	0.3 (3)		0.5 (5)		0.8 (8)				
10pF (100)	J	0.3 (3)		0.5 (5)		0.8 (8)				
12pF (120)	J	0.3 (3)		0.5 (5)		0.8 (8)				
15pF (150)	J	0.3 (3)		0.5 (5)		0.8 (8)				
18pF (180)	J		0.3 (3)	0.5 (5)		0.8 (8)				
22pF (220)	J		0.3 (3)	0.5 (5)		0.8 (8)				
27pF (270)	J		0.3 (3)	0.5 (5)		0.8 (8)				
33pF (330)	J		0.3 (3)	0.5 (5)		0.8 (8)				
39pF (390)	J		0.3 (3)	0.5 (5)		0.8 (8)				
47pF (470)	J		0.3 (3)	0.5 (5)		0.8 (8)				
56pF (560)	J		0.3 (3)	0.5 (5)		0.8 (8)				
68pF (680)	J		0.3 (3)	0.5 (5)		0.8 (8)				
82pF (820)	J		0.3 (3)	0.5 (5)		0.8 (8)				
100pF (101)	J		0.3 (3)	0.5 (5)		0.8 (8)				
120pF (121)	J			0.5 (5)		0.8 (8)				
150pF (151)	J			0.5 (5)		0.8 (8)				
180pF (181)	J			0.5 (5)		0.8 (8)				
220pF (221)	J					0.8 (8)				
270pF (271)	J					0.8 (8)				
330pF (331)	J					0.8 (8)				
390pF (391)	J					0.8 (8)				
470pF (471)	J					0.8 (8)				
560pF (561)	J					0.8 (8)				
680pF (681)	J					0.8 (8)				
1000pF (102)	J					0.8 (8)				
1200pF (122)	J				0.5 (5)	0.8 (8)				
1500pF (152)	J				0.5 (5)	0.8 (8)				
1800pF (182)	J				0.5 (5)	0.8 (8)				

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM03		GRM15		GRM18		GRM21		GRM31
L x W [EIA]		0.6x0.3 [0201]		1.0x0.5 [0402]		1.6x0.8 [0603]		2.0x1.25 [0805]		3.2x1.6 [1206]
Rated Volt.		50 (1H)	25 (1E)	50 (1H)	10 (1A)	50 (1H)	10 (1A)	50 (1H)	10 (1A)	50 (1H)
TC		U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)	U2J (7U)
Capacitance, Capacitance Tolerance and T Dimension										
2200pF (222)	J				0.5(5)	0.8(8)				
2700pF (272)	J				0.5(5)	0.8(8)				
3300pF (332)	J				0.5(5)	0.8(8)				
3900pF (392)	J				0.5(5)	0.8(8)				
4700pF (472)	J				0.5(5)	0.8(8)				
5600pF (562)	J					0.8(8)				
6800pF (682)	J					0.8(8)				
8200pF (822)	J					0.8(8)				
10000pF (103)	J					0.8(8)				
12000pF (123)	J						0.8(8)	0.6(6)		
15000pF (153)	J						0.8(8)	0.6(6)		
18000pF (183)	J						0.8(8)	0.6(6)		
22000pF (223)	J						0.8(8)	0.85(9)		
27000pF (273)	J							0.85(9)		
33000pF (333)	J							1.0(A)		
39000pF (393)	J							1.25(B)		
47000pF (473)	J							1.25(B)		
56000pF (563)	J								0.85(9)	0.85(9)
68000pF (683)	J								1.25(B)	1.15(M)
82000pF (823)	J								1.25(B)	1.15(M)
0.10μF (104)	J								1.25(B)	1.15(M)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type P2H(6P) Characteristics

Part Number		GRM15	GRM18
L x W [EIA]		1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		50 (1H)	50 (1H)
TC		P2H (6P)	P2H (6P)
Capacitance, Capacitance Tolerance and T Dimension			
1.0pF (1R0)	C	0.5(5)	0.8(8)
2.0pF (2R0)	C	0.5(5)	0.8(8)
3.0pF (3R0)	C	0.5(5)	0.8(8)
4.0pF (4R0)	C	0.5(5)	0.8(8)
5.0pF (5R0)	C	0.5(5)	0.8(8)
6.0pF (6R0)	D	0.5(5)	0.8(8)
7.0pF (7R0)	D	0.5(5)	0.8(8)
8.0pF (8R0)	D	0.5(5)	0.8(8)
9.0pF (9R0)	D	0.5(5)	0.8(8)
10pF (100)	J	0.5(5)	0.8(8)
12pF (120)	J	0.5(5)	0.8(8)
15pF (150)	J	0.5(5)	0.8(8)
18pF (180)	J	0.5(5)	0.8(8)
22pF (220)	J	0.5(5)	0.8(8)
27pF (270)	J	0.5(5)	0.8(8)
33pF (330)	J		0.8(8)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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1

Part Number		GRM15	GRM18
L x W [EIA]		1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		50 (1H)	50 (1H)
TC		P2H (6P)	P2H (6P)
Capacitance, Capacitance Tolerance and T Dimension			
39pF (390)	J		0.8(8)
47pF (470)	J		0.8(8)
56pF (560)	J		0.8(8)
68pF (680)	J		0.8(8)
82pF (820)	J		0.8(8)
100pF (101)	J		0.8(8)
120pF (121)	J		0.8(8)
150pF (151)	J		0.8(8)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type R2H(6R) Characteristics

Part Number		GRM03	GRM15	GRM18
L x W [EIA]		0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		25 (1E)	50 (1H)	50 (1H)
TC		R2H (6R)	R2H (6R)	R2H (6R)
Capacitance, Capacitance Tolerance and T Dimension				
1.0pF (1R0)	C	0.3(3)	0.5(5)	0.8(8)
2.0pF (2R0)	C	0.3(3)	0.5(5)	0.8(8)
3.0pF (3R0)	C	0.3(3)	0.5(5)	0.8(8)
4.0pF (4R0)	C	0.3(3)	0.5(5)	0.8(8)
5.0pF (5R0)	C	0.3(3)	0.5(5)	0.8(8)
6.0pF (6R0)	D	0.3(3)	0.5(5)	0.8(8)
7.0pF (7R0)	D	0.3(3)	0.5(5)	0.8(8)
8.0pF (8R0)	D	0.3(3)	0.5(5)	0.8(8)
9.0pF (9R0)	D	0.3(3)	0.5(5)	0.8(8)
10pF (100)	J	0.3(3)	0.5(5)	0.8(8)
12pF (120)	J	0.3(3)	0.5(5)	0.8(8)
15pF (150)	J	0.3(3)	0.5(5)	0.8(8)
18pF (180)	J	0.3(3)	0.5(5)	0.8(8)
22pF (220)	J	0.3(3)	0.5(5)	0.8(8)
27pF (270)	J	0.3(3)	0.5(5)	0.8(8)
33pF (330)	J	0.3(3)	0.5(5)	0.8(8)
39pF (390)	J	0.3(3)		0.8(8)
47pF (470)	J	0.3(3)		0.8(8)
56pF (560)	J	0.3(3)		0.8(8)
68pF (680)	J	0.3(3)		0.8(8)
82pF (820)	J	0.3(3)		0.8(8)
100pF (101)	J	0.3(3)		0.8(8)
120pF (121)	J			0.8(8)
150pF (151)	J			0.8(8)
180pF (181)	J			0.8(8)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type S2H(6S) Characteristics

Part Number		GRM03	GRM15	GRM18
L x W [EIA]		0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		25 (1E)	50 (1H)	50 (1H)
TC		S2H (6S)	S2H (6S)	S2H (6S)
Capacitance, Capacitance Tolerance and T Dimension				
1.0pF (1R0)	C	0.3(3)	0.5(5)	0.8(8)
2.0pF (2R0)	C	0.3(3)	0.5(5)	0.8(8)
3.0pF (3R0)	C	0.3(3)	0.5(5)	0.8(8)
4.0pF (4R0)	C	0.3(3)	0.5(5)	0.8(8)
5.0pF (5R0)	C	0.3(3)	0.5(5)	0.8(8)
6.0pF (6R0)	D	0.3(3)	0.5(5)	0.8(8)
7.0pF (7R0)	D	0.3(3)	0.5(5)	0.8(8)
8.0pF (8R0)	D	0.3(3)	0.5(5)	0.8(8)
9.0pF (9R0)	D	0.3(3)	0.5(5)	0.8(8)
10pF (100)	J	0.3(3)	0.5(5)	0.8(8)
12pF (120)	J	0.3(3)	0.5(5)	0.8(8)
15pF (150)	J	0.3(3)	0.5(5)	0.8(8)
18pF (180)	J	0.3(3)	0.5(5)	0.8(8)
22pF (220)	J	0.3(3)	0.5(5)	0.8(8)
27pF (270)	J	0.3(3)	0.5(5)	0.8(8)
33pF (330)	J	0.3(3)	0.5(5)	0.8(8)
39pF (390)	J	0.3(3)	0.5(5)	0.8(8)
47pF (470)	J	0.3(3)		0.8(8)
56pF (560)	J	0.3(3)		0.8(8)
68pF (680)	J	0.3(3)		0.8(8)
82pF (820)	J	0.3(3)		0.8(8)
100pF (101)	J	0.3(3)		0.8(8)
120pF (121)	J			0.8(8)
150pF (151)	J			0.8(8)
180pF (181)	J			0.8(8)
220pF (221)	J			0.8(8)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type T2H(6T) Characteristics

Part Number		GRM03	GRM15	GRM18
L x W [EIA]		0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		25 (1E)	50 (1H)	50 (1H)
TC		T2H (6T)	T2H (6T)	T2H (6T)
Capacitance, Capacitance Tolerance and T Dimension				
1.0pF (1R0)	C	0.3(3)	0.5(5)	0.8(8)
2.0pF (2R0)	C	0.3(3)	0.5(5)	0.8(8)
3.0pF (3R0)	C	0.3(3)	0.5(5)	0.8(8)
4.0pF (4R0)	C	0.3(3)	0.5(5)	0.8(8)
5.0pF (5R0)	C	0.3(3)	0.5(5)	0.8(8)
6.0pF (6R0)	D	0.3(3)	0.5(5)	0.8(8)
7.0pF (7R0)	D	0.3(3)	0.5(5)	0.8(8)
8.0pF (8R0)	D	0.3(3)	0.5(5)	0.8(8)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

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Part Number		GRM03	GRM15	GRM18
L x W [EIA]		0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		25 (**1E**)	50 (**1H**)	50 (**1H**)
TC		T2H (**6T**)	T2H (**6T**)	T2H (**6T**)
Capacitance, Capacitance Tolerance and T Dimension				
9.0pF (**9R0**)	**D**	0.3(**3**)	0.5(**5**)	0.8(**8**)
10pF (**100**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
12pF (**120**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
15pF (**150**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
18pF (**180**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
22pF (**220**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
27pF (**270**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
33pF (**330**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
39pF (**390**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
47pF (**470**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
56pF (**560**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
68pF (**680**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
82pF (**820**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
100pF (**101**)	**J**	0.3(**3**)	0.5(**5**)	0.8(**8**)
120pF (**121**)	**J**			0.8(**8**)
150pF (**151**)	**J**			0.8(**8**)
180pF (**181**)	**J**			0.8(**8**)
220pF (**221**)	**J**			0.8(**8**)
270pF (**271**)	**J**			0.8(**8**)
330pF (**331**)	**J**			0.8(**8**)
390pF (**391**)	**J**			0.8(**8**)
470pF (**471**)	**J**			0.8(**8**)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.

Chip Monolithic Ceramic Capacitors

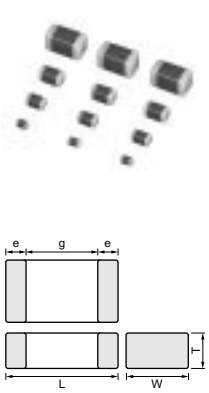
for General Purpose GRM Series (High Dielectric Constant Type)

■ Features

1. Highter resistance of solder-leaching due to the Ni-barriered termination, applicable for reflow-soldering, and flow-soldering (GRM18/21/31 type only).
2. The GRM series is lead free product.
3. Smaller size and higher capacitance value.
4. High reliability and no polarity.
5. Excellent pulse responsibility and noise reduction due to the low impedance at high frequency.
6. The GRM series is available in paper or embossed tape and reel packaging for automatic placement. Bulk case packaging is also available for GRM15/18/21(T=0.6,1.25).
7. Ta replacement.

Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRM022	0.4±0.02	0.2±0.02	0.2±0.02	0.07 to 0.14	0.13
GRM033	0.6±0.03	0.3±0.03	0.3±0.03	0.1 to 0.2	0.2
GRM15X	1.0±0.05	0.5±0.05	0.25±0.05	0.1 to 0.3	0.4
GRM153			0.3±0.03		
GRM155			0.5±0.05	0.15 to 0.35	0.3
GRM185	1.6±0.1	0.8±0.1	0.5 +0/-0.1	0.2 to 0.5	0.5
GRM188*			0.8±0.1		
GRM216	2.0±0.1	1.25±0.1	0.6±0.1	0.2 to 0.7	0.7
GRM219			0.85±0.1		
GRM21A			1.0 +0/-0.2		
GRM21B			1.25±0.1		
GRM316	3.2±0.15	1.6±0.15	0.6±0.1	0.3 to 0.8	1.5
GRM319			0.85±0.1		
GRM31M			1.15±0.1		
GRM31C	3.2±0.2	1.6±0.2	1.6±0.2		
GRM329	3.2±0.3	2.5±0.2	0.85±0.1	0.3min.	1.0
GRM32A			1.0 +0/-0.2		
GRM32M			1.15±0.1		
GRM32N			1.35±0.15		
GRM32C			1.6±0.2		
GRM32R			1.8±0.2		
GRM32D			2.0±0.2		
GRM32E			2.5±0.2		

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



■ Applications

General electronic equipment

High Dielectric Constant Type X5R(R6) Characteristics

Part Number		GRM02		GRM03		GRM15			GRM18					GRM21			GRM31				GRM32	
L x W [EIA]		0.4x0.2 [01005]		0.6x0.3 [0201]		1.0x0.5 [0402]			1.6x0.8 [0603]					2x1.25 [805]			3.2x1.6 [1206]				3.2x2.5 [1210]	
Rated Volt.		10 (1A)	6.3 (0J)	10 (1A)	6.3 (0J)	50 (1H)	16 (1C)	10 (1A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	25 (1E)	16 (1C)	6.3 (0J)	50 (1H)	25 (1E)	16 (1C)	6.3 (0J)	25 (1E)	16 (1C)
TC		X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)
Capacitance, Capacitance Tolerance and T Dimension																						
68pF (680)	K	0.2 (2)																				
100pF (101)	K	0.2 (2)																				
150pF (151)	K	0.2 (2)																				
220pF (221)	K	0.2 (2)																				
330pF (331)	K	0.2 (2)																				
470pF (471)	K	0.2 (2)																				
680pF (681)	K		0.2* (2)																			
1000pF (102)	K		0.2* (2)			0.5 (5)			0.8 (8)													
1500pF (152)	K		0.2* (2)	0.3 (3)																		

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
**: In case of Rated Volt.6.3V, Capacitance Tolerance should be M.
GRM21B Series 6.3V/22μF (L: 2.0±0.15, W: 1.25±0.15, T: 1.25±0.15mm)
GRM31C Series 6.3V/100μF (L: 3.2±0.3, W: 1.6±0.3, T: 1.6±0.3mm)

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Part Number		GRM02		GRM03		GRM15			GRM18					GRM21			GRM31				GRM32	
L x W [EIA]		0.4x0.2 [01005]		0.6x0.3 [0201]		1.0x0.5 [0402]			1.6x0.8 [0603]					2x1.25 [805]			3.2x1.6 [1206]				3.2x2.5 [1210]	
Rated Volt.		10 (1A)	6.3 (0J)	10 (1A)	6.3 (0J)	50 (1H)	16 (1C)	10 (1A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	25 (1E)	16 (1C)	6.3 (0J)	50 (1H)	25 (1E)	16 (1C)	6.3 (0J)	25 (1E)	16 (1C)
TC		X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)
Capacitance, Capacitance Tolerance and T Dimension																						
2200pF (222)	K		0.2* (2)	0.3 (3)		0.5 (5)			0.8 (8)													
3300pF (332)	K		0.2* (2)	0.3 (3)																		
4700pF (472)	K		0.2* (2)	0.3 (3)		0.5 (5)			0.8 (8)													
6800pF (682)	K		0.2* (2)	0.3 (3)																		
10000pF (103)	K		0.2* (2)	0.3 (3)			0.5 (5)		0.8 (8)													
15000pF (153)	K				0.3* (3)																	
22000pF (223)	K				0.3* (3)		0.5 (5)		0.8 (8)													
33000pF (333)	K				0.3* (3)		0.5 (5)															
47000pF (473)	K				0.3* (3)		0.5 (5)															
68000pF (683)	K				0.3* (3)		0.5 (5)															
0.10μF (104)	K				0.3* (3)		0.5 (5)			0.8 (8)												
0.15μF (154)	K							0.5* (5)				0.8 (8)										
0.22μF (224)	K							0.5* (5)		0.8 (8)												
0.33μF (334)	K							0.5* (5)														
0.47μF (474)	K							0.5* (5)		0.8* (8)												
0.68μF (684)	K							0.5* (5)														
1μF (105)	K							0.5* (5)		0.8* (8)												
2.2μF (225)	K										0.8* (8)			1.25* (B)			1.6 (C)					
4.7μF (475)	K												0.8* (8)	1.25* (B)								
10μF (106)	K, M**												0.8* (8)		1.25* (B)			1.6* (C)				
22μF (226)	M															1.25* (B)			1.6* (C)		2.5* (E)	
47μF (476)	M																			1.6* (C)		2.5* (E)
100μF (107)	M																			1.6* (C)		

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
**: In case of Rated Volt.6.3V, Capacitance Tolerance should be M.
GRM21B Series 6.3V/22μF (L: 2.0±0.15, W: 1.25±0.15, T: 1.25±0.15mm)
GRM31C Series 6.3V/100μF (L: 3.2±0.3, W: 1.6±0.3, T: 1.6±0.3mm)

High Dielectric Constant Type X6S/X6T(C8/D8) Characteristics

Part Number		GRM03		GRM15		GRM18		GRM21			GRM31			GRM32	
L x W [EIA]		0.6x0.3 [0201]		1.0x0.5 [0402]		1.6x0.8 [0603]		2.0x1.25 [0805]			3.2x1.6 [1206]			3.2x2.5 [1210]	
Rated Volt.		6.3 (0J)	4 (0G)	6.3 (0J)	4 (0G)	10 (1A)	4 (0G)	25 (1E)	10 (1A)	4 (0G)	10 (1A)	4 (0G)		10 (1A)	6.3 (0J)
TC		X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6S (C8)	X6T (D8)	X6S (C8)	X6S (C8)
Capacitance, Capacitance Tolerance and T Dimension															
15000pF (153)	K	0.3*(3)													
22000pF (223)	K	0.3*(3)													
33000pF (333)	K	0.3*(3)													
47000pF (473)	K	0.3*(3)													
0.10μF (104)	K		0.3*(3)												
0.15μF (154)	K			0.5*(5)											
0.22μF (224)	K			0.5*(5)											
0.33μF (334)	K			0.5*(5)											
0.47μF (474)	K			0.5*(5)											
0.68μF (684)	K				0.5*(5)										
1.0μF (105)	K				0.5*(5)										
2.2μF (225)	K					0.8*(8)									
4.7μF (475)	K						0.8*(8)	1.25*(B)							
10μF (106)	K								1.25*(B)						
22μF (226)	M									1.25*(B)	1.6*(C)				
47μF (476)	M											1.6*(C)		2.5*(E)	
100μF (107)	M												1.6*(C)		2.5*(E)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
GRM21B Series 4V/22μF (L: 2.0±0.15, W: 1.25±0.15, T: 1.25±0.15mm)
GRM31C Series 4V/100μF (L: 3.2±0.3, W: 1.6±0.3, T: 1.6±0.3mm)

High Dielectric Constant Type X7R/X7T/X7U(R7/D7/E7) Characteristics

Part Number		GRM02	GRM03			GRM15				GRM18					GRM21						GRM31					GRM32				
L x W [EIA]		0.4x0.2 [01005]	0.6x0.3 [0201]			1.0x0.5 [0402]				1.6x0.8 [0603]					2.0x1.25 [0805]						3.2x1.6 [1206]					3.2x2.5 [1210]				
Rated Volt.		10 (1A)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	4 (0G)	100 (2A)	50 (1H)	25 (1E)	10 (1A)	4 (0G)	100 (2A)	50 (1H)	10 (1A)	6.3 (0J)	4 (0G)
TC		X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7U (E7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7U (E7)	X7R (R7)	X7R (R7)	X7R (R7)	X7T (D7)	X7U (E7)
Capacitance, Capacitance Tolerance and T Dimension																													
68pF (680)	K	0.2 (2)																											
100pF (101)	K	0.2 (2)	0.3 (3)																										
150pF (151)	K	0.2 (2)	0.3 (3)																										
220pF (221)	K	0.2 (2)	0.3 (3)			0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																		
330pF (331)	K	0.2 (2)	0.3 (3)			0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																		
470pF (471)	K	0.2 (2)	0.3 (3)			0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																		

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
GRM21B Series 100V/0.47μF, 25V/2.2μF, 16V/4.7μF, 10V/10μF, 4V/22μF (L: 2.0±0.15, W: 1.25±0.15, T: 1.25±0.15mm)
GRM31M Series 100V/0.68μF, 25V/2.2μF (L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15mm)

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Part Number		GRM 02	GRM03			GRM15				GRM18					GRM21						GRM31					GRM32				
L x W [EIA]		0.4x0.2 [01005]	0.6x0.3 [0201]			1.0x0.5 [0402]				1.6x0.8 [0603]					2.0x1.25 [0805]						3.2x1.6 [1206]					3.2x2.5 [1210]				
Rated Volt.		10 (1A)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	4 (0G)	100 (2A)	50 (1H)	25 (1E)	10 (1A)	4 (0G)	100 (2A)	50 (1H)	10 (1A)	6.3 (0J)	4 (0G)
TC		X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7U (E7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7U (E7)	X7R (R7)	X7R (R7)	X7R (R7)	X7T (D7)	X7U (E7)
Capacitance, Capacitance Tolerance and T Dimension																														
680pF (681)	K		0.3 (3)			0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																			
1000pF (102)	K		0.3 (3)			0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																			
1500pF (152)	K		0.3 (3)			0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																			
2200pF (222)	K			0.3 (3)		0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																			
3300pF (332)	K			0.3 (3)		0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																			
4700pF (472)	K				0.3 (3)	0.5 (5)	0.5 (5)			0.8 (8)	0.8 (8)																			
6800pF (682)	K				0.3 (3)		0.5 (5)			0.8 (8)	0.8 (8)																			
10000pF (103)	K				0.3 (3)		0.5 (5)			0.8 (8)	0.8 (8)																			
15000pF (153)	K						0.5 (5)				0.8 (8)				1.25 (B)															
22000pF (223)	K						0.5 (5)				0.8 (8)				1.25 (B)															
33000pF (333)	K							0.5 (5)			0.8 (8)				1.25 (B)															
47000pF (473)	K							0.5 (5)			0.8 (8)				1.25 (B)															
68000pF (683)	K								0.5 (5)		0.8 (8)										1.15 (M)									
0.10µF (104)	K								0.5 (5)	0.8 (8)	0.8 (8)																			
0.15µF (154)	K											0.8 (8)				1.25 (B)					1.15 (M)									
0.22µF (224)	K											0.8 (8)			1.0 (A)	1.25 (B)														
0.33µF (334)	K												0.8 (8)		1.0 (A)	0.85 (9)														
0.47µF (474)	K											0.8* (8)			1.25 (B)	1.25 (B)														
0.68µF (684)	K													0.8 (8)			0.85 (9)				1.15 (M)	1.15 (M)								
1.0µF (105)	K												0.8* (8)			1.25 (B)					1.6 (C)									
2.2µF (225)	K													0.8* (8)			1.25* (B)						1.15 (M)			2.5 (E)				
4.7µF (475)	K																	1.25* (B)				1.6 (C)					2.5 (E)			
10µF (106)	K																		1.25* (B)				1.6* (C)							
22µF (226)	M																			1.25* (B)				1.6* (C)				1.35* (N)	

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
GRM21B Series 100V/0.47µF, 25V/2.2µF, 16V/4.7µF, 10V/10µF, 4V/22µF (L: 2.0±0.15, W: 1.25±0.15, T: 1.25±0.15mm)
GRM31M Series 100V/0.68µF, 25V/2.2µF (L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15mm)

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Part Number		GRM02	GRM03			GRM15				GRM18					GRM21						GRM31					GRM32				
L x W [EIA]		0.4x0.2 [01005]	0.6x0.3 [0201]			1.0x0.5 [0402]				1.6x0.8 [0603]					2.0x1.25 [0805]						3.2x1.6 [1206]					3.2x2.5 [1210]				
Rated Volt.		10 (1A)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	4 (0G)	100 (2A)	50 (1H)	25 (1E)	10 (1A)	4 (0G)	100 (2A)	50 (1H)	10 (1A)	6.3 (0J)	4 (0G)
TC		X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7U (E7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7U (E7)	X7R (R7)	X7R (R7)	X7R (R7)	X7T (D7)	X7U (E7)
Capacitance, Capacitance Tolerance and T Dimension																														
47µF (476)	M																							1.6* (C)			2.5* (E)		
100µF (107)	M																												2.5* (E)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
GRM21B Series 100V/0.47µF, 25V/2.2µF, 16V/4.7µF, 10V/10µF, 4V/22µF (L: 2.0±0.15, W: 1.25±0.15, T: 1.25±0.15mm)
GRM31M Series 100V/0.68µF, 25V/2.2µF (L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15mm)

High Dielectric Constant Type Y5V(F5) Characteristics

Part Number		GRM15				GRM18		GRM21	GRM31	GRM32
L x W [EIA]		1.0x0.5 [0402]				1.6x0.8 [0603]		2.0x1.25 [0805]	3.2x1.6 [1206]	3.2x2.5 [1210]
Rated Volt.		50 (1H)	25 (1E)	16 (1C)	10 (1A)	50 (1H)	25 (1E)	50 (1H)	6.3 (0J)	100 (2A)
TC		Y5V (F5)	Y5V (F5)	Y5V (F5)	Y5V (F5)	Y5V (F5)	Y5V (F5)	Y5V (F5)	Y5V (F5)	Y5V (F5)
Capacitance, Capacitance Tolerance and T Dimension										
1000pF (102)	Z	0.5(5)				0.8(8)				
2200pF (222)	Z	0.5(5)				0.8(8)				
4700pF (472)	Z	0.5(5)				0.8(8)				
10000pF (103)	Z	0.5(5)				0.8(8)				
22000pF (223)	Z		0.5(5)			0.8(8)				
47000pF (473)	Z		0.5(5)			0.8(8)				
0.10µF (104)	Z		0.5(5)			0.8(8)				1.35(N)
0.22µF (224)	Z			0.5(5)		0.8(8)				
0.47µF (474)	Z			0.5(5)			0.8(8)	0.85(9)		
1.0µF (105)	Z				0.5*(5)					
100µF (107)	Z								1.6*(C)	

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).

High Dielectric Constant Type X5R(R6) Characteristics Low Profile

Part Number		GRM15	GRM18		GRM21			GRM31	
L x W [EIA]		1.0x0.5 [0402]	1.6x0.8 [0603]		2.0x1.25 [0805]			3.2x1.6 [1206]	
Rated Volt.		4 (0G)	16 (1C)	6.3 (0J)	25 (1E)	16 (1C)	10 (1A)	25 (1E)	16 (1C)
TC		X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)	X5R (R6)
Capacitance, Capacitance Tolerance and T Dimension									
1.0µF (105)	K, M**	0.3*(3)	0.5*(5)		0.6*(6)		0.85(9)		
2.2µF (225)	K			0.5*(5)	0.85*(9)			0.6*(6)	
4.7µF (475)	K					0.85*(9)		0.85*(9)	
10µF (106)	K						0.85*(9)		0.85*(9)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
**: In case of Rated Volt.4V, Capacitance Tolerance should be M.
GRM219 Series 10V/10µF (L: 2.0±0.2, W: 1.25±0.2, T: 0.85±0.1mm)

High Dielectric Constant Type X6S(C8) Characteristics Low Profile

Part Number		GRM18		GRM21			GRM31
L x W [EIA]		1.6x0.8 [0603]		2.0x1.25 [0805]			3.2x1.6 [1206]
Rated Volt.		10 (**1A**)	4 (**0G**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	16 (**1C**)
TC		X6S (**C8**)	X6S (**C8**)	X6S (**C8**)	X6S (**C8**)	X6S (**C8**)	X6S (**C8**)
Capacitance, Capacitance Tolerance and T Dimension							
1.0μF (**105**)	**K**	0.5*(**5**)		0.6*(**6**)			
2.2μF (**225**)	**K**		0.5*(**5**)	0.85*(**9**)			0.6*(**6**)
4.7μF (**475**)	**K**				0.85*(**9**)		0.85*(**9**)
10μF (**106**)	**K**					0.85*(**9**)	

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).
GRM219 Series 6.3V/10μF (L: 2.0±0.2, W: 1.25±0.2, T: 0.85±0.1mm)

High Dielectric Constant Type X7R/X7T(R7/D7) Characteristics Low Profile

Part Number		GRM15			GRM18	GRM21
L x W [EIA]		1.0x0.5 [0402]			1.6x0.8 [0603]	2.0x1.25 [0805]
Rated Volt.		50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	25 (**1E**)
TC		X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7T (**D7**)	X7R (**R7**)
Capacitance, Capacitance Tolerance and T Dimension						
220pF (**221**)	**K**	0.25(**X**)				
330pF (**331**)	**K**	0.25(**X**)				
470pF (**471**)	**K**	0.25(**X**)				
680pF (**681**)	**K**	0.25(**X**)				
1000pF (**102**)	**K**	0.25(**X**)				
1500pF (**152**)	**K**	0.25(**X**)				
2200pF (**222**)	**K**		0.25(**X**)			
3300pF (**332**)	**K**			0.25(**X**)		
4700pF (**472**)	**K**			0.25(**X**)		
6800pF (**682**)	**K**			0.25(**X**)		
10000pF (**103**)	**K**			0.25(**X**)		
1.0μF (**105**)	**K**				0.5*(**5**)	0.85(**9**)

The part numbering code is shown in ( ).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).

GRM Series Specifications and Test Methods (1)

Below GRM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GRM Series Specifications and Test Methods (2) (P.29).

No.	Item	Specifications		Test Method
		Temperature Compensating Type	High Dielectric Type	
1	Operating Temperature Range	−55 to +125℃	B1, B3, F1: −25 to +85℃ R1, R7: −55 to +125℃ R6: −55 to +85℃ C8: −55 to +105℃ E4: +10 to +85℃ F5: −30 to +85℃	Reference temperature: 25℃ (2Δ, 3Δ, 4Δ, B1, B3, F1, R1: 20℃)
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, should be maintained within the rated voltage range.
3	Appearance	No defects or abnormalities		Visual inspection
4	Dimensions	Within the specified dimensions		Using calipers (GRM02 size is based on Microscope)
5	Dielectric Strength	No defects or abnormalities		No failure should be observed when 300%* of the rated voltage (temperature compensating type) or 250% of the rated voltage (high dielectric constant type) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V
6	Insulation Resistance	C≦0.047μF: More than 10,000MΩ C>0.047μF: More than 500Ω · F C: Nominal Capacitance		The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 20/25℃ and 75%RH max. and within 2 minutes of charging, provided the charge/discharge current is less than 50mA.
7	Capacitance	Within the specified tolerance		The capacitance/Q/D.F. should be measured at 20/25℃ at the frequency and voltage shown in the table.
8	Q/ Dissipation Factor (D.F.)	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	[R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≧0.068μF) W.V.: 50/25V: : 0.025 max. (C<10μF) : 0.035 max. (C≧10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C<3.3μF) : 0.1 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.025 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≧0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	

Char. / Item	ΔC to 7U, 1X (1000pF and below)	ΔC to 7U, 1X (more than 1000pF) R6, R7, C8, F5, B1, B3, F1	R6, R7, F5 (C>10μF)	E4
Frequency	1±0.1MHz	1±0.1kHz	120±24kHz	1±0.1kHz
Voltage	0.5 to 5Vrms	1±0.2Vrms	0.5± 0.1Vrms	0.5± 0.05Vrms

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GRM Series Specifications and Test Methods (1)

Continued from the preceding page.

Below GRM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GRM Series Specifications and Test Methods (2) (P.29).

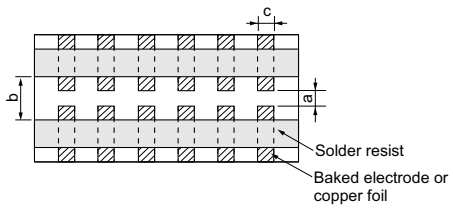
<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Type</th></tr>
<tr><td rowspan="3">9</td><td rowspan="3">Capacitance Temperature Characteristics</td><td>No bias</td><td>Within the specified tolerance (Table A-1)</td><td>B1, B3: Within ±10% (−25 to +85℃)
R1, R7: Within ±15% (−55 to +125℃)
R6: Within ±15% (−55 to +85℃)
E4: Within +22/−56% (+10 to +85℃)
F1: Within +30/−80% (−25 to +85℃)
F5: Within +22/−82% (−30 to +85℃)
C8: Within ±22% (−55 to +105℃)</td><td rowspan="3">The capacitance change should be measured after 5 min. at each specified temp. stage.
(1)Temperature Compensating Type
The temperature coefficient is determined using the capacitance measured in step 3 as a reference.
When cycling the temperature sequentially from step 1 through 5 (5C: +25 to +125℃/ΔC: +20 to +125℃: other temp. coeffs.: +25 to +85℃/+20 to +85℃) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A-1.
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.
<table><tr><th>Step</th><th>Temperature (℃)</th></tr><tr><td>1</td><td>Reference Temperature ±2</td></tr><tr><td>2</td><td>−55±3 (for ΔC to 7U/1X/R6/R7/C8)
−30±3 (for F5), 10±3 (for E4)
−25±3 (for other TC)</td></tr><tr><td>3</td><td>Reference Temperature ±2</td></tr><tr><td>4</td><td>125±3 (for ΔC/R7), 105±3 (for C8)
85±3 (for other TC)</td></tr><tr><td>5</td><td>Reference Temperature ±2</td></tr></table>
(2) High Dielectric Constant Type
The ranges of capacitance change compared with the 20℃ value over the temperature ranges shown in the table should be within the specified ranges.*
In case of applying voltage, the capacitance change should be measured after 1 more min. with applying voltage in equilibration of each temp. stage.
<table><tr><th>Step</th><th>Temperature (℃)</th><th>Applying Voltage (V)</th></tr><tr><td>1</td><td>Reference Temperature ±2</td><td rowspan="4">No bias</td></tr><tr><td>2</td><td>–55±3 (for R1, R7, R6)
–25±3 (for B1, B3, F1)
–30±3 (for F5)/10±3 (for E4)</td></tr><tr><td>3</td><td>Reference Temperature ±2</td></tr><tr><td>4</td><td>125±3 (for R1, R7)/
85±3 (for B1, B3, R6
F1, F5, E4)</td></tr><tr><td>5</td><td>Reference Temperature ±2</td><td rowspan="4">50% of the rated voltage</td></tr><tr><td>6</td><td>–55±3 (for R1)/
–25±3 (for B1, F1)</td></tr><tr><td>7</td><td>Reference Temperature ±2</td></tr><tr><td>8</td><td>125±3 (for R1)/
85±3 (for B1, F1)</td></tr></table></td></tr>
<tr><td>Capacitance Drift</td><td>Within ±0.2% or ±0.05pF (Whichever is larger.)
*Do not apply to 1X/25V</td><td>*Initial measurement for high dielectric constant type
Perform a heat treatment at 150+0/–10°C for one hour and then set for 24±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>10</td><td colspan="2">Adhesive Strength of Termination</td><td colspan="2">No removal of the terminations or other defect should occur.
 

Fig. 1a</td><td>Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1a using an eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1 sec.
The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
*1N (GRM02), 2N (GRM03), 5N (GRM15, GRM18)
(in mm)
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GRM02</td><td>0.2</td><td>0.56</td><td>0.23</td></tr><tr><td>GRM03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GRM15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr><tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr><tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr><tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr><tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr></table></td></tr>
</table>

Continued on the following page.

GRM Series Specifications and Test Methods (1)

Continued from the preceding page.

Below GRM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GRM Series Specifications and Test Methods (2) (P.29).

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
11	Vibration Resistance	Appearance	No defects or abnormalities		Solder the capacitor on the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should 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, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance		
		Q/D.F.	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≧0.068μF) W.V.: 50/25V: : 0.025 max. (C<10μF) : 0.035 max. (C≧10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C<3.3μF) : 0.1 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.025 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≧0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	
12	Deflection		No crack or marked defect should occur.		Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2a using an eutectic solder. Then apply a force in the direction shown in Fig. 3a for 5±1 sec. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
13	Solderability of Termination		75% of the terminations are to be soldered evenly and continuously.		Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion) . Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in an eutectic solder solution for 2±0.5 seconds at 230±5℃ or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.

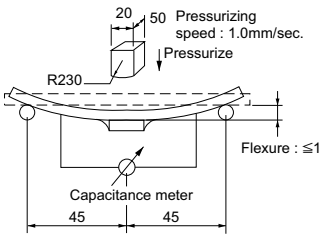


Fig. 3a

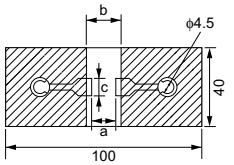


Fig. 2a

t: 1.6mm (GRM02/03/15: t: 0.8mm)

Type	a	b	c
GRM02	0.2	0.56	0.23
GRM03	0.3	0.9	0.3
GRM15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Continued on the following page.

GRM Series Specifications and Test Methods (1)

Continued from the preceding page.

Below GRM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GRM Series Specifications and Test Methods (2) (P.29).

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Set at room temperature for 24±2 hours, then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/−10℃ for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement. •Preheating for GRM32/43/55 Step 1: 100 to 120℃, 1 min. Step 2: 170 to 200℃, 1 min.
		Appearance	No defects or abnormalities		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	B1, B3, R1, R6, R7, C8 : Within ±7.5% F1, F5, E4: Within ±20%	
		Q/D.F.	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≧0.068μF) W.V.: 50/25V: : 0.025 max. (C<10μF) : 0.035 max. (C≧10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C<3.3μF) : 0.1 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.025 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≧0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)		
		Dielectric Strength	No defects		
15	Temperature Cycle		The measured and observed characteristics should satisfy the specifications in the following table.		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments shown in the following table. Set for 24±2 hours at room temperature, then measure. Step 1: Min. Operating Temp. +0/−3, 30±3; Step 2: Room Temp., 2 to 3; Step 3: Max. Operating Temp. +3/−0, 30±3; Step 4: Room Temp., 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/−10℃ for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement.
		Appearance	No defects or abnormalities		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	B1, B3, R1, R6, R7, C8 : Within ±7.5% F1, F5, E4: Within ±20%	
		Q/D.F.	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≧0.068μF) W.V.: 50/25V: : 0.025 max. (C<10μF) : 0.035 max. (C≧10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C<3.3μF) : 0.1 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≧0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)		
		Dielectric Strength	No defects		

Continued on the following page.

GRM Series Specifications and Test Methods (1)

Continued from the preceding page.

Below GRM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GRM Series Specifications and Test Methods (2) (P.29).

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
16	Humidity (Steady State)		The measured and observed characteristics should satisfy the specifications in the following table.		Set the capacitor at 40±2℃ and in 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, then measure.
		Appearance	No defects or abnormalities		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	B1, B3, R1, R6, R7, C8 : Within ±12.5% F1, F5, E4: Within ±30%	
		Q/D.F.	30pF and over: Q≧350 10pF and over 30pF and below: Q≧275+2.5C 10pF and below: Q≧200+10C C: Nominal Capacitance (pF)	[R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≧0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C<3.3μF) : 0.125 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≧0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)		
17	Humidity Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for F1, F5/10V max. Apply the rated DC voltage for 1 hour at 40±2℃. Remove and set for 24±2 hours at room temperature. Perform initial measurement.
		Appearance	No defects or abnormalities		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	B1, B3, R1, R6, R7, C8 : Within ±12.5% F1, F5, E4: Within ±30% [W.V.: 10V max.] F1, F5: Within +30/−40%	
		Q/D.F.	30pF and over: Q≧200 30pF and below: Q≧100+10C/3 C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≧0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C<3.3μF) : 0.125 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≧0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.	
		I.R.	More than 500MΩ or 25Ω · F (Whichever is smaller)		

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GRM Series Specifications and Test Methods (1)

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Below GRM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GRM Series Specifications and Test Methods (2) (P.29).

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
18	High Temperature Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply 200% (GRM21BR71H105, GRM21BR72A474, GRM31CR71H475: 150% of the rated voltage) of the rated voltage at the maximum operating temperature ±3℃ for 1000±12 hours. Set for 24±2 hours 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 at the maximum operating temperature ±3℃ for one hour. Remove and set for 24±2 hours at room temperature. Perform initial measurement.
		Appearance	No defects or abnormalities		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	B1, B3, R1, R6, R7, C8: Within ±12.5% F1, F5, E4: Within ±30% [Except 10V max. and. C≧1.0μF] F1, F5: Within +30/−40% [10V max. and C≧1.0μF]	
		Q/D.F.	30pF and over: Q≧350 10pF and over 30pF and below: Q≧275+2.5C 10pF and below: Q≧200+10C C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≧0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C<3.3μF) : 0.125 max. (C≧3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max.(C<0.1μF) : 0.125 max.(C≧0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)		

Table A-1

(1)

Char.	Nominal Values (ppm/℃)*1	Capacitance Change from 25℃ (%)					
		−55		−30		−10	
		Max.	Min.	Max.	Min.	Max.	Min.
5C	0± 30	0.58	−0.24	0.40	−0.17	0.25	−0.11
6C	0± 60	0.87	−0.48	0.59	−0.33	0.38	−0.21
6P	−150± 60	2.33	0.72	1.61	0.50	1.02	0.32
6R	−220± 60	3.02	1.28	2.08	0.88	1.32	0.56
6S	−330± 60	4.09	2.16	2.81	1.49	1.79	0.95
6T	−470± 60	5.46	3.28	3.75	2.26	2.39	1.44
7U	−750±120	8.78	5.04	6.04	3.47	3.84	2.21
1X	+350 to −1000	−	−	−	−	−	−

*1: Nominal values denote the temperature coefficient within a range of 25℃ to 125℃ (for ΔC)/85℃ (for other TC).

(2)

Char.	Nominal Values (ppm/℃)*2	Capacitance Change from 20℃ (%)					
		−55		−25		−10	
		Max.	Min.	Max.	Min.	Max.	Min.
2C	0± 60	0.82	−0.45	0.49	−0.27	0.33	−0.18
3C	0±120	1.37	−0.90	0.82	−0.54	0.55	−0.36
4C	0±250	2.56	−1.88	1.54	−1.13	1.02	−0.75
2P	−150± 60	−	−	1.32	0.41	0.88	0.27
3P	−150±120	−	−	1.65	0.14	1.10	0.09
4P	−150±250	−	−	2.36	−0.45	1.57	−0.30
2R	−220± 60	−	−	1.70	0.72	1.13	0.48
3R	−220±120	−	−	2.03	0.45	1.35	0.30
4R	−220±250	−	−	2.74	−0.14	1.83	−0.09
2S	−330± 60	−	−	2.30	1.22	1.54	0.81
3S	−330±120	−	−	2.63	0.95	1.76	0.63
4S	−330±250	−	−	3.35	0.36	2.23	0.24
2T	−470± 60	−	−	3.07	1.85	2.05	1.23
3T	−470±120	−	−	3.40	1.58	2.27	1.05
4T	−470±250	−	−	4.12	0.99	2.74	0.66
3U	−750±120	−	−	4.94	2.84	3.29	1.89
4U	−750±250	−	−	5.65	2.25	3.77	1.50

*2: Nominal values denote the temperature coefficient within a range of 20℃ to 125℃ (for ΔC)/85℃ (for other TC).

GRM Series Specifications and Test Methods (2)

Below GRM Series Specifications and Test Methods (2) are applied to "*" PNs in capacitance table.
In case "*" is not added in capacitance table, please refer to GRM Series Specifications and Test Methods (1) (P.23).

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>B1, B3, F1: −25 to +85℃
R1, R7, C7, D7, E7: -55 to +125℃
C6, R6: −55 to +85℃
F5: −30 to +85℃
C8, D8: −55 to +105℃,</td><td>Reference temperature: 25℃
(B1, B3, R1, F1: 20℃)</td></tr>
<tr><td>2</td><td colspan="2">Rated Voltage</td><td>See the previous pages.</td><td>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, should be maintained within the rated voltage range.</td></tr>
<tr><td>3</td><td colspan="2">Appearance</td><td>No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>4</td><td colspan="2">Dimensions</td><td>Within the specified dimensions</td><td>Using calipers</td></tr>
<tr><td>5</td><td colspan="2">Dielectric Strength</td><td>No defects or abnormalities</td><td>No failure should 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.</td></tr>
<tr><td>6</td><td colspan="2">Insulation Resistance</td><td>More than 50Ω · F</td><td>The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at reference temperature and 75%RH max. and within 1 minutes of charging, provided the charge/discharge current is less than 50mA.</td></tr>
<tr><td>7</td><td colspan="2">Capacitance</td><td>Within the specified tolerance
*Table 1
<table>
<tr><td>GRM155</td><td>B3/R6</td><td>1A</td><td>124 to 105</td></tr>
<tr><td>GRM185</td><td>B3/R6</td><td>1C/1A</td><td>105</td></tr>
<tr><td>GRM185</td><td>C8/D7</td><td>1A</td><td>105</td></tr>
<tr><td>GRM188</td><td>B3/R6</td><td>1C/1A</td><td>225</td></tr>
<tr><td>GRM188</td><td>R7/C8</td><td>1A</td><td>225</td></tr>
<tr><td>GRM188</td><td>B3/R6</td><td>1A</td><td>335</td></tr>
<tr><td>GRM219</td><td>B3/R6</td><td>1C/1A</td><td>475, 106</td></tr>
<tr><td>GRM219</td><td>C8</td><td>1A</td><td>475</td></tr>
<tr><td>GRM21B</td><td>B3/R6</td><td>1C/1A</td><td>106</td></tr>
<tr><td>GRM21B</td><td>R7/C8</td><td>1A</td><td>106</td></tr>
<tr><td>GRM319</td><td>B3/R6</td><td>1C/1A</td><td>106</td></tr>
</table></td><td rowspan="2">The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table.
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>C≦10μF (10V min.)*1</td><td>1±0.1kHz</td><td>1.0±0.2Vrms</td></tr>
<tr><td>C≦10μF (6.3V max.)</td><td>1±0.1kHz</td><td>0.5±0.1Vrms</td></tr>
<tr><td>C>10μF</td><td>120±24Hz</td><td>0.5±0.1Vrms</td></tr>
</table>
*1 However the voltage is 0.5±0.1Vrms about Table 1 items on the left side.</td></tr>
<tr><td>8</td><td colspan="2">Dissipation Factor (D.F.)</td><td>B1, B3, R6*2, R7*3, C7, C8, D8*2: 0.1 max.
F1, F5: 0.2 max.</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Capacitance Temperature Characteristics</td><td>No bias</td><td>B1, B3 : Within ±10% (−25 to +85℃)
F1 : Within +30/−80% (−25 to +85℃)
R6 : Within ±15% (−55 to +85℃)
R1, R7 : Within ±15% (−55 to +125℃)
F5 : Within +22/−82% (−30 to +85℃)
C6 : Within ±22% (-55 to +85℃)
C7 : Within ±22% (−55 to +125℃)
C8 : Within ±22% (−55 to +105℃)
D7 : Within +22/-33% (-55 to +125℃)
E7 : Within +22/-56% (-55 to +125℃)
D8 : Within +22/-33% (-55 to +105℃)</td><td rowspan="2">The capacitance change should be measured after 5 min. at each specified temp. stage.
The ranges of capacitance change compared with the reference temperature value over the temperature ranges shown in the table should be within the specified ranges.*
In case of applying voltage, the capacitance change should be measured after 1 more min. with applying voltage in equilibration of each temp. stage.
*GRM43 B1/R6 0J/1A 336/476 only: 1.0±0.2Vrms
<table>
<tr><th>Step</th><th>Temperature (℃)</th><th>Applying Voltage (V)</th></tr>
<tr><td>1</td><td>25±2 (for R6, R7, C6, C7, C8, D7, D8, E7, F5)
20±2 (for B1, B3, F1, R1)</td><td rowspan="4">No bias</td></tr>
<tr><td>2</td><td>−55±3 (for R1, R6, R7, C6, C7, C8, D7, D8, E7)
−30±3 (for F5)
−25±3 (for B1, B3, F1)</td></tr>
<tr><td>3</td><td>25±2 (for R6, R7, C6, C7, C8, D7, D8, E7, F5)
20±2 (for B1, B3, F1, R1)</td></tr>
<tr><td>4</td><td>125±3 (for R1, R7, C7, D7, E7)
105±3 (for C8, D8)
85±3 (for B1, B3, F1, F5, R6, C6)</td></tr>
<tr><td>5</td><td>20±2 (for B1, F1, R1)</td><td rowspan="4">50% of the rated voltage</td></tr>
<tr><td>6</td><td>−55±3 (for R1)
−25±3 (for B1, F1)</td></tr>
<tr><td>7</td><td>20±2 (for B1, F1, R1)</td></tr>
<tr><td>8</td><td>125±3 (for R1)
85±3 (for B1, F1)</td></tr>
</table>
•Initial measurement for high dielectric constant type
Perform a heat treatment at 150 +0/−10°C for one hour and then set for 24±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>50% of the Rated Voltage</td><td>B1: Within +10/−30%
R1: Within +15/−40%
F1: Within +30/−95%</td></tr>
</table>

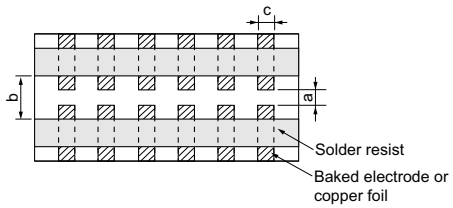
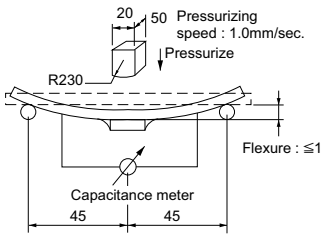
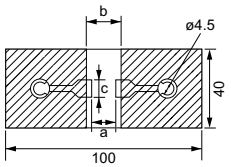
*2: GRM31CR60J107, GRM31CD80G107: 0.15 max.
*3: GRM31CR71E106: 0.125 max.

Continued on the following page.

GRM Series Specifications and Test Methods (2)

Continued from the preceding page.

Below GRM Series Specifications and Test Methods (2) are applied to "*" PNs in capacitance table.
In case "*" is not added in capacitance table, please refer to GRM Series Specifications and Test Methods (1) (P.23).

No.	Item		Specifications	Test Method
10	Adhesive Strength of Termination		No removal of the terminations or other defects should occur.  Fig. 1a	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 1a using an eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. *1N: GRM02, 2N: GRM03, 5N: GRM15/GRM18
11	Vibration	Appearance	No defects or abnormalities	Solder the capacitor on the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should 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, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance	
		D.F.	B1, B3, R1, R6*2, R7*3, C7, C8, E7, D7, D8*2: 0.1 max. C6: 0.125 max. F1, F5: 0.2 max.	
12	Deflection		No cracking or marking defects should occur.  Fig.3a	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2a using an eutectic solder. Then apply a force in the direction shown in Fig. 3a for 5±1 sec. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  t: 1.6mm Fig. 2a (GRM02/03/15: t: 0.8mm)
13	Solderability of Termination		75% of the terminations is to be soldered evenly and continuously.	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion) . Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in an eutectic solder solution for 2±0.5 seconds at 230±5℃ or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.

Type	a	b	c
GRM02	0.2	0.56	0.23
GRM03	0.3	0.9	0.3
GRM15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

*2: GRM31CR60J107, GRM31CD80G107: 0.15 max.
*3: GRM31CR71E106: 0.125 max.

Continued on the following page.

GRM Series Specifications and Test Methods (2)

Continued from the preceding page.

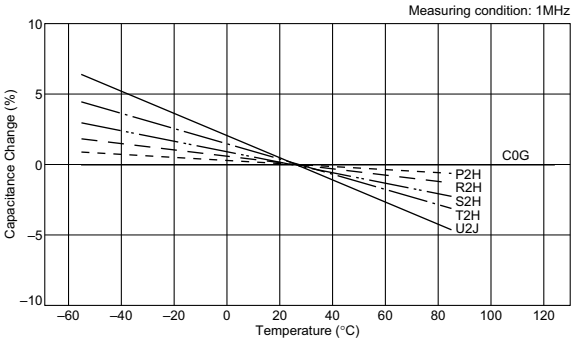
Below GRM Series Specifications and Test Methods (2) are applied to "*" PNs in capacitance table.
In case "*" is not added in capacitance table, please refer to GRM Series Specifications and Test Methods (1) (P.23).

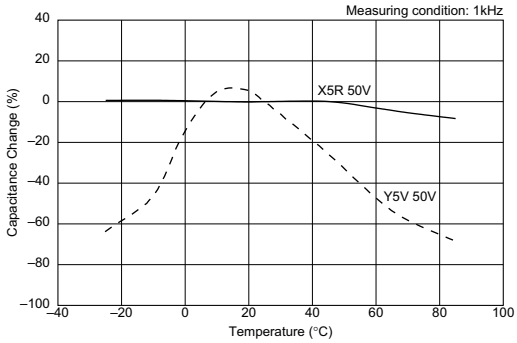
No.	Item		Specifications	Test Method
14	Resistance to Soldering Heat	Appearance	No defects or abnormalities	Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Set at room temperature for 24±2 hours, then measure. ∗Do not apply to GRM02. •Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/−10℃ for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement. ∗Preheating for GRM32/43/55 Step 1: 100 to 120℃, 1 min. Step 2: 170 to 200℃, 1 min.
		Capacitance Change	B1, B3, R1, R6*4, R7, C6, C7, C8, E7, D7, D8: Within ±7.5% F1, F5: Within ±20%	
		D.F.	B1, B3, R1, R6*2, R7*3, C7, C8, E7, D7, D8*2: 0.1 max. C6: 0.125 max. F1, F5: 0.2 max.	
		I.R.	More than 50Ω · F	
		Dielectric Strength	No defects	
15	Temperature Sudden Change	Appearance	No defects or abnormalities	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 shown in the following table. Set for 24±2 hours at room temperature, then measure. Step 1: Temp. (℃) Min. Operating Temp. +0/−3; Time (min.) 30±3 Step 2: Room Temp.; 2 to 3 Step 3: Temp. (℃) Max. Operating Temp. +3/−0; Time (min.) 30±3 Step 4: Room Temp.; 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/−10℃ for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement.
		Capacitance Change	B1, B3, R1, R6, R7, C6, C7, C8, D7, D8: Within ±7.5% E7: Within ±30% F1, F5: Within ±20%	
		D.F.	B1, B3, R1, R6*2, R7*3, C7, C8, E7, D7, D8*2: 0.1 max. C6: 0.125 max. F1, F5: 0.2 max.	
		I.R.	More than 50Ω · F	
		Dielectric Strength	No defects	
16	High Temperature High Humidity (Steady)	Appearance	No defects or abnormalities	Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. The charge/discharge current is less than 50mA. •Initial measurement Perform a heat treatment at 150+0/−10℃ for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement. •Measurement after test Perform a heat treatment at 150+0/−10℃ for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: Within ±12.5% F1, F5: Within ±30%	
		D.F.	B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: 0.2 max. F1, F5: 0.4 max.	
		I.R.	More than 12.5Ω · F	
17	Durability	Appearance	No defects or abnormalities	Apply 150% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3℃. Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement Perform a heat treatment at 150+0/−10℃ for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement. •Measurement after test Perform a heat treatment at 150+0/−10℃ for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: Within ±12.5% F1, F5: Within ±30%	
		D.F.	B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: 0.2 max. F1, F5: 0.4 max.	
		I.R.	More than 25Ω · F	

∗2: GRM31CR60J107, GRM31CD80G107: 0.15 max.
∗3: GRM31CR71E106: 0.125 max.
∗4: GRM153R60G105, GRM188R60J106: Within ±12.5%

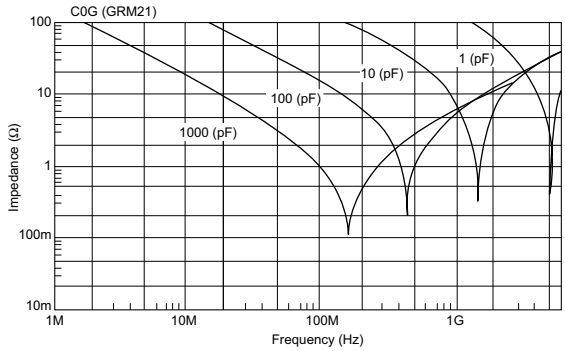
GRM Series Data

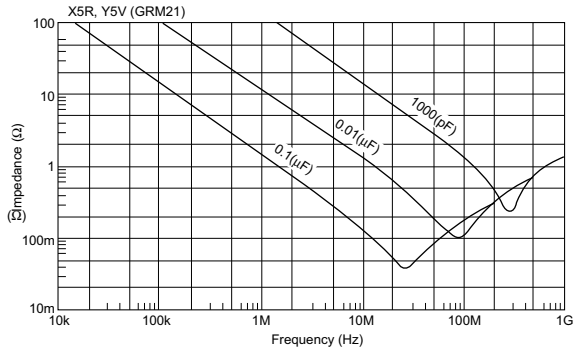
■ Capacitance - Temperature Characteristics



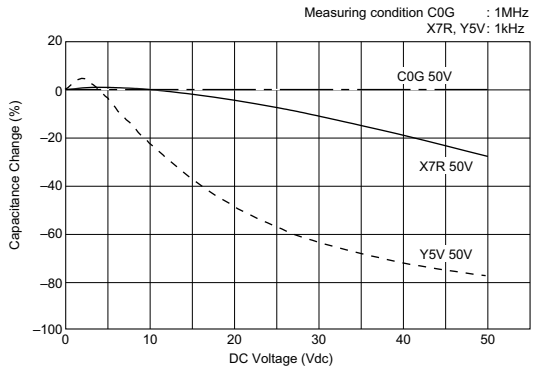


■ Impedance - Frequency Characteristics

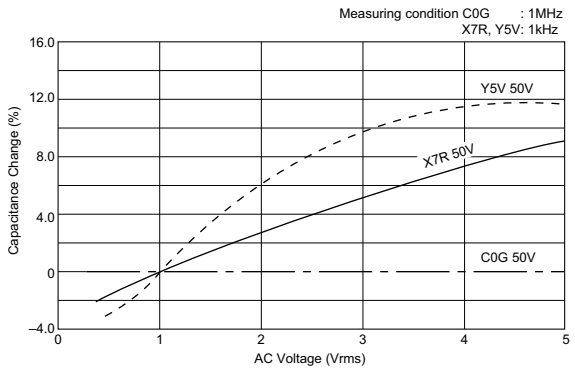




■ Capacitance - DC Voltage Characteristics



■ Capacitance - AC Voltage Characteristics



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GRM Series Data

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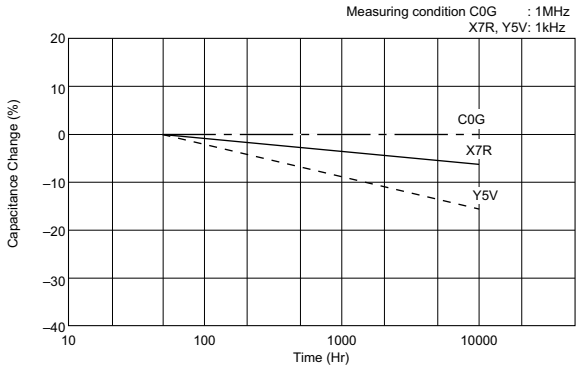
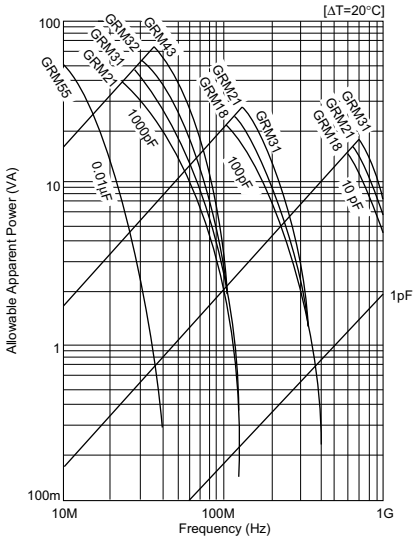
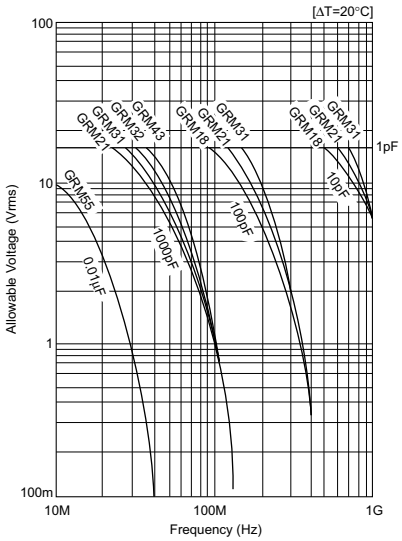
■ Capacitance Change - Aging



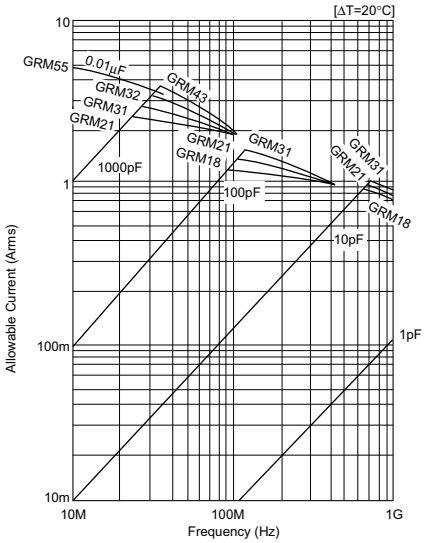
■ Allowable Apparent Power - Frequency



■ Allowable Voltage - Frequency



■ Allowable Current - Frequency



Chip Monolithic Ceramic Capacitors

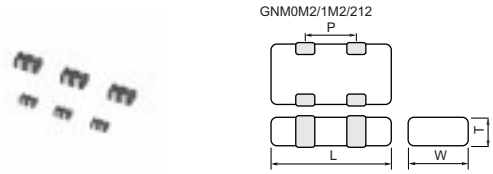
Capacitor Array GNM Series

■ Features

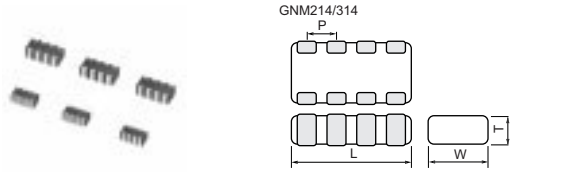
1. High density mounting due to mounting space saving
2. Mounting cost saving

■ Applications

General electronic equipment



Part Number	Dimensions (mm)			
	L	W	T	P
GNM0M2	0.9 ±0.05	0.6 ±0.05	0.45 ±0.05	0.45 ±0.05
GNM1M2	1.37 ±0.15	1.0 ±0.15	0.5 +0.05/-0.10	0.64 ±0.05
			0.6 ±0.1	
			0.8 +0/-0.15	
GNM212	2.0 ±0.15	1.25 ±0.15	0.6 ±0.1	1.0 ±0.1
			0.85 ±0.1	



Part Number	Dimensions (mm)			
	L	W	T	P
GNM214	2.0 ±0.15	1.25 ±0.15	0.6 ±0.1	0.5 ±0.05
			0.85 ±0.1	
GNM314	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	0.8 ±0.1
			0.85 ±0.1	
			1.0 ±0.1	
			1.15 ±0.1	

Temperature Compensating Type C0G(5C) Characteristics

Part Number		GNM1M	GNM21	GNM31	
L x W [EIA]		1.37x1.0 [0504]	2.0x1.25 [0805]	3.2x1.6 [1206]	
Rated Volt.		50 (**1H**)	50 (**1H**)	100 (**2A**)	50 (**1H**)
TC		C0G (**5C**)	C0G (**5C**)	C0G (**5C**)	C0G (**5C**)
Capacitance, Capacitance Tolerance and T Dimension					
10pF (**100**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
15pF (**150**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
22pF (**220**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
33pF (**330**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
47pF (**470**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
68pF (**680**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
100pF (**101**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
150pF (**151**)	**K**	0.6(**2**)	0.6(**4**)	0.8(**4**)	0.8(**4**)
220pF (**221**)	**K**	0.6(**2**)	0.6(**4**)		0.8(**4**)
330pF (**331**)	**K**				0.8(**4**)

The part numbering code is shown in each ( ). The (2) & (4) code in T (mm) means number of elements (two) & (four).
Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type X5R(R6) Characteristics

Part Number		GNM0M			GNM1M					GNM21			GNM31	
L x W [EIA]		0.9x0.6 [0302]			1.37x1.0 [0504]					2.0x1.25 [0805]			3.2x1.6 [1206]	
Rated Volt.		16 (**1C**)	10 (**1A**)	6.3 (**0J**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	16 (**1C**)	10 (**1A**)
TC		X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)
Capacitance, Capacitance Tolerance and T Dimension														
1000pF (**102**)	**M**				0.6(**2**)									
2200pF (**222**)	**M**					0.6(**2**)								
4700pF (**472**)	**M**					0.6(**2**)								
10000pF (**103**)	**M**	0.45*(**2**)	0.45*(**2**)	0.45*(**2**)		0.6(**2**)								
22000pF (**223**)	**M**	0.45*(**2**)	0.45*(**2**)	0.45*(**2**)			0.6(**2**)	0.6(**2**)						
47000pF (**473**)	**M**	0.45*(**2**)	0.45*(**2**)	0.45*(**2**)			0.6(**2**)	0.6(**2**)						
0.10µF (**104**)	**M**	0.45*(**2**)	0.45*(**2**)	0.45*(**2**)				0.6(**2**)						
0.22µF (**224**)	**M**						0.8*(**2**)							
0.47µF (**474**)	**M**									0.85(**2**)				
1.0µF (**105**)	**M**						0.8*(**2**)	0.5*(**2**)	0.8*(**2**)	0.85(**2**)	0.85*(**4**)	0.85*(**4**)	0.85(**4**)	0.85(**4**)
2.2µF (**225**)	**M**							0.8*(**2**)	0.8*(**2**)		0.85*(**2**)	0.85*(**2**)		

The part numbering code is shown in each ( ). The (2) & (4) code in T (mm) means number of elements (two) & (four).
Dimensions are shown in mm and Rated Voltage in Vdc.
*: Please refer to GNM Series Specifications and Test Methods (2)(P.40)

High Dielectric Constant Type X7R/7S(R7/C7) Characteristics

Part Number		GNM1M					GNM21			GNM31			
L x W [EIA]		1.37x1.0 [0504]					2.0x1.25 [0805]			3.2x1.6 [1206]			
Rated Volt.		50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)		50 (**1H**)	25 (**1E**)	16 (**1C**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	6.3 (**0J**)
TC		X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)
Capacitance, Capacitance Tolerance and T Dimension													
470pF (**471**)	**M**						0.6(**4**)						
1000pF (**102**)	**M**	0.6(**2**)					0.6(**4**)						
2200pF (**222**)	**M**		0.6(**2**)					0.6(**4**)					
4700pF (**472**)	**M**		0.6(**2**)					0.6(**4**)					
10000pF (**103**)	**M**		0.6(**2**)					0.6(**4**)					
22000pF (**223**)	**M**			0.6(**2**)	0.6(**2**)				0.85(**4**)				
47000pF (**473**)	**M**			0.6(**2**)	0.6(**2**)				0.85(**4**)	0.85(**4**)		1.0(**4**)	
0.10µF (**104**)	**M**			0.6(**2**)		0.6(**2**)			0.85(**4**)	0.85(**4**)	0.85(**4**)	1.0(**4**)	
1.0µF (**105**)	**M**												1.15(**4**)

The part numbering code is shown in each ( ). The (2) & (4) code in T (mm) means number of elements (two) & (four).
Dimensions are shown in mm and Rated Voltage in Vdc.

GNM Series Specifications and Test Methods (1)

Below GNM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GNM Series Specifications and Test Methods (2) (P.40).

No.	Item	Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
1	Operating Temperature Range	5C: –55 to +125°C	R7, C7: –55 to +125°C R6: –55 to +85°C	
2	Rated Voltage	See the previous pages.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance	No defects or abnormalities		Visual inspection
4	Dimensions	Within the specified dimensions		Using calipers
5	Dielectric Strength	No defects or abnormalities		No failure should be observed when 300% of the rated voltage (5C) or 250% of the rated voltage (R7) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance	More than 10,000MΩ or 500Ω · F (Whichever is smaller)		The insulation resistance should 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/Q/D.F. should be measured at 25°C at the frequency and voltage shown in the table.
8	Q/ Dissipation Factor (D.F.)	30pF min.: Q≧1000 30pF max.: Q≧400+20C C: Nominal Capacitance (pF)		

Char.	25V min.	16V	10V	6.3V
R7, R6, C7	0.025 max.	0.035 max.	0.035 max.	0.05 max.

Item \ Char.	5C	R7
Frequency	1±0.1MHz	1±0.1kHz
Voltage	0.5 to 5Vrms	1.0±0.2Vrms

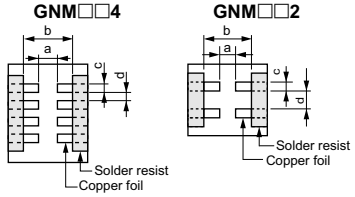
No.	Item		Specifications	Test Method
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A)	The capacitance change should be measured after 5 min. at each specified temperature stage. (1) Temperature Compensating Type The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step1 through 5, the capacitance should 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 steps 1, 3 and 5 by the cap. value in step 3.
		Temperature Coefficent	Within the specified tolerance (Table A)	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.)	
10	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 5N force in parallel with the test jig for 10±1 sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.

Char.	Temp. Range	Reference Temp.	Cap. Change
R7	–55°C to +125°C	25°C	Within ±15%
R6	–55°C to +85°C		
C7	–55°C to +125°C		Within ±22%

Step	Temperature (°C)
1	25±2
2	–55±3 (for 5C/R7/C7), –30±3 (for F5)
3	25±2
4	125±3 (for 5C/R7/C7), 85±3 (for F5)
5	20±2

(2) High Dielectric Constant Type
The ranges of capacitance change compared with the above 25°C value over the temperature ranges shown in the table should be within the specified ranges.

GNM□□4 GNM□□2



Type	a	b	c	d
GNM1M2	0.5	1.6	0.32	0.32
GNM212	0.6	1.8	0.5	0.5
GNM214	0.6	2.0	0.25	0.25
GNM314	0.8	2.5	0.4	0.4

(in mm)

Fig. 1

Continued on the following page.

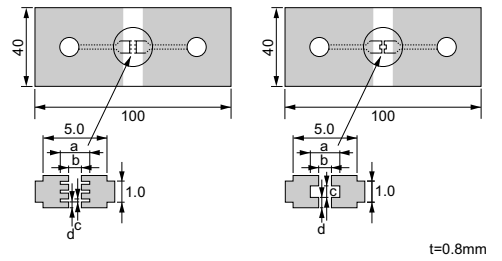
GNM Series Specifications and Test Methods (1)

Continued from the preceding page.

Below GNM Series Specifications and Test Methods (1) are applied to Non "*" PNs in capacitance table.
In case "*" is added in capacitance table, please refer to GNM Series Specifications and Test Methods (2) (P.40).

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
11	Vibration Resistance	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). The capacitor should 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, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance		
		Q/D.F.	30pF min.: Q≧1000 30pF max.: Q≧400+20C C: Nominal Capacitance (pF)	Char. / 25V min. / 16V / 10V / 6.3V R7, R6, C7 / 0.025 max. / 0.035 max. / 0.035 max. / 0.05 max.	
12	Deflection		No cracking or marking defects should 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 direction shown in Fig. 3 for 5±1 sec. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
13	Solderability of Termination		75% of the terminations are to be soldered evenly and continuously.		Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). 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 or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours, then measure. • Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R7, R6, C7: Within ±7.5%	
		Q/D.F.	30pF min.: Q≧1000 30pF max.: Q≧400+20C C: Nominal Capacitance (pF)	Char. / 25V min. / 16V / 10V / 6.3V R7, R6, C7 / 0.025 max. / 0.035 max. / 0.035 max. / 0.05 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)		
		Dielectric Strength	No failure		

•GNM□□4 •GNM□□2



Type	a	b	c	d
GNM1M2	2.0±0.05	0.5±0.05	0.32±0.05	0.32±0.05
GNM212	2.0±0.05	0.6±0.05	0.5±0.05	0.5±0.05
GNM214	2.0±0.05	0.7±0.05	0.3±0.05	0.2±0.05
GNM314	2.5±0.05	0.8±0.05	0.4±0.05	0.4±0.05

(in mm)

Fig. 2

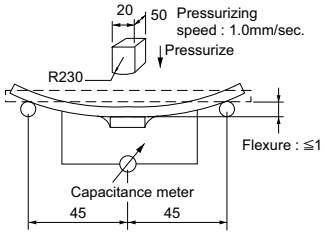


Fig. 3

Continued on the following page.